

Department of Physiotherapy, Faculty of Health Science

Interdisciplinary Rehabilitation

edited by

Sławomir Jarzab

Małgorzata Paprocka-Borowicz

Andrzej Pozowski



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Wroclaw Medical University

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Prospects of Health Resort Therapy Among Patients with Rheumatoid Arthritis

Możliwości stosowania lecznictwa uzdrowiskowego wśród chorych na reumatoidalne zapalenie stawów

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Abstract

Health resort therapy finds its usage in a treatment and complex chronic patients rehabilitation, where the most numerous group is represented by rheumatoid disease patients, especially those suffering from rheumatoid arthritis (RA). Elementary forms of health resort therapy are based on implementation of mineral resources. In addition, climate and landscape conditions, which create environment advantageous to healing, are important in this recovery therapy. Health resort healing methods founded on application of natural resources are complemented to diverse forms of kinesiotherapy and physiotherapy. Complex use of mentioned methods meaningfully supports course of essential pharmacological therapy, however positive effects of balneological cure allow to reduce dose of administered analgesics and anti-inflammatory medications. Life of patients with rheumatoid arthritis is accompanied by pain and difficulties in performing ADLs (activities of daily living) because of muscular contractures, inflammatory joint oedema, decreased ROM (range of motion) and joint stiffness. As a result, physical domain of QoL (Quality of Life) is underestimated. According to professional literature, health resort therapy gives positive effects to healing process of rheumatoid arthritis patients, such as: relieve in pain impression and joint oedema, decrease in morning joint stiffness, increase in joint ROM and muscle strength. Laboratory RA-indicators are improved, what is confirmed by reduction of inflammatory process' activity. Effects measurement of leading health resort therapy is a general improvement in well-being and efficiency of ADLs and rising of health-related quality of life domain's assessment.

Key words: rheumatoid arthritis, health resort therapy.

Streszczenie

Lecznictwo uzdrowiskowe znajduje zastosowanie w leczeniu i kompleksowej rehabilitacji osób przewlekle chorych, spośród których największą grupę stanowią pacjenci z chorobami reumatycznymi, w tym chorzy z reumatoidalnym

zapaleniem stawów (r.z.s.). Podstawowe formy leczenia uzdrowiskowego są oparte na wykorzystywaniu naturalnych surowców. Poza tym istotne znaczenie dla terapii uzdrowiskowej mają warunki klimatyczne i krajobrazowe, które tworzą środowisko przyrodnicze sprzyjające leczeniu. Uzdrowiskowe metody lecznicze oparte na stosowaniu tworzyw naturalnych są uzupełniane różnymi formami kinezyterapii i metodami fizjoterapeutycznymi. Kompleksowe zastosowanie wszystkich tych metod znacząco wspiera przebieg niezbędnego leczenia farmakologicznego, często jednak osiągnięte pozytywne rezultaty kuracji balneologicznej pozwalają na zmniejszenie ilości przyjmowanych przez pacjentów leków przeciwbólowych i przeciwzapalnych. Chorym z reumatoidalnym zapaleniem stawów w codziennym życiu towarzyszy ból, liczne utrudnienia w wykonywaniu podstawowych czynności związane z przykurczami mięśni, obrzękami stawów, ograniczeniem ruchów w stawach, a także z powodu deformacji stawów. Dlatego też większość z nich nisko ocenia fizyczną dziedzinę jakości życia. Z literatury wynika, że leczenie uzdrowiskowe u pacjentów z r.z.s. daje pozytywne rezultaty w postaci złagodzenia dolegliwości bólowych i obrzęków stawów, zmniejszenia sztywności porannej, zwiększenia zakresu ruchu w stawach i siły mięśni. Poprawiają się także wskaźniki laboratoryjne, co potwierdza zmniejszenie aktywności procesu zapalnego. W wyniku zastosowanej kompleksowej terapii uzdrowiskowej następuje ogólna poprawa samopoczucia pacjentów, sprawności w wykonywaniu codziennych czynności, podniesienie oceny wskaźników jakości życia zależnych od zdrowia.

Słowa kluczowe: reumatoidalne zapalenie stawów, lecznictwo uzdrowiskowe.

Introduction

RA is a chronic, incurable, inflammatory disorder leading to loss of functioning and disability. It is one of the most common arthropathies. About 20 million of the world's population, 8 million in Western Europe and about 400 thousand of people in Poland are afflicted by RA. Every year, about 8 to 16 thousand of new cases are noted in Poland. The disease incidence appears to be greater in patients between 30 to 50 years of age [9]. It is a disabling and painful condition and together with its progress patients are not longer able to work and live an active and social life, relationships are being weakened. Hardship of daily life, fears of future consequences of the disease and lack of RA acceptance result in states of low mood or even depression. The cause of rheumatoid arthritis is unknown, so there is no effective method of treatment hence focusing on alleviating present symptoms and preventing joints' destruction. For these reasons variety of therapeutic methods are in use: pharmacological therapy, physiotherapy, psychological and social therapy and health resort therapy. The aims of such complex RA therapy are: pain relieving, reduction of inflammatory process activity, fitness increase by muscles power strengthening increasing range of movements, prevention of joints deformation and muscle contractures, preparation of patients to live with RA and reduce their fears and stress level.

The objective of this publication is to present prospects of health resort therapy and its influence on Quality of Life of patients with RA.

The most important therapeutic procedures in RA are: control of the inflammatory process, a long-term support to maintain good range of movements,

prevention of the general deterioration, joints deformation and muscular atrophy. All these goals could be achieved by the complex therapeutic rehabilitation. Comprehensive therapy based on variety of methods should be chosen according to present patient's condition.

Methods of RA therapy:

- pharmacological therapy adequate to symptoms in order to reduce the RA development and its destructive effects on locomotor system [1, 7, 9, 11, 21],
- kinesiotherapy,
- physical therapy,
- climate therapy and balneology (health resort therapy),
- psychotherapy,
- surgery treatment,
- orthopaedic support.

Health resort therapy is a continuation of the ambulatory or hospital treatment. Sanatorium cure is a long-term (several weeks), complex rehabilitation and therapeutic management run by specialists in a different from home environment which gives opportunities of total relaxation and simultaneous recreation of the healing process and rehabilitation. A distinct feature of health resort therapy is a complex action on the whole body using natural resources and local climate properties. Basis of the health resort therapy is balneology – branch of medical science concerned with therapeutic value of baths, especially those taken in natural mineral waters and other resources: peloids (moor peat, peat), gases and climate stimuli. Health resort therapy is not a rivalry for pharmacological treatment, it is a supplementation.

The assignments of health resort therapy are: healing chronic diseases, physical and psychological rehabilitation, primary and secondary prophylaxis, self-care and life style correction and better self-control [14]. Methods of health resort therapy are characterised as therapeutic stimuli aiming at the functional reserves of the body by elicitation of the adaptive and compensatory reactions. As the consequences, regulation mechanisms of physiological system get stronger and more efficient with quicker regeneration processes. Intensity of these therapeutic stimuli depend on many factors as well as positive patient's reaction – regarding his/her age, type and progression of the disease, general psychophysical condition and frequency, strength and character of therapeutic stimuli. Systematic administration of individually matched procedures influence on general improvement in body functioning and local symptomatic relief [12, 13].

The head goals of health resort therapy are: prevention from joints deformation, muscle contractures, betterment in ROM (range of movements) and fitness level and relaxation of fixed muscle contractures [2, 3, 12]. Reduction of inflammatory process leads to regional pain relieve, cardiovascular circulation improvement and consequently lifts mood.

Indications and contraindications to balneological therapy divide into general (connected with health resorts profiles) and particular (connected with the nature of a disease) [12–14,].

Particular indications in health resort therapy [2, 3, 12]:

- degenerative peripheral joint disease: minor joints – slight or medium ROM restriction; major joints – slight ROM restriction;
- spondyloarthritis: slight and moderate ROM restriction;

- chronic rheumatic pain syndrome: bursitis, tendinous synovitis, fasciitis, myositis;
- arthritis with spinal cord arthritis: Reiter's syndrome, psoriatic arthritis, ankylosing spondylitis – slight ROM restrictions and slight joint degeneration;
- RA in the 1st, 2nd, 3rd stage of physical activity and all phases of radiological progression;
- other connective tissue diseases: Sjögren's syndrome, rheumatic polymyalgia, circumscribed scleroma;
- metabolic diseases with joint degeneration during remission: arthritis urica, chondrocalcinosis;
- post-surgery states in rheumatic diseases.

Patients requiring intensive care and those unable to perform self-care cannot be qualified to health resort therapy.

General contraindications to health resort therapy include some diseases, which can unexpectedly aggravate or affect other systems or organs.

Suggested diseases: acute and chronic contagious diseases, surgery required diseases, uncontrollable hypertension, advanced heart and/or respiratory failure, full-symptom hepatic and renal failure, advanced hyperthyroidism, severe haemorrhagic diseases, psychiatric problems, dementia, alcoholism, drug addiction, frequent epileptic attacks, active cancer, pregnancy and lactation [12, 13].

Particular contraindications are closely connected with particular indications – depending on the phase of the disease and general patient's condition.

Particular contraindications [12–14]:

- RA in the 4th stage – bedridden patient, lack of self-care,
- acute phase of RA – fever, heavy oedema of joints, recent inflammatory effusion,
- advanced seizure of internal organs in the course of rheumatoid diseases,
- surgery required conditions for example prolapse of the nucleus pulposus of the spine,
- acute and chronic infectious otitis and arthritis.

Health resort therapy takes advantage of several specific and unspecific curative methods applied at the same time and if administered correctly, they bring desired effects of balneological therapy [13].

Foreground role play natural specific methods based on hydrotherapy, kinesiotherapy, physiotherapy and massage. In the complex health resort therapy they are supported by other unspecific methods supplementary to mentioned ones and represented by: pharmacotherapy, individualized diet, psychotherapy and health education [12, 13].

Balneotherapy is a basic method used in health resort therapy taking advantage of mineral waters, peloids and therapeutic gases [14].

The most useful in a healing process are following mineral waters [13, 14]:

- saline waters – contain significant amounts of dissolved salts (NaCl) and iodides, bromides, rarely magnesium, iron and sulphur,
- bicarbonate waters – rich in natural, free and bound carbon dioxide and bicarbonates of other elements,
- sulphur waters – rich in sulphur compounds, hydrogen sulphide, polysulphide, colloidal sulphur,
- radio-active waters – with radioactivity at least 74 Bekerele/dm³,

- thermal waters (thermes) – low-mineralised waters, with outflow temperature higher than 20°C.

In rheumatic diseases, all mentioned waters are of high value but in RA therapy mainly saline and sulphur waters are of the most usage [2].

Peloid therapy involves highly concentrated compounds of minerals such as purified therapeutic mud or peat and applying them to the body during thermal therapy. The fresh mud comprises of decomposed aquatic plants. Medicinal mud (peloids) is a natural product (water sediments, peat sediments of bogs and mud volcanoes). Peloids are formed under the influence of microorganisms, since they are saturated with biogenic components (nitrogen, sulphur, carbon).

The health resort's physician decide of mud concentration applied to patient's skin at around 40 degrees of Celsius. The effect of the hot mud is very relaxing to muscles, reducing local swelling around joints, muscle tension and strengthening anti-inflammatory activity and immune processes of the body. The curative effect of mud is a combination of heat, mechanical and chemical factors and depends not only upon the initial patient's condition but also physical and chemical characteristics as well. Peloids have a positive effect in the cases of chronic inflammation and pains. The mud treatment has also a bio-stimulating effect activating metabolism and cells renovation and helps to remove toxins and surplus of water from the organism. The mud procedures create a feeling of deep relaxation and pleasant languor [2, 14].

In RA therapy, it is contraindicated to overheat patient's body, so the mud is used at neutral temperature – roughly 38°C [3].

Peat has specific bacteriostatic and anti-inflammatory properties as:

- heating activity: anti-inflammatory, analgesic, muscle relaxation [3, 17],
- mechanical activity: lymph outflow from intercellular space, facilitation of effusion absorption [3, 17];
- sorption-exchange activity: immunomodulation, anti-inflammatory [3, 17].

Kinesiotherapy is defined as the application of specific, medically proved exercises adapted to enhance strength, endurance, and mobility of individuals with functional limitations or those requiring extended physical conditioning. In RA therapy, it is a basic form of therapy, which prevents from contractures, muscular atrophy, ligament weakness, enhancing ROM and muscle strength and providing with better fitness and life-activity condition. In local kinesiotherapy, actions are focused on particular organ/system through exercises, such as: passive, active-passive, active, isometric, assisted, manual and loaded [5, 6, 9].

Physiotherapy is a group of methods taking advantage of variety forms of natural energy and physical factors (solar radiation) and artificial physical factors generated by different appliances [10].

Basic methods of physiotherapy are as follows [5, 10, 13, 14]:

- phototherapy: infrared, ultraviolet and visible radiation, laserotherapy,
- ultrasound therapy,
- magnetic therapy,
- hydrotherapy: pearl baths, hydromassages, whirlpool baths, showers,
- heat therapy (paraffin compresses) and kriotherapy (general and local),
- electrotherapy:
 - direct current: electroplating, iontophoresis, hydroelectric bathes,

- low frequency alternating current: electrostimulation, diadynamic current,
- medium frequency alternating current: Nemeo interference current,
- high frequency alternating current: short-wave diathermy, alternating diathermy,
- medical massage: classic (dry), underwater (hydro-air massage).

The purposes of those procedures are: improvement of peripheral circulation, muscle tension strengthening and reducing contractures, relieving joint and local tissues pain. In case of RA therapy the best effects give physiotherapy, especially magnetotherapy, ultrasound therapy, kriotherapy, electrotherapy (iontophoresis) [5, 10, 13, 14, 16, 19].

Diet therapy is an unspecific form of treatment but very important in health resort therapy [8]. Along with the main disease, there are frequent additional diseases and complaints which require specially prepared diet. For patient with RA a proper food may alleviate the disease process and slowing down its progress.

Long-term studies, conducted by Swedish scientists, showed that meat elimination from the diet is beneficial for RA patients [18]. Since the most advisable is non-meat diet (vegetarian) with addition of fat rich sea fish which are a vast source of poli-unsaturated fatty acids which are proved to improve ROM and decrease pain level. Unsaturated fatty acids provide the body with selenium, calcium, iodine and easy-assimilating proteins. It is important to eliminate histamine precursors from the diet, since it is a mediator of inflammatory process in rheumatic diseases. Whereas, vegetables and fruits, as a part of the diet, present very significant source of vitamins, especially vitamin C – an antioxidant which takes part in collagen production. Collagen restricts inflammation enzymes activity and helps in joint regeneration. The sources of collagen are: fruit jelly, fish in jelly, powdered shark cartilage – available at chemists'. Some vegetables (garlic, onion) containing sulfur compounds, restricting secretion of hormones responsible for the inflammation process. Important ingredients of the diet are spices with anti-inflammatory, pain relieving and edema-stiffness-reducing features (for example: anise, ginger, curcuma, clove) [8, 18].

Health resort therapy as a combination of several healing methods conducted in different environments, having a positive impact on patients' physical and mental state. Usually that form of therapy is lacking side effects [3].

Standard curative program consists of saline and sulfur baths, moor peat compression, local kriotherapy, electrotherapy (iontophoresis, diadynamic current), magnetotherapy and laser therapy, massages, kinesiotherapy, diet therapy, pharmacotherapy and health education. All these actions influence positively on inflammatory processes and correlated symptoms reduction and patient's condition improvement [15, 16].

After health resort specialists' experience and years of observations it is stated that health resort therapy brings benefit to patients' condition and Quality of Life (QoL) [4]. Among natural resources are sulfur waters, which in RA curative therapy, has an anti-inflammatory effect by decreasing copper level and increasing iron level in blood serum. Such waters influence peripheral circulation positively. It has been proved that 93% of examined patients voiced better arterial perfusion in fingers. About 77% of patients benefit from health resort therapy

and gain an improvement in health condition, and up to several years remission of the disease [4, 15].

Health resort therapy – aimed at rheumatic diseases – is highly recognisable and widely used in many countries. In one edition of ‘Polish Balneology’ (2008) there were presented effects of balneological therapy in some rheumatic diseases (including RA) performed in region of the Dead Sea [20]. In that region, sea water with high salt concentration about 345 g/l, thermal waters, moor peat deposits and unique climate (high barometric pressure over 791 mm/Hg, air with higher concentration of the oxygen, high and constant air temperature without changes in humidity, more insolation) are used in health resort therapy. Series of studies confirmed health benefits in patients, who underwent a session in these resorts [20].

In health resort therapy interactions between patient and medical team are essential. The patient should feel safe, relaxed and believe in efficacy the healing process. The presence of welcoming people make patient to feel comfortable and not alone with their problems.

According the analysis of literature, it is proved that health resort therapy in RA patients brings positive effects: minimising pain, morning joint stiffness and oedema, improving ROM and muscle tension. That reflects in laboratory parameters, reduce activity of the inflammatory process, improving patients’ general health condition and indicators of the health related QoL.

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Karolina Frączyk, Sandra Grancaris, Marek Jagodziński

Amputations in Vascular Illnesses. Complex Physiotherapy Proceedings at Patients After Amputation and Using the Artificial Limb

Amputacje w chorobach naczyniowych. Kompleksowe postępowanie fizjoterapeutyczne u pacjentów po amputacji oraz zaprotezowaniu kończyny

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Abstract

Amputations which are result of illnesses of peripheral vessels are the most group of amputations within ground of lower limbs. They make as much as 70–80% of all operations and they are mainly result of senescence of society. It is especially weighty problem in social depiction, because the amputations apart from handicap of patient's living functions may cause trauma. Indispensable element of post-amputation procedure, which has to reduce a handicap of patient's motor functions and improve the quality of his life is a complex rehabilitation. A purpose of our work is to bring closer patient's problems after an amputation and process of enhance after operation. We also discussed illnesses which are the causes of amputation of limbs and separation of techniques of vessel amputation.

Key words: vessel amputation, complex rehabilitation, artificial limb.

Streszczenie

Amputacje wynikające z chorób naczyń obwodowych są największą grupą amputacji w obrębie kończyn dolnych. Stanowią aż 70–80% wszystkich przeprowadzonych zabiegów i wynikają głównie z powodu starzenia się społeczeństwa. Jest to szczególnie poważny problem w ujęciu społecznym, ponieważ zabieg odjęcia kończyny, poza upośledzeniem funkcji życiowych pacjenta, może powodować także urazy psychiczne. Nieodzownym elementem postępowania poamputacyjnego, mającym służyć zmniejszeniu upośledzenia funkcji ruchowych i polepszeniu jakości jego życia, jest kompleksowa rehabilitacja. Celem pracy jest przybliżenie problemów pacjenta po amputacji kończyny i procesu usprawniania po zaprotezowaniu. Omówiono również choroby będące przyczyną dokonywania odjęć kończyn oraz odrębność technik amputacji naczyniowych.

Słowa kluczowe: amputacja naczyniowa, kompleksowa rehabilitacja, proteza.

Introduction

The largest group of amputation in the lower limbs is associated with peripheral vascular disease. They are about 70–80% of all performed amputations and are the result mainly due to an aging population. Primarily affects individuals over 50 years of age. Most are occupied both lower limbs, upper limbs seizure is very rare. Often limb amputation is necessary in order to save lives, but the surgery usually performed to restore function lost the rest of the limb due to ischemia [2, 12].

Chronic Peripheral Vascular Disease

Diabetes

Diabetes is the cause of a quarter of all major amputations due to peripheral circulatory disorders in lower limbs [12].

Irregularities in vascularization are associated with atherosclerosis and arterial occlusion, ischemia, soft tissue and bones of the foot, as well as foci of necrosis. Damage to the foot is determined as ischemic diabetic foot syndrome. Peripheral arterial occlusive disease in patients with diabetes, it usually concerns the arteries below the knee and small arteries feet. The presence of diabetes contributes to degenerative disease of the foot – change of foot shape, calluses, infections, necrosis, threatening the whole organism. Early symptoms of ischemic diabetic foot are dry and cracking skin, hair and tissue atrophy, decreased pulse in the arteries: the dorsal pedal and posterior tibial, bruising fingers or feet after leaving the extremities, pallor after lifting legs above the level of the body. Late symptoms are associated with malnutrition and disappearance of foot. The weakness or deterioration of the pulse, are already discernible at the level of the popliteal and femoral arteries.

Estimated, in Poland because of diabetes is made about 2400 amputations yearly. Risks associated with amputation in the background of diabetes are 20 times higher than in the absence of its occurrence [8].

Buerger's Disease (TAO, Thromboembolism – Occlusive Vasculitis)

Burger's disease represents approximately 7% of all cases obliterative – inflammatory diseases of the arteries in patients 50 years of age. The onset of illness usually occurs in 3-4 decade of life, mainly in men smoking cigarettes.

TAO is a segmental, not atheromatous disease of arteries and veins of the lower limbs and upper, medium size. Initial symptoms include excessive fatigue and leg pain, redness of the abandoned limbs and paleness raised. A typical symptom is sensitivity to cold, associated with ischemia, or increased activity of sympathetic fibers. In approximately 40% of patients occurs Raynaud's phenomenon. In the more severe form observed hardness of skin, gangrene of the toes or entire feet.

Vasoconstriction are located piecewise and the possibility of recanalization is rare. Therefore, if patient do not stop smoking cigarettes, there is a very high risk of amputation [1, 8].

Occlusive Arterial Disease (Arteriosclerosis Obliterans)

It is a chronic occlusive arterial disease, including calcification of blood vessel walls, while the accumulation of cholesterol in arterial lining. Formerly, athero-

sclerosis was associated with coronary heart disease, now known that it occurs beyond the area of the coronary arteries, causing peripheral arterial disease. This in turn limits the mobility and causes not-healing ulceration, rest pain and gangrene of limbs. In some patients with atherosclerotic, stenosis progressed to total occlusion vessel, restricting blood flow to the extremities, causing muscle ischemia and hypoxia, causing pain. Limbs are pale, they are cold faster, hair disappears and there is no detectable pulse in some arteries. In advanced forms, occurs shortening and claudication pain at rest, especially at night.

To rescue the ischemic limb-threatening gangrene, applies vascular procedures, which in 40-50% of patients give a chance to avoid amputation [1].

Acute Circulatory Disorders of Peripheral

Venous Gangrene

Nowadays, thanks to effective thrombolytics, significantly decreased the frequency of the decision to amputate in the course of venous gangrene. If necessary to limb amputation, it should be postponed until a clear line of demarcation – the difference in skin color and temperature [12].

Arterial Embolism

Arterial embolism may be the cause of acute limb ischemia, even in people with normal peripheral circulation. It means sudden closure of the lumen by plug run by the blood stream. Characteristic localizations of arterial blockages are their bifurcation. Most blockages occur at the bifurcation of the common femoral artery, next the iliac and popliteal arteries.

Over 80% of arterial embolism can be removed surgically, mainly by using the Fogarty catheter introduced into the artery in the groin area. If treatment fails, amputation is necessary [12].

Appointing the Height of Amputation

About the choice of the amputation level decides patient's general condition and the local state of the limb, the potential rate of healing of the stump and the ability to walk using an artificial limb.

If a patient is infirm, and his potential for walking and self-service is low, is preferred above the knee amputation, because care of stump is easier. When it is obvious that a patient after amputation shall be able of independent locomotion, limbs should be amputated below the knee.

There are several components which determine level of amputation: limb temperature, pharmacological function tests, oscillometry, arteriography, plethysmography, intraoperative introspection, patient's clinical condition [13].

The Surgical Technique of Vascular Amputations

Nowadays departs from the application of the guillotine amputation, consisting of the section at one level all the tissues and bones. Circular technique of amputation is done by cutting of soft tissue below the bone, to prevent the exposure of the bone stump. During the treatment of amputation an should be paid to the adequate supply of the skin, muscles, nerves, blood vessels and bone. After the amputation, it is assumed sterile dressing then elastic bandage, using moderate pressure. It's important to immobilise the nearest joint, to model stump, pre-

vent the accumulation of hematoma, not cause abnormal blood flow, allow for the controlled compression, shaping and hardening and stump care [13].

Psychological Preparation Prior to Amputation

Amputation is irreversible loss of body parts, so the patient has to be prepared for surgery and life after amputation, after which the social situation is radically changed. Almost 80% of patients pass on the pension. Until then, they are staying for nearly a year on sick leave, which lowers their standard of living [3]. It is therefore essential for the patient to accept his disability and believe in the possibility of independence during use of dentures and an active social life [9].

General-keep-fit Preparation Before Amputation

When it is decided the need for amputation, the patient is implemented a series of exercises aimed at strengthening the muscles of the arms and legs and improve physical fitness. Through the active exercises of the lower limbs remains normal movement in joints, prevents contractures. Second lower limb is weakened (in particular strength of the extension of the knee is weakening, because of limiting the mobility), so it is necessary to take care of its condition. It is essential to increase the mobility of torso (rotation from the back to sides, sitting and moving in a sitting position). To improve blood flow in the extremities, special exercises called Burger's training are introduced, which consists in high, low and indirect setting of the affected limb [6].

Defects and Illness of Stumps

They most often come into existence because of the bad technique of cutting off the limb, wrong proceedings post-operative, bad hygiene, not good applying the artificial limb. They most often concern the shape, setting and movements of stump, quality of scars and external coatings, circulatory, and tenderness.

Often at the end of the stump protrudes tip of the bone covered in most cases with the cicatricial and painful tissue. Then the protruding bone is removed, the muscles are sewn up on the peak and the tip of the stump is covered with the healthy skin with the moderate tension.

Stumps with disorders of the circulation are cyanosed, cold, excessively hidrotic, swelled, sensitive for the oppression and coldly, during the normal oppression can cause ischemic manifestations in the form of trophic ulcerations and intense pains. Then it is necessary to apply curing illness of peripheral arteries and careful fitting the artificial limb with a maximum burden on the buttocks and sciatic tumor. Stumps with disorders of the venous circulation, should be bandaged and it is necessary to perform physical treatments and exercises, improving the outflow of the venous blood [5, 6].

Rehabilitation After Amputation

Rehabilitation is a continuous process, it begins before the decision on removal of the limb, until restoration of the patient to the adequate physical and mental efficiency.

In preparing the patient for a smooth move in a wheelchair or on crutches, it is important to strengthen the muscles of the upper limbs. Exercises are performed on parallel bars, patient learns to walk using elbow crutches, move off

the bed to wheelchair and back. To increase the efficiency of muscle stump, is amended as resistance exercises.

The period after the amputation the stump is being prepared for artificial limb, mainly through the formation with the use of special nets and bandages and through hardening [5].

Bandaging

For bandaging the stump are used stretchy bands about the breadth dependent on the size of the stump. Oppression of the bandage on the soft tissues should cause them to shrinkage. Stump should be bandaged to the moment of application of artificial limb, at least 3 times per day it is necessary to change bandage on stump, in order to avoid loosening [3].

Below are shown ways of bandaging stumps after amputation at the thighs level.

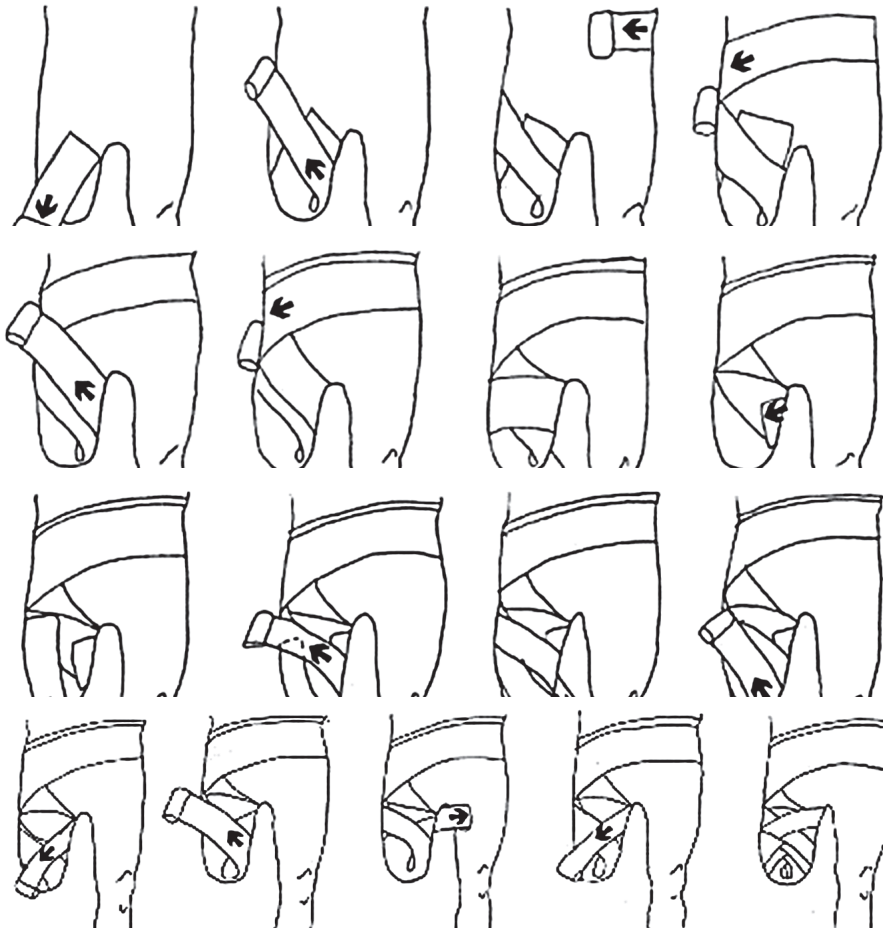


Fig. 1. Bandaging the stump after amputation at the thigh level [10]

Hardening

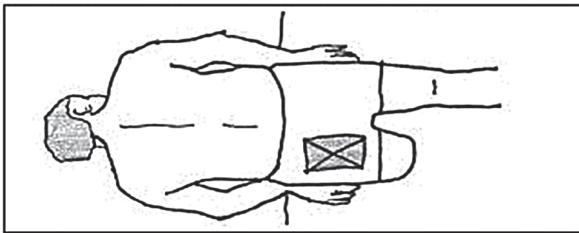
Right after amputation the stump is becoming excessively sensitive to mechanical stimuli which can become the reason of rejection the artificial limb. Therefore one should gradually accustom it to the oppression – first lean on soft objects (mattress, sandbag), and then for hard (board), gradually increasing oppression.

During the initial period of hardening can be applied rotational massages, baths, water baths with massage with the sponge and the brush or a terry glove. Also are applied baths alternating in warm and cold water [3].

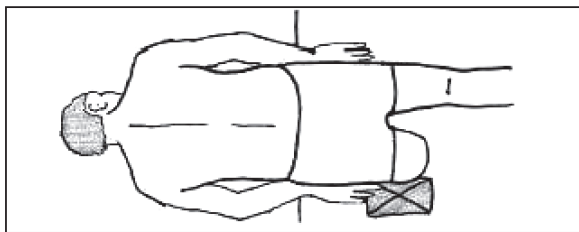
Recumbencies Against Contractures

To prevent contractures, in amputation at the level thigh, are used special recumbencies:

- in lying on the back – into surroundings of greater trochanters is being put an additional mattress,
- in lying on the abdomen (5–6 days following surgery) – the lower limbs in adduction, joined with sling, what prevents abduction tendencies; into regions of buttocks is assumed a weight, e.g. pouch with sand, which not allowing for bending hip joints,
- in lying on the abdomen (10–14 days following surgery) – the pelvis is stabilized to the bed with sling which is suspended on the ski lift above hip joints and is joining the stump to the healthy limb, giving the possibility of raising both lower limbs upwards; hip joints are in hyperextension [14].

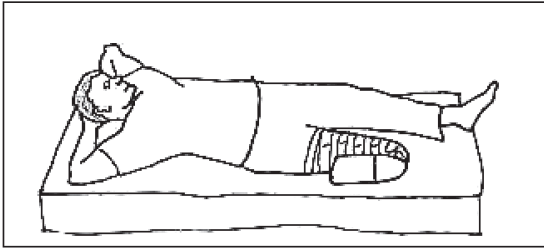


Prevent bending the hip joint, through laying the bag with sand on the buttock

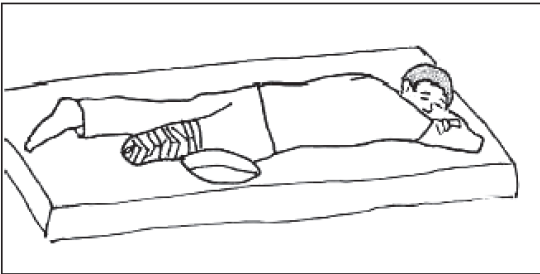


Prevent abduction the hip joint, through laying the bag with sand all over the side of the stump

Fig. 2. Recumbencies against contractures after amputation at the thigh level [10]



Prevent abduction the hip joint, through laying the bag with sand all over the side of the stump (in lying on the back)



Extension of the knee and the hip (in the lying on the abdomen)

Fig. 3. Recumbencies against contractures after amputation at the shin level [10]

In Figs. 2 and 3 there are presented other, simple recumbencies against contractures, by using bag with sand, to prevent flexural and abduction's contractures, after the amputation of the thigh, and recumbencies against contractures after subtraction of the shin.

Exercises Against Contractures

Until the healing of the wound, applies to the positions against contractures:

- in amputation of the shin – in lying on back,
- in amputation of the thigh – in lying on the belly or the side on the amputated side, not making the outside rotation during turn, with using the pouch on the stump.
- After healing up of post-operative wound, are being exercised antagonistic muscles to contracted, beginning from the free active exercises going to resistance exercises. Because of the appearing small scope of the movement in the joint, starts with redressement exercises. Also applying thermal treatments is recommended [3].

Exercises Strengthening Muscles

Moving in the artificial limb requires the strength of muscles of the stump and muscles which compensate the lack of the lost limb, which are being strengthened with resistance exercises, applied already after giving in to the

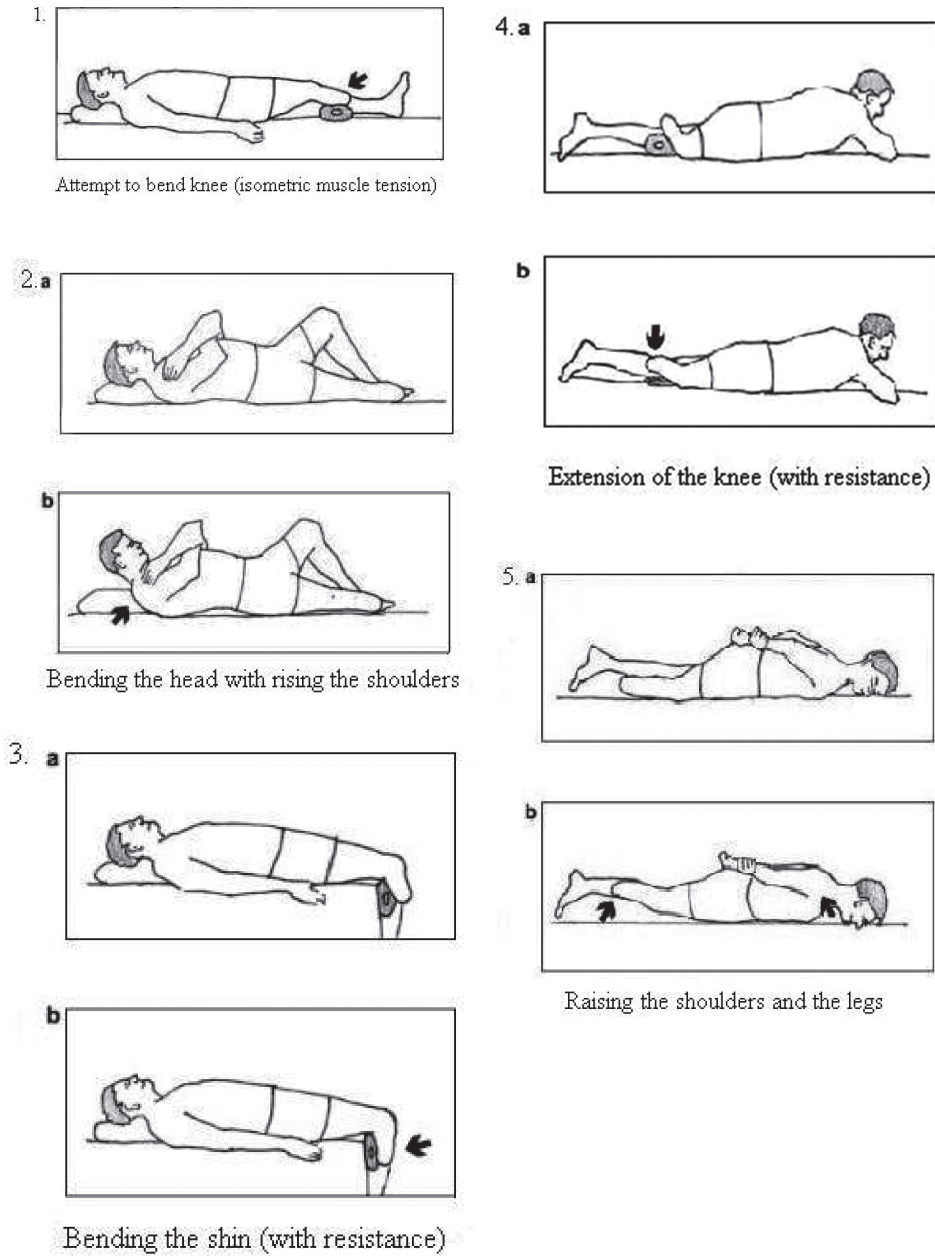


Fig. 4. Exercises for patients after amputation at the shin level [10]

sensitivity of the stump, of 3 weeks after amputation. They have to keep the appropriate scope of the movement, build strength of muscles, correct the blood supply, loosen adhesions in the cicatrix and reduce swellings [5].

In Fig. 4 were showed sets of exercises for patients after amputation at the shin and the thigh level.

Achieving a Standing Position

On the second day after surgery, a patient begins to attain a standing position, carried out twice a day, for several minutes. Patients in good general condition, alone or with the help of a physiotherapist, are trying to move on crutches. In people with heart disease, in bad condition general, is possible to achieve a standing position with the help of special tables [11].

Temporary Artificial Limb (in the Case of Subtraction of Thigh)

Has a well-suited to the stump funnel, where is located body weight support, in an area of tumor sciatic. It is stocked with the Silesian or Californian strip (what makes it easier to maintain the artificial limb on the stump), and the knee lock with the elastic knee launcher. It is ended with the prosthesis of foot with a movable ankle, or applied more often elastic foot of the SACH type [5].

Learning of walking with the Artificial limb

The first thing which the learning of walking in the artificial limb starts with is its correct establishing, teaching the patient how to service and care for it and the stump [7].

The next step is to erect the patient in the railings. The patient learns transferring the weight of the body to the artificial limb, applying equivalent exercises, also by keeping one's balance. The learning of walking in the railings starts with the correct stereotype of the walk (most often at the beginning it is walk 4-bar). It then goes to the learning of walking on the axillary and elbow crutches. The safeguard assures the sense of security determines fast and thorough learning.

In amputation on the level of the thigh we begin the learning of walking with the step of the healthy leg. It is important to pay attention to the regular step, time of burdening, alternating walk, correct posture of the body. The patient should learn to walk in all directions: forward, sideways, and with the repayments.

While walking up the stairs, the patient enters at first with healthy leg, and next adds the limb with the prosthesis. However, while descending the stairs, at first he puts the leg with prosthesis, and then the healthy leg [3].

Below are shown exercises used during the learning of walking. (Figs. 6 and 7.)

General-keep-fit Exercises

They are carried out individually, their difficulty is graded. Respiratory exercises are being integrated into these treatments. Learning of falling down and getting up from the earth is being ranked among this group of exercises. Learning begins in standing position, without using crutches, later with using them [4].

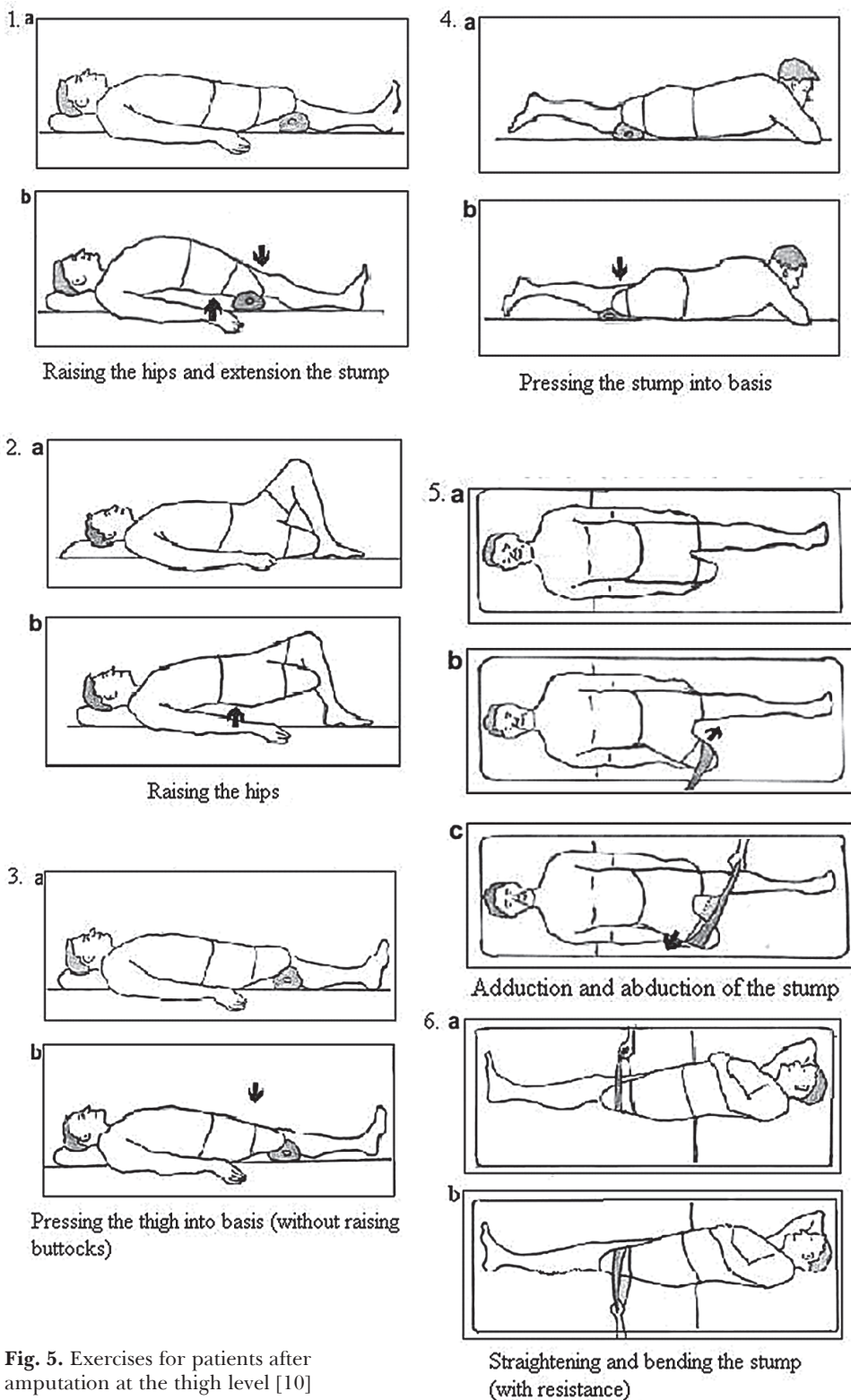


Fig. 5. Exercises for patients after amputation at the high level [10]

Physiotherapy

Possibilities of patient's rehabilitation depend on his activity prior to surgery, cardiovascular endurance and motivation. There are applied the physiotherapy treatments, such as: ultrasounds in the medium doses, TENS currents, iontophoresis, diadynamic, interference currents, rotary bath of the stump. They are applied with patients in order to alleviate the symptoms of phantom pain. In the case of local pain in the stump the laser and the cryotherapy can be applied [14].

Final Artificial Limb – with a Safe Knee

For the final artificial limb is qualified the patient who has successfully completed an initial period of rehabilitation (temporary artificial limb), after evaluation of his physical fitness. Learning of the locomotion in the definitive prosthesis is a continuation of the process already begun with temporary artificial limb [3].

The final artificial limb has the funnel, the knee with launcher, the adapter linking the knee with the foot and the mechanism of the safe knee which consists in using the friction force for blocking bending the prosthesis burdened in the knee joint [7].

Perfecting of walking

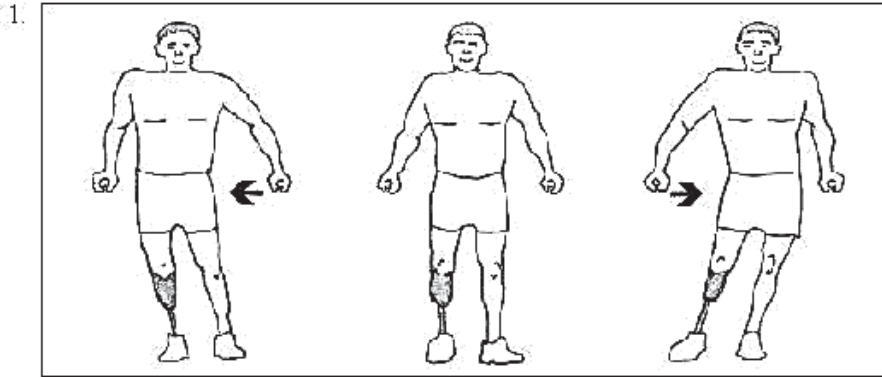
Pays attention to correct gait pattern, improving the aesthetics of walking. Pancoditional exercises are continued with the inclusion of elements of sports. There are conducted activities in the pool in the form of exercises with the ball and swimming lessons. The patient improves walking up the stairs, using the techniques learned during the application of a temporary artificial limb. He learns to walk using one crutch.

In the period of streamlining, the patient is being taught the technique of defeating the kerb, raising objects from the earth, independent sitting down and getting up and other activities of the everyday life [4].

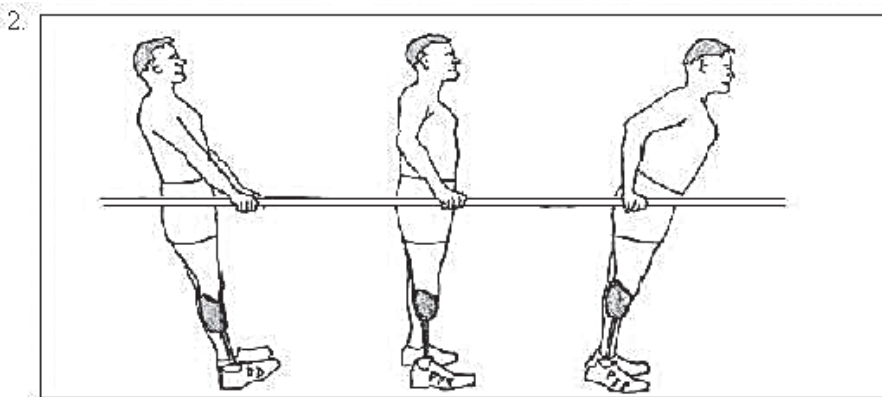
Conclusions

An important objective of this study was to present the problem of amputation, associated with this surgery, medical procedures and present the possibilities of medicine and technology to support the patient touched with the problem of amputation of the limb. Presented the way which the patient must pass with the help of the orthopaedic support, compensating of lost body part, to regain comfort physical and psychological, necessary for the normal life. Described the difficulties with which the patient is struggling, presented physical activity accompanying the patient during the rehabilitation and highlighted as an important role in the process of amputation and prosthesis plays an appropriate psychological approach to the patient.

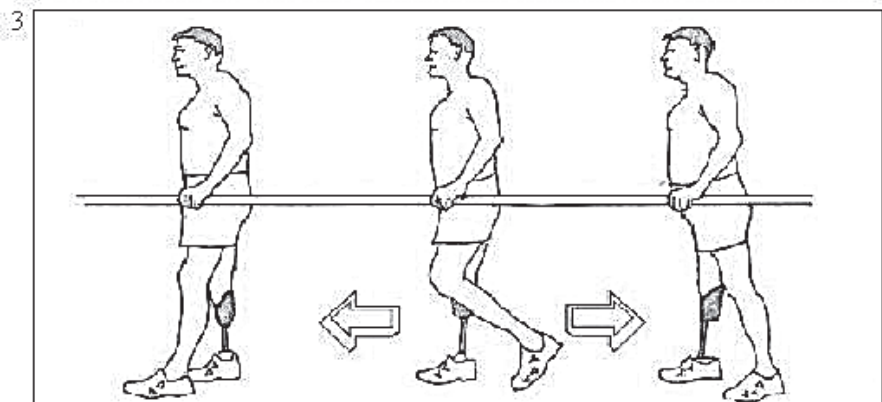
An essential conclusion, which arises after analysing the work is to realize, how important in the whole process is the patient's cooperation with doctors, physiotherapists, prostheticians, psychologists, immediate family and other people involved in obtaining the final result, which is restoring the patient's physical fitness.



Transferring the weight of the body to the right and left leg

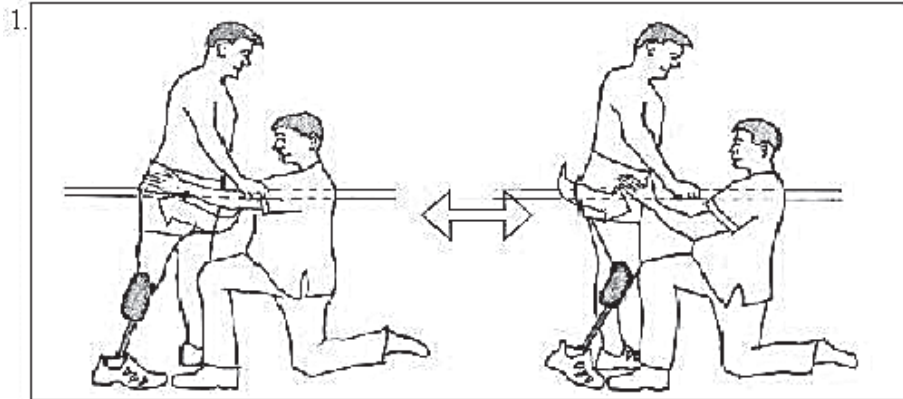


Transferring the weight of the body backwards and forwards

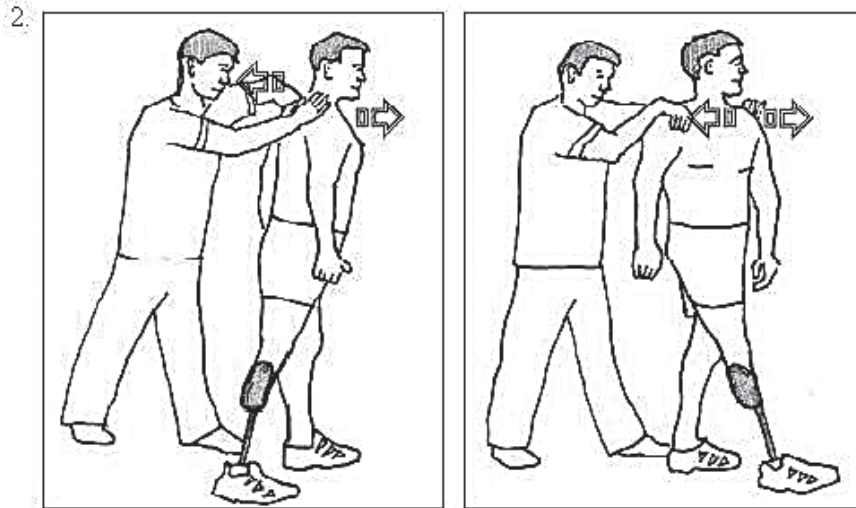


Standing on the prosthesis. Transferring the weight of the body with the step forward ahead and into the back

Fig. 6. Exercises without belaying physiotherapist [10]



Supporting the rotation of the pelvis in the transverse plane



Counter-rotation of shoulders. Improvement in the balance and the coordination

Fig. 7. Exercises with belying physiotherapist [10]

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Diagnostic Methods and Exercise Tests in Cardiac Rehabilitation

Metody diagnostyczne i testy wysiłkowe w rehabilitacji kardiologicznej

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Abstract

Physical effort tests in cardiological rehabilitations are used to determine patients with poor prognosis, i.e. with the risk of another heart attack and sudden death. There are different ways of evaluating clinical conditions and interventions. In the risk stratification, we use clinical data and results of additional physical tests in order to modify pharmacological treatment and determine indication for coronary revascularization. It serves as the basis for individualizing the prescription of exercise training and for assessing the need and extent of supervision required. It is also important that patient feel more secure after the tests. In the paper we review selected diagnostic tests used in cardiological rehabilitation.

Key words: cardiological rehabilitation, effort tests, diagnostic methods.

Streszczenie

Testy wysiłkowe w rehabilitacji kardiologicznej mają na celu wyodrębnienie grupy o złym rokowaniu. W przypadku pacjentów po zawale serca jest konieczne wskazanie chorych o największym ryzyku nagłego zgonu i ponownego zawału mięśnia sercowego. W stratyfikacji ryzyka posługujemy się danymi klinicznymi oraz wynikami badań dodatkowych. Na ich podstawie modyfikuje się leczenie farmakologiczne i określa wskazania do rewaskularyzacji tętnic wieńcowych. Test wysiłkowy jest także pomocny w wyborze odpowiedniego modelu rehabilitacji kardiologicznej. Ważne jest zwiększone poczucie bezpieczeństwa chorych po wykonaniu takiej próby. W pracy omówiono wybrane testy diagnostyczne mające zastosowanie w rehabilitacji kardiologicznej.

Słowa kluczowe: rehabilitacja kardiologiczna, testy wysiłkowe, metody diagnostyczne.

Introduction

Effort tests can be defined as non-invasive functional tests for the assessment of integrated response systems: respiratory, cardio vascular, hematopoietic, neuropsychological and musculoskeletal systems at a sub-maximal or maximal effort [3].

Tests used in cardiac rehabilitation can be separated with respect to the following criteria:

1. Method of measuring physical performance (peak uptake of oxygen):
 - indirect – electrocardiographic effort test;
 - direct – spiroergometric cardiovascular-pulmonary test.
2. Indications to discontinue the effort:
 - maximal test – limited by symptoms;
 - submaximal tests.
3. Methods of load – the type of an ergometer:
 - mechanical track,
 - cycling ergometer,
 - manual ergometer.
4. Types of testing protocol:
 - graded tests,
 - ‘ramp’ tests, with a constant increase in load [3].

In cardiac rehabilitation, effort tests are used to categorize patients with a poor prognosis. For example, in patients after myocardial infarction, it is necessary to identify those with the highest risk of sudden death or recurrence of myocardial infarction. Risk stratification uses clinical data and the results of additional tests which help modify pharmacological treatment and determine the indications for the revascularization of coronary arteries. Effort tests are also helpful in choosing the right model of cardiac rehabilitation. Also important is the fact that patients have an increased sense of security after the test.

In this era of effective treatment of myocardial infarction by primary coronary angioplasty, the role of early post-infarction tests has decreased. Patients after successful coronary angioplasty and with no significant changes in other coronary arteries, have a small infarcted area and a good prognosis. According to the guidelines of ACC/AHA, test exercises after a heart attack can be performed in order to:

- 1) assess the degree of physical efficiency,
- 2) determine the allowable loads of effort at work and home,
- 3) determine the relevant parameters of cardiac rehabilitation,
- 4) evaluate the effectiveness of treatment,
- 5) prepare risk stratification,
- 6) assess the prevalence of coronary problems after heart attack,
- 7) determine when the patient may return to work [1, 2].

Traditionally, effort tests that are performed after a heart attack are divided into two groups; submaximal and symptom-limited maximal. Submaximal tests are performed until moderate fatigue – (13 points according to the Borg scale), heart rate of 120bpm, 70% of maximal heart rate, or specific to a particular age group, BMI-dependent sub-maximal effort threshold. A maximal test is limited by symptoms forcing the end of the test, such as chest pains, fatigue (16-18 point Borg scale), a horizontal or downward ST slope segment more than 2 mm, ventricular arrhythmia, or a decrease in systolic blood pressure. The nature and level of such a test allows a more reliable assessment of physical performance.

Tests limited by symptoms are more sensitive in detecting ischemia. In patients with uncomplicated myocardial infarction, submaximal tests can be performed in 3rd–5th day post event, while the effort test limited by symptoms can be performed from the 5th day after the occurrence [9, 10].

The optimal timing of exercise tests after a myocardial infarction remains an open question. An advantage of exercise performed before leaving the hospital is a positive effect on the patient's psyche and the ability to detect ischemic changes that might become apparent during the patient's daily activities. The test also helps determine the effort levels during post-clinical cardiac rehabilitation. An exercise test limited by symptoms, performed by low-risk patients up to 3 weeks after the infarction, is considered safe and can assess their physical efficiency better. Experts do agree that such a test is recommended with non-invasive treatment during hospitalization and for potential candidates for this treatment [3].

Indications to perform a test exercises after myocardial infarction (STEMI – ST-elevation myocardial infarction) according to ACC / AHA (year 2004).

Class I

1. Effort tests should be performed during hospitalization or shortly after leaving the hospital in patients with myocardial infarction and non-invasive treatment in order to assess ischemia.
2. In patients with resting ECG changes which could hamper interpretation, it is indicated to perform test exercises.

Class IIb

An exercise test before leaving the hospital in order to determine the recommended level of daily physical activity or in order to determine the clinical significance of stenosis in the coronary arteries identified by coronary catheterization.

Class III

Test exercises should not be performed within 2–3 days after myocardial infarction for patients with no successful reperfusion.

Test exercises should not be performed for the examination of patients with unstable coronary artery disease, decompensated heart failure, life-threatening heart rhythm disorders, diseases that significantly limit the physical efficiency or other absolute contraindications for physical exercises.

Test exercises should not be used for the determination of risk stratification in patients already selected for coronary revascularization.

Effort tests are usually safe, provided they are performed by appropriately trained personnel and with strict adherence to indications and contraindications. Complications, including fatalities, are rarely reported. Fatal incidents (fatal myocardial infarction, or rupture of the heart) occur at 3 per 10,000 tests (0.03%), non-fatal myocardial infarction and sudden cardiac arrest in 9 per 10,000 tests (0.09%), and ventricular tachycardia more frequently – 14 cases per 1,000 (1.4%) [3]. These incidents occur almost twice as often during symptom-limited tests compared to the submaximal tests.

The Scheme of an Electrocardiogram Exercise Test

The electrocardiographic exercise test (ExT) includes an analysis of the electrocardiographic response (ECG), hemodynamic responses – heart rate (HR) and blood pressure (BP), and subjective and objective symptoms concerning a strictly defined test protocol, and the exercise [3].

Electrocardiogram tests are performed in appropriately designed studios. Conditions to be fulfilled by a laboratory of exercise tests are defined by cardiac societies. Recommendations include good air ventilation, and constant temperature (recommended 20–23°C). It is necessary to equip the lab with breathing and resuscitation equipment (defibrillator, intubation kit, a set of cardiac medications). It is also necessary to have appropriately trained medical personnel.

In order to perform the test the patient's consent is required along with adequate preparation of the patient – a light meal 2–3 hours before the test, no great effort for about 12 hours before the test, and comfortable clothes. A supervising physician surveys the patient, conducts a brief clinical examination, and makes the patient familiar with the scheme of the study. The medications being taken by the patient need to be determined.

Absolute contraindications to an electrocardiogram exercise test are:

- recent acute myocardial infarction (first 2 days),
- unstable coronary artery disease,
- uncontrolled arrhythmia causing discomfort or hemodynamic disturbances,
- symptomatic severe stenosis,
- decompensated heart failure,
- acute pulmonary embolism,
- acute myocardial infarction or pericarditis,
- active endocarditis,
- acute illness unrelated to the heart (eg. infection, hyperthyreosis), acute aortic dissection,
- physical incapacity that prevents a proper and safe execution of the test,
- lack of patient consent.

Relative contraindications include:

- narrowing of the left main coronary artery,
- moderate valve stenosis, electrolytic imbalance,
- severe hypertension ($\geq 200/110$ mm Hg),
- tachyarrhythmia / bradyarrhythmias,
- hypertrophic cardiomyopathy with outflow obstruction,
- atrioventricular block of a high degree,
- mental condition that prevents the performance of the exercise.

Absolute indications to discontinue an electrocardiogram exercise test:

- increase in ST (≥ 0.1 mV) in a lead other than myocardial scar with Q-waves,
- decrease in systolic blood pressure by more than 10 mmHg compared to the resting level despite the increasing load accompanied by other symptoms of ischemia,
- significantly increased coronary pain (moderate to severe – degrees 3 to 4),
- symptoms from the central nervous system (such as ataxia, dizziness, pre-syncope),

- signs of reduced perfusion (paled face or cyanosis),
- fixed ventricular tachycardia,
- technical difficulties in monitoring ECG or blood pressure,
- interruption at the patient's request.

Relative indications for the interruption of an electrocardiogram exercise test:

- rapidly increasing reduction in ST (> 2 mm) horizontal or descending, or a sudden change of heart axis,
- decrease in systolic blood pressure by more than 10 mmHg compared to the resting level despite the increasing load in the absence of other symptoms of ischemia,
- increasing coronary pain,
- significant fatigue, leg muscle cramps, symptoms of claudication,
- arrhythmia other than fixed ventricular tachycardia, i.e. additional multi-center ventricular contractions, three consecutive chamber stimulations, supraventricular tachycardia, atrio-ventricular block, bradycardia,
- excessive increase in blood pressure (systolic blood pressure > 250 mm Hg and / or diastolic blood pressure > 115 mm Hg),
- the appearance of bundle branch block, not distinguishable from ventricular tachycardia,
- the patient's general condition (eg, weakness, cold sweat, pale skin).

Exercise Test Protocols

Depending on the laboratory equipment, exercise tests can be performed on a cycling ergometer or a treadmill to provide a progressively increasing load (Fig. 1).

The most commonly used protocol is the Bruce protocol or a modified Bruce protocol. The basic unit of measurement is MET, metabolic equivalent of task, a unit of resting oxygen consumption equal to 3.5 ml O₂/kg/min. It varies depending on the rate of metabolism – for example during fever, thyroid disease, or obesity (4). Examinations performed during an exercise test concern electrocardiographic, hemodynamic and clinical changes.

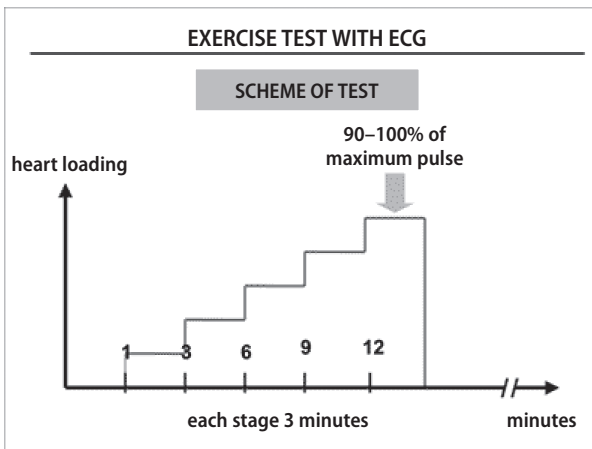


Fig. 1. Bruce protocol [9]

Electrocardiographic Changes

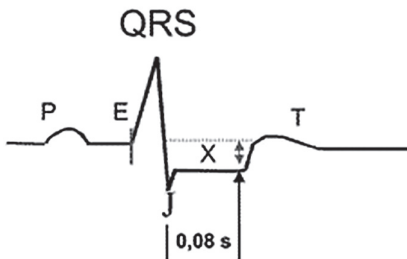
ECG is assessed before, during, and at least a 3 minutes after exercise. The analysis covers at least three consecutive cycles (never one). The assessment of the electrocardiogram also involves computer averaging. The assessment should examine if there is a reduction of ST by more 0.1 mV during rest, and whether the PR interval occurs in an isoelectric line. The ST should be measured 60–80 ms after the J point (Fig. 2). The nature of the ST deviation is assessed – whether it is horizontal, ascending or descending, the relation of the ST changes to the heart rate, number of leads with ST changes and their duration. Apart from the ST changes, one may assess R-wave amplitude, QRS, T, QT duration, and QT dispersion. Of prognostic significance is the degree of cardiac acceleration in the effort against the increasing load – chronotropic competence, the rate of reduction in heart rate during recovery, the presence of arrhythmia and any conduction disturbances. The interpretation of the exercise test results is affected by any reduction in resting ST above 1 mm, ventricular conduction disturbances caused by the hypertrophy of chambers, pre-excitation syndromes, chamber stimulation, or bundle branch blocks.

A fixed block of the right bundle branch does not affect the interpretation of the exercise test, except for precordial leads V1-V3. In these leads, the initial reductions in ST undergo physiological intensification during the effort and may mask ischemia. A fixed block of the left bundle branch (LBBB) prevents an assessment of ST changes during exercise due to the substantial reduction in ST during effort both in ischemia and without ischemia. LBBB appearing below 120 bpm may indicate ischemia, and LBBB occurring above 120 bpm is usually due to conduction aberration [8, 9].

Hemodynamic Changes

Blood pressure

Under physiological conditions, systolic blood pressure rises during exercise, while diastolic pressure remains constant or decreases. An incorrect response is defined as a lack of increase in systolic blood pressure by more than 20–30 mm Hg, or a drop in relation to the resting value. A lack of increase in systolic blood pres-



$x \geq 0.1 \text{ mV}$ – in 2 next precordial leads and/or limb leads/unipolar

Fig. 2. The evaluation of ST changes during an exercise test [9]

sure above 110 mmHg is also regarded as incorrect. Too small an increase in systolic blood pressure in relation to the load or a decrease during effort can be caused by a narrowing of the left ventricular outflow (stenosis, hypertrophic cardiomyopathy with narrowing in the outflow path) severe left ventricular dysfunction, ischemia, or as a result of applied pharmacotherapy [8, 9].

Heart Action

Target heart rate is usually calculated based on the generalized formula 220-age (in years). A maximal test is performed to achieve 90-100% of maximum heart rate (HR_{max}), and a submaximal test to 70% HR_{max} [1]. The tests examine cardiac function at rest before exercise, the degree of increase in heart rate during exercise and the decrease in heart rate during rest following the exercise.

The causes of excessive acceleration of heart rate during the exercise or rest phases:

- poor general condition,
- prolonged immobilization,
- anemia,
- metabolic disorders (eg. hyperthyreosis),
- excessive adrenergic activation,
- hypovolemia,
- intake of medications that dilate the vascular bed.

Causes of bradycardia during rest or inadequate acceleration in heart rate during effort:

- physical training,
- failure of the sinus node,
- autonomic nervous system disorders in metabolic diseases (e.g. diabetic neuropathy),
- the use of drugs to decelerate the action of the heart (eg, β -blockers, ivabradine, calcium channel blockers).

Clinical Assessment

Clinical assessment takes into account the exercise capacity, exercise duration, degree of fatigue, presence of coronary pain, discomfort that forces a withdrawal from the exercise, and the overall clinical condition of the patient (presence of symptoms in the nervous system – astigmatism, dizziness, reduced symptoms of peripheral perfusion, sweating, paling, weakness). The degree of fatigue is often assessed using the Borg scale. Table 1 shows the original and Table 2 presents an abridged Borg scale.

Maximum size of the work done by the tested individual is expressed in metabolic equivalents (MET) or watts (W).

Coronary ailments are assessed through the examination of the character of the coronary pain, severity of this pain, growing of pain during the effort, the time since the beginning of the effort until the occurrence of coronary pain, rate of recovery from pain after the cessation of the exercise.

Adverse prognostic parameters after myocardial infarction are: ischemic reduction in ST > 1 mm (at low load), functional capacity < 5 MET, insufficient increase in BP (RRS < 110 mm Hg or an increase < 30 mm Hg in comparison with resting values) [5].

Table 1. Fatigue according to the Borg scale [5]

RPE (rate of perceived exertion)	Effort
6	no exertion at all
7	extremely light
8	
9	very light
10	
11	light
12	
13	somewhat hard
14	
15	hard (heavy)
16	
17	very hard
18	
19	extremely hard
20	maximal exertion

Table 2. Abridged Borg scale [6]

RPE	Fatigue
0	no exertion
0.5	extremely light
1	very light
2	light
3	moderate
4	somewhat hard
5	hard
6	
7	very hard
8	
9	
10	extremely hard
> 10	maximal exertion

Ergospirometric Challenge Test (CPET – Cardiopulmonary Exercise Test)

CPET allows a more accurate assessment of physical efficiency than the classical electrocardiograph test. It helps differentiate the causes of poor physical performance, monitors the effects of treatment, and facilitates further therapeutic decisions.

Indications to perform an ergospirometric exercise test according to ACC/AHA [9]:

Class I

1. Assessment of exercise capacity and the effects of treatment in patients with heart failure, in terms of indications for heart transplant.
2. Differentiation of causes of dyspnea (cardiac, pulmonary embolism) caused by exercise, or differentiation of causes of impaired exercise capacity, if they are still unclear.

Class IIa

Assessment of exercise capacity in patients with unclear data from conventional tests (exercise duration, amount of completed work)

Class IIb

1. Assessment of the effectiveness of the treatment of a specific group of patients for whom the improvement in exercise tolerance is an important goal or an endpoint.
2. Determination of the intensity of physical training as part of cardiac rehabilitation.

Class III

Routine assessment of exercise capacity.

In addition to parameters that are measured in an electrocardiographic exercise test – (clinical, hemodynamic), CPET also covers ventilation parameters – the number of breaths per minute, breath volume, minute ventilation, oxygen consumption, carbon dioxide production and derived parameters.

Other variables examined during the ergospirometric test are [10, 12]:

1. Basic parameters

- VO_2 (*oxygen uptake*)
- VO_2/kg (*oxygen uptake/body weight*)
- VCO_2 (*CO₂ production*) –
- RER (*respiratory exchange ratio*) – $\text{RER} = \text{VCO}_2/\text{VO}_2$
- AT (*anaerobic threshold*) –
- $\text{VO}_2 \text{ AT}$, $\text{VO}_2/\text{kg AT}$ – oxygen uptake at the anaerobic threshold
- VO_2/Pulse (*oxygen pulse*) –

Parameters of ventilation and gaseous exchange:

- VE (*minute ventilation*)
- VT (*tidal volume*) –
- BF (*breath frequency*) –
- BR (*breathing reserve*) – $\text{VE}_{\text{max predicted}} - \text{VE}_{\text{reached}}$ – difference between the the PREDYKCYJNA and achieved minute ventilation
- EQ O_2 (*ventilatory equivalent for O₂*) = VE/VO_2 – minute ventilation necessary for the uptake of 1 liter of oxygen (calculated parameter)
- EQ CO_2 (*ventilatory equivalent for CO₂*) = VE/VCO_2 – minute ventilation necessary for the production of 1 liter of carbon dioxide (calculated parameter)
- VE/VCO_2 slope – slope of the regression curve
- PET O_2 – the concentration of oxygen in the exhaled air
- PET CO_2 – the concentration of carbon dioxide in the exhaled air.

Maximum oxygen uptake ($\text{VO}_{2\text{max}}$) during exercise is a measure of exercise capacity. This is the maximum amount of oxygen that may be intaken with inhaled air during exercise involving a large proportion of muscle mass.

VO_2 may increase fifteen times from rest values of about 3.5 ml/kg/min. (about 250 ml/kg/min for middle-aged people) (30–50 ml/kg/min). In highly trained individuals VO_2 may increase even twenty times (up to 80 ml/kg/min) [12].

In patients with diseases of the circulatory system, the achievement of maximum oxygen intake is usually impossible. Therefore, peak oxygen consumption is assessed (peak VO_2). It is the amount of oxygen intaken during effort result-

	VO2 peak	AT	VE reserve	VE/VO2	SaO2	O2pulse	HRreserve
Cardiac insufficiency	↓	↓	↑	↑	n	↓	n/0
Cardiovascular pulmonary disease	↓	↓	↑	↑	↓	↓	n/0
Obturation	↓	n/brak	↓/0	↑	↓	n/↓	↑
Restriction	↓	n/↓	↓	↑	↓	n/↓	↑/n
Chest wall diseases	↓	n/brak	↓	↑	↓	n	↑
Poor physical condition	↓	n/↓	n/↑	↑	n	↓	n
Insufficient effort	↓	n/brak	↑	n	n	n	↑

Fig. 3. Diagnosis of the causes of impaired tolerance to tolerance on the basis of an ergspirometric exercise test [11]

ing in fatigue with 15–16 points in the Borg scale. The test is diagnostically useful when ventilatory anaerobic threshold is exceeded. This is the limit of effort-induced uptake of oxygen, above which further effort is accompanied by an increased excretion of carbon dioxide, and the metabolism of muscles is dominated by anaerobic conversions. The assessed parameters of gas exchange are sufficient to determine extra-cardial causes of reduced physical performance (Fig. 3). Spirometry performed before exercise gives additional useful information for the differentiation of cardiac and pulmonary causes of dyspnea and low physical performance.

Maximal oxygen consumption in an exercise test is presented as an objective prognostic indicator, particularly useful in determining the indications and timing of heart transplantation in patients with advanced systolic heart failure. Peak oxygen consumption is a non-invasive indicator of cardiac minute and its response to effort. In patients with advanced heart failure, oxygen consumption is also affected by extra-cardial factors such as muscle mass, peripheral circulation, and respiratory diseases. Eligibility for heart transplantation is facilitated by a four-stage scale of heart failure proposed by Weber in 1982, depending on the peak oxygen consumption during exercise. An absolute indication for transplantation is a peak oxygen consumption below 10 ml/kg/min [9].

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Balneology in Arthrosis Spa Treatment

Balneologia w leczeniu uzdrowiskowym choroby zwyrodnieniowej stawów

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Abstract

It's estimated in Poland almost 2 million people suffer from arthrosis although some research indicates 17% of population. This disease is also the most common cause of disability certificates. It's regarded that arthrosis concerns 25–30% of people in age from 45–64, 60% older than 65 and more than 80% of people older than 75 [5]. Beside diabetes, arthrosis is the most frequent disease amongst patients being subjects of spa-treatment. Elementary targets of spa-treatment: chronic diseases treatment, physical and mental, rehabilitation, prophylaxis, healing education. Balnotherapeutical measures rarely do bring rapid results. Predominantly recovery happens later on, often after the treatment is over. When choosing a spa we should take into consideration climate conditions of resort required in the given disease. According to curative properties arthrosis can be treated in the following resorts: Augustów, Busko, Ciechocinek, Cieplice, Goczałkowice, Horyniec, Inowrocław, Iwonicz, Kamień Pomorski, Kołobrzeg, Konstancin, Krynica, Łądek, Muszyna, Polanica, Połczyn, Przerzeczyn, Solec, Swoszowice, Szczawnica, Świeradów, Świnoujście, Ustka, Ustroń, Wieniec, Złockie [1].

Key words: balneology, arthrosis, spa treatment.

Streszczenie

Szacuje się, że w Polsce na chorobę zwyrodnieniową stawów cierpi około 2 miliony osób, choć niektóre dane mówią o 17% społeczeństwa. Ta choroba jest najczęstszą przyczyną orzekania o inwalidztwie. Uważa się, że choroba dotyczy 25–30% osób w wieku 45–64 lat, 60% starszych niż 65 lat i więcej niż 80% osób w wieku powyżej 75 lat. Oprócz cukrzycy, jest to najczęstsze schorzenie występujące wśród chorych poddających się leczeniu uzdrowiskowemu. Za podstawowe zadania leczenia uzdrowiskowego możemy uznać: leczenie chorób przewlekłych, prowadzenie rehabilitacji psychicznej i fizycznej, prowadzenie profilaktyki, prowadzenie wychowania zdrowotnego. Metody balneoterapeutyczne rzadko przynoszą natychmiastowe rezultaty. Przeważnie poprawa zdrowia chorych następuje później, często już po zakończeniu stosowania serii zabiegów leczniczych. Wybierając uzdrowisko, należy wziąć pod uwagę warunki klimatyczne miejscowości odpowiedniej dla danego schorzenia. Według profili leczniczych – na podstawie ogólnodostępnych danych – chorobę zwyrodnieniową stawów można leczyć w następujących uzdrowiskach: Augustów, Busko, Ciechocinek, Cieplice, Goczałkowice, Horyniec, Ino-

wrocław, Iwonicz, Kamień Pomorski, Kołobrzeg, Konstancin, Krynica, Łądek, Muszyna, Polanica, Połczyn, Przerzeczyn, Solec, Swoszowice, Szczawnica, Szczawno, Świeradów, Świnoujście, Ustka, Ustroń, Wieniec, Złockie.

Słowa kluczowe: choroba zwyrodnieniowa stawów, balneologia, leczenie uzdrowiskowe.

Introduction

It is estimated in Poland almost 2 million people suffer from arthrosis although some research indicates 17% of population. This disease is also the most common cause of disability certificates. It is regarded arthrosis concerns 25–30% of people in age from 45–64, 60% older than 65 and more than 80% of people older than 75 [5].

This very disease was widely described just at the beginning of the 20th century. First description was given by Archibald Garrod. It was viewed solely as an outcome of the natural ageing process. Nevertheless arthrosis may as well occur amongst young people whereas older people do not show any signs of arthrosis.

Arthrosis is a chronic disease and also one of the most serious social problems. Beside diabetes, arthrosis is the most frequent disease amongst patients being subjects of spa-treatment. Spa-treatment uses natural factors for treatment, rehabilitation and prophylaxis. The fundamental and the most important domain of this treatment is balneotherapy e.g. therapy which uses medicinal water and peloids [2].

Medicinal water is used in form of baths, treatment by drinking (crenotherapy), inhalations, irrigations; Peloids are used in form of baths, packing, compress, tampons and paste treatment and lints in inhalations and in dry plus wet baths.

Balneotherapy affects:

- mechanically through:
 1. Hydrostatic pressure – diuretic & antismelling activity
 2. Relative decrease of the body mass which enables joints activity and increase of the muscle power.
 3. Change of the blood viscosity;
- thermally through:
 1. Painkilling.
 2. Muscle relaxation.
 3. Anti-inflammatory activity.
 4. Increase of flexibility of connective tissue.
 5. Extension of superficial blood vessels.
 6. Phagocytosis and diffusion stimulation.
 7. Liquid joint viscosity reduction.
 8. Immunological activity;
- chemically through:
 1. Mineral substances and gas absorption.
 2. Mineral substances deposition in skin.
 3. Chemical substances rinsing – according to K.L. Schmidt [4].

In process of spa treatment we observe temporary worsening of health condition amongst patients. These, so called “spa reactions” can cause crisis in treat-

ment and appear after 3–6 baths, predominantly in brine, hydrosulphuric acid water or therapeutic mud. Spa reaction is caused by excessive reaction of organism to stimulus connected directly with spa treatment. In complicated cases it lasts from 1–7 days. According to Hildebrandt this reaction most often occurs between the first and beginning of the last week of the spa treatment, mostly between days 7 and 12 and between 18 and 22. This reaction tells that organism ability to counteract loading of the physical stimulus is decreased. Too intense stimulus may cause detrimental organism reactions. That is why spa treatment must be carried in a planned manner, avoiding too many treatments [3]. In spa conditions generally such treatment programs are used which contain a few methods. It enables increasing effectivity of synergic treatment applying spurs of different character. Most popular methods are: balneotherapy, climatotherapy, hydrotherapy, physiotherapy, health education, psychotherapy, diet and pharmaceutical therapy.

Spa climatic conditions ought to be taken into consideration while picking the right spa in which the patient is to be cured. Many functional changes occur in the organism under the influence of climate impulse, also organism reactivity normalization, immunity increase, thermoregulation mechanisms improvement [2]. Climate treatment is a complimentary treatment in recovery and is an accompanying stimulus treatment in balneology. These are general natural methods of the climate treatment: heliotherapy – sunbathing, aérotherapy – airbathing, talassotherapy – sea climate and seabathing treatment [1].

Health-resorts vary with climate, physical and chemical characteristics of water, peloids and treatment gases. Therapeutic waters or underground waters with confirmed therapeutical characteristics show stable chemical composition and natural chemical and microbiological purity. These are following waters occurring in polish health-resorts: brines, hydrogen sulphide waters, radon waters.

Brines occurring in Ciechocinek, Inowrocław and in seaside resorts as well as in Beskid region are briny waters which contain NaCl concentrate over 1.5 % (usually it's from 2% to 5%). Muscles relaxation, peripheral vessels extension, stimulation of microcirculation, antiphlogistic activity, brines hydrostatic activity, especially in baths with motor activities have special meaning in treating motor system.

Hydrogen sulphide baths occur in Busko, Solec, Horyniec, Przerzeczyn, Łądek, Wieniec, Swoszowice. Local effect, connected with the influence on skin metabolism shows in keratolytic activity, keratoplastic, antifungus, vasomotor and antiphlogistic. Hypodermic vessels extension and microcirculation stimulation influence better blood flow in skin, internal organs and joints. It is thought sulphur injected through skin is used to synthesize chondroitin sulfate acid being a part of articular cartilage what will improve condition of cartilages and ligament [4]. In many diseases we can observe increased concentration of uric acid, i.e. in rheumatic diseases, arthropathy. Amongst these patients after 5–6 baths there is a significant decrease of uric acid what considerably influences disease process.

Hydrogen sulphide baths are operated in waters saturated with CO₂ e.g. sorrels occurring mainly in Beskid and Kłodzko health-resorts. These baths are applied in rheumatic diseases connected with peripheral circulation disorders and in soft tissues inflammation. The most important issue is that baths cure without heat.

Radon baths are operated in rado-active water containing radon 222 and its radioactive degradation. It is applied in Świeradów, Łądek, Czerniawa, Szczawno, Długopole, Duszniki, Kudowa. These baths have antiphlogistic, desentisizing and painkilling properties.

In peloidotherapy only therapeutic mud, traditionally called moor, is applied. The most important property of peloids is based on its specific thermal properties and its chemical and biological ingredients. General overheating with mud increases metabolism, congestion of muscles, joints and tissues contributing in their relaxation and in the end decreases pain and increases muscles flexibility and joints mobility. Locally it increases absorption in inflammatory discoloration. Biological and chemical ingredients contained in peloids such as humic acid act anti-inflammatory, antiseptic, bacteriostatic, astringing and antiviral.

Peloidotherapy in arthrosis improves blood flow in joints, relax joint capsule, ligaments, consequently contributes in increasing range of moves. In chronic and subacute pain syndromes of bottom spine segment, mud wrapping in temperature 42–44 °C cause significant pain reduction, increase of spine movement and normalization of tension in paravertebral muscles. Mud therapy is practiced in Busko, Cieplice, Goczałkowice, Iwonicz, Kołobrzeg, Piwniczna and Swoszowice [1].

Balneotherapeutic methods rarely do bring rapid results, predominantly health improvement follows later, often after the treatment is over. Treatment results achieved with such methods prevail over pharmatherapeutical effects because they are more permanent. Moreover, spa treatment methods do not cause any side effects what is their big advantage.

Fundamental tasks of the spa treatment: chronic diseases treatment, physical and psychical rehab, preventive treatment, health education.

When it comes to adults it is recommended to use ambulatory and sanatorium spa treatment and rehab no often than once in 12 months [6].

Among rheumatic diseases, cured in health resorts dominate koksarthrosis, gonarthrosis, degenerative hands and feet disease, degenerative spine disease including discopathy.

I. Ponikowska's researches showed that clinical state's improvement of 54 patients with degenerative changes lasted fairly 9 months. Optimal improvement followed after 3–4 weeks after the treatment was over. Besides mechanical and thermal activity of waters, its ingredients play main part in curing arthrosis, such as sulphur influencing cartilage [3].

Following are counter-indications in spa-treatment for adults and children:

- alcoholism and drug addiction,
- lack of consolidation, patients in plaster, pseudoarthrosis, submissive fracture,
- vascular system diseases, peripheral nervous system diseases, peptic ulcer, duodenum disease,
- mental diseases, psychoneurosis, obsessive-compulsive disorder,
- decrepit patients,
- diseases with strict recommendation towards surgical treatment,
- infectious diseases, infectious disease vectors, parasitic diseases,
- pregnancy and nursing,
- diabetic acidosis,
- active pulmonary tuberculosis,

- nocturnal enuresis, urinary catheterisation, artificial anus, fistula, decubitus ulcers, ulcerations,
- hypertension (over 190/110 mm Hg),
- hyperthyreosis, hypothyreosis, adrenocortical insufficiency,
- anemia,
- circulatory, breathing, kidney, liver failure,
- malignant tumours and condition after surgical treatment,
- pleura abscess,
- blindness, deafness, speech articulation disorders without guide's care,
- cardiac aneurysm, arterial aneurysm,
- pediculosis,
- helminthiasis,
- hepatitis.

According to medical profiles, arthrosis can be cured in following health-resorts:

Augustów, Busko, Ciechocinek, Cieplice, Goczałkowice, Horyniec, Inowrocław, Iwonicz, Kamień Pomorski, Kołobrzeg, Konstancin, Krynica, Łądek, Muszyna, Polanica, Polczyn, Przerzeczyn, Solec, Swoszowice, Szczawnica, Szczawno, Świeradów, Świnoujście, Ustka, Ustroń, Wieniec, Złockie [1].

Spa treatment has significant and vast meaning in curing arthrosis. It is a chronic disease and patients very often are "convicted" to long term pharmacologic treatment. Thanks to balneological therapy it is possible to put aside such treatment even for a few months, what positively influences psychophysical condition of patients.

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Complementary Forms of Therapies in Treating Children with Cerebral Palsy

Formy uzupełniające terapii dzieci z zespołem mózgowego porażenia dziecięcego

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Abstract

Cerebral palsy is a group of polyaetiological symptoms of central nervous system damage in its development phase. Due to the damage of brain structures, the growth of neurological mechanisms controlling posture, balance and movement is either delayed or incorrect. Cerebral palsy also features such accompanying symptoms as: the impairment of eyesight, hearing, speech, perception and visual-motoric disturbance with mental handicap. Thanks to brain compensatory abilities, it is possible to influence the disturbed function's improvement. Presently, we possess various methods, facilitating children with cerebral palsy. Their aim is to stimulate the areas of psychokinetic development, yet their ways of realizing this aim differ. Alongside basic methods of improvement, there are many other, helpful forms of therapy. They supplement the main methods in psychological, pedagogical and kinesthetic aspect. The methods of psychokinetic development facilitation for children with cerebral palsy have been revised: the Good Start method, W. Sherborne's Developing Movement method, J. Baran's play therapy, the Snoezelen method, TheraSuit, S. Masgutowa's Impulses Integration method and animotherapy. A child with cerebral palsy is not only a matter of motoric disorders, but of psychopedagogic area as well. The neurotherapeutic approach is insufficient, therefore establishing a facilitation program which includes kinetic therapy with pedagogical, emotional and social aspects, is indispensable. Learning new ways and techniques which enhance basic therapy, may significantly influence the effectiveness of complex rehabilitation of a child with cerebral palsy.

Key words: cerebral palsy, complex therapy.

Streszczenie

Mózgowe porażenie dziecięce jest zespołem polietiologicznych objawów uszkodzenia ośrodkowego układu nerwowego w fazie jego rozwoju. Na skutek uszkodzenia struktur mózgu rozwój mechanizmów neurologicznych kontrolujących postawę, równowagę i poruszanie się jest opóźniony lub nieprawidłowy. Charakterystyczne dla zespołu jest występowanie objawów towarzyszących, takich jak: upośledzenie wzroku, słuchu, mowy, zaburzenie percepcji, zdolności wizualno-motorycznych oraz upośledzenie umysłowe. Dzięki możliwościom

kompensacyjnym mózgu można wpłynąć na poprawę zaburzonych funkcji. Obecnie istnieje wiele różnorodnych metod usprawniania dzieci z mózgowym porażeniem. Głównym ich zadaniem jest stymulowanie sfer rozwoju psychoruchowego, różnią się natomiast sposobem realizacji tego zadania. Obok podstawowych metod usprawniania istnieje także wiele innych, pomocniczych form terapii. Stanowią one uzupełnienie głównych metod w aspekcie psychologicznym, pedagogicznym oraz ruchowym. Dokonano przeglądu wybranych metod wspomagania rozwoju psychoruchowego dzieci z mózgowym porażeniem dziecięcym: metody Dobrego Startu, metody Ruchu Rozwijającego W. Sherborne, terapii zabawą J. Baran, metody Snoezelen, TheraSuit, metody Integracji Odruchoń S. Masgutowej i animoterapii.

Dziecko z zespołem mózgowego porażenia dziecięcego to problem nie tylko zaburzeń ruchowych, ale także sfery psychopedagogicznej. Podejście neuroterapeutyczne jest niewystarczające, dlatego niezbędne jest utworzenie programu usprawniania uwzględniającego terapię ruchową, aspekty pedagogiczne, emocjonalne i społeczne. Poznanie nowych metod i technik wspierających podstawową terapię może w istotny sposób wpłynąć na skuteczność kompleksowej rehabilitacji dziecka z mózgowym porażeniem dziecięcym.

Słowa kluczowe: mózgowie porażenie dziecięce, terapia kompleksowa.

Introduction

Cerebral palsy (CP) – *Paralysis cerebialis infantilis (PCI)* – is a non-progressive disorder of functions in the developing central nervous system, especially in the central motoneuron, which is caused by the appearance of pathological factors that affect the foetus and the complications, connected with labour. Cerebral palsy is not a separate nosological entity, but it constitutes a polyaetiological set with various clinical symptoms, depending on the place of central nervous system damage [3, 7]. Due to the damage of brain structures, the growth of neurological mechanisms controlling posture, balance and movement is either delayed or incorrect. Cerebral palsy also features such accompanying symptoms as the impairment of eyesight, hearing, speech, perception and visual-motor disturbance with mental handicap [3]. Thanks to brain compensatory abilities, it is possible to influence the improvement of disturbed functions. Presently, we possess various methods, facilitating children with cerebral palsy. Their aim is to stimulate the areas of psychokinetic development, yet their ways of realizing this aim differ. Alongside basic methods of improvement, there are many other, helpful forms of therapy. They supplement the main methods in psychological, pedagogical and kinaesthetic aspect. Here we have the following methods facilitating complex therapies of children with CP.

The Good Start Method

The forerunner of this method was Thea Bugnet van der Voort, a Dutchwoman that devised it in France under the name of Le Bon Deport. She elaborated on a set of physical exercise combined with breathing exercise for relaxation.

The Good Start method includes visual, aural and motor stimuli. The aural stimulus is a song. Graphic patterns with letters are the visual stimulus and the

motor stimulus encompasses motion done during the graphic patterns reconstruction, attuned to the rhythm of music. The therapy uses songs for children and folk music, as the folk music is not only closer to the child but also easier to perceive due to the interval structure. Vocal and rhythmic exercise facilitate aural perception and motor activity, alongside creative and intellectual development, calming a child's nervous system. Visuospatial stimulation happens in such a way that children reproduce the patterns from very simple ones to more complex. This takes place by moving the limbs that recreate a painters' expressions on various types of surface. Children use different tools which require gradually more precision. Such activities develop analysis with visual synthesis, the precision of arbitrary movements, visuomotor coordination with motor activity. The classes are of didactic nature, yet are executed in a form of play; they are conducted in teams so that they teach them social cooperation. Each team consists of up to 8 children. All the 3 types of exercise that are an integral part of every class are conducted simultaneously during that time.

The assumption of the Good Start method is the coincident development of linguistic, visual, aural, tactile, kinaesthetic (feeling motion) and motor functions. The aim of the method is to facilitate the sensory organs' functions with lateralization development, children' orientation in their body scheme and space. Participation in the classes favours psychomotor development disorder rehabilitation and aids in coping with difficulties in obtaining basic school skills [2, 5].

W. Sherborne's Developmental Movement

The method was devised by an English physiotherapist and teacher Weronica Sherborne. The main assumption of the method is stimulating a child's development through physical and emotional contact with motion aided with words, rhythm and music. Its application is especially useful in patients with cerebral palsy and coexisting mental handicap.

The aim of the method is, via movement, to develop one's body awareness alongside the awareness of space and acting within it. Also sharing the space with other people, establishing relation with them and with it, a general motor facilitation of a child [10].

W. Sherborne claims that by exercise a child learns about its strength, motor abilities, and thanks to this it displays initiative more frequently, becoming more creative. The exercise base on the child's natural needs, satisfied through playing with its parents. The classes are systematic (at least once a week), individually or in a group in which every child is accompanied by a partner – most often a parent [5, 10]. During the exercise, children practise with their partners on low positions.

We can specify six groups of exercise in the method:

1. Exercise developing one's body awareness. Learning about body parts, their movement and properties by motion and touch.
2. Space awareness exercise. Learning about the child's surrounding environment, orientation within it and sharing the space with others.
3. Exercise "with". The child learns to cooperate with others during exercise with their partners. They are taught how to take care of other person, how to be needed and how to take responsibility for the companion.

4. Exercise “against”. Exercise develop strength, learning about it, sensing it, and motor dexterity, developed through types of exercise “against” the partner.
5. Exercise “together”.
6. Creative movement.

The child is taught cooperation, partnership, roles division, overcoming fear and emotions. A sense of comfort and trust towards the partner is thus developed.

The therapist adjusts his or her lesson plan to the child’s suggestions. Through play, the child learns the environment, begins to trust oneself and others, and only then when it feels safe, can it become creative.

The above mentioned groups we choose according to the child’s condition and possibilities, though the various exercise groups can be combined. These activities should be based mainly on tactile sensations, such as being adjacent to, being propped or moved. Also, the sensations should be balanced, rhythmic and forcible. The child should be allowed to take the initiative during the play, so that it could be the originator, according to its interests [6, 10].

Weronica Sherborne’s method greatly influences the emotional, social and cognitive development of a child, especially in the sphere of its body orientation scheme with creative attitude towards life. The influence on motor area of a child is also crucial, raising its overall physical efficiency. The asset of the method is also its great availability – the exercise can be done in any conditions – no additional apparatus is required [6].

J. Baran’s Play Therapy

Play as a form of compensatory therapy was devised by Joanna Baran in 1986 that aims at improving perception, motor and mental functions. The method is meant to psychomotor facilitation of children with CP between the age of two to six. Children who take interest in their surrounding and like to play, can take part in the therapy. In the beginning, the child’s level of interest and its relations with adults in the play are determined. The therapist’s role is to encourage a child to take the effort, help him or her if he or she is having difficulties with performing a move and repeat it many times during the play. Doing multiple motions permits the child to realize them on the basis of felt sensations. J. Baran made programs to improve visuomotor coordination with thinking functions, which aids the choice in selection of games for a specific child. The programmes include a collection of games with helpful devices necessary for their conduction. The author prepared sets of play which are in accordance with the natural development of child’s visuomotor coordination function and thinking.

Visuomotor coordination improvement programme:

Part A of the programme presents the games that aim at the development of motor patterns of elementary manipulative functions.

Part B deals with creating of visuomotor associations for graphic functions, that is shaping visual control over a drawing hand.

Part C shapes visuomotor orientation in such activities as construction, drawing, synthesis – combining elements into one piece.

Thinking development programme includes the following exercise:

- familiarizing with objects’ usage,
- naming the features of items,

- comparing objects,
- realizing the cause and effect relation or its lack.

Before the improvement an examination is made to check various functions. Therapy begins with the first undone activity. Special games are assembled from the visuomotor coordination programme and from the thinking programme.

An example of the visual coordination game is one in a rural household with miniature domestic animals where the child exercises index finger opposition.

A model of a game from the thinking programme is categorising pictures into two groups and giving the objects' application for example "to dress", "to eat".

The form of therapy makes it possible to apply it by parents at home as well. It is to sensitise them to various disorders and show parents the possibilities how to deal with them. The treatment is also aimed at therapists as an offer of auxiliary or alternative therapy, when the efficiency of others is low [1, 5].

The Snoezelen Method

The method originates from Holland and was created by specialists dealing with mentally handicapped children, Ad Verheula and Jan Helseggeg. It is applied in the Czech Republic as a multisensory method of treating children with mental handicap. It was found useful for instance in treating children with CP, in which there is also mental handicap. The main assumption of the snoezelen method is to create a special surrounding for a child which would stimulate its development with multiple stimuli. The name comes from two Dutch words: *snuffen* and *doezellen* which means "to feel" and "to sleep, relax" [9].

The way of treatment consists in placing a child in a specially prepared room, called "snoezelen room". The surrounding a child lives in is, in this method, the main area of sensory stimulation. Such stimulation serves the children with mental handicap to improve their communication with other, correctly developed ones. The basic assumption of the method is the verification that perception, gaining experience and thorough development of personality in the first place assure the sensory experiences, accompanied by feeling and motor activity.

The place for the therapy is equipped with many multifunctional devices and other scholarly aids that effectively stimulate senses by the use of luminous, auditory, olfactory and gustatory stimuli. Individual approach to a patient is of utmost importance, taking heed of his or her individual preferences and needs, yet the development stimulation of higher cognitive areas with abstract thought and memory processes are abandoned. Techniques which are applied develop skills necessary only for fulfilling physical, emotional, psychic and spiritual needs.

The therapy covers exercise that aim at:

- development of perception, emotionality, cognition and communication,
- development of self-regulation and personality harmonizing,
- motor movement development,
- attention sifts and child's focusing,
- decline of aggressive and auto-aggressive behaviour,
- enhancing the balance between a unit's relaxation and activation,
- positive socialisation and integration into social structures.

Snoezelen bases on the cooperation of three factors (therapeutic triangle): ordered space, a patient and a therapist. A stress-free cooperation without any burden in relation between a child (a participant) and a therapist is crucial.

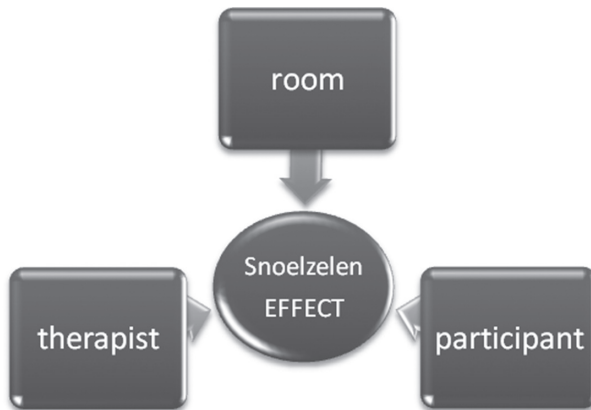


Fig. 1. A Snoelzelen therapeutic triangle [9].

The treatment is at present applied as a auxiliary one for children with mental deficiencies [9].

The rehabilitation program with the use of TheraSuit orthotics

The idea of using rehabilitation costumes in facilitating children with neural and motor illnesses was adopted from astronautics. The first spacesuit for astronauts was created in 1971 in USSR. Its aim was to counteract the negative effects of decreased gravitation, which caused the muscle atrophy and osteoporosis. Such suits began to be used to facilitate children in the nineties.

The TheraSuit rehabilitation suit was devised and introduced into the American market in 2002 by two physical therapists, Richard and Izabela Kościelny. It is a soft, proprioceptive dynamic orthotics, comprised of system of resilient connecting elements, such as a hat, trousers, waistcoat, kneepads and shoes with special jonctions. The system allows the child's posture to be corrected, thus restores the posture muscles' proper functioning and enables learning the proper movement pattern. Proper adjustment of the pull exerts specific burden and pressure, thanks to which the proprioceptors, located in muscles, tendons and ligaments are stimulated. The TheraSuit suit ensures external trunk stabilisation, simplifying the performance of more fluent and coordinated limbs' moves. The suit does not limit child's moves, which allows the dynamic correction to be conducted. Initially, the suit aids weakened muscles. With their strength's growth, the tension of resilient connectors increases and the suit takes the resistance function.

With the creation of the suit, an intensive rehabilitation programme was devised. Its target was to hasten the progression of the child's development. The programme uses the knowledge from training physiology and physiology of exercise and sport.

The therapy influences the following:

- muscle tension standardisation;
- increase of active move range;
- increase of strength and dexterity;

- increase and improvement of control over strengthened muscles, enabling a child to improve a function and achieve motor independence;
- improvement of proprioception;
- reduction of pathological impulses;
- restoration of correct posture and move patterns;
- correction of exterior body stabilisation;
- correction of labyrinthine system functions;
- acceleration of acquiring new motor skills.

TheraSuit constitutes an auxiliary form of therapy and can be used in such methods as: PNF, Bobath, Manual Therapy, Kinesiotaping, Thera – Band, Sensoric Integration and Domana – Delacato [13].

Neurosensorimotor Impulses Integraton Programme According to S. Masgutowa

The author of this method is Swietlana Masgutowa, educational and developmental psychology doctor, worker of Russian Academy of Education. Since 1988 Masgutowa conducts scientific research dealing with therapeutic techniques used in impulses and habits integration. The therapy devised by dr. S. Masgutowa is to support the impulses integration process within the framework of neurosensorimotor system functioning. The reaction pattern disorder hampers a child's psychic development and that of controlled motor skills.

The idea of the therapy relies on the correction of improper impulse patterns through their integration on the following levels:

- sensorimotor for the safety of their proper neurological functioning,
- impulse patterns with intentional moves,
- impulse patterns and motor habits,
- motor area and cognition.

The therapy consists of two main elements:

- 1) diagnosis of primary reaction and motion pattern,
- 2) facilitation and integration of primary movement system and movement patterns.

Reflex pattern integration is possible thanks to the activation of genetic memory of primary motion pattern. It happens on all levels of the "impulse wheel": the stimulus reception by sensory receptors, its analysis in the brain and motor response. The stimulus reception takes place through sensory stimulation, stimulus recognition by our sense system and information processing with the brain. Sensory stimulation concerns proprioceptive and surface feeling. The analysis means the recognition of a stimulus by the brain as the one that requires protection or is of developmental nature. The motor response constitutes a brain feedback reaction on the sensory stimulus. Such a reaction can be correct, dysfunctional or pathological.

In this method the sets of exercise offered come from educational kinesiology – P. and G. Dennisons' Brain Gym. These are oriented towards optimising the functioning and integration of focus dimension, centering and laterality. The exercises proposed by S. Masgutowa ensure neurophysiological basis of learning, integrate reactions with all the body movement system and improve various coordination levels [8, 12].

Animotherapy

Also called Animal-assisted Therapy, it is a kind of treatment which facilitates patients with the help of properly selected and trained animals. Being in touch with an animal helps in basic therapy of children with CP. Animals provide many benefits in psychic, physical and social area. Staying with animals positively influences the child, decreasing its stress level, stimulates its motor activity and is a source of sensorimotor stimulation. The aid of animals during the exercise distracts the child's attention away from it, thus allowing him or her to perform it correctly. Animal therapy, depending on the animal, takes on different forms, such as: hippotherapy, Therapy Dog, dolphin therapy, Therapy Cat and onotherapy. Apart from the aforementioned, there are therapies with parrots, applied in logopaedics and with aquarium fish that display a soothing influence on the child.

The oldest form of therapy is that with a horse, Equine Assisted Activity. It encompasses the following: physiotherapy on a horse, psycho-pedagogical ride on a horse, therapy on a horse and horse ride for the handicapped. It has been proven that EAA improves sensory sphere, motor area (balance, coordination, motor activity, tension standardisation), somatognosia, emotional, cognitive and social sphere.

The Therapy Dog, or Kynotherapy is a form of treatment, where a dog is the therapist. Golden Retriever and Labrador Retriever are the two types of breed most frequently used. Staying with dogs allows the children to behave spontaneously, teaches focusing attention and facilitates learning their body image. Such classes consist in showing how to move the way the animal does, how to take care of it in terms of its' needs and hygiene, with relaxing exercise performed with the dog. The form of classes may vary, from meetings with the dog, education with it or therapy.

Dolphin therapy consists in the children being in the presence of a dolphin, playing with it and performing various types of exercise in water. The water environment here is an asset of this therapy. The effects of such treatment are mood betterment, caused by secreting endorphins in the child's body and a beneficial influence on damaged cells that are penetrated by a beam of ultrasounds, sent by dolphins.

Therapy Cat. It is a form of treatment in which the cat aids the facilitation. This way of treatment positively affects the child's disposition, stimulates its motor activity, develops sensitivity, regulates heart rate by influencing blood pressure and cholesterol level.

Onotherapy is a form of treatment with the use of a donkey. Those animals are not skittish, yet very patient, calm and durable, easily memorising an assigned task. Owing to their small build, donkeys do not instil fear of height and are easy to mount. Donkey's walk is long, slow and sedate. These features decide of the benevolent therapeutic environment, which this animal constitutes [4, 11].

Conclusions

A child with cerebral palsy is not only a matter of motor disorders, but of psychopedagogic area as well. The neurotherapeutic approach is insufficient, therefore establishing a facilitation program which includes kinetic therapy with pedagogical, emotional and social aspects, is indispensable. Learning new ways

and techniques which enhance basic therapy, may significantly influence the effectiveness of complex rehabilitation of a child with cerebral palsy.

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The Compression Therapy in Rehabilitation of Lymphatic and Venous System Diseases of Lower Limb

Rehabilitacja metodą kompresoterapii w chorobach układu limfatycznego i żylnego kończyn dolnych

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Abstract

Compression therapy is the oldest method of treatment applied to diseases of the venous and lymphatic system. Compression therapy is an important element of treatment of chronic venous insufficiency at every stage. Simultaneously it is the primary method to prevent the return of the disease. Compression consists of applying a gradual external pressure on the limb for the purpose to oppose to the forces of gravity and to improve the blood flow. To make the therapy effective and to use it properly the causes of cardiovascular disorders should be recognised. In treatment a tourniquet is used and articles that make graduated pressure like: compression knee socks, compression stockings, compression tights. A properly applied compression therapy reduce the venous pressure, improves the conditions for healing of ulcers by improving the blood flow without affecting the arterial system. According to current standards, prevention and treatment of venous diseases in various degrees of progression, including venous ulcers and lymphedema should be a multidirectional type of work and combine different forms of therapy and concentrate actions of doctors, nurses and physiotherapists.

Key words: compression therapy, compression, lymphatic oedema, vein oedema, lymphatic-vein oedema.

Streszczenie

Kompresoterapia to najstarsza metoda leczenia chorób dotyczących układu żylnego i limfatycznego. Terapia uciskowa jest istotną częścią leczenia przewlekłej niewydolności żylny na każdym jej etapie. Jednocześnie jest podstawową metodą zapobiegającą nawrotom choroby. Kompresja polega na stosowaniu stopniowego ucisku zewnętrznego na kończynę w celu przeciwstawienia się siłom grawitacji i poprawy ukrwienia. Aby terapia była skuteczna, należy dążyć do rozpoznania przyczyny zaburzeń układu krwionośnego i stosować ją w prawidłowy sposób. W leczeniu stosuje się opaski uciskowe oraz wyroby o stopniowanym ucisku, takie jak: uciskowe podkolanówki, pończochy, rajstopy. Poprawnie

zastosowana metoda kompresji zmniejsza nadciśnienie żyłne, polepsza warunki gojenia owrzodzeń przez poprawę ukrwienia, nie wywierając wpływu na układ tętniczy. Zgodnie z obowiązującymi standardami profilaktyka i leczenie chorób żył o różnym stopniu zaawansowania, w tym owrzodzeń żylnych czy obrzęków limfatycznych powinny mieć charakter wielokierunkowy i łączyć różnorakie formy terapii oraz skupiać działania lekarzy, pielęgniarek i fizjoterapeutów.

Słowa kluczowe: kompresoterapia, terapia uciskiem, obrzęk limfatyczny, obrzęk żylny, obrzęk żyłno-limfatyczny.

History

Compression therapy which is the treatment by oppression is one of the oldest methods of treatment for diseases of the venous and lymphatic tissues.

Some of the first documented informations about bandaging of the limbs can be found in Egyptian papyrus. These documents describe the technique of bandaging acquired and improved in the process of mummification of corpses. Thanks to this Egyptians had the skills to bandage all the parts of the body, not just the lower limbs.

Also Hippocrates appreciated the advantages of bandaging in the proces of healing of ulceration and varicose veins of the lower extremities [2].

Introduction

Lymphedema is the accumulation of high-protein fluid in tissue spaces and lymph vessels. This fluid contains a migratory and settled immune cells, metabolic products, cells in apoptosis process, endothelial cells and others. In the process of formation of oedema the increased number of cells is within the limb [2].

The Physiology of Lymph Flow

Lymph flow is enforced by the spontaneous contraction of individual limphangion. Limphangion rhythmically shrinks at average 4–6 times per minute, pumping lymph to the previously evacuated limphangion lying above. Pressure in the initial lymphatic vessel is from -1 to -5 mm Hg, in collecting lymphatic vessel from 0 to $+5$ mm Hg. The valves prevent backflow of lymph to the lower lying limphangion. The strength and frequency of contractions depends on the fulfillment of lymphatic vessels. The more extended is limphangion, the more force it use to shrink. Systolic pressure of lymph is $0-5$ mm Hg, diastolic pressure $10-15$ mm Hg.

Supporting mechanisms of lymphatic circulation are, as in the venous circulation, the pump of muscles, the pulse from adjacent arteries, adverce thoracic pressure, breath movements [1].

The Causes of Edema

Lymphatic insufficiency, which in terms of pathophysiological classification is devidet into: dynamic insufficiency – as a results of impossible removal of excess fluid in the efficient lymphatic system, mechanical insufficiency – as a results of damaged lymphatic vessels (primary, secondary), resulting in completely impossible outflow of lymph, “Safety Valve” insufficiency [1].

Classification of Oedema by Kinmontha

Primary oedema (idiopathic) – the cause is hypoplasia or agenesis of the lymphatic vessel:

- congenital (*lymphoedema congenitum*) – occurs before the age of 1 (Milroy's disease),
- early (*lymphoedema praecox*) – occurs between 1 and 35 years of age (Meigea disease),
- late (*lymphoedema tar dum*) – begins after the age of 35.

Secondary oedema – caused by different handicapping factors of lymphatic vessels:

- postinflammatory – swelling may occur even several years after undergoing process of inflammation of the skin, subcutaneous tissue, blood and lymph nodes (Rose, infected wounds, insect bites), it occurs to fibrosis and vascular occlusion,
- postoperative – come into existence as a result of removal of lymphatic gland and vessel during surgery (for example after removal of the contents of axillary after mastectomy)
- tumour – as a result of attack of primary malicious tumour on lymph nodes or metastases in lymph nodes,
- traumatic – as a result of damage of the lymphatic vessels by the injury or after fracture,
- after radiotherapy – a result of vascular damage and angiofibrosis, lymphadenofibrosis by radiation,
- mixed venous-lymphatic – a complication of venous inefficiency, fibrosis, venous oedema, infection of venous ulcers, and others,
- parasitical – is growing as the primary symptom, of lymphatic filariasis – the invasion of the skin and lymphatic vessels by filariasis – parasites transmitted by mosquitoes [2].

The Clinical Picture of Lymphedema

There are two forms of lymphedema: chronic and acute (rarely develops). Chronic swelling occurs much more frequently. Initially it is painless and small. Most occur in the vicinity of ankle or forefoot, increases in the summer and recede in winter (seasonal). Later it increases its size, is revealed by increased painfulness in cold months, there is no atrophy.

Lymphedema spreads from the ankle to the foot and shin. A characteristic feature is that even if it is small it does not disappear after a night rest.

A very characteristic symptom of lymphedema is the occurrence of positive Stammer symptom, that is the lack of deflection and elevation of the skin of the back of the second toe (a negative test does not exclude the existence of oedema). The characteristic “doughy” swelling occurs. Over time, foot take shape of a „Buffalo hoof”, the difference between the circumference of the lower and upper leg disappears, it is called “Elephant foot” and the swelling is moving towards the thigh.

In the initial period of lymphedema the skin is pale or pale pink, with an increased body temperature. In the next stage it becomes hard, thick and loses flexibility. The nails of the toes have yellowish color, they become fragile, brittle and may fall out. This often leads to mycotic infections [2].

Clinical Stages of Lymphedema (by Brunner):

- Grade I – gantle swelling of the foot and lower leg, appearing at the end of the day, spontaneously retreating after lifting the limb.
- Grade II – all-day swelling spontaneously retreating after night with positive Stammer symptom (thickening of skin folds over the second toe, difficult in rising skin).
- Grade III – lasting swollen, not resigning after the elevation of the limb.
- Grade IV – a permanent swelling that deforms the limb, quite often complicated by inflammation of the skin (erysipelas, eczema, lymphatic fistula).
- Grade V – Elephantiasis – a huge limb swelling deforming limb with thickened skin, muscle changes (muscular dystrophy), handicaping limb function [2].

Clinical Picture of Venous Oedema

Venous oedema arise from insufficiency of veins and caused complications such as varicose veins, phlebitis, varicose ulcer of leg. Type of swelling depends on the location of thrombosis and find if the blood can find another drain way. However, the size of swelling depends on the location of clot (intramuscular vein and tibial vein – small swelling, common femoral vein and common iliac vein – massive swelling). At the beginning there is a clear, large swelling, pain and extensive acrocyanosis. In some patients the pain is so strong that it does not retreat even after positioning the limb above heart level [2].

The Clinical Picture of Veno-Lymphatic Oedema

It is emerge as an effect of load of the venous system resulting in disorder in functioning of lymphatic vessels and the appearance of veno-lymphatic oedema. The skin becomes thick and oversized. Swelling is spreading from the legs towards the feet. The appearance of foot is typical for lymphoedema. Very quickly the ability to retreat of the swelling after night rest disappear. The atrophy of the fat tissue of the skin on the shin can be seen, causing thinning of the skin and subcutaneous tissue, fibrosis, callus. The skin consolider with fascia – Lipodermatosclerosis. This process is mostly manifested over ankle, which causes the tightening of circumference of shin – the limb remind In shape an inverted bottle of champagne. At this point, the skin is discolored, thin, hard, does not move regarding to to the ground (Milan's atrophie blanche). In some cases, as the disease progress the oedema of the subcutaneous tissue disappear resulting in significant movement deficiency in the ankle joint. Foot is set in an equinovarus position that fulfill only the support role [2].

The Compression Therapy

Compression therapy is the primary method of treatment of the venous diseases, ulcers and preventing from reversion. It consists of applying a progressive external pressure on the limb in order to oppose the forces of gravity and improve the blood flow. To make the therapy effective the causes of cardiovascular disorders should be identify and the therapy should be use correctly. Properly applied compression reduces the venous pressure, improves the condition for ulcers healing by improving blood flow, without affecting the arterial system.

The compression therapy is based on the pressure between surfaces arising between the pressing material and the skin. If the pressure is properly established on the extremity the external pressure is higher than the venous pressure and it varies depending on body position.

In the standing position the blood pressure should interact with external hydrostatic pressure and decrease upwards. The greatest pressure should occur in the ankle area, where the weight of the blood column is the greatest. The optimum value of pressure at this level is 40 mm Hg [2].

The Principles of Compression Therapy

Starling Law

“If there is a gradient of oncotic pressure on both sides of the semipermeable membrane, such as capillary vessel walls, the water moves through it, until the concentrations on both sides reach an equilibrium. Oncotic pressure is generated by the plasma albuminous colloid” [2].

Laplace’s Law

“The pressure inside the membrane is always higher than outside, but equal zero when it concerns a flat surface that is when the radius of curvature is level” [2].

Methods of Compression Therapy

There are many ways to perform compression therapy in the treatment of leg diseases. The following divide is based on the elastic properties of materials used in compression therapy.

I. Medical compression stockings: custom-made, standard, knee, stockings, tights.

They can be use to treat minor ulcerations, lasting too long (less than 3 months). It is the most common and easiest way to secure the continuous degree of pression. It is easy reach, easy to change the dressing and to keep the hygiene of ulcers. Its disadvantage is that it is susceptible to become quickly dirty as a result of exudate, which cause a frequent washing, which results in a weakening of the fiber structure of stockings. Most patients choose stockings that exert minimal pressure of 30 mm Hg at the ankle level.

Indications: prevention of chronic venous insufficiency, prevention of the return and thrombotic complications in a period of increased risk [4].

II. Bandages: inflexible, a short stretch, a long stretch, a single-layer and multilayer.

Inflexible

These include: soaked with zinc paste bandages (anti-inflammatory, reduces swelling, redness and pain), Unna boots or stiff elastic-sides. They need to be fit on by qualified personnel.

Oppression of bandage depends on: the size of swelling, the ability of patient to walk, circumference of shank.

With big oedema a pressure at 60 mm Hg must be obtained in distal lower leg.

We do not use such big pressure values in patients with atherosclerosis obliterans. Putting on a few layers of bandage we get an equal distribution of pressure. The oppression decrease from ankle upward due to its small circuit in relation to the calf (this explains the Laplace’s Law). During the walk and

muscle contraction the maximum pressure under bandage is 80 mm Hg, while during diastole reaches 40–50 mm Hg, that is so-called „massaging effect”. The pressure difference depends on the stiffness of the compression material.

Indications: active venous ulcer in the phase of increase of oedema [4].

Short Stretch

In the initial phase of treatment of ulcers bandages are often exchanged, but with the progress of healing the need to change them decreases. They are applied tighter than elastic bandages. As in elastic bandages it is necessary to get a high blood pressure at rest in the distal lower leg decreasing in the proximal direction.

Indications: the prevention of accumulation of edema or as supporting therapy after its retreat, in the process of venous ulcers in patients with a right Ankle Brachial Pressure Index, physically active patients [4].

Long Stretch

The degree of oppression at the time of being fit on do not need to be as high as in the case of elastic bandages. The best is to put them in the morning, before getting up from bed and removing them before bedtime. Tension during the day practically does not change, so it may cause pain and discomfort, especially when patient is sitting or lying down.

Indications: primary and secondary prevention of venous disorders, prevention of recurrence, in the treatment of venous ulcers, only if there is no disorder in blood supply [4].

Multilayer

This type of bandage can be left without change even for a few days. A few layers provides adequate pressure during walking and at rest. It adopts the characteristics of inelastic bandage. There are also available a four-layer bandages consisting of: cotton wool, crepe, elastic and self-adhesive layer.

Indications: venous ulcers [4].

III. The intermittent pneumatic compression: single-chamber devices, sequential chamber: foot, lower leg, the whole limb.

The intermittent pneumatic compression reduces swelling and improves blood circulation in the arteries. This type of compression is used mostly in patients with a large swelling that prevents walking. This method differs from other methods by occurrence of the oppression phase between particular cycles of pressure, in which the beneficial effect is the occurrence of a short, reactive hyperaemia. This treatment improves skin elasticity. Compression strength is selected individually (depending on the swelling), but can not exceed 120 mm Hg. Duration time of the massage is 20–30 minutes, and after the limb is bandaged.

Indications: prevention of venous thrombosis, treatment of thrombotic syndrome, veno-lymphatic oedema, venous ulcers [4].

IV. Intermittent static pressure

A mercury bath

This bath is used in lymphatic oedema, particularly in arterio-venous origin. In the treatment a mercury-filled cuffs are used. They produce a high-pressure phase (above systolic values) [4].

V. Underlay

Underlays are used in an effort to increase the pressure, when the action of stockings or bandage is insufficient. This is when a foam rubber pads are used.

Its edges are flattened so it does not cause a sharp indentation on the skin. They are put on with the curved side toward the shank [4].

Compression Techniques

Elastic bandages and stockings are easy to use and can be used by the patient himself or by personnel.

Bandages with zinc paste are put on with higher resting pressure.

Immediately after the putting the dressing on, the patient should be in constant motion for about 30 minutes. After this time the pressure drops to about 40mmHg, causing substantial regression of oedema. The dressing should be changed frequently during the initial phase, over time once a week.

The bandage must cover the whole foot, which is in maximum dorsiflexion and reach up to the head of the fibula. We start the bandage from the ankle or heel to dorsal tendons, then we bandage a foot to the base of the fingers. The morning swelling may occur in the distal part of foot and disappears during the move.

Other layers of bandage are put on the lower leg in a spiral shape or figure eight (in order to partially coincide at each other at about 30–50%).

To gain a graduated compression we put more layers to the lower part of the leg than the upper part, so that we get more pressure within the ankle.

Most patients require only bandage of shin. Only in the case of large swelling or venous thrombosis of thigh, it is necessary that the bandage reached the groin. In the middle of the thigh pressure must exceed 40 mm Hg [4].

All exercises should be performed in the sleeves, compression stockings (or after bandage) and in positions that simplify the gravity drainage of lymph from the limb.

Indications for Use of Compression

Categorizing patients for compression therapy it is important to take into account the indications and contraindications to specific classes of oppression. In Poland the classes of oppression are adopted from European standard:

- Class I – 20–30 mm Hg,
- Class II – 1930 to 1940 mm Hg,
- Class III – 1940 to 1950 mm Hg,
- Class IV – 50–60 mm Hg.

Indications for use of compression articles in Class I: prevention, leg heaviness and fatigue, minor varicose veins, after the surgery of varicose veins (at least 3–6 months).

Indications for use tights in Class II: a condition after a superficial inflammation of veins, chronic venous insufficiency, once healed small ulcers.

Indications for use of compression articles in Class III: indications from above classes, but more advanced, post-traumatic oedema, reversible lymphoedema.

Indications for use of compression articles in Class IV: heavy after clot syndrome, irreversible lymphoedema.

Absolute contraindications: significant lower limb ischaemia (WK-R < 0.6), decompensated heart failure

Relative contraindications: minor limb ischemia (WK-R > 0.6), thromboembolic disease (acute phase), diabetes, swelling of a different etiology than the

venous, acute inflammation of the subcutaneous tissue, skin diseases with high leakage, infection of the skin, rheumatoid arthritis of the spine [2].

Effects of Compression Therapy

On the venous system – the task of compression therapy is to reduce venous hypertension by reducing venous reflux. The activity of the muscle pump is improved. As a consequence, this leads to a better return of blood to the heart. This can be adverse in patients with heart insufficiency.

On the arterial system – intermittent mechanical compression enhances the flow in large peripheral arteries and in small arteries of the skin.

On the lymphatic system – compression reduces the pressure in the lymphatic vessels, improving lymph circulation. Treatment of this swelling takes place in two stages. The purpose of the initial phase is to activate and drain the swelling. During the maintenance phase we try to keep the obtained the limb circumference and size. The short stretch bandages in conjunction with walk exercises restore lymphatic drainage and normalize the morphology disorders of lymphatic vessels in the skin.

On the microcirculation – compression stimulates blood flow in the microcirculation. The increase of tissue pressure by external compression reduces capillary filtration and increased reabsorption of fluid. The use of compression therapy may increase the pressure gradient and improve blood flow. Compression action causes an immediate regression of pain and a beneficial effect on ulcer healing [2].

Conclusions

The compression therapy remains the basic treatment of venous ulcers. The effectiveness of the external pressure depends on the effects of bandage pressure or stockings and the flexibility of used material. Variable strength of opression depends on several factors, such as compression method, type of material used, the level of patient activity, anatomy and dimensions of the limbs (which may change due to swelling).

Very important are the skills and knowledge of the person putting the compression on. Appropriate patient education, his motivation and attitude are an important factor to achieve better therapeutic effects. It is recommended to make active and passive exercises, including foot and ankle exercises. They activate the calf muscle pump and supplement the effects of compression stockings [2, 4].

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Ozone as a Therapeutic Factor

Ozon jako czynnik terapeutyczny

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Abstract

Ozone therapy is a treatment method using oxygen and ozone mixture. It is a perfect remedy having antiseptic, fungicidal, virucidal properties which can be reached at the concentration of 3–5 mg/l. These properties make the ozone widespread and extensively applicable in medicine. The use in therapy is principally associated with its antiseptic and oxidative-catalytic properties as ozone's activity is directed towards cellular metabolism, including particularly an increase in the amount of oxygen supplied to tissues. Ozone applied in therapeutic doses supports treatment of e.g. ischemia of limbs in arteriosclerosis and diabetes, crural ulceration, purulent skin lesions, antibiotic resistant infections, motor organs diseases. The most often used methods are: oxygen-ozone baths, autohemotransfusion, dressings containing ozone, deep insufflations with oxygen-ozone mixture. Unfortunately, treatment with use of oxygen-ozone mixture is not pervasive in medicine and in physiotherapy, either. The aim of this research is proving that ozone therapy should be used to support the basic treatment.

Key words: ozone therapy, oxygen-ozone mixture, motor organ.

Streszczenie

Ozonoterapia jest to metoda leczenia chorych mieszaniną tlenowo-ozonową. Jest to doskonały środek o właściwościach bakteriobójczych, grzybobójczych oraz wirusobójczych, które osiąga przy stężeniu 3–10 mg ozonu/l. Te właściwości zapewniły ozonowi tak szerokie zastosowanie w medycynie. Wykorzystanie w terapii jest związane przede wszystkim z właściwościami dezynfekującymi i utleniająco-katalitycznymi, gdyż ozon wykazuje działanie ukierunkowane na metabolizm komórkowy, w tym zwłaszcza na zwiększenie ilości tlenu dostarczanego tkankom. Ozon stosowany w dawkach terapeutycznych wspomaga leczenie m.in.: niedokrwienia kończyn w przebiegu miażdżycy oraz cukrzycy, owrzodzeń podudzi, zmian ropnych skóry, zakażeń odpornych na działanie antybiotyków, chorób narządu ruchu. Najczęściej stosowanymi metodami są: kąpiele tlenowo-ozonowe, autohemotransfuzje, opatrunki zawierające ozon, głębokie insulfacje mieszaniną ozonowo-tlenową. Leczenie mieszaniną tlenowo-ozonową jest jednak mało rozpowszechnione zarówno w środowisku medycznym, jak i fizjoterapeutycznym. Celem pracy jest udowodnienie, że ozonoterapia powinna stanowić uzupełnienie leczenia podstawowego.

Słowa kluczowe: ozonoterapia, mieszanina tlenowo-ozonowa, narząd ruchu.

Introduction

Recently ozone is commonly associated with the problem of the “ozone hole” that was discovered in 1985 and with environmental protection. However this variation of oxygen was already discovered in 1840 by Shonbein during the electrolysis of water. Described previously as an “electric matter”, the sensible odour during storms and lightning was called ozone.

The profitable effects of ozone were noticed by Fox. He observed the killing effect of microorganisms by ozone using the ozone lamp invented by Siemens. The recognized bactericidal properties were used by Siemens and Halske to create the first factory for water ozonization. In not so far times ozone had been applied for the disinfection of wounds and surgical instruments during the war in Korea. The fundamentals of today's ozone therapy were introduced by Professor Otakar Rokitansky, who used oxygen-ozone therapy and confirmed its benefits and explained the processes occurring in living organisms during ozone therapy. In Poland for the first time the treatment of oxygen-ozone mixture was made by Professor Zygmund Antoszewski [4].

Properties of Ozone and its Effect on the Structure of the Organism

Ozone (O_3) is a high energy, allotropic variety of oxygen with a molecular weight 48th. It is a bluish gas, denser than air, 15 times more soluble in the water than oxygen. It has strong oxidizing properties, so it is widely used to treat drinking water.

The greatest concentration of ozone occurs at an altitude of 20–30 km above the Earth in the stratosphere. It works as a filter – selectively stops UV-C radiation lethal to living organisms. It reduces the UV-B rays and absorbs completely the rays with the wavelength below 295 μm .

In the atmosphere the ozone is produced as a result of electric discharges such as lightning during storms. It is also emitted in the process of short wave radiation (quartz lamps, bactericidal lamps).

Ozone is a toxic gas. During breathing it causes pathological changes in the respiratory epithelium. It causes damage to biological membranes by the radical reactions with their structures. The first symptoms of irritation by ozone are coughing, scratching in the throat, headache, drowsiness. At higher concentrations can cause increases in blood pressure, pulse acceleration and pulmonary edema leading to death [4].

Biological Effects on Tissues

For the increasing use of ozone therapy, appeals the proven beneficial effects of ozone used on the body's tissues.

To the most important we include:

1) the impact of ozone on metabolism of oxygen in a cell by:

- the increase return of oxygen by hemoglobin molecule,
- erythrocyte membrane flexibility (which helps to improve circulation, especially in the capillaries, because red blood cells more easily passes through its light what is connected with the improved flexibility, therefore the supplying of tissues in oxygen and nutrients is improved);

- 2) the impact on the immune system:
 - through the stimulation and production of lymphocyte T and lymphocyte Ts.
- 3) the effects of ozone on the fat metabolism:
 - ozone administered in a mixture of oxygen-ozone increases the ratio of HDL/LDL
 - in patients with advanced atherosclerosis;
- 4) the virucidal action:
 - as a result of strong oxidative properties of ozone, and the lack of affirmation that the microorganisms may become immune against ozone during the conduct of therapy,
 - ozone has devastating effects on such strains as Polio (poliomyelitis), Adeno, Echo, Cox, Hermes A and B, herpes hypervirus and retroviruses;
- 5) antiseptic and fungicidal action of ozone:
 - the killing of microorganisms takes time, depending on the method of ozone therapy, from several seconds to several hours,
 - ozone therapy makes pathogens bacillus of *Escherichia Coli*, *P. vulgaris*, *Ps. Aeruginosa* and *Clostr. Perfringens* more sensitive,
 - the fungicidal activity in relation to, inter alia, *Cand. albicans*, *Mon. albicans*, *Trychopython* *Microsporium*;
- 6) the impact of ozone therapy on the inflammatory processes:
 - oxygen-ozone therapy causes decrease of acute-phase proteins (which play important roles in inflammatory processes), which greatly stabilizes the intensity of inflammation;
- 7) the impact of ozone on tissue energy metabolism:
 - an accelerating rate of glycolysis and the increase of use of glycogen in the muscles,
 - in patients undergoing physical exercise it was confirmed that ozone increases rate of security processes of resynthesis of adenosine-5'-triphosphate (ATP) and appeal in accelerating the speed of glycolysis [4].

Application of Ozone in the Treatment of Locomotor System

Ozone therapy is used as a supporting method in the traditional treatment of diseases of the locomotor system. Among many examples we can mention:

1. Open injury of organs of locomotor system with risk of primary infection. In these cases mainly bactericidal action is needed.

Example: In a study conducted on 28 patients with traumatic injuries (mainly compound fractures) a positive impact of ozone therapy on the healing process was affirmed. In addition to traditional treatment, a bath in an oxygen-ozone mixture, surface rinsing with ozonated fluids, dressings soaked with ozonated preparation of olive oil, the administration of intravenous and intra-arterial ozonated infusion fluids was done.

As a result of ozone therapy in 11 patients a much faster than normal wound healing occurred, in 3 patients a significant reduction in inflammation. Only 2 patients reported purulent complications. Comparing studies on this and another group of patients treated traditionally the average duration of antibiotic therapy decreased (from 41 to 19 days) and average length of hospitalization (from 74 to 28 days) [1].

2. Chronic disorders of locomotor system such as chronic osteoarthritis.

It is a known therapeutic problem. Chronic disease in this group are virtually incurable disease. Even after many years of remission the recurrence of the disease process can be noted. This is why it is talked about healing, rather than the cure of chronic diseases of locomotor system. In these cases, ozone therapy is used with all of its techniques with proven success [3].

Example: 18 patients with infections after planned surgery, with endoprostheses of joint with chronic traumatic infections were submitted to surgery and antibiotic treatment, also numerous days deep ozone therapy. At all patients came to heal the wound and stop the inflammatory process. In two patients septic changes appeared again in 6 and 9 month of observation. The results of these studies show the effectiveness of ozone therapy. that help the treatment of chronic diseases of locomotor system [2].

3. Losses of soft tissue and skin (especially as an adaptation to the transplantation-discussed in the section about autochem transfusion) [4].

4. Wounds difficult to heal (including diabetic foot and crural ulceration).

5. Post-operative and after injuries infections [9].

Ozone Therapy Methods

Ozone Baths

The knowledge about the excellent water-solubility of ozone (it dissolves almost 15 times better than in other body fluids) was used to create bath in ozonated water. This became the basis to construct the device and to applied this procedure in water environment.

Such procedures allow for penetration of beneficial ozone in a oxygen-ozone mixture through a layer of skin into the bloodstream, where under the influence of several reactions comes to a positive response from the system. The impact of ozone on the same skin can not be ignored. It is manifested by the increase of its flexibility, elasticity and improvement of its overall appearance.

The contraindication to bath in water environment are trophic changes, ulcers, wounds, dermatomycosis which are frequently seen in patients with limb ischemia. However, knowing the impact of balneo-ozono-therapy treatment the ozonated water spray was used in this group of patients.

The study confirmed that this is the right form of treatment for patients with limb ischemia. For testing and treatment a group of 73 patients was qualified, including diabetic patients with lower limb ischaemia and patients with obliterative atheromatosis of lower limbs. Patients were divided into two groups. In group I a therapy in form of ozone water baths (OWB) was used, in group II an aerosol ozone baths (AOB).

The details of the test group are shown in Table 1.

The majority of patients had high type closure. The highest percentage of patients were patients classified in stage II according to Fontaine scale.

Procedures were used by the following parameters [6].:

1) Ozone water baths:

- every other day,
- water temperature 37°C,
- duration time 30 min,
- immersion to the sternum,
- the average concentration of ozone in water, 3.94 $\mu\text{g/ml}$.

Table 1. Detail of studied group [6]

	Patients	Group I	Group II
Quantity	73	53	20
Gender: F/M	21/52	13/40	8/12
Average age	62	61	64
Average BMI	26	26	25
Diabetes	33	25	8

2) Aerosol ozone baths:

- duration time 30 min,
- the average ozone concentration 3.24 μml ,
- a partial treatment for lower limbs.

In addition to balneo-ozono-therapy treatment, patients received additional injections with ozonated physiological saline.

Patients were asked for subjective evaluation of the results after treatment and aggregate evaluation of the results made on the basis of own angiological research. The maximum score was 28 points. Points obtained in the range of 20–28 were assessed as the 3rd – highest level of improvement (III), 14–20 2nd level of improvement (II) and 7–13 points 1st level of improvement (I). The average score was higher in group I and was respectively 16.7 and 14.7 points. The largest portion of patients obtained 2nd level of improvement, while only 2–1st level.

It has been shown that in the study group the intermittent claudication distance was extended both on the treadmill exercise test as well as in marching trial. In addition the reduce of the level of total cholesterol, LDL-cholesterol and fibrinogen was found [6].

Given that the high efficiency, low cost and easy to use apparatus for ozone bath treatment can be recommended for use in health-resorts as well in smaller scale at home conditions. Their examples of this type of apparatus are: Balsan Futura or Ozonomatic.

Superficial Lavage with Ozonated Fluid

This method of ozone therapy is used in cases where bactericidal activity of ozone is desirable. Ozone reacts with organic compounds, causing their degradation called ozonolysis. During this process, namely the reaction of O_3 with non-saturated fatty acids, peroxides are formed which serve as a catalyst oxygen carriers. Ozone peroxide opposed to natural media have different effects: replacing harmful peroxides, free radicals so it purify the body [3].

Dressings Containing Ozone

By far the largest daily usefulness in maintaining healthy skin and treatment of its chronic diseases has ozone preparations for external use.

It is long known that ozone has the feature to combine with fat forming substances, which under the influence of water release free oxygen.

The best type of this preparation is the ozonated olive oil, which is commonly known for its skin-beneficial properties. For centuries it is the basis for many medicines and cosmetics. It contains more than 80% monounsaturated

fatty acids and a significant amount of vitamin E and floral polyphenols. It can regenerate soft tissue. Combining ozone with the best quality oil we obtained natural, beneficent for the skin. Sterile and durable preparation, because fixation of ozone with fat last for about 2 years. In touch with sweat on the surface the biologically active substances are released, that have a protective, oxygenating and revitalizing effect. At the same time antimicrobial properties of ozone make ozonated olive usable both to improve the appearance of healthy skin and for the treatment and alleviation of various pathological changes such as: hard healing wounds (including infected), damage to the epidermis, diabetic foot, trophic changes, bedsores, chronic leg ulceration, thermal burns (including solar), radiological burns in oncology, skin inflammation of various etiology (the growth of herpes).

The ointment should be applied on the surface of the skin (or wound) 2–3 times during the day and this place should be closed with sterile dressing. The preparation should not be used on necrotic tissue. It is also useful in the prevention of bacterial and mycosis infections of hands and feet, wherever it is possible to predict infection (eg, swimming pools, public showers). Was also used in dentistry [4].

Dry Baths (Gas Baths)

The treatment consists of administering an oxygen-ozone mixture into the precisely put ozone resistant plastic cuff. There are several indications for this method: leg ulcers, caused by vascular diseases, diabetic foot, burns and chronic wounds, post-traumatic infection, nosocomial infections.

Application of this method involves a number of dangers. It is mainly due to a potentially greatest exposure of patients and staff respiratory system to a high concentrations of ozone. That is why a special attention should be paid when putting the cuff. Also checking of leak-tightness should be reliable and regular [4].

Ozonized Autohemotransfusion

It relies on insertion of a needle into a large vein and take 100–300 ml of blood into the bottle with anticoagulant using a vacuum generating apparatus. Then from medical oxygen an oxygen-ozone mixture is produced. Generated concentration is most about 54–60 of the gamma $O_3/cm^3 O_2$. Ozonated blood changes its color into bright red. Then the apparatus controls the implementation of the blood back into the bloodstream thanks to the overpressure. Sometimes the blood has to be ozonated two or three times to obtain the color of arterial blood. To improve the contact of ozone with blood the bottle should be shaken every time.

This technique is useful everywhere where we want to use biological action of ozone flowing from administering it parenterally. This is particularly related to microcirculation insufficiency and associated peripheral tissue hypoxia and states where there is a seeding of pathogenic bacterial material into the blood that menace sepsis and a fatal disseminated intravascular clotting. The dose should be chosen individually, depending on the disease and therapeutic outcome we want to achieve. Dose of 1000–2000 gamma O_3 stimulate the immune system, while larger doses from 3000 to 6000 gamma O_3 work immunosuppressive [3].

Indications for autohemotransfuzji: acute and chronic viral infections, circulatory problems, polyneuropathy, circulatory disorders in atherosclerosis, diabetic angiopathy, hyperlipidemia, post-traumatic, early osteoarthritis, metabolic diseases such as diabetes, severe burns and frostbite.

Example: At The Department of Burns in Siemianowice Śląskie an autohemotransfusion as an auxiliary method for the preparation of granulation tissue to skin transplantation in patients in which traditional techniques have failed was used. Patients qualified in the study previously passed multiple transplantations of skin (from 3 to 11), but these did not accepted.

The traditional method of preparation was used and autohemotransfusion for 9 to 15 cycles, and after transplantation to the healing of wounds. The result in most patients was the acceptance of transplantation with the formation of granulation tissue. Only 2% of patients did not achieve acceptance. Supportive treatment of oxygen-ozone mixture did not cause side-effects [4].

Drainage Rinse with Ozonated Fluids

Drainage can be used continuously or intermittently, depending on the disease and the location of the disease. Infusion fluid is achieved by dosing in to the bottle with physiological liquid or with Ringer liquid in amount of 500 ml, an oxygen-ozone mixture at a concentration of 54–60 gamma O₃/cm³ in amount up to 400 ml. During ozonation a bottle should be shaken, which ensures a better solubility of ozone. The advantage of this method is the creation of hydrogen peroxide in aqueous solution, which has spasmolytic action. This method is useful in infections of strains of bacteria that are resistant to antibiotic drainage. However, this technique involves the disadvantages associated with patient discomfort, maintaining the efficiency of the hydraulic system of drainage and to ensure the sterility of infusion fluid [4, 8].

Contraindications

- conditions after acute myocardial infarction,
- fresh bleeding,
- hyperthyroidism,
- hypertension,
- pregnancy,
- alcohol poisoning [11].

Conclusions

Ozone in appropriate doses is antiseptic, fungicidal and virucidal, which can be used in the treatment of inflammation of organs of locomotr system.

Thanks to multiple techniques of ozone therapy the most appropriate can be selected for each patient.

The balneo-ozono-therapy is an effective method of treatment in lower limb ischemia in patients with atherosclerosis and diabetic ischemia.

A simple technique with ozonated olive oil may be used by the patient as a therapy at home.

Ozone therapy should be more prevalent as an auxiliary method in medicine and rehabilitation.

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Influence of Birth School Attendance on Active Labour Process

Wpływ uczestnictwa ciężarnej w szkole rodzenia na przebieg porodu

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Abstract

The childbirth is a special moment both for the baby and the future parents. It brings the partners together and lets them have a new look at their previous existence. The participation in antenatal classes, which are based on the assumption of psychoprophylactic delivery, enables pregnant women to prepare themselves to the childbirth through deepening their labour knowledge and creating an active attitude towards it, as well it teaches them appropriate labour activities such as proper relaxation and breathing during the labour pains. Active labour means to believe in yourself and in your ability to give birth. It is not merely a purpose, but rather a way to achieve an intended goal, which is a welcoming the baby. The goal of this study was obtaining information concerning the influence of psychophysical preparation during antenatal classes and the verification if these preparations help pregnant women to eliminate or minimize prenatal fears. Women in postnatal period (first days of childbirth, staying in hospital) were examined with a survey. Studied group consisted of 35 women in age of 17 to 37 years, attending to antenatal classes; control group consisted of women not attending to antenatal classes – 33 women in the age of 17–40 years.

Key words: active birth, antenatal classes.

Streszczenie

Poród zarówno dla dziecka, jak i przyszłych rodziców jest wydarzeniem szczególnym. Zbliża partnerów oraz daje im możliwość nowego spojrzenia na całą dotychczasową egzystencję. Uczestnictwo w zajęciach szkoły rodzenia, opierającej się na założeniach psychoprofilaktyki porodowej, umożliwi przygotowanie kobiety ciężarnej do porodu przez pogłębianie wiedzy o porodzie i wytworzenie aktywnego nastawienia. Uczy także odpowiednich czynności porodowych, takich jak relaksacja lub oddychanie podczas skurczów. Rodzić aktywnie oznacza uwierzyć w siebie, w swoją zdolność do urodzenia dziecka. Jest nie tylko celem samym w sobie, ale również drogą do osiągnięcia zamierzonego rezultatu, którym jest powitanie na świecie niemowlęcia. Celem pracy było uzyskanie informacji dotyczących wpływu szkoły rodzenia na przebieg porodu aktywnego oraz czy tego rodzaju zajęcia pomagają kobietom w zwalczaniu lub chociaż zminimalizowaniu lęku przedporodowego. Badaniem ankietowym poddano kobiety w okresie poporodowym (pierwsze dni połogu, podczas pobytu w szpitalu). Grupę badanych

stanowiło 35 pacjentek w wieku 17–37 lat, uczęszczających do szkoły rodzenia, grupę kontrolną – pacjentki nieuczestniczące w zajęciach szkoły rodzenia – 33 kobiety w wieku 17–40 lat.

Słowa kluczowe: poród aktywny, szkoła rodzenia.

Introduction

The History of Birth Schools Idea

The problem of preparing for the natural labour was already discussed in XIX century in France and England. Obstetricians wondered how to help women ease labour pains and fight the traditional obstetric model. Starting from the fifties of the XIX century several symposiums and congresses on psycho-physical preparation to the labour process were held. In Poland, first such symposium was organized by the Polish Gynecological Society, Psycho-profylaxis and Kinesiotherapy Section in Łódź, in June 1975. The main topic was: "Labour psycho-profylaxis and kinesiotherapy in obstetrics and gynecology" [1].

The forerunner of the birth schools idea was a British obstetrician G.D. Read. He started giving classes for pregnant women, stating that a woman giving birth should get rid of fear and stress, which could diminish her pain. He introduced so called "Read circle" concept, which says that fear during labour results in muscles tension, which then increases the feeling of pain, which then results in increased fear. In order to stop this vicious circle, a woman should learn the phases of child delivery and clearly define her tasks. Read thought that awareness and acceptance of the labour process help to get rid of fear, while ignorance, inertness and passivity can only increase it [6].

The first birth school in Poland was established in 1957 in Łódź by Professor Włodzimierz Fijałkowski, a famous gynaecologist-obstetrician. He promoted a new approach to parenthood, being a gift to which a man should respond to

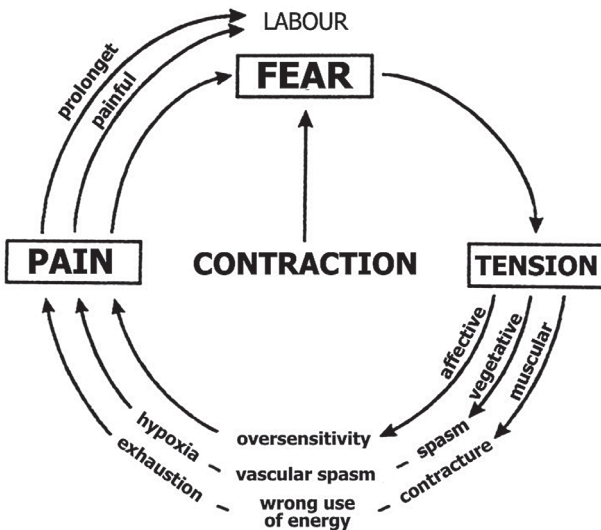


Fig. 1. The complex of fear-tension-pain (according to Read 1933)

in a positive way. The Professor, called “the father of Polish birth schools”, wrote: “Birth school is a place and time for both parents’ activity in the process of preparing for their parental roles, by 9-months dialogue with their child, participation in the labour, ecological nursing up to bringing-up their children and providing them with a good start in their own life”.

Presently, in Poland there are more than 440 birth schools located in hospitals, at committees, foundations, parishes, as well as private ones. Before they took their present shape, they were subject to several changes. At first, natural labour – without anesthesia and fear was emphasised. Now, birth schools prepare both parents for an active labour and taking care of their new-born child [5, 7].

Birth School

Birth school classes are run by qualified medical staff: obstetricians, midwives and physiotherapists, whose skills are continually improved by taking part in several trainings and workshops. The classes can be attended by pregnant women or couples – parents-to-be. Many schools run 2 or 3-months courses. Other schools have courses taking a few weeks. Some schools offer so called “weekend classes” (Saturdays and Sundays). The classes cover theory, practice and gymnastics.

Classes devoted to theory give knowledge on pregnancy and labour periods emphasizing all the breakthrough points. They also promote healthy lifestyle, proper hygiene, diet, physical activity, avoiding coffee, cigarettes, drugs, alcohol, Lecturers try to give the participants all the knowledge that can help avoid abnormalities and complications.

Parents-to-be learn also how to behave and cooperate with medical staff. They learn about modern labour techniques (e.g. water immersion) and methods of labour pain soothing. All the issues connected with lying-in period, taking care of a new-born baby are taught. These classes enable experience exchange and support in the new life situation.

Classes devoted to practice are run mainly by physiotherapists and cover gymnastics preparing for the labour, proper breathing techniques (using diaphragm and adjusting breathing to contractions), learning to stop breathing in order to support the pushing action and developing ability to relax, which helps to manage tiredness and fears. These classes also teach proper nursing and breast-feeding techniques.

An important part of the course are stretching exercises combined with breathing. They help to correct bad posture resulting from pregnancy, improve blood circulation, eliminate heaviness of the body, prevent toxins accumulation and finally work as painkiller. Aerobics improve lungs and heart efficiency, improve ability to take greater effort during pregnancy and labour. Pilates exercises performed with quiet relaxing music build body and mind balance. Elements of stretching improve flexibility of the joints, while Fitball exercises activate the deepest muscles, improve balance and prevent spine pains. The advantage of taking exercises is the fact that much less women are subject to pathology, such as pre-term birth, past-term birth, incorrect fetus position or obesity. Additionally, not intensive physical exercise increase blood flow through uterus and placenta which has a positive influence on fetus development and pregnancy. Birth school programme includes also exercises for the postnatal period.

As can be deduced from the above description of exercises taken in birth schools, their main aim is to prepare participating couples for an aware and active labour, help them reject the old stereotype that childbirth must be connected with passiveness and pain. And giving birth to a new life is a result of active and effective woman's effort, which is the source of happiness and satisfaction.

Active Labour

Active Labour Movement was started in Great Britain in the early eighties. It was a rebellion against traditional obstetrics model and presented totally different approach to the woman's role in the labour period. This meant that woman is able to make decisions connected with the labour process, so she is ready to take responsibility and shut out the stereotype of passive and obedient patient, who cannot influence in any way this important moment in her and her child's lives. Moreover, active labour allows for supporting baby in the moment of a dramatic change. Baby is exposed to losing connection with their mother which is felt as direct threat. So, labour psycho-prophylaxis is really important: a woman that is aware and prepared fears no longer for herself, so she can sense the "voiceless" baby experiences. This allows the baby to come to this world in the most gentle way, without physical or mental damage [1, 4].

Active labour fosters making breaks between contractions more effective. Woman in labour can relax and slow down her breath more easily. She can find a position that is the best for her. Thanks to active work during contractions and breaks between them, labour is quicker and more dynamic. There is less need for medicines diminishing pain. Active labour allows women to choose the best and most comfortable – both for her and the baby – labour position. Apart from choosing the position it is also important to move their hips, walk or even dance. Movement is also very important in the initial stage of labour because it helps the baby to get the right position in the birth canal.

Goal

There is no denying that birth school classes have a positive influence on a natural labour process. It has been confirmed by both obstetricians' research and participants of such classes. This work's aim is to confirm the importance of psycho-prophylactic preparation in a birth school for active labour process basing on a survey.

Material and Method

Subject to the survey were women in lying-in period (first days after birth, in hospital) patients of Reproduction and Obstetrics Clinic in Wrocław. In total, 68 women aged 17–43 were subject to the survey. The survey group (A group) were 35 patients, who declared participation in birth school classes. The control group (B group) were 33 patients aged 17–40, who did not attend birth schools. Part of the survey was a questionnaire prepared by the authors of this work. The questionnaire provided information on patients' data and their anxieties connected with pregnancy and labour well as their subjective evaluation of their theoretical and physical preparation to the childbirth. The answers to the questionnaire were analyzed according to sociometric method: frequency of the given answers. The elements referring to the labour process and effectiveness of the knowledge acquired in a birth school were subject to content analysis.

Results

Decision whether to attend a birth school is connected with woman's educational stage (Fig. 1 and Fig. 2). In the survey group 51% of women graduated from university and 31% – high school, while in the control group: accordingly 37% and 24%.

100% of women taking part in classes confirmed that they knew the stages of labour, while in the control group 15.15% of women did not know anything about it. Analyzing the labour – 94.29% of women from the group A gave natural birth, while 24.24% women in group B had a C-section.

The next question of the questionnaire: "How did the knowledge gained before the labour help you get through it?", group A women chose the answers referring to less stress and readiness for an active birth, while group B women chose the answers proving lack of knowledge on the labour process and stress (as shown in the Fig. 3).

The fear level was comparable: in group A high level of fear chose 34.29%, medium 60%. low 5.71%, in group B accordingly: 39.39%, 42.42%, 6.06% and 0.09% women who did not fear the labour. But this factor depends on the number of labours experienced. Multiparas did not feel any anxiety, while primiparas were more often afraid.

37.14% of graduates from birth schools defined their physical condition as very good, 42.86%, as good, and 20%, as fair. On the other hand, 12.12% of women who did not attend classes described their physical condition as very good, 33.33% as good, and 13.36% as fair or weak. A group of patients from the group B described their condition as bad (18.18%). As we can see in the Fig. 4, group A patients took exercise much more often, and a significant part of group B patients (40%) did not take any exercise.

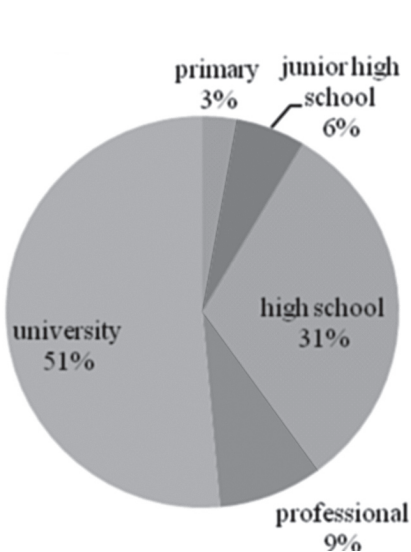


Fig. 2. Educational stage of women attending to birth school

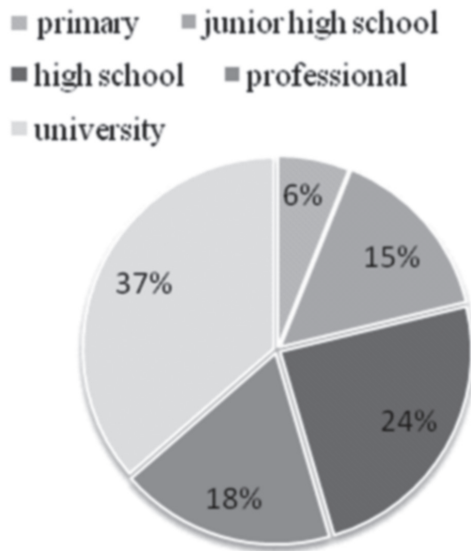


Fig. 3. Educational stage of women not attending to birth school

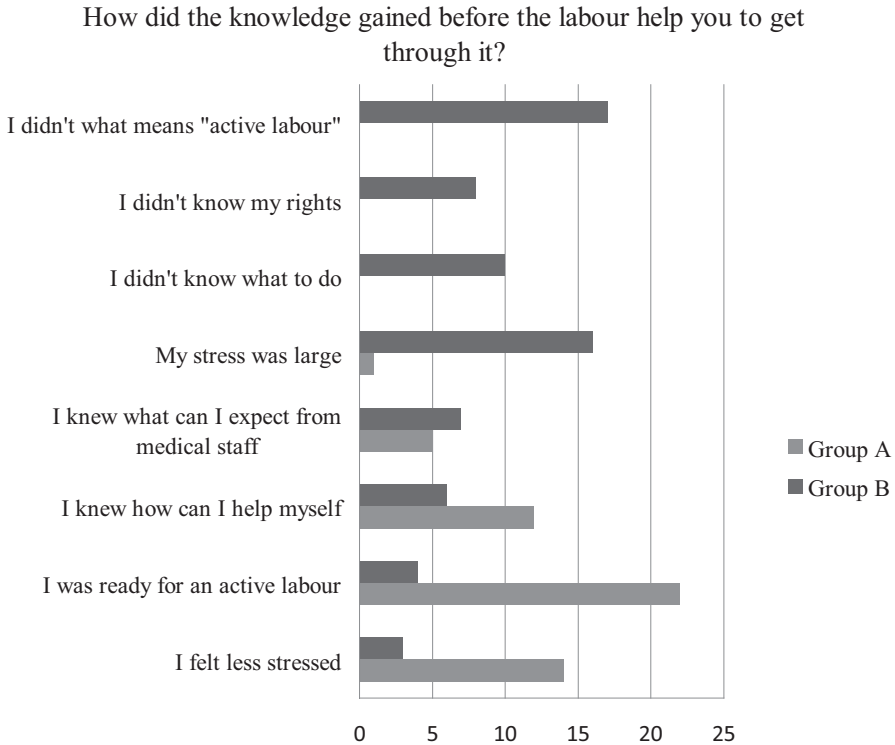


Fig. 4. How did the knowledge gained before the labour help you to get through it?

94.29% from the group A used several labour positions, and in the control group 54.54% used labour positions, but for 51.51% the positions were ordered by a doctor or a midwife and only 9.09% could choose them for themselves.

The main source of information about the possibility to attend a birth school were doctors, midwives or media, sometimes friends and relatives (Table 1).

According to 85.71% of birth school graduates the classes diminished stress connected with labour, and 88.57% said that they had a positive influence on acceptance and managing pain.

Most of the respondents confirmed that the exercises taken at a birth school were useful for the labour process (94.29%). Breathing exercises and effective push exercises were considered the most useful (Table 2).

Table 1.

Sources of knowledge on birth schools	Percent %
Friends	14.65
Media	39.02
Relatives	12.2
Doctor/midwife	34.15

Table 2.

Which ones of the exercises were the most useful during the childbirth?	Percent %
General exercises	4.08
Breathing exercises	51.02
Relaxing exercises	8.16
Effective push exercises	30.61
None	6.12

80% confirmed that they felt more comfortable after the birth school classes.

Conclusions

Birth schools become more and more popular not only in the west of Europe but also in Poland. The number of parents who want to develop their knowledge about pregnancy and labour (47.37%) and prepare themselves to take a good care of their children (15.79%) is continuously growing.

Classes preparing for labour were attended more often by well educated women, living in urban areas, who before their pregnancy were physically active. Most of them were primiparas, which can be explained by their anxiety and desire to be well prepared for this moment. Participation in the classes brings several benefits; namely it allows them to prepare well for labour and nursing and improves their personal comfort during the pregnancy. It was confirmed in our research. Moreover, most of the women recognized such course as necessary to get through all this in the right way (94.29%).

The main aim of birth schools is to prepare parents for aware and active labour, because this is no longer something that „one must endure”. Now, it must be "experienced properly". Schools promote natural labour, in which the woman is convinced that she is able to give birth to her child and she takes responsibility for all that happens, and her anxiety is only about her baby well-being. Natural labour means also limited medical interference and giving up analgesics for full and aware participation in the labour process [1, 4]. The research shows that all birth school graduates gave birth naturally, and among women who had not been prepared 24.24% decided to have C-section, which was not necessary.

In the birth school women learn so called vertical positions for the labour [8]. The analysis of the questionnaire shows that 94.29% of the birth school graduates used several positions and 48.57% (33.) chose them alone. However, only 54.54% of women who did not attend a birth school used any of these positions, and for 51.51% the positions were chosen by doctors or midwives. Several researches show that traditional position "on the back" forced by medical staff (as it enables them to control the progress of the childbirth action) is the worst physiological position. Due to gravitation labour is more difficult, cervix is directed up, pressure of the baby's head on the cervix is minimal, and dilation process is slower. Vertical positions are those in which the birth canal is directed down. They enable quicker labour, make contractions less painful and allow for maximum use of their intensity. So, it is really important to know different positions and be able to decide which and when to use them [8].

In the pregnancy woman's body is subject to significant load resulting from increasing weight and necessity to keep alive the baby growing inside. Oxygen demand is bigger and it is important to improve mother's breath and blood circulation capacity [1, 3]. So, woman's organism must be prepared for additional work and this great effort which a childbirth is. And it is obvious that moderate physical activity during pregnancy is absolutely necessary. Birth schools promote healthy lifestyle and systematic exercise. Apart from that, they offer classes on general gymnastics run by physiotherapists, where pregnant women learn about types of exercises for each pregnancy stage. The research shows that exercises were more often taken by women who attended birth schools: a few times a week 31.43%, once a week 60%, while 40% of women who did not attend birth schools did not exercise at all. Such numbers allow for conclusion that birth schools encourage women to take exercises regularly and help them understand the importance of physical activity.

94.29% of women attending birth schools confirmed that exercises done in the classes helped them during the labour. Breathing exercises and effective push exercises were considered the most helpful. Breathing exercises improve capacity of the respiratory system, increase the minute capacity of heart, increase breathing muscles strength and lengthen voluntary apnea. Belly breathing provides the baby with bigger amount of oxygen. Synchronizing breath and uterus contractions diminishes or even eliminates pain. And effective push exercises which are based on relaxing perineum muscles and using esophageal sphincter allow for decreasing resistance of muscles surrounding cervix and birth of the fetal head after the contraction.

48.57% of birth school graduates declare participation in the classes again at next pregnancy. The remaining 51.43% do not think it necessary because they feel well prepared for the next childbirth after the last one. Almost all of them recommend birth schools to future mothers.

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Occurrence of Round Back in Blind Children in School Age

Występowanie pleców okrągłych u osób niewidomych w wieku szkolnym

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Abstract

In our work we describe a defect attitude which is round back of the blind – those who are born blind and people who lost their sight. We have examined 33 children attending in the Special Center School – Blind Children Upbringing in. These children were aged 10–16 years old. People who are blind due to lack of so important sense as sight must compensate for the orientation – the most hands sliding forward in search of obstacles. It is the basic behavior, derived from the American model of learning orientation. That attitudes of round back is very frequent. Even rehabilitation and corrective gymnastics classes cannot eliminate completely the drawbacks due to the habitual setting, and the fear of the unknown space. Therefore, the role of physiotherapy, and correction will be possible to prevent progression of defects, so that it does not deteriorate health.

Key words: round back, blind children.

Streszczenie

Autorzy pracy zajęli się wadą postawy, jaką są plecy okrągłe u osób niewidomych – zarówno tych, którzy urodzili się niewidomi, jak i osób, które utraciły wzrok. Zbadano 33 dzieci w wieku 10–16 lat uczących się w Specjalnym Ośrodku Szkolno-Wychowawczym Dzieci Niewidomych we Wrocławiu. Osoby niewidome z powodu braku tak ważnego zmysłu jak wzrok muszą sobie kompensować orientację w przestrzeni – najczęściej wysuwając ręce do przodu w poszukiwaniu przeszkód. Jest to podstawowe zachowanie wywodzące się z amerykańskiego modelu nauczania orientacji w przestrzeni. Wada postawy, jaką są plecy okrągłe jest niezwykle częsta. Nawet rehabilitacja oraz zajęcia z gimnastyki korekcyjnej nie wyeliminują całkowicie wady ze względu na nawykowe ustawienie oraz strach przed nieznaną przestrzenią. Dzięki fizjoterapii będzie więc możliwa korekcja oraz zapobieganie progresji wady, tak by nie pogarszała stanu zdrowia.

Słowa kluczowe: plecy okrągłe, dzieci niewidome.

Introduction

Body posture is a system of individual sections of the body, how a man takes in a relaxed, unconstrained vertical position. It is an expression of physical, mental and health condition of the body. On the formation of body posture affect both genetic factors and environmental.

The period of most intense development of the body posture is a period of growth, when anabolic processes predominate over catabolic processes. During this period, not only the dimensions of the body are changing fast, but also its proportions. At that time the lower limbs are growing five times, four upper limbs, trunk three times, and the head twice.

There is no doubt that the blunt growth and changes in proportion with age is an important factor in the process individual's posture genesis. Changing conditions biomechanical changes occurring in muscle strength and weight to a large extent determine the attitude of the body.

Against the background of these factors may arise many disorders and irregularities are the cause of the attitude of various defects, mainly in the area of the spine.

Irregularities occur in multiple planes and axes, including the spine in the sagittal plane, in which we distinguish four types of defects: round shoulders, the back is concave, the back-circular concave, flat Backs.

During our research we focused mainly on the first of these flaws, as one of the most common in children and adolescents blind.

Characteristics of Back Round

This defect is characterized by: reduced anteversion of pelvis, ejecting head in front, deepening of thoracic kyphosis, ejecting shoulders forward, slided and the withdrawal of blades, flattening and collapsing of the chest.

If this defect occurs to relax and stretch muscles: rectifier thoracic spine, parallelogram, trapezius and latissimus dorsi of the back. Contracturing other hand muscles: chest, abdomen and buttocks. In extreme cases, can lead to severe complications of the circulatory and respiratory system.

Children with visual defect are at increased risk of downside risk attitude. A lower dose of movement and the associated poorer motor development during the first years of life, lack of control in creating a sensory habit of correct posture, weight, growth deficiency, are not always appropriate social and living conditions, all factors accompanying the development of a blind child, encouraging the emergence of irregularities in his attitude.

Visual Disturbances, as a Factor in the Defect Attitude

As already mentioned above, children with defects of eyesight are a group more vulnerable to defects in posture. Despite early intervention and rehabilitation of the lack of eyesight, or a malfunction affects the development of posture. Numerous studies of these children show a higher incidence of faulty posture than in the population of healthy children.

1. Eye diseases.

Among people with genital ulcer impairments distinguish:

- blind,
- sightless during living,
- partially-sighted.

2. For the blind include three categories.

- totally blind – they do not come to any visual impression, the eyes are gray or black. The blind population of such persons is about 30% to 40%,
- blind retaining a sense of light – distinguish day from night, the light from darkness,

- residually seeing – visual acuity does not exceed 1/20 the normal focus and field of view is contained in 20%.

Polish Association of Disabled People, the Commission accepted that the group of blind persons include those who can not see from birth or from early childhood so that they do not remember that we have ever seen. The upper limit of vision loss shall be 5 years old.

To include blind people who have seen since birth, but after 5 years for various reasons have lost the eye. Regardless of whether the vision loss occurred suddenly as a result of such injury or gradually as a result of such diseases, all of these people have preserved visual impressions and correct image of the outside world.

In people with poor sight distance visual acuity is between 1/20 and 1/4 normal vision and visual field does not exceed 20°. These people even after application of correction in the form of glasses can not see the details. With close proximity to these people only recognize the outlines of people or larger items.

Healthy people learn about the world through the processing of information received by the different senses in the form of light stimuli, auditory, tactile, olfactory and taste. This information is subject to processing operations, such as mating, have been generalized, interpreted, etc.

Loss of sense of sight limits the ability of a cognitive limited is because the number of incoming sensory. Approximately 85% of the nonverbal information is obtained through a man of vision.

Characteristics of Physical and Motor Development of Blind and Partially-sighted

1st Blind

The development of physical and motor there are significant differences between blind children and their healthy peers.

The research carried out by various authors indicate that blind children have a lower height and body weight in comparison with sighted peers. They also have smaller dimensions in length and delicate bones. Just as in healthy children there was wide variation in terms of type profiles. Meets both the obese children, as well as very frail.

The faulty eyesight causes less physical activity. Children blind from birth, is not stimulated by visual stimuli are a number of motor inhibition. These children do not look around, not crawling, not bent. This affects negatively the development of the curvature of the spine and muscle development apparatus. This is one of the causes of faulty postures such as the lateral curvature of the spine.

Inability to perform under the control of eye movements reduces their accuracy.

In children, there is a blind tendency to sedentary lifestyle. This item is conducive to slope and eject the head, flattened chest, back round and the formation of contractures of the lower limbs flexion displacement.

Lack of physical activity and static lifestyle very postural muscles weaken corset, this makes it difficult to maintain correct posture and promotes rising posture defects. This imposes a need for us to implement the corrective procedure at an early stage of development of the child.

Motor symptoms occur from the earliest stage of development.

The scope depends on the delays to the start of rehabilitation and its progress.

Ongoing studies have shown that blind children develop more slowly in the first three years of life compared to sighted peers.

One example is the delay in lifting the head, which slows down the development of neck and shoulder muscles, and this delay affects the crawling and walking.

Another problem of a blind child in terms of its physical is no form of imitation. Makes it difficult to study such movements like climbing or squatting. These deficiencies as soon as one to complement through rehabilitation.

An important issue is motivated motility blaidisms – mannerisms – tics, which are already at a young age the result of the enormous emotional tension – the natural movement due to the lack of physical activity. Most starts from monotonous shooting head, and then the whole body. This undesirable activity can sometimes cause more social problems than the damage to the eye as such. These behaviors are not accepted, differ significantly from the norm, may even cause injury to a particular child's face.

Blaidisms occur in various forms:

- rocking back and forth from simultaneous transfer of body weight;
- from foot to foot;
- motor behavior significantly different from sighted people, such as walking upright on the legs, lack of gestures, facial movements called. "Mask" or the very rich, uncontrolled facial expressions;
- prevalence of defensive reflexes, in order to sense obstacles, walking on toes legs wide apart in order to examine the site, the deviation of the trunk to the rear to protect the face, pulling ahead of their arms or pressing the sides to protect the elbows;
- mines, or pose as a protective response to suffering, which express the squinting and wipe your eyes, turning away from the light or leaving the head.

The level of motor abilities of blind children is less like a sighted peers.

2nd Sightless During Living

Sightless persons lost their sight at a certain stage of life. The intensity of the various related problems depends on the age at which it occurred. If we consider motor development and physical situation is not as unfavorable as in blind children. The later is a loss of sight the better the physical development and physical fitness. Also, posture is the same as sighted children, which of course does not mean that it is always correct. Undoubtedly, however, occurs much less defect attitude, as in blind children. Most are round the back and side curvature of the spine.

Child who has lost sight development until they lose sight normally. Dominates all four forms of movement in a manner appropriate to their age. Learning takes place through imitation. Walking is characterized blinded child care is generally well preserved motor coordination, the feet are properly placed, and most significantly – there is a general stiffening of the body so characteristic for the blind. Other forms of movement such as a stroke to run the projection is generally tackled. Performed the movements are smooth, aesthetic, their economy is correct.

3rd Partially Sighted

Children are a group of low vision, intermediate between the sighted children and the blind.

Developmentally poorly sighted children are lower and lighter than healthy peers, but these differences are not as clear as for blind children.

Sight has a defect in the formation of numerous defects in posture. It runs the limited mobility of joints of the spine. This is probably the result of reduced physical activity.

These children are struggling to maintain proper alignment of the body in space, they are less stable posture and difficulties in maintaining it, testify to the significant swing of the trunk.

The efficiency of motor-sighted children is lower than the sighted children, but at a higher level, as in the blind.

Research your back round in blind children and adolescents:

No sight is a factor causing impaired psychomotor development of children, which leads to high incidence of faulty posture. The purpose of this study is to answer, inter alia, the following questions:

How often are blind in the back round?

Is your back round is more common in girls and boys (including age ranges)?

Can be placed in schools for blind children enough emphasis on the correction of body posture?

Do you put in schools for blind children enough emphasis on posture correction

Material and Methods

The research material is a group of 33 blind children, students in the Special School-Tutorial Center for Blind Children in Wrocław. All children are blind from birth, normal intellectually. We examined two groups:

1st grade 4–6 elementary school (10–13 years),

2nd high school class 1–3 (13–16).

The number of children belonging to various groups shown in Table 1.

Test Methods

In the first place determined by the weight and tape sewing average body weight, height and weight, growth rate of BMI (Table 2).

BMI was calculated on the BMI calculator, developed on the basis of views disease Centers for Control and Prevention. Account of the differing standards for age and gender. Standards for children and youth include age range of 10–20 years.

Table 1. The number of subjects in each group

Group	Boys	Girls	Total
Elementary school	7	10	17
High school	11	6	16
Total	18	16	33

Table 2. Selected average performance of the physical development of the girls and boys

Sex	Elementary school		High school	
	boys	girls	boys	girls
High (cm)	155.4	152.1	169.8	159.6
Weight (kg)	40.6	52.6	65	52.5
BMI (kg/m ²)	17 normal	23 normal	22 normal	21 normal

Posture has been studied using the measurement of the distance between the rear ponds humeri in the frontal plane. First noted dermatograph spines of both shoulder blades. Using a tailor's tape measured the distance between two points before and after correction of body posture of the child tested. Most students first measurement (before correction) went higher than that after the correction. Then, the difference was calculated in cm of both measurements, grouping together children in a way shown in Table 3. As the limit for the determination of defects in the back round, the difference in measurements taken over 2 cm.

Test Results

Posture analysis shows that the majority of children suffer back round. It is 65% of primary school pupils and 76% of high school students (Fig. 1). It should be noted that the defect occurs more often in high school (11%), reflecting the progression of defects. This may be due to the fact that the schools put more emphasis on the development of skills necessary for independent living, pushing into the background correction and the formation of the habit of correct posture.

Looking closer to the elementary school can say that 43% of boys have your back round. In girls, the defect is almost two times more frequently, in up to 80% noted a difference of over 2 cm in the measurement of rear (Fig. 2).

This may be due to the fact that girls at that time beginning to ripen. The period of adolescence begins at approximately teenagers age 10 and ends at age 15, but the biggest development of the body falls on 12 years of age. When girls

Table 3. Differences between the "rear measurement" before and after correction of posture in children.

Dissimilarity	Elementary school			High school		
	boys	girls	total	boys	girls	total
Dissimilarity to 2 cm	4	2	6	3	1	4
Dissimilarity from 2 cm to 4 cm	1	4	5	4	4	8
Up to 4 cm	2	4	6	4	1	5

begin to mature, they can not cope with changes in the body. All the more so in the absence of vision, a very important sense for humans. Initial changes can cause stress. Inability to keep pace as occurring biological changes in the body, including the growing breasts, causing feelings of shame.

To hide the chest stand out head and deficiencies and take forward stooping posture, which favors the formation of a back round.

Another factor influencing the difference in prevalence of back round in girls and boys is that boys generally have in this century much more physical activity than girls.

In comparison with the elementary school, classes are not recorded in high school, so much of a difference between the incidence of back round in girls and boys (Fig. 3). This amounts to 10%. It should be noted, however, that the shoulders are round, both in girls (83%) and boys (73%) very frequently found fault.

Progression of defects can be seen especially in boys. Round shoulders are more common in high school than boys from elementary school (Fig. 4). The

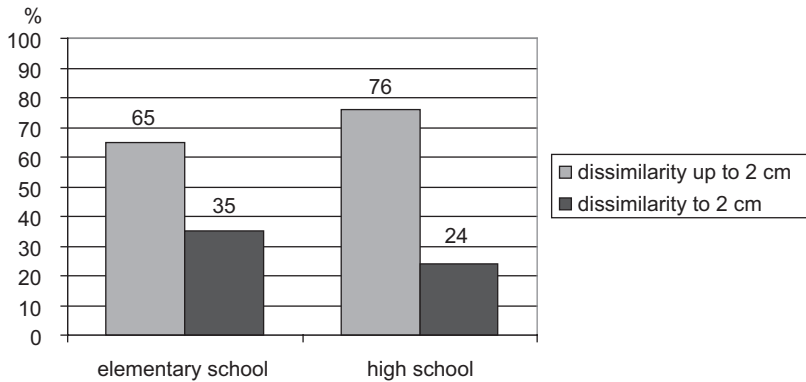


Fig. 1. The incidence of greater than 2 cm difference in the measurement of the rear, before and after correction of body posture in children with elementary school grades 4-6 and 1-3 high school

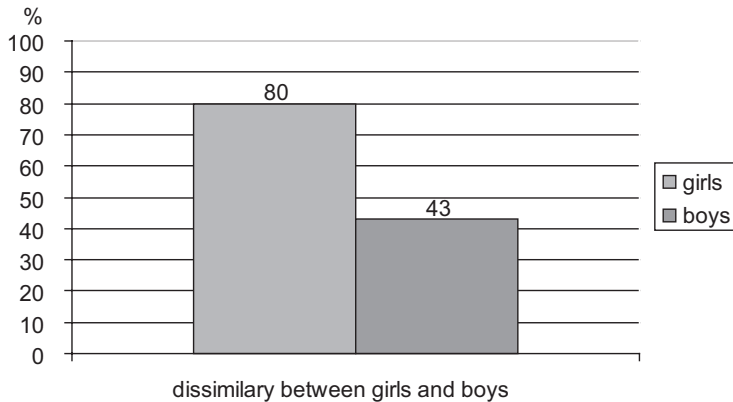


Fig. 2. The incidence of greater than 2 cm difference in the measurement of the rear, before and after correction of body posture in girls and boys in grades 4-6 elementary school

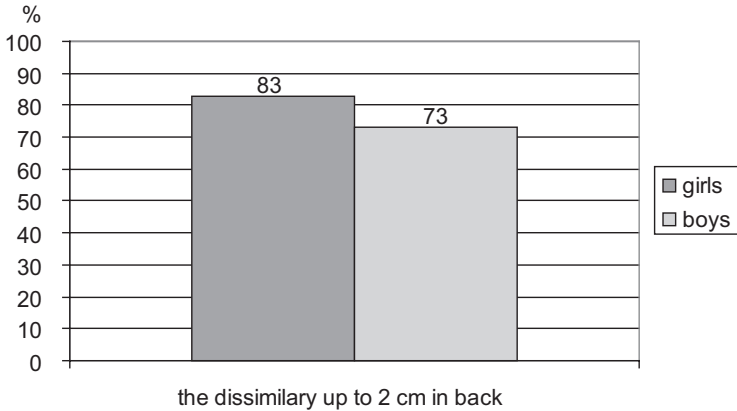


Fig. 3. The incidence of greater than 2 cm difference in the measurement of the rear, before and after correction of body posture in girls and boys from grades 1–3 high school

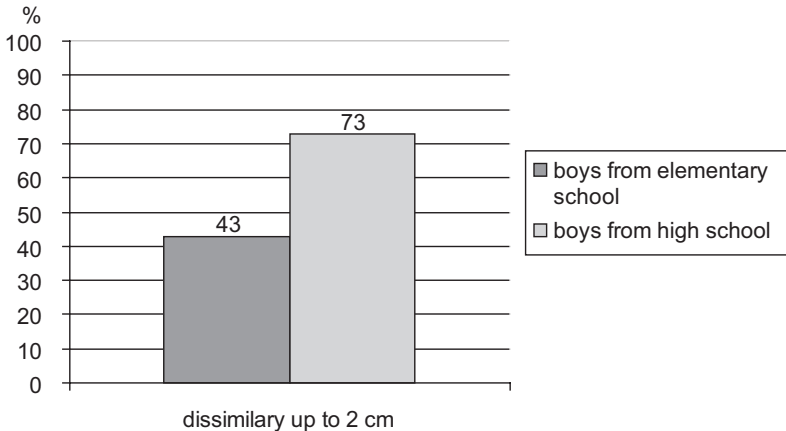


Fig. 4. The incidence of greater than 2 cm difference in the measurement of the rear, before and after correction of body posture in boys with elementary school and high school students

difference is 30%, which may be evidence of poorly selected prevention and correction of faulty posture in schools for blind children. Another factor is the growth of a big jump in boys at this age. In addition, there is the so-called reaction “Search”, put forward hand in front of him, bending their heads to the sternum (defensive reaction) and search for obstacles that are often below the shoulders, causing roundness of the back.

Progression of defects in girls is only 3% (Fig. 5). This is relatively few. Girls at this age already accustomed to the changes in their body, not ashamed, and better sense division.

It is surprising, however, that the 80% of primary school girls who present with back round, half have a difference of over 4 cm in the measurement of rear. In high school, a difference of over 4 cm in the measurement of rear has 20% of girls with round back, which is about 30% less than in primary schools. This indicates that the deeper the defect is less common in girls than in girls primary school. This is because the middle school age girls start to care about their appearance.

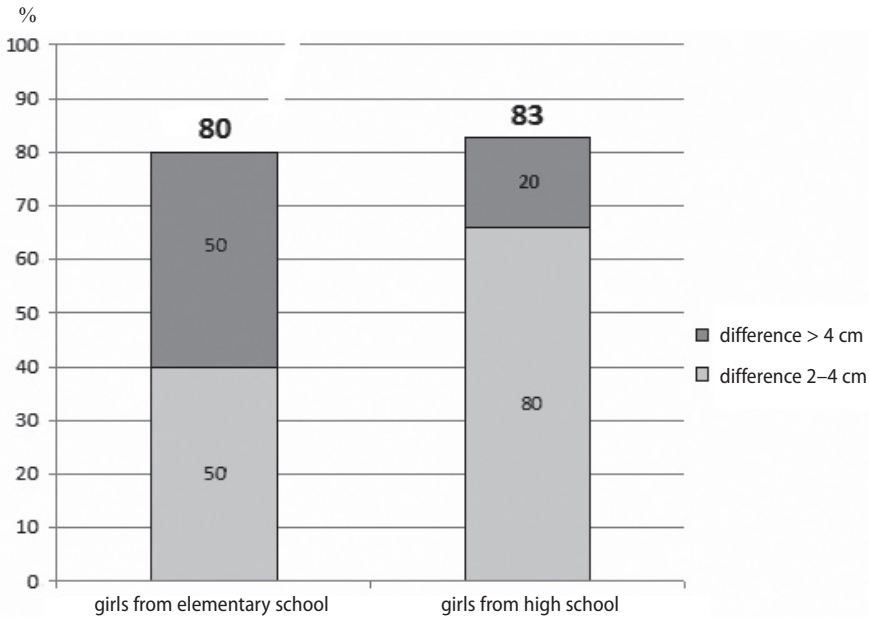


Fig. 5. The incidence of greater than 2 cm difference in the measurement of the rear, before and after correction of body posture in girls elementary school and high school students

Results

Summing up the results of this study should be noted that in most subjects are round the back.

Schools for blind children and young people pay much attention to the development of spatial orientation, the skills necessary for independent living and to compensate for the senses, in spite of the attitude of the defect, which are round the back has not been eliminated. The reasons are many. Basically at this age are round the back frequently encountered drawback, however, in this particular case, what are the blind children, and their specific development, we must also take account of this defect in the conduct of gymnastics. The back round is not only a cosmetic defect, but largely limited mobility, and adversely affect the respiratory system, making it difficult to achieve full independence.

It may prove necessary to develop an appropriate physical education program, which will be to increase the number of hours devoted to physiotherapy, which will positively affect the development of coordination skills and the prevention and correction of faulty posture.

During physical education classes, teachers should make more of the items and corrective exercises, keeping in mind that the child is blind and unable to take any form of physical activity, but it must be adapted to his physical abilities, ages and interests.

Please also note that the primary task of corrective gymnastics teacher is taking such action, which will benefit the child, but will not adversely affect the eye. Exercises that cause the one hand, shifting posture, the other may affect the organ of sight. Exercise of the adverse impact of moves include increasing intracranial pressure such as bending. Hence it is important appointment with a spe-

cialist in the field of ophthalmology specific contraindications, which give blind children and young people can safely participate in the classes.

It is also perpetuating the habit of correct posture not only in physical education classes, but also at school in class and at home. This applies particularly to blind children, which, during locomotion, especially in the new environment, habitually put forward the hands forward by examining the area and also attract the defense reaction of the head to the chest. When navigating with the aid of white canes, unconsciously lean to be able to "see" the widest range of land after which they move. Stooping posture also admit when reading texts written in Braille machines and work on your computer. In addition, blind children from being deprived of sight, have difficulties in identifying the location of her body in space. This also applies to the vertical housing, which often manifests itself in the roll of the seat as a form of motion. Therefore, the child should be constantly reminded of the need to correct posture. Every once in a longer stay in the right setting, with time leads to a reflex automation based on a correct attitude to increase awareness of your body position in space.

In conclusion it is worth mentioning that the most important goal is to encourage blind children to take the easy work on yourself. This is possible by treating them as an entity and not the object of the whole process of correction. Also, it is important that all physiotherapists, teaching staff and parents, jointly seek to improve the posture of a blind child, giving him an adequate correction of defects in the conditions conducive to life.

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The Usage of Acupuncture Methods in Fighting Pain and Treating Some of Muscular and Skeletal System and Nervous System Disorders

Metody akupunktury w zwalczaniu bólu oraz leczeniu wybranych chorób narządu ruchu i układu nerwowego

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Abstract

The research describes a method of acupuncture which derives from traditional Chinese medicine. In China and other eastern countries the method has been practiced for years. Nowadays, it is used as a complement of the conventional treatment. The research includes information about non-invasive methods that are an effective alternative to a needle insertion. The method presented as a first is electropuncture which is based on stimulating the skin in biologically active points. This procedure is conducted indirectly with an electroscope by placing electrodes on body. Laseropuncture is a sterile treatment based on the gentle biological influence of a laser directed on particular acupuncture points. Additionally, the research includes information about acupressure which concerns the massage (stroking, pressure and tapping) of particular acupuncture points. All methods named above can be used as an alternative to physical therapy in a treatment of muscular and skeletal system and nervous system disorders.

Key words: acupuncture, electropuncture, acupressure, biologically active points (AP).

Streszczenie

Przedstawiona praca rozwija temat akupunktury, która jest elementem tradycyjnej medycyny chińskiej. Metoda ta jest praktykowana od tysięcy lat w Chinach oraz innych wschodnich krajach. Aktualnie stosuje się ją jako uzupełnienie leczenia konwencjonalnego. W pracy zostały zawarte informacje na temat metod, które nie ingerują w powłoki ciała, jak w przypadku tradycyjnego nakłuwania igłami, ale są równie skuteczne. Opisana została metoda elektropunktury, czyli drażnienia skóry w miejscach aktywnych biologicznie. Zabieg ten przeprowadza się bezpośrednio za pomocą elektrod umieszczanych na ciele z zastosowaniem aparatury zwanej elektroskopem. Laseropunktura, której atutem jest aseptyczność zabiegu, opiera się na działaniu biologicznym lasera małej mocy ukierunkowanego na wybrane punkty akupunktururowe. Kolejną metodą zaliczaną do termopunktury jest moksa, w której do zabiegów wykorzystywane są tłące się stożki lub cygara wykonane z piołunu chińskiego (*Artemesium moxae*). W pracy zawarto również informacje na temat akupresury polegającej na masażu: głaskaniu, ucisku, opukiwaniu określonych punktów akupunktururowych. Wszystkie te metody przedstawiono w odniesieniu do możliwości ich stosowania

w schorzeniach dotyczących narządu ruchu oraz układu nerwowego jako alternatywę do stosowanych zabiegów w fizykoterapii.

Słowa kluczowe: akupunktura, elektropunktura, akupresura, miejsca aktywne biologicznie.

Acupuncture

Acupuncture derives from the traditional Chinese Medicine which have existed for over 5000 years, since the ancient times. Its intricate philosophy is not easy to understand for empiricists. Obviously, not everyone treats the philosophy of the Chinese Medicine and the conventional medicine equally. Yet, simplifying both forms of medicine, we can notice some similarities between them.

According to the Chinese Medicine, there is a life energy circulating in human body and a disease is a result of the disorder of the flow of energy. Dysfunction of one organ may disturb the proper functioning of the body. On the body surface, there are many biologically active points which are connected with the internal organs. Taking the common features mentioned above into account it is easier to associate the traditional Chinese medicine with today's idea of a disease development and the physical therapy [1, 4].

Biologically Active Points

The traditional acupuncture assumes that there is a life energy Chi circulating continually in the human body. It is essential to a proper functioning of the body. The energy circulates in a strict order through the energy channels called meridians. The meridians are neither the blood vessels nor the nervous system. They are the channels of the flow of energy. Through them, the energy flows from the outside of the body into the internal organs, and the other way round. The division of the meridians is an extensive subject, therefore it will not be mentioned in this essay. In the flow of the meridians, there are specific, biologically active points (acupuncture points). The flow of energy through these points may be disturbed by any disorders of the organism. A stimulation of these points may help to restore the proper circulation of the Chi energy. The acupuncture points have several specific features; the network of their blood vessels is thick, their nerve fibers are of cholinergic type, and there have been found 2–3 times as much mastocytes as in other points of the body.

The functional features of the biologically active points:

- low sensing level,
- increased local temperature,
- increased gas exchange on the body surface (good CO₂ absorption of the biologically active points),
- low electrical resistance (20–250 Ω),
- high capacitance 0,1–1,0 μF),
- high electrical potential (up to 350 mV).

The treatments presented in the essay are an alternative to a traditional acupuncture, i.e. needling the body layers. In Poland, as well as in the whole Europe, only the trained doctors are entitled to perform such procedure. However, having completed an appropriate course, every physiotherapist may perform electro-puncture, laseropuncture or acupresure. The procedures do not injure the skin layers. In many cases they are as effective as a traditional acupuncture. They may

also be a variation of the traditional physiotherapy treatment. At the same time, they increase the range of the procedures that could be performed [1, 2].

Neuro-physiological Bases of Acupuncture

Presentation of neuro-physiological bases of the acupuncture may make it easier to understand its influence on the organism. Acupuncture is based on organ-skin and skin-organ reactions which has been known to the Chinese doctors for ages, and with which the European scientist have been familiar since the twentieth century. Thanks to organ-skin reaction organism receives a signal about disease or disorders of particular internal organ. Such signal is understood as pain or high muscle tension in so called Head's zone on the body layers. However, skin-organ reaction is based on stimulating the indicated biologically active points connected with particular organs in the area of Head's zone. The therapeutic influence, on the reflexive way, causes segmentary impulses in the particular metamere of the body. The stimuli which influence the nerve ending cause the active impulses. Through the centripetal nerves, the impulses are passed to the spinal cord and then to the brain. Subsequently, they pass through spinal nerves and autonomic nerves to the limbs and through the efferent nerves (sympathetic and parasympathetic) to the internal organs.

As a result of stimulation, the tiny arteries and the capillaries in the afflicted organs dilate, which causes a flow of fresh blood saturated with the oxygen and rich in nutritional substances.

Thanks to the improvement of the blood circulation the organ is purified from metabolites, well nourished, oxidized and deprived of the anabolits [1, 2].

A presentation and description of the Head's zones is essential to understand the therapeutic influence of acupuncture. The zones are connected with the phenomenon of the spinal nerves' arrangement. The body is divided into the range of metameres. It is manifested in the intrauterine life. The particular metameres, which include skin, muscles, viscera, bones, and blood vessels, are nerved by peripheral nerves of the adequate part of spinal cord.

The development of the foetus limbs in the mother's womb causes the change of the formally arranged metameres. During the development, the components that create a particular segment fall apart. In spite of such phenomenon, the components remain in the area of the metamere, because they do not lose the connection with the spinal cord. It cases a lot of connections between different segments on the various levels. The connections may explain how the stimulation of the points in one segment may influence the organs in another place.

Stimulating may also have an analgetic influence on the body. The appropriate treatments may also soften a feeling of pain. The most accurate way to explain it is to introduce the Hayman's principle and the phenomenon of the minus induction of the two sensory stimuli. Following Zbigniew Garnuszewski's words, according to the Hayman's principle the two mechanical stimuli that cause the pain have an inhibitory influence on each other. The stronger stimulus has proportionally more inhibiting influence on the weaker stimulus [1]. We can encounter a similar phenomenon when two stimuli of the same strength influence, one after another, a particular place on the body. The latter stimulus is sensed as a stronger one or as if it was the only stimulus influencing the body.

The stimuli caused by a stimulation releases the endorphin from the pituitary gland and the midbrain. The endorphin goes to cerebrospinal fluid and blood and then back to brain where it combines with particular receptors. Such process leads to smothering the feeling of pain [1–3].

Electropuncture

Electropuncture is an influence of the electrodes on the biologically active point (AP). This is an alternative to the treatment that includes needling the body layers. An electric stimuli of the diverse frequency and intensity may be described as an impulse that stimulates the receptors of the acupuncture point.

In the 30-ties of XX century, the French, Soulie de Morant and Roger de la Fuye, showed that the biologically active points are characterized by the particular bioelectrical properties, especially relatively low resistance (when compared to one of the surrounding skin).

The French constructed also the first diagnostic apparatus called a punctoscope. During the following research it has proved that there are many parameters that influence the resistance, i.e. the activity of the sweat and tallow glands, the temperature or the rate of moisture. Each of the punctoscopes constructed recently has got a probe which searches for acupuncture points (AP) and a neutral electrode which is held by a patient to lock the circuit. The apparatus use a current of low intensity (several μA) and voltage (up to 10 V) [1].

The procedure of stimulating the biologically active points, just like any other physiotherapeutic procedure connected with the use of current, has its own methodology. The alternating current, which is said to be safer and more effective, is mainly used in modern stimulators. The direct current is used relatively seldom because of the electrochemical reactions unfavourable for tissues.

An intensity, voltage and frequency of the electric stimuli is chosen according to the necessity. The value of the intensity, which normally oscillates between 10 to 500 μA , is rather extensive. However, the value of 500 μA should not be exceeded. The voltage should be similar to the value of the electric *potential* between the inside of the body and the surface of the skin ($\approx 3\text{V}$).



Fig. 1. Electrostimulator KOLMIO ETAN 4

About the frequency:

- from 6 to 60 Hz is applied in stimulating the organs and tissues (e.g. flaccid paralysis of muscles, atony),
- from 15 to 60 Hz is applied when a sedating effect is needed (it relieves the pain of radiculalgia, discopathy, neuralgia, myalgia).

The typical procedure lasts about 10–20 minutes. The time may depend on the direct effect we want to achieve; a shorter procedure has a stimulating effect, longer, however – sedative.

A heart pacemaker or a metal element implanted in the body is a contraindication to such procedure [1, 2, 5].

A commonly used in Poland device to electropuncture is an electrostimulator Kolmio Etan 4.

The electrostimulator KOLMIO ETAN 4 has the following characteristics:

- four independent channels, enabling concurrent stimulation of up to 8 points,
- working with surface and needle electrodes,
- two working modes (simple and packaged impulses),
- polarization selection (positive, negative, alternating),
- common regulation of the frequency for all channels,
- independent regulation of amplitude for each channel,
- special electrode for acupunctural point stimulation,
- automatic acupunctural point detector [10].

Laseropuncture

Laseropuncture is a form of stimulation therapy. The impulse that stimulates the biologically active points' receptors is a laser radiation beam that influences the skin layers directly. The first tests carried out with the use of a low beam laser brought encouraging effects. It was noticed that the method has a lot of advantages: it is easy to perform, safe, it is not time consuming, and it guarantees a total sterility. Its therapeutic effects are similar to the effects of needling. The stimulation of the biologically active points with a use of laser radiation has turned out to be an aseptic and atraumatic method which can be conducted on people with the inflammatory processes of the skin (especially with a purulent inflammation). In such case, needling might cause a general infection. This method may also be an alternative for the patients afraid of the needles, especially children – they are more willing to have a procedure of laseropuncture conducted on them because it does not cause pain. Furthermore, time of the procedure may be shortened to 300 seconds [1, 5].

The biological effects of the influence of the low beam laser on the human body depend on several factors, i.e. how many beams reach the acupuncture point, how many of them are eventually absorbed so that they irritate the receptors, how many are refracted and which are diffused in the tissues. Only the beams that reach the biologically active point may activate its receptors, release the skin-organ reflex and give the welcomed therapeutic results. Yet, the influence of the low beam laser does not restrict to the skin-organ reflex. The beam which penetrates through epidermis influences all layers and components. It also influences the bio-chemical processes and enlarges the flow of blood in the area of laser stimulation. In the therapeutic dose, the radiation does not damage cells and tissues and it does not cause an inflammation. According to the clinical results of the laseropuncture it has been proved that it has anti-inflammatory and analgetic influence and it decreases the swelling.



Fig. 2. Biolaser 2

There are two types of lasers commonly used in laseropuncture:

- a solid-state laser; length of the waves – 780 nanometers and 904 nanometers (*infrared laser*),
- *neon-helium* laser – it emits the light beam – 632.8 nanometers [1].

Each of the lasers has a different ability of penetrating the tissues, which is important in treating various types of diseases. Relatively, the *neon-helium* laser has a lower ability of penetration than the infrared laser and it is up to 2–3 mm deep. It is used in a superficial stimulation of the biologically active points. A beam of infrared laser may penetrate deeper, up to 12–13 mm. Due to these values, the use of infrared laser is more common in laseropuncture [1, 5].

BIOLASER 2 is an example of an apparatus used to laseropuncture in Poland. The device is also equipped in automatic searching of acupuncture points [9].

Technique of the procedure is relatively simple. Having prepared the apparatus (low beam laser) and regulated the power and frequency, we have to direct it towards the biologically active point and activate it. How strong the power of laser should be depends on factors like:

- type of disease,
- its duration,
- age of the patient,
- thickness and colour of the skin,
- individual tolerance.

With adult patients, we can use a 1–4 mW laser, with children – 1–2 mW. The time of stimulation depends on age; 20–25 s. on adults and 15–20 s. on children. After stimulating one point, we move on to another. During one procedure we can stimulate maximally 12 points. Whole time of stimulation may not exceed 350 seconds. In the state of acute inflammation, the procedure should be performed everyday. In chronic diseases – twice a week. If visible general reactions occur, the time between procedures should be extended [1, 2, 5].

Acupressure

Acupressure is a method of treating by pressing the biologically active points around body layers. It is a physical therapy which is a form of acupuncture well known in the Far East. This massage is based on restoring the patency of the energy channels with the stimulus – a pressure.

The important advantage of this procedure is the fact that every patient can perform it themselves. However, it is essential to know the exact location of acupuncture points [6, 7].

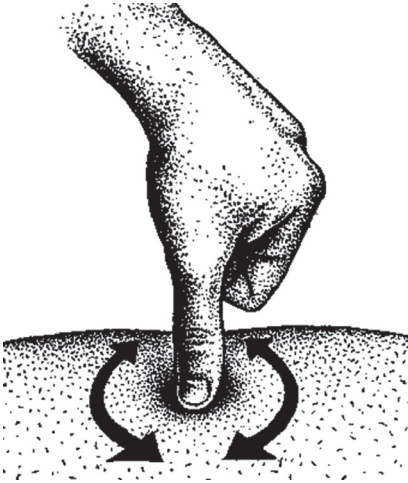


Fig. 3. One of the pressures using in the acupressure

The procedure may be performed by using a finger pressure. A wooden or metal stick may also be used. If we want the pressure to be stronger, we can put a middle finger on the index finger. An intensity of the pressure can be divided into three types: weak, medium and strong. While pressing, some therapists prefer to hold the skin with thumb and index finger in the biologically active point and then make a vibration. A massage with a stick is performed in the same way as the finger pressure. Each stick is ended with a little ball (2–10 mm) [1].

Various types of pressure may be used:

- constant point pressure during which the finger or stick bends in 45–90°,
- a pressure combined with a circular movement,
- a pressure combined with a spiral movement – in left and right,
- a pressure combined with a sliding movement – upwards, downwards and sideways.

Generally, a combination of the above-mentioned methods is most commonly practiced [5].

We can distinguish two techniques of the local massage, depending on the effect we want to achieve. They depend on duration and intensity of the stimuli.

- a sedative technique is characterized by a weak or medium pressure, lasting usually 20–30 s. Then, a circular movement pressure lasting about 30 s. is added. Next, a constant pressure and a pressure combined with the one of sliding movements and, finally- a spiral movement. The whole stimulation time of one point: about 2 minutes [5].
- a stimulating technique is characterized by a strong, short pressure after which the finer of stick is taken from the point abruptly. Time of the pressure: about 3–7 seconds. An interval should be equal to the duration of pressure [5].

We stimulate the point 4–5 times, trying to do it during 1 minute.

Acupressure is a safe and well tolerated by a patient method. However, it may not be performer on everyone. Contraindications: inflammation of the skin,

open wounds, varices, swelling, thrombophlebitis, vessel and cardiac insufficiency [7].

The Usage of Acupuncture Methods in Treating Particular Disorders of Muscular and Skeletal System and Nervous System

The essay describes particular diseases of the of muscular and skeletal system, and nervous system. The disease entities have been chosen according to the frequency of their occurrence in the everyday work of physiotherapists. Every acupuncture point has its own nomenclature, and their location may be found in every atlas of acupuncture points. Every experienced therapist, who has acquired a good knowledge of anatomy, should not have problems with a localization of the points on the body.

Dyscopathy – the points that should be stimulated if the patient suffers from discopathy:

- Huatuo,
- Ashi's points,
- Dumai 14,
- Shigizbui,
- Urinary bladder 57 (Chengshan),
- Urinary bladder 58 (Feyang),
- Gall bladder 30 (Huantiao),
- Urinary bladder 60 (Kunlun),
- Articular point 9 and 40.

Degenerative spine disease:

- Urinary bladder 11 (Dachu),
- Huatuo's points,
- Dumai 14 (Dazhui),
- Dumai 12 (Shenzhu),
- Shiqizbui,
- Gall bladder 30 (Huantiao),
- Urinary bladder 40 (Weizhong),
- Urinary bladder 60 (Kunlun).

Gonarthrosis (arthrosis of knee):

- Points: 35 (Hdliing) and 36 (Xiyan),
- Stomach 34 (Liangqui),
- Stomach 36 (Zusanli),
- Gall bladder 34 (Yanglingquan),
- Spleen 9 (Yinlingquan),
- Articular point 49.

Degenerative spine disease:

- Extra point Huatuo,
- Gall bladder 30 (Huantiao),
- Urinary bladder 54 (Zhibian),
- Urinary bladder 40 (Weizhong),
- Urinary bladder 57 (Chengshan),
- Gall bladder 34 (Yanglingquan).

Osteoporosis:

- Gall bladder 39 (Xuanzhong),
- Liver 3 (Taichong),
- Large intestine 4 (Hegu),

- Stomach 36 (Zusanli),
- Triple Heater 4 (Yangchi),
- Ear auricle point 22.

Neuralgia shoulder:

- Triple Heater 15 (Tianliao),
- Triple Heater 14 (Jianliao),
- Large intestine 15 (Jianyu),
- Large intestine 14 (Biano),
- Small intestine 12 (Bingfeng),
- Small intestine 10 (Naoshu),
- Large intestine 4 (Hegu).

Sciatica:

- Urinary bladder 25 (Dachangshu),
- Urinary bladder 54 (Zhibian),
- Urinary bladder 37 (Yinmen),
- Urinary bladder 57 (Chengshan),
- Urinary bladder 58 (Feiyang),
- Gall bladder 30 (Huantiao),
- Gall bladder 34 (Yanglinquan),
- Gall bladder 39 (Xuanzhong).

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Scoliometer Bunnell Test as Part of the Diagnosis in the Course of Idiopathic Scoliosis

Badanie skoliometrem Bunnella jako element diagnostyki w przebiegu skoliozy idiopatycznej

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Abstract

Idiopathic scoliosis is a developmental spinal and trunk curvature. It pertains to 2–3% of the growing up population and 1% of them require treatment. As far as proper treatment is concerned, early disease detection enables quick intervention which enables to stop the progress and changes connected with the disease. The Bunnell scoliometer is a simple, non-invasive diagnostic tool enabling to detect changes, carry out the observations of the therapy and is used in medical, physiotherapy and nursing practice.

Key words: idiopathic scoliosis, scoliometr Bunnell, diagnostics, testing.

Streszczenie

Skolioza idiopatyczna jest rozwojowym skrzywieniem kręgosłupa i tułowia. Dotyczy 2–3% populacji dorastającej, w której 1% wymaga leczenia. Wczesne wykrycie pozwala na podjęcie odpowiedniego leczenia, dzięki temu można zahamować progresję i zmiany z nią związane. Skoliometr Bunnella jest prostym, nieinwazyjnym instrumentem diagnostycznym pozwalającym na wykrycie zmian, prowadzenie obserwacji terapii, który znajduje zastosowanie w praktyce lekarskiej, fizjoterapeutycznej i pielęgniarstwa.

Słowa kluczowe: skolioza idiopatyczna, skoliometr Bunnella, diagnostyka, badanie.

Definition

Idiopathic scoliosis is a developmental spinal and trunk deformation. Idiopathic scolioses constitute 80% of all scolioses [8]. Idiopathic scoliosis is a deviation from anatomical axis either of the whole spine or a spinal segment which results in secondary changes in the motor system, thorax and internal organs. The origin is unknown. The nature of deformation is three-dimensional: in frontal plane appear the lateral spinal curvature, in sagittal plane appear the disorders of physiological thoracic kyphosis and in transverse plane appear the rotation of vertebrae round their axis. Deformation develops simultaneously in all three planes (vertebral column torsion). According to *Scoliosis Research Society* scoliosis is a vertebral column curvature which angle measured in *Cobb* way on a – p radiogram performed in standing position amounts to at least 10°. The

disease manifests in the period of vertebral column growth. A spontaneous evolution is possible in the beginning both towards the deformation increasing and its either regression or stabilization. Exceeding a certain size leads to irreversible progression. Periods of progression correspond to periods of quick growth of vertebral column. Deformations pertaining to growth of osseous system and soft tissues add to primary displacements. Thus time is the fourth dimension of scoliosis [6, 7]. Idiopathic scoliosis appear at 2–3% of growing up population and 1% of them require treatment.

Risk of spinal curvature progression at children is an important element which is all the more bigger the earlier the scoliosis appear and it is greater at girls than at boys; greater in primary double arch scoliosis than in single arch scoliosis and the greater is the *Cobb* angle at time of detecting the curvature [6].

Documentation

Documentation of scoliosis should be simple, accurate and contain always the same entry algorithm of each case. Multifforme model of disease entity generates problems in working out the appropriate documentation. Objective, simple and at the same time accurate way of documenting has been worked out by Wejsflog. He divided the scoliosis symptoms into three groups:

1. Class I symptoms: changes within vertebral column and sacral bone,
2. Class II symptoms: changes within skeletal elements directly connected with vertebral column,
3. Class III symptoms: further segments of motor system organs.

Making up an auxiliary documentation is a useful tool in keeping the scoliosis history which, in actual fact, will contain the elements of diagnosis, prognosis, recommendation and check-up of results and will enable to give more accurate rate of appropriateness and results of therapy [7, 9].

The Bunnell Scoliometer Measuring Device

The scoliometer is a simple design measuring device. I had been introduced by Bunnell in the first half of the eighties of last century. Its shape resembles a rectangle made of plastic of very low weight which enables to keep it easily in a lab coat. Scoliometer is a peculiar level containing a cannulae filled with liquid which is marked with a scale from the central 0 to 30° to the left and 30° to the right. The level indicator in form of a metal ball is placed in the cannulae.

Position of Testing

Testing of trunk rotation, such nomenclature is proposed by Bunnell following the patients' acceptance, is done in push up position to Adams' test which assesses either structural or functional scoliosis [1, 2].

Methodology of Testing

A tested patient standing in upright position is bending on slightly splayed lower limbs in straight knee joints with upper limbs lowered between the feet. The course of curvature and posterior iliac spines should be marked with dark felt-tip pen. A testing person presses the notch of the Scoliometer onto spinous process, in level of vertebral column, in place of biggest rotation of vertebrae. Attention should be paid to level of vertebral column, in thoracic segment a pa-

tient's bending forward should be smaller than in case of lumbar segment. To eliminate any mistakes connected with irregularity of lower limbs, the test should be carried out in sitting position with bending forward and results of thoracic and lumbar segments should be correlated [14]. For measurement should be selected an area of dorsum which shows the biggest KRT value [3]. In case of symmetry, an indicator shows 0° on the scale.

The test legitimacy

Measurement of vertebrae rotation is one of the most important elements of scoliosis assessment [12].

Bunnell discovered a certain legitimacy while carrying out the testing on a group of 1065 patients. 52% of patients with curvature $< 20^\circ$ according to Cobb showed $KRT > 5^\circ$ and 1.2% of patients with curvature $20\text{--}35^\circ$ according to Cobb showed $KRT < 5^\circ$. Such results induced Bunnell to work out the relationship between result of KRT scoliometer testing and the angle of curvature according to Cobb. Bunnell proposed the values 5° . KRT according to Bunnell corresponds to 11° according to Cobb, 7° KRT according to Bunnell corresponds 20° according to Cobb [2]. Krawczynski showed a high correlation degree of KRT with Cobb's angle in thoracic scoliosis and considerably lower degree of correlation of KRT with Cobb's angle in lumbar scoliosis [13]. Algorithm $0^\circ\text{--}3^\circ$ KRT physiological asymmetry is binding in testing results, $4^\circ\text{--}6^\circ$ KRT – necessity to repeat the testing after 3–4 months, 7° and $7^\circ <$ referral to a medical specialist and taking X-ray.

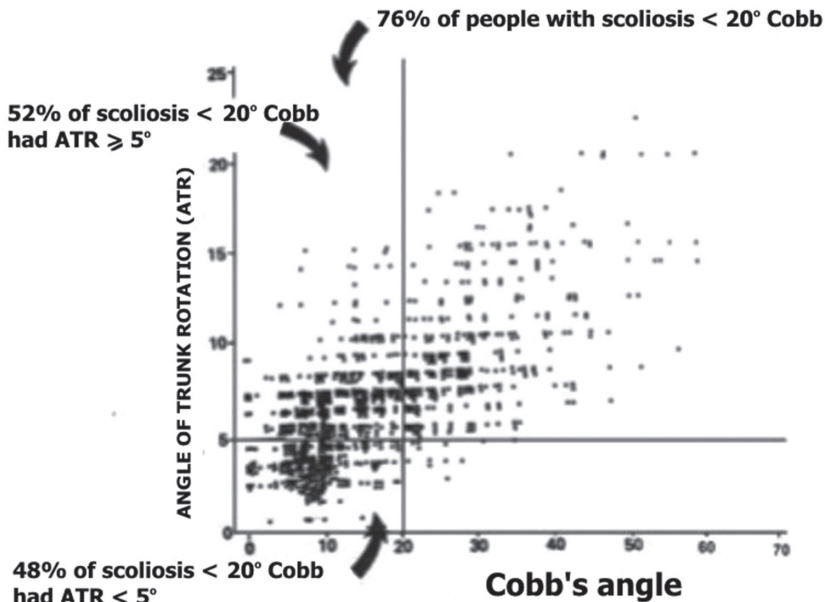


Fig. 1. Correlation Chart and angle of trunk rotation angle according to Cobb in Bunnell

Conclusions

Scoliosis is a pathology developing in the period of growing up and mainly pertains to girls [4]. Changes pertain not only to spine and cause abnormalities in respiratory system as well as upset function of internal organs, on more than one occasion change the child's external appearance which in growing up age is adverse as far as psyche is concerned. Early detecting enables a quick intervention of a specialist allowing for an appropriate treatment and curbing of progression and changes connected with scoliosis. However, the most important aspect is the possibility of applying a noninvasive treatment thus saving a patient from surgical intervention. In Poland there is no programme of early detecting of scoliosis. The balance examinations (10th and 14th year of life) leave a child in a break when idiopathic scoliosis [5] manifests and deepens. Medical staff at schools is deprived of a physician's presence and nurses do not have adequate qualifications as far as detecting of abnormal spinal curvatures including the scolioses [5] are concerned. The Bunnell scoliometer seems to be an ideal device for early detecting of idiopathic scolioses. Its reasonable price, small size, simplicity in performing the testing and reading a result makes that it can be used for screening examinations by nurses working at schools and teachers of physical education which would enable to detect any alarming symptoms and pay attention of parents to consult a specialist [12]. The Bunnell scoliometer is used in course of low degree scolioses for check-ups of scoliosis progression. Frequent X-rays are adverse for human organism and Scoliometer test is noninvasive and allows for scoliosis check-ups without harmful radiation [2]. Following Kotwicki's thought, a simple scoliometer is worth its weight in gold and should find its place in pocket of each orthopaedist and physiotherapist [10].

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Analysis of Influence of Dance on Mature Females Physical Agility

Analiza wpływu tańca na sprawność fizyczną kobiet dojrzałych

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Abstract

Physiotherapy should not only be concerned with treatment, but also with prophylaxis. It is necessary in the modern, aging society, to search for opportunities for physical activity, which could help establish and maintain fitness in adult age. Dance could be a good example of such an activity. The aim of the study was to: 1) evaluate the physical agility of salsa dancing and non-dancing females, and 2) assess the correlation between a single leg balance test from the “Eurofit” test battery and balance parameters recorded during a stabilometric test on a Zebris platform. 20 females took part in the study. Research group comprised females who dance salsa (38.20 ± 11.64 yrs, 71.38 ± 19.51 kg, 165.9 ± 6.17 cm), the control group – females who do not dance salsa (38.8 ± 3.15 yrs, 64.04 ± 6.06 kg, 168.2 ± 7.76 cm). Physical agility was tested by means of selected tests from the “Eurofit” test battery, and by an objective analysis of center of foot pressure recorded on a Zebris platform. Statistically significant difference between the two tested groups was recorded in the third test from the “Eurofit” test battery (flexibility sit and reach test), as well as in a one leg balance test performed on the left leg with eyes closed on a Zebris platform. A statistically significant correlation was noted for the left leg, between the length of the centre of pressure and the area of the centre of pressure, and the value of balance test from the “Eurofit” test. Physical activity in the form of dance (salsa) may have a positive influence on one’s flexibility and stability in one leg stance.

Key words: salsa, “Eurofit” test, Zebris platform.

Streszczenie

Fizjoterapia nie powinna ograniczać się jedynie do leczenia, ale także zwracać uwagę na profilaktykę. We współczesnym społeczeństwie, które wykazuje tendencje starzenia się, należy poszukiwać form aktywności fizycznej pozwalających utrzymać sprawność również w wieku dojrzałym. Przykładem takiej aktywności może być taniec. Celem pracy jest ocena sprawności fizycznej kobiet tańczących salsę w porównaniu ze sprawnością kobiet nietańczących oraz analiza korelacji

między próbą równoważną testu „Eurofit” a parametrami równoważnymi zarejestrowanymi na platformie stabilometrycznej Zebris w badanej grupie kobiet. Badaniem objęto 20 kobiet. Grupę badawczą stanowiły kobiety tańczące salsę ($38,20 \pm 11,64$ lat; $71,38 \pm 19,51$ kg; $165,9 \pm 6,17$ cm), grupę kontrolną kobiety nietańczące ($38,8 \pm 3,15$ lat; $64,04 \pm 6,06$ kg; $168,2 \pm 7,76$ cm). Poziom sprawności fizycznej oceniono, wykorzystując wybrane próby testu „Eurofit” oraz obiektywną analizę rozkładu nacisku stóp na podłoże zarejestrowane na platformie Zebris. Statystycznie istotną różnicę odnotowano w III próbie testu „Eurofit” (test gibkości), a także w pomiarze równowagi na platformie Zebris dla kończyny dolnej lewej podczas próby z zamkniętymi oczami. Aktywność fizyczna (w formie tańca – salsy) może pozytywnie wpłynąć na gibkość oraz stabilność posturalną jednonóż.

Słowa kluczowe: salsa, test „Eurofit”, platforma Zebris.

Introduction

Increasing development of the modern civilization causes a systematic decrease in people’s physical activity. A lot of work and tasks are nowadays performed while sitting, which may bring about illnesses related to the lack of movement. Passive lifestyle, the effect of the development of civilization, has become one of the reasons behind obesity, low metabolism, cardiovascular insufficiency and other dysfunctions of the body common in the modern society [2, 3]. Objectives that we have to set in this context should primarily focus on prevention, based on promoting physical activity in all age groups. The process of upbringing should develop, increase and for as long as possible maintain the body’s readiness for taking up and solving various tasks which require acquired and formed motor abilities and habits, good functioning of the motor system, good health condition, and such motor characteristics as speed, strength, agility, elasticity, endurance, coordination and power [4]. It is necessary to be in good physical shape throughout one’s lifetime. It can not only enrich and develop the body’s biological values [7, 8], or facilitate the performance of work-related tasks, but it can also improve one’s well-being. Despite undeniable advantages of physical activity, barely any interest in active leisure activities is observed [5, 11] and women are far less active than men [6, 9, 10].

Such reports prove that is important to study the influence of physical activity on the agility of people in all age groups. We should constantly search for forms of physical activity appropriate for one’s age. Dance is a form of physical activity [1]. It not only shapes movement precision and spatial orientation, it is also key in shaping proper posture. Paying attention to aesthetics, dance teachers require that dancers keep their backs straight, retract their shoulder blades and lift their heads up. Dance affects also motor memory, which is shaped by repeating sequences of steps and dance moves [12]. With all the positive effects of training dancing, one can say that dancing might be a good method for women to maintain physical agility in adult age. The thesis was verified by this research.

Aim

The aim of the study was to evaluate the following: 1) the physical agility of salsa dancing and non-dancing females, and 2) the correlation between a single leg balance test from the “Eurofit” test battery and balance parameters recorded during a stabilometric test on a Zebris platform.

Material and Methods

20 females took part in the study. The first group, later on referred to as the research group, comprised ten females (38.20 ± 11.64 yrs, 71.38 ± 19.51 kg, 165.9 ± 6.17 cm) who danced salsa for 3.5 years, twice a week, on average. The average BMI in the group was 25.73 and the average percentage of body fat from skinfold thickness was 33.77. The second group, further on referred to as the control group, comprised ten females who did not dance salsa (38.8 ± 3.15 yrs, 64.04 ± 6.06 kg, 168.2 ± 7.76 cm) (Fig. 1). There were no statistically significant differences between the two groups in terms of age, weight and height.

Diagnostic and Measurement Methods

In this research the analysis of physical agility level of female participants was carried out by means of the “Eurofit” test battery. The test is most often used to evaluate the agility level of young people. It may however be used to assess the fitness of adults; it is perceived as a tool that allows to record chang-

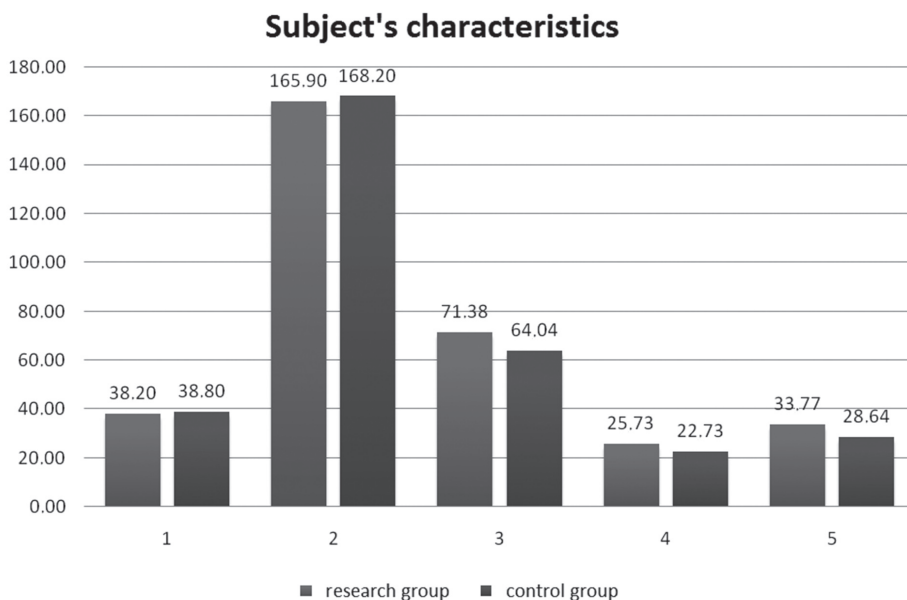


Fig. 1. Detailed description of two research groups.

1 – age (years), 2 – height (cm), 3 – weight (kg), 4 – BMI, 5 – body fat (%)

es in physical agility from school age to adulthood [15]. Physical agility was evaluated by using eight selected tests which assessed balance, limb movement speed, trunk flexion in sitting position, horizontal jump, handgrip strength, bent arm hang and 10×5 meter shuttle run. The procedure of every test is described in detail below.

Test 1 – The Flamingo Balance Test (FLB). The subject stood on the beam with shoes removed, trying to keep balance by holding the instructor's hand. While balancing on the preferred leg, the free leg was flexed at the knee and the foot of this leg held close to the buttocks. The test started the watch as the instructor let go. The stopwatch was stopped each time the person lost balance (either by falling off the beam or letting go of the foot being held). The test started over, again with timing until the subject would lose balance. There were maximum 15 attempts during 30 seconds. The number of falls was noted as the score of the subject. The aim of the test was to keep balance standing single leg on the beam.

Test 2 – The Plate Tapping (PLT). The subject stood comfortably in front of an adjustable table. Two yellow discs (20 cm diameter) were placed with their centers 80 cm apart on the table. A rectangle (10×20 cm) was placed equidistant between both discs. Subject's non-preferred hand was placed on the rectangle. The subject moved the preferred hand back and forth between the discs over the hand in the middle as quickly as possible. This action is repeated for 25 full cycles (50 taps). The test was performed twice, the better result was recorded. Time (s) was the unit of the test. The aim of the study was to assess the speed and the coordination of limb movement.

Test 3 – Sit and Reach Flexibility Test (SRFT). After a brief warmup the subject sat on floor with shoes off. Subject placed bottom of feet (25 to 30 cm apart) against side of box (approximately 30 cm high) with knees straight. Tester placed measuring stick on box parallel to subjects legs; 38 cm at edge of box closest to subject and end of measuring stick ("0") toward subject. Subject placed hand over hand and reached as far as possible over measuring stick without bending knees. The length of the reach was measured in (cm). Best of two tries was recorded. The aim of the test was to evaluate hamstrings and lower back flexibility.

Test 4 – Standing Broad Jump (SBJ). The subject stood behind a line marked on the ground with feet slightly apart. A two feet take-off and landing was used, with swinging of the arms and bending of the knees to provide forward drive. The subject attempted to jump as far as possible, landing on both feet without falling backwards. The test was performed twice and the better result (the measurement in centimeters taken from take-off line to the back of the heels after landing) was used in further analysis. The purpose of this test was to measure the explosive power of legs.

Test 5 – Handgrip Strength (HGR). The subject held the dynamometer in the hand to be tested, with the arm and forearm alongside the body; the hand did not have any contact with the rest of the body. Non-tested upper extremity was naturally lying downward. The handle of the dynamometer was adjusted – the base rested on first metacarpal (heel of palm), while the handle rested on middle of four fingers. When ready the subject squeezed the dynamometer with maximum isometric effort, which was maintained for about 5 seconds. The test was performed twice for each side and the better result (recorded in psi) was used in further analysis.

Test 6 – Sit Up (SUP). The aim of this test was to perform as many sit-ups as one can in 30 seconds. Subjects lay on the mat with the knees bent at right angles, with the feet flat on the floor placed in 30 cm width and held down by a partner. The fingers were to be interlocked behind the head. On the command subjects raised the chest so the upper body was vertical and then returned to the floor. The test was performed only once, the number of properly done sit ups was recorded.

Test 7 – Bent Arm Hang (BAH). The subject was assisted into position, the body lifted to a height so that the chin was level with a horizontal bar. The bar was grasped using an overhand grip (palms facing away from body), with the hands shoulder width apart. The aim was to evaluate the functional strength by calculating the time (in seconds) of holding the hang with upper extremities flexed in elbows. The test was performed once.

Test 8 – 10 × 5 m Shuttle Run Test (SRT). There were two marker cones placed five meters apart. The subjects started with one foot at one marker. After being instructed by the tester, the subject run to the opposite marker, turned and returned to the starting line, repeating five times without stopping (thus covering 50 meters total). At each marker both feet must fully cross the line. The aim of the test was to evaluate the running speed and agility.

In the “Eurofit” test battery the subjects used equipment and tools recommended by the authors of the method:

Test 1: metal beam 50 cm long, 4 cm high and 3 cm wide, covered with a non-slip surface 5mm thick, stabilized by two supports 15 cm long and 2 cm wide.

Test 2: a table with adjustable height, 2 rubber yellow discs (20 cm diameter) fixed to the table 80 cm apart, a rectangle (10 × 20 cm) placed between the yellow discs, a stopwatch.

Test 3: A box 40 cm long, 45 cm wide, 35 cm tall, top panel (65 cm long, extending 25 cm beyond the wall of the box against which the subject placed her feet) inscribed with 1 cm gradation, the panel is fixed so that the gradation of 50 cm is drawn in the point where subject’s feet touch the box; a ruler 30 cm long placed on top of the panel.

Test 4: Tape measure, non-slip floor and two landing mats.

Test 5: handgrip dynamometer

Test 6: stopwatch, landing mat

Test 7: A horizontal bar elevated so that the tallest subject can perform a full hang, a landing mat, stopwatch, a stool.

Test 8: a stopwatch, measure tape, chalk, two lines drawn 5 m apart with marker cones on each end of the line (rubber marker cones placed 120 cm apart) [13].

Apart from the “Eurofit” test battery, the authors of the study also used the Zebris stabilometric platform. FDM-S Zebris platform (Zebris Medical GmbH, Germany) allows for objective measurement of static and dynamic aspects of plantar pressure forces during gait or stance by calculating the length and area of centre of foot pressure (COP) distribution. The static software module used in the study enabled an evaluation of balance abilities by analyzing the COP movement. Lower limb load asymmetry (left-right and front-back) during the stance was also assessed. Further analysis was done using two parameters recorded during the tests: length of COP and the area of ellipse also set by COP. Stabilometric single leg tests were also performed on the left and right lower

extremity. Subjects attempted to maintain a stable position during a 30-second examination. The test was performed twice, with open and closed eyes. Before the test began all subjects were informed about the aim and type of the study and signed the informed consent form. Physical agility tests and stabilometric tests were carried out in the gym and in the Department of Physiotherapy of Stanisław Staszic Higher Vocational State School in Piła.

Statistical Methods

For all measured parameters descriptive analysis was performed. To evaluate differences in results between the test and control group non-parametric Mann-Whitney U test was done. The correlation between the results of the Flamingo Balance Test from the “Eurofit” test battery and the parameters recorded on the stabilometric platform was analyzed using Spearman’s rank correlation coefficient. Statistical significance was set at $p < 0.05$.

Results

Mean, minimal and maximal values of all the results from all eight trials of the “Eurofit” test battery are presented in Table 1.

Table 1. A comparison of the “Eurofit” test battery results of the test and control group

Test		Test group				Control group			
		mean	min.	max.	SD	mean	min.	max.	SD
Flamingo Balance Test (number of errors)	right lower extremity	4.00	8	0	3.20	3.40	8	0	2.63
	left lower extremity	4.40	8	1	2.84	3.40	8	0	2.55
Plate Tapping (s)		9.76	15.59	7.22	2.30	10.13	14.43	8.48	1.71
Sit and Reach Flexibility (cm)		14.30	7	19	3.97	7.00	-5	17	6.96
Standing Broad Jump (cm)		148.20	122	226	32.82	155.40	130	187	18.04
Handgrip Strength (psi)	lower upper extremity	14.20	10	18	2.35	14.50	12	17	1.58
	right upper extremity	13.20	9	16	2.35	13.20	10	17	2.70
Sit Up (no of repetitions)		20.00	8	28	2.39	15.70	5	23	6.72
Bent Arm Hang (s)		7.37	0	18.52	9.01	3.69	0	11.96	3.97
10 × 5m Shuttle Run Test (s)		22.72	26.58	19.78	2.22	22.10	24.83	20.55	1.59

The table shows that in most tests females who participate in dance classes scored better. Unfortunately, in the majority of cases the differences between the values of analyzed motor abilities were not statistically significant. Statistically significant differences between the two groups were noted only in the third test of the “Eurofit” test battery (Sit and Reach Flexibility Test) (Fig. 2.) Mean result was 14.30 ± 3.97 cm for dancing females and 7.00 ± 6.96 cm for non-dancing females.

Certain tendencies were also observed in the obtained results ($p < 0.05$). Both in the sixth test ($p = 0.13$, Fig. 3) and seventh test ($p = 0.24$, Fig. 4) of the “Eurofit” test battery better results were recorded in the group of females dancing salsa. It was observed that subjects in the research group were able to hold the hang with upper extremities flexed in elbows longer than the females in the control group, and that their abdomen muscles were stronger, though the differences were not statistically significant.

Mean values and standard deviations of all parameters recorded during the stabilometric test on the Zebris platform are presented in Table 2. The table shows that subjects who participate in dance classes scored better in most tests. Unfortunately, like in the case of the “Eurofit” test battery results, in most cases the differences were not statistically significant.

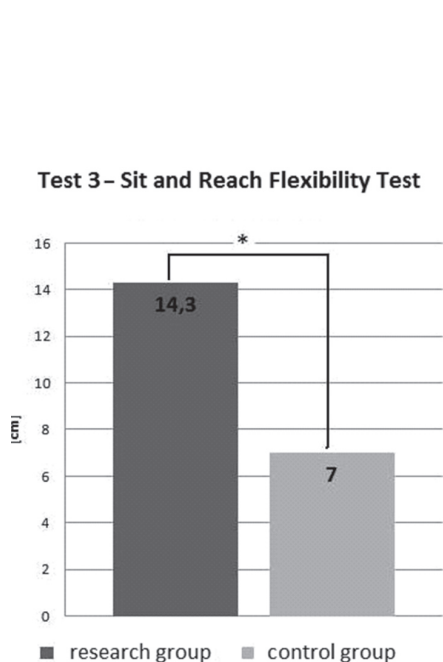


Fig. 2. Comparison of mean results of both groups in the third test of the “Eurofit” test battery

* $p < 0.05$ Mann-Whitney U Test

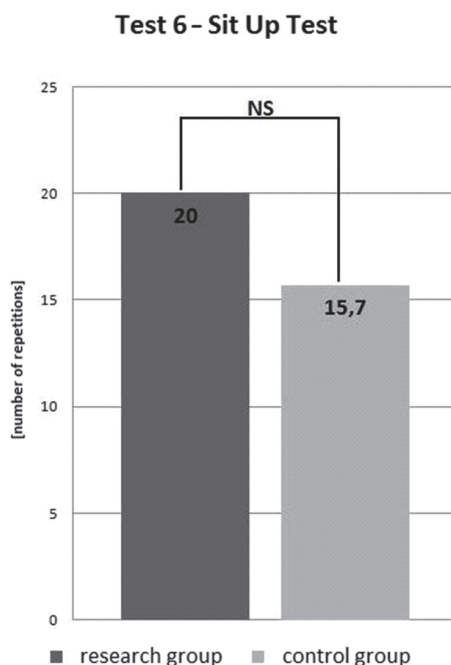


Fig. 3. A comparison of mean values of both groups in the sixth test of the “Eurofit” test battery ($p = 0.13$)

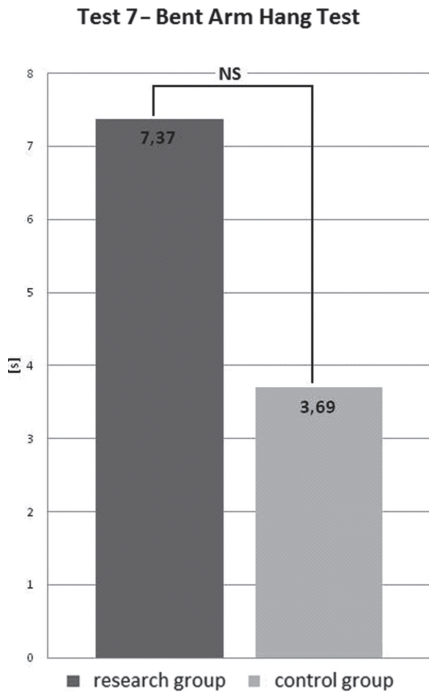


Fig. 4. Comparison of both groups' mean results in the Flamingo Balance Test performed on lower left extremity with closed eyes, * $p < 0.05$ Mann-Whitney U Test

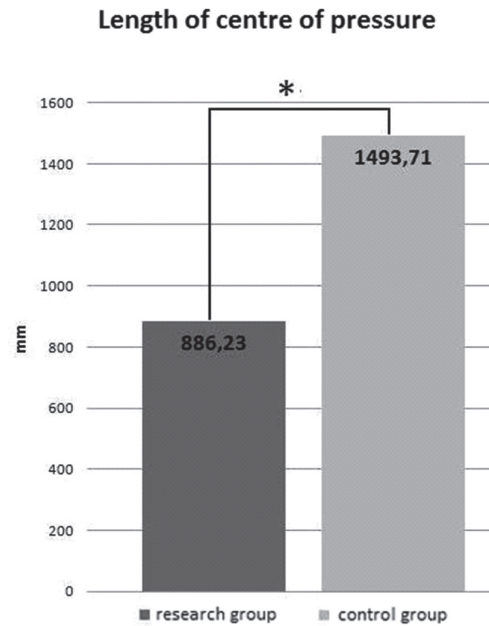


Fig. 5 Comparison of both groups' mean results in the Flamingo Balance Test performed on lower left extremity with closed eyes, * $p < 0.05$ Mann-Whitney U Test

Statistically significant differences between the two groups were observed in the Flamingo Balance Test performed on left lower extremity. The area of ellipse set by COP in both open eyes and closed eyes test ($p = 0.02$ and $p = 0.03$, respectively) was significantly smaller in the group of dancing women than in the non-dancing women.

Tables 3 and 4 present the values of Spearman's rank correlation coefficient between the Flamingo Balance Test of the "Eurofit" test battery and the parameters recorded during tests on the stabilometric platform. The values of correlation obtained for the lower right extremity are presented in Table 3 and for the lower left extremity in Table 4.

Tables 3 and 4 prove that a statistically significant correlation was observed only for the lower left extremity between the length of COP, the area of COP and the result obtained in the Flamingo Balance Test of the "Eurofit" test battery.

Conclusions

Physical activity in the form of salsa dancing can have a positive influence on one's agility and single leg stance stability. Moreover, in order to obtain a more precise evaluation of the influence of dance on the level of women's physical activity, a similar research should be conducted among a much more ranged population.

Table 2. Comparison of values recorded on the dynamometric platform Zebris FDM-S in the research and control group

Test type	Test group		Control group	
	mean	SD	mean	SD
Length of COP (mm)				
Lower right extremity – open eyes test	166.87	73.09	255.60	143.07
Lower right extremity – closed eyes test	1280.41	830.32	946.00	435.60
Lower left extremity – open eyes test	181.09	62.82	239.65	114.71
Lower left extremity – closed eyes test	886.23	623.29	1493.71	1039.57
Area of ellipse set by COP (mm ²)				
Lower right extremity – open eyes test	902.56	150.75	1136.49	365.90
Lower right extremity – closed eyes test	2326.85	457.21	2432.68	612.74
Lower left extremity – open eyes test	889.30	158.70	1188.79	365.54
Lower left extremity – closed eyes test	2053.27	574.31	2692.71	671.45

Table 3. Values of Spearman's rank correlation coefficient in all tested subjects (lower right extremity)

	Flamingo Balance test of the "Eurofit" test battery	Length of COP/ open eyes	COP area/ open eyes	Length of COP/ eyes closed	COP area/ eyes closed
Flamingo Balance test of the "Eurofit" test battery	1.00	-0.36	-0.23	0.23	-0.06
Length of COP/open eyes	-0.36	1.00	0.57 *	0.15	0.16
COP area/open eyes	-0.23	0.57*	1.00	0.32	0.52*
Length of COP/eyes closed	0.23	0.15	0.32	1.00	0.79*
COP area/eyes closed	-0.06	0.16	0.52*	0.79*	1.00

*p < 0.05.

Table 4. Values of Spearman's rank correlation coefficient in all tested subjects (lower left extremity)

	Flamingo Balance test of the "Eurofit" test battery	Length of COP/ open eyes	COP area/ open eyes	Length of COP/ eyes closed	COP area/ eyes closed
Flamingo Balance test of the "Eurofit" test battery	1.00	-0.69*	-0.65*	-0.53*	-0.56*
Length of COP/open eyes	-0.69*	1.00	0.65*	0.50*	0.45*
COP area/ open eyes	-0.65*	0.65*	1.00	0.47*	0.58*
Length of COP/eyes closed	-0.53*	0.50*	0.47*	1.00	0.91*
COP area/ eyes closed	-0.56*	0.45*	0.58*	0.91*	1.00

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The Applicability of the Method of Biofeedback – Clinical Biofeedback in Physiotherapy

Możliwości zastosowania metody biologicznego sprzężenia zwrotnego – *biofeedback* w fizjoterapii klinicznej

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Abstract

XXI century is the age of high technology, combining the achievements of many fields of science. Contemporary neurology is based on the concept that human brain is characterized by a certain degree of plasticity which underlies the processes of its development and regeneration. Biofeedback (bio – a living organism) itself is a process that enables a person to affect one's physiological functions – to control and modify them. The idea of biofeedback is to create a double-loop, closed-loop information. The outer loop is created by a technical device, measuring various parameters of the body such as brain waves (EEG Biofeedback), heart-beat, muscle activity (EMG – biofeedback), skin temperature (temperature biofeedback), and processing gathered information into a form recognizable for our perception – a feedback signal for our senses (sight, hearing, touch). The inner loop is the nervous system, which, through sensory feedback, constantly controls the motor activities. Feedback method is widely used in various fields of clinical physical therapy: neurology (to improve locomotory and manual function in patients after strokes, spinal and craniocerebral injuries), cardiology, gynecology and obstetrics (insufficiency of pelvic diaphragm muscles), orthopedy.

Key words: feedback, biofeedback.

Streszczenie

XXI wiek jest wiekiem neurotechnologii, łączącym zdobycze wielu dziedzin nauki. Współczesna neurologia opiera się na stwierdzeniu, że mózg ludzki charakteryzuje się pewnym stopniem plastyczności leżącej u podstaw jego rozwoju i regeneracji. *Biofeedback* („bio” – żywy organizm, „feedback” – sprzężenie zwrotne) jest procesem umożliwiającym wpływ na fizjologiczne funkcje własnego organizmu, ich kontrolę i modyfikowanie. Metoda biologicznego sprzężenia zwrotnego polega na stworzeniu podwójnej pętli zamkniętego obiegu informacji. Pętlę zewnętrzną tworzy urządzenie techniczne mierzące poszczególne parametry organizmu, takie jak fale mózgowie (EEG *biofeedback*), czynność serca, aktywność mięśni (EMG *biofeedback*), temperaturę skóry (*biofeedback* temperaturowy) i inne, a następnie przetwarzające informację na postać możliwą do percepcji i dostarczające do narządów zmysłu (wzrok, słuch, dotyk) sygnału zwrotnego. Pętlą wewnętrzną jest układ nerwowy, który za pomocą czuciowych sprzężeń zwrotnych

stale steruje czynnościami ruchowymi. Metoda sprzężenia zwrotnego ma szerokie zastosowanie w różnych dziedzinach fizjoterapii klinicznej: neurologicznej (do usprawniania funkcji lokomocyjnych, funkcji manualnych ręki u osób po udarach mózgu, uszkodzeniach rdzenia kręgowego, urazach czaszkowo-mózgowych), kardiologicznej, ginekologiczno-położniczej (w niewydolności mięśni dna miednicy), ortopedycznej (w reedukacji posturalnej i in.).

Słowa kluczowe: sprzężenie zwrotne, *biofeedback*.

Introduction

It is believed that the twenty-first century is the age of neurotechnology, science linking areas of medicine and psychology with the achievements of modern engineering. After an age of exhaustive study neurological specialists have found that the brain is an organ constantly changing under the influence of environmental factors and characterized by some degree of plasticity [19].

The word “biofeedback” comes from the combination of two words: “bio” – concerning living organisms and “feedback”. The formal definition given by the AAPB (Association For Applied Psychophysiology and Biofeedback) states: “Biofeedback is a process enabling a person to learn how to change physiological activity to improve their health and achievements. Precise instruments measure physiological activity such as brainwaves, heart activity, muscle activity and skin temperature. These instruments instantly return the exact ‘feedback’ to the user. Presentation of this information – often in combination with changes in thinking, emotions and behavior – supports desired physiological changes. Over time, those changes may last even without feedback devices” [2].

Feedback providing information on the physiological state of the organism causes a person to become more aware of one’s body and the processes running within it. The person begins to understand how various physical and psychological stimuli affect the body, and thus can control those stimuli better. By learning how to control their own physiological processes and alleviate symptoms of the disease a sense of active participation in the rehabilitation process develops in a patient. And this consciousness that there is possibility to do something that has a positive effect, often influence other areas of human life, bringing a number of positive changes [17, 18].

What is Biofeedback

Biofeedback is an interdisciplinary method, that involves various ways of perception and techniques of controlling your own body physiological behaviours that normally stays out of consciousness and are not controlled freely [10]. The nervous system controls the processes undergoing in the body by controlling the functions of organs and regulating their interactions. For proper control a flow of information between the brain and executive organs (that also communicate with each other) is necessary (executive organs also communicate with each other). Efficient regulation of the organ function by central nervous system requires feedback information on the course of this function – it is a biological feedback. This physiological neuromechanism is used to examine to what extent primary control commands are fulfilled and to make necessary adjustments [10, 20]. Behavior of the whole organism is related to the function of regulating mechanism. On one

hand, central nervous system processes afferent signals from receptors, and on the other, through efferent paths it controls effector structures, such as skeletal muscles, smooth muscles, heart, and endocrine system [10].

The idea of biofeedback is to create double-loop, closed-loop information. The inner loop is the nervous system, which, through sensory feedback, constantly controls the motor activities. The outer loop is created by a technical device, that allows to: measure various parameters, process gathered information into a form recognizable for our perception, provide sense organ (sight, hearing, touch) a signal which is proportional to measured parameter. [14]

“If a certain response is generated, and it is followed by an enhancing stimulus, the probability of reoccurring of this reaction increases. Each reaction, that can be quickly enhanced, may be conditioned, and anything that the body can perceive may become an enhancing stimulus” (Zimbardo, Movement, 1977).

Types of Biofeedback

- EEG Biofeedback – Neurofeedback – electrodes placed on the surface of the scalp record the changes in electric potentials of the brain, and the graphic image of the amplitude and frequency is presented on a monitor in a manner understandable to the patient. The patient is to control his brain activity, so the signal seen on the screen changes.
- EMG Biofeedback (electromyography) – the idea of biofeedback session is that the device picks up electrical signals in muscles, and then translates them into a form understandable to the patient (eg, flashing light bulb or acoustic signal is activated) when a muscle contracts.
- GSR Biofeedback (Galvanic Skin Response) or EDR (Electro Dermal Response) – measures the electrical conduction of the skin, which varies depending on the overall stimulation of the sympathetic nervous system. Electrodes are placed on the fingertips. GSR graph has the greatest range and is the most sensitive measurement of all types of biofeedback.
- Biofeedback breathing – apparatus for biofeedback consists of a rhythm and a length of exhaust sensors. The results are shown as an audiovisual curve.
- Biofeedback Temperature – Skin temperature depends, in addition to external factors, including the mental status of man. Temperature sensor (thermistor) is assumed pad. The aim of training is to achieve a higher temperature than the current individual patient.
- HEG biofeedback (Hemo-encephalo-graphy) – measures the temperature of the head using an infrared thermometer placed on the head or registers changes in the infrared spectrum generated by flowing blood (more red color means a greater blood oxygenation).
- Biofeedback cortical potentials, SCPs availability – changes in the polarity of the cerebral cortex is recorded as free potentials from the surface of the skull. Negative polarity means greater activity of neurons in registered area of the brain [16].

The Applicability of Feedback Method in Physiotherapy

Biofeedback in Postural Reeducation

At each stage of development postural defects may occur as a result of various factors. Unnoticed at first, they tend to progress in time. As the defect pro-

gresses, when unfavourable environmental conditions occur (incorrect position during doing homework, sitting during school lessons, uneven shoulder weighing down, limited physical activity) incorrect body positions are maintained and perpetuated.

Competent habit of correct posture is processed into a new pattern (program-matrix), which is the analog current postural situation. Defective pattern perpetuates gradually – then we are talking about the habit of abnormal posture, and correct posture is something unnatural, troublesome for a child. Principle of corrective procedure is to restore (re-education) the proper standard according to which correct body posture, the processes of teaching and what is more important maintaining such a posture is controlled. This is possible only through many repeated exercises. However, a certain problem arises in the correction procedure – the posture control system begins to treat faulty posture as a standard stimulus and corrective actions as errors. Although proprioceptors are not damaged and receive information appropriately, the feedback flowing from them, is incorrectly processed in the CNS.

Method of substitution feedback consists of providing information to the CNS through other than common physiological route, replacing the information about the course of movement and position of the body from proprioceptors by information from exteroceptors (sound stimuli, light, sensory).

The types of exercises using substitute feedback-biofeedback:

- elongation exercises – using column light indicator,
- elongation-antigravity exercises using sound indicator,
- monitoring posture with the use of “harness” with sound indicator,
- monitoring posture with the use of “harness” with stimulator equipped with a surface electrodes, placed on the convex side of curvature, providing sensory stimulus to straighten the back or causing muscle spasm if the correction does not occur,
- corrective exercises with the use of EMG biofeedback, using spinal muscles biopotentials, which are received by the surface electrodes placed on the top bend, or on either side of the spine, amplified and processed to sound or light signals. For example the task to maintain the level of the two column light indicators on the same level, which will provide a symmetrical muscle work on both sides of the spine (elektromyography, myoscope) [1].

Application of Biofeedback in Neurological Rehabilitation

Regenerating capacity in terms of human brain, is closely related to its plasticity. It is possible thanks to the ability of neurons to respond to receptors stimulation. In this way the functional and structural plasticity of our brain gives us the ability to change the functions of synaptic connections and ability to change neural structures. It is of great importance for clinical neurorehabilitation [10].

Improving Locomotor Functions

Control of movement is the result of a complex process, involving programming, planning and initiating movement (controlled by the brain structures). A move is made possible by the interaction of descending and ascending impulses, creating a number of feedback loops between the central and peripheral nervous system [6]. In a healthy person a closed neurophysiological system of

feedback sensory connections constantly controls the motor operations. The body receives enormous amount of sensory stimuli, from which it chooses one that are most important to complete certain activity. In patients with damaged CUN the proper flow of information and the opportunity to control motor activities is disturbed. Therefore, use feedback techniques in such patients enables use of a new information inflow route and formation of motor-sensory associations. Move, random at the beginning, through the process of multiple repetitions, is perfected and in time the chain of feedbacks is no longer necessary and may be eliminated [4].

Types of exercises:

- exercises of walking on the treadmill correction using the mirror as the source of biofeedback information [5],
- exercise of proper loading of limbs on the balancing platform with the use of visual and auditory feedback [3],
- exercises of balance and symmetrical limb loading on the hydraulic platform, coupled with the computer system [6],
- training on a treadmill equipped with functions of biofeedback in patients with hemiparesis, giving improvement of the locomotor ability [7],
- study of walking using signal stick with software and biofeedback function (with light, sound, and proprioceptive signals – special design of a stick allows it to bend when the pressure is too strong. The task is to charge paretic limb and avoid overloading of a stick and healthy limb so that signals do not occur [6, 8].

The effect is improvement in symmetric loading of lower limbs, gait parameters, locomotion, overall efficiency, functional and mental status of the patient. All this gives patient better functioning and greater independence in everyday life.

Restoring Hand Manual Functions and Reducing Spasticity

The consequences of stroke is the intermuscle functional imbalances (flexor and extensors) and increasing of spasticity, are serious problems for both the therapist and the patient. They cause abnormal movement, forced arrangement of limbs, the formation of contractures, pain, which significantly reduces self-reliance, makes the care difficult and comfort of the patient's life worse [9]. The lost perception of kinesthetic sensations from the proprioceptors activated by motion, can be replaced receiving signals from other receptors. The kinesthetic signals, realized in the performance of any limb movement or muscle tension may be replaced by visual signals on the screen or signals aids are monitored by the speaker (Kinalski, 2008):

- restoring hand manual functions and reducing spasticity using TENS controlled by EMG Biofeedback. Flat surface electrode or electrode-glove are used in stimulation. Electrostimulation is connected to the exercises with visual feedback for the spastic muscles (so-called active self-controlled exercises) [9],
- restoring the efficiency of the upper extremity and hand with the use of EMG biofeedback (myofeedback). This method was called by the author CCSK- self-controlled active exercises (Kinalski 1988). It allows you to obtain a spastic muscle relaxation, and to train even when muscle strength is 0 on the Lovett scale because Bioelectric activity of muscle, even in the ab-

sence of apparent motion is presented in a visual or acoustical. This method is used in patients after strokes and in the late periods after spinal cord injury [10].

Use of EEG-Biofeedback After Craniocerebral Injuries

In the case of neurofeedback reactions undergoing conditioning are the various rhythms of the brain bioelectrical activity. Persons after stroke, and cranial injuries that have lost motor function, through mental training – imagining the movement of impaired limb are able to activate the motion. This is because the defective limb movement may be replaced by the visual signal displayed on the screen, or one signal may be replaced by another signal. The effects of patients work is recorded on the electroencephalogram monitor, which shows a significant reduction in the amplitude of alpha and beta waves, which means neurons activation [16].

Training using EEG biofeedback after craniocerebral trauma. The person is connected to a computer, is able to affect one's EEG. The appropriate amount of training in a targeted way helps to modulate (enhance or weak) the brain bioelectric activity and thus indirectly affect the functioning of the whole organism [12].

Applications Biofeedback in Gynaecological – Obstetric Physiotherapy

Urinary Incontinence

Urinary incontinence and disturbed urination is a serious problem significantly impeding life and functioning in the society. Temporary urinary incontinence, more or less severe, is common in pregnancy and after deliveries, after gynecological operations and in women in menopausal age.

Biofeedback is used in female patients with: urge incontinence, genuine stress incontinence (GSI). An involuntary leakage of urine during physical labor, cough occur without feelings of urgency [11].

In perineal muscle exercises EMG signals from sphincter muscles (transmitted from electrodes) and pressure signals from vagina (transmitted from rectal or vaginal pressure probe) are used. Biofeedback gives the possibility to activate the appropriate muscle groups, controlling strength and duration of contraction [10].

Anal Sphincters Insufficiency

Anal sphincters insufficiency is lack of conscious control over defecation process. Impaired sphincters function is a result of damage in the anatomical structure of sphincter apparatus, mostly due to the use of obstetrical instruments during childbirth, especially long and complicated.

Method of controlled anal sphincters exercises biofeedback is introduction into anus probes with balloons attached to the monitor. The patient has the opportunity to observe a pressure increase that produces the same channel in the rectum, thereby controlling sphincter contraction. Gradually visual control is eliminated [12].

Application of Biofeedback in Cardiac Rehabilitation

Cardiological patient primary goal is to reduce psychological tension, anxiety and stress. A skillful control of breathing is basic in relaxation learning. In

therapy the methods of respiratory biofeedback are used – the patient learns to control the length and depth of breath, receiving feedback information in the form of light or sound signals. Such therapy is additionally combined with relaxation training.

This method has been successfully applied in: patients after cardiac surgery, treatment of essential hypertension, treatment of ischemic heart disease [15].

Conclusion

Biofeedback is a method that enables us to use the enormous potential of our brain – potential that allows us to control physiological functions of our organism with the power of mind. It is completely safe for the patient, but it also requires his active participation and cooperation in the rehabilitation process. The fact that the patient is able to monitor with his senses the course of therapy, has an important beneficial psychological impact and greatly increases the effectiveness of therapy. This feeling of active participation is a central aspect of the subjective approach to the patient.

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Medical Training Therapeutic as a Form of Active Rehabilitation

Medyczny trening terapeutyczny jako aktywna forma rehabilitacji ruchowej w zespołach bólowych kręgosłupa

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Abstract

Medical training therapy is a therapeutic system of active rehabilitation. Start of this therapy was given by a Norwegian Oddvar Holten, who 1965 in Oslo founded the institute for its development. After acceptance by the Norwegian Ministry of Health MTT has spread in the 70's, 80's last century in other European countries. In the early 90th-century Tom Arild Torstensen took over Holten Institute in Oslo. Based on clinical work and research he developed the current form of MTT. According to the definition of the German textbook „Medical training therapy is the application of therapeutic physical exercise at the (still) healthy persons or patients, the prevention or treatment of medical therapy, the medical commission, with clear indications, for the achievement of defined objectives. MTT is a continuation of medical treatment using other means”. The source of the above mentioned definition is the movement. Popularity of this method gives increasing the amount of movement in the population for health care and effectiveness of restoration with the most possible involvement of the patient in the course of rehabilitation. Performing a large number of repetitions in one training course, which leads the patient alone, but always under the watch of specially prepared professional physiotherapist, also gives the possibility of this therapy in groups. This increases a productivity of one therapist.

Key words: training, spine, movement efficiency.

Streszczenie

Medyczny trening terapeutyczny jest systemem aktywnej rehabilitacji. Początek tej terapii dał Norweg Oddvar Holten, który w Oslo w 1965 r. założył instytut zajmujący się jej rozwojem. Po uznaniu przez norweskie ministerstwo zdrowia zaczęła się rozprzestrzeniać w latach 70., 80. zeszłego wieku również w innych krajach europejskich. We wczesnych latach 90. XX w. Tom Arild Torstensen przejął prowadzenie Instytutu Holtena w Oslo. Na podstawie prac klinicznych i badań opracował obecną formę MTT. Według definicji niemieckiego podręcznika, „medyczny trening terapeutyczny jest zastosowaniem treningu fizycznego u (jeszcze) zdrowych osób lub pacjentów, w ramach medycznej prewencji lub leczniczej terapii, na lekarskie zlecenie, z jasnymi wskazaniem, dla osiągnięcia zdefiniowanych celów. MTT jest kontynuacją medycznego leczenia z zastosowaniem innego środka”. Środkiem w wyżej przytoczonej definicji jest ruch. Zapotrzebowanie na zwiększenie ilości ruchu w populacji w celu profilaktyki zdrowotnej oraz skuteczność przywracania sprawności z jak największym zaangażowa-

niem pacjenta w czasie leczenia rehabilitacyjnego dodaje popularności tej metodzie. Wykonywanie dużej liczby powtórzeń w przebiegu jednego treningu, które pacjent prowadzi samodzielnie, cały czas jednak pod fachową opieką specjalnie przygotowanego fizjoterapeuty, pozwala na prowadzenie terapii w grupach. Zwiększa to bardzo wydajność pracy jednego terapeuty.

Słowa kluczowe: trening, kręgosłup, ruch.

Introduction

In 1965 the norwegian Oddvar Holten found the institute for the development of a system called active rehabilitation Medical training therapy in Oslo. After acceptance by the Norwegian ministry of health, this method began to spread in the 70's and 80's of the last century in other European countries. For example, in Germany, it is not longer widely used as a component of fitness, but as an essential part of physiotherapy treatment process. Training MTT can be prescribed by a doctor and then be subject to refund. The demand for increasing the amount of traffic in the population for health care efficiency and effectiveness of restoration at the greatest possible involvement of the patient in the course of rehabilitation following the popularity of this method.

Medical training is the application of therapeutic physical exercise for the (still) healthy subjects or patients, the prevention or treatment of medical therapy, the medical commission, with clear indications, for the achievement of defined objectives. MTT is a continuation of medical treatment with another measure, namely traffic [1]. Otherwise, the MTT can be described as controlled, targeted therapeutic or preventive process involving systematic and planned subjecting the body mobility and incentive in the form of gradually increasing load, with the result that comes to adapt and maintain or improve the individual characteristics of the motor and the impact on functional, metabolic, morphological and mental processes in the human body.

Medical means the use of in the event of a pathology, trauma, and in various types of dysfunctions or muscular imbalances. Therapeutic – the field of action is much broader than sports, and includes all the features of motoric improvement, the improvement of the locomotor pattern – mainly functional, stability, training, activities of daily living (ADL), has a significant effect on the metabolism and mental well-being of the patient. Exercise is a form of traffic to control, improve a mobility impairment. They are known for a good effect on the human body and constitute an essential part of rehabilitation. Conducted irregularly, however, do not give long-lasting changes in physiological parameters, and it is precisely this form of training the physical activity, where such changes can be expected.

Special equipment for MTT is modeled on instruments of the weights, but partly modified and fully adapted to the needs of the patients. The basic exercise equipment include: treadmill, ergometer, stepper or other instruments for “cardio” training. At least two exercise machines for the torso and two others for the extremities. Complementary exercise mats on the floor, dumbbells and weights, other equipment such as: balls, rubber thera-band, walking sticks, gym equipment for quarter balance, etc. An important role of the rehabilitation meets the column, which gives ample opportunity to exercise combinations. The patient is always acquainted with the equipment adjustments and the selection of the burden for safe execution of training.

Effect of Training on the Organism

Under the influence of motoric tasks with the use of passing the burden different degree body react and adapt to “new conditions”. This adjustment is called adaptation and is divided as follows:

- morphological adaptation (hypertrophy of muscle fibers, increased amounts of DNA and RNA, increased miofibrills and energy-rich phosphate),
- neuromuscular adaptation (better recruitment of fibers, attendance, and their synchronization in the work, increasing the production of transmitters),
- adaptation of the connective tissue (tissue that builds tendon hypertrophy, restoration of trabeculae, improvement of tissue covering the entire area of articular cartilage),
- systemic adaptation (adjusting to the new load conditions of the circulatory system and respiratory system, improve physiological parameters, improving the functioning of other systems),
- motor adaptation (reduction of Neuromuscular dysbalance the new temporal and spatial priming, optimization work agonists and antagonists),
- adaptation of metabolic processes (to improve the “burning” body fat),
- hormonal adaptation (decrease in the quantity of catecholamines in the blood, increased insulin secretion, increased insulin sensitivity).

Table 1. Indications and contraindications in MTT

Indicate	Contra
<ul style="list-style-type: none"> • rebuild muscle tissue after injury and orthopedic surgical trauma • chronic exhaustion syndrome (chronic fatigue syndrome CFS =) • muscular atrophy with nieczynności • dysbalanse muscle • hypertension • coronary artery disease • metabolic disorders • insulin resistance, hyperinsulinemia • type II diabetes • obesity • some respiratory diseases • osteoporosis • pain syndromes • back pain (various origins) • hypertonia, muscular hypotony • tension headaches origin • depression • some forms of rheumatic diseases (polyarthritis, fibromyalgia, syndrom Bechterev) • after the destruction of the body states (eg, treatment attrition after passing the body). 	<ul style="list-style-type: none"> • circulatory failure • state after recent myocardial infarction • chronic infections • acute inflammation • lack of active cooperation of the patient • disease with contraindications to exercise using a resistance load. • some chronic diseases (not all are an absolute contraindication, but the final decision is made by a doctor instructing).

Table 2. The main goals in MTT

The objectives of the cognitive	The objectives of the motor (main)	The objectives of the affective (emotional)
Everything is related to learning about the principles and methods of training, the possible effects to be achieved, the reaction, which you can expect from the body after a workout	therapy of degenerative disorders, and postoperative states posttraumatic for reducing pain, improving overall motor-related ADL, work and sports activities	gaining patient trust, motivating the patient to restore confidence in the performance of more difficult exercises

Objectives

The general objectives are to maintain results obtained in earlier stages of rehabilitation, restoring the patient to return to the profession or to the best possible performance on a daily basis, improving the resistance of the load to which the patient is exposed to normal daily life, in the profession. It is also vital visualization and rooting for physical activity and preventing the consequences of a shortage of traffic.

The essence of the training is an appropriately selected training schedule. The therapist is specially trained in this area. He or she has to compile a specific plan by investigation of training and personal function tests, to make the right choice of exercises and repetition. The interview focuses on the center point of the disease as well as on all additional conditions affecting the state of the musculoskeletal system. Decisive criteria in the selection of exercises is also information about their work, additional physical activity, particularly those activities which are difficult in the patients every day's life. Functional test for determination of initial training amount for training of strength, for example, the ergometer or treadmill will test for strength training – a test using a dynamometer, etc. The implementation of the initial tests and studies shall be established for which muscle groups are needed stabilizing exercises, and for what mobilizing or a combination of these two. Training meets its basic principle, that is individually tailored to each patient, if these rules are pre-maintained. Documentation of training should be carried out conscientiously and necessarily controlled by the operator to the possibility of modifying the contents of the plan, depending on the patient's condition. When we improve the condition of the patient to overcome a higher burden or a difficult task, but if exercise brings pain or decrease the rate of deterioration in handicap. When selecting a therapist instructs the patient exercises on how to perform the exercises (the precise description of the starting position, movement and final position), an activity that exercises the appropriate structures and the appropriateness of the exercise. Learning any new exercises should always include demonstration exercises by the therapist, hold the first motion, together with the patient (assisting the maintenance of effort), and carry out the evaluation exercise by the patient. Training time is typically long. In the initial stage until an hour (for example, counting 7–9 in the three series of exercises in 30 repetitions, including breaks).

In advanced stages of the execution of all exercises can even lengthen the training time. Number of repetitions, number of runs, the pace of exercise and rest between sets depends on the primary objective of training and status of the patient. Performing a large number of repetitions in one training course, which leads the patient alone, but always under the care of specially prepared professional physiotherapist, it also gives the possibility of this group therapy. Increases is a very productive, one therapist training should be done at least twice a week. Beginning the training should take place no later than 4 to 6 weeks after rehabilitation treatment. To the selection of the training load may be helpful "the pyramid trainings load". Using the MTT in rehabilitation is a very good form of physical activity for patients with the pain of the spine but are no longer on the acute phase of pain. The spine is the central axis of the body, fulfilling important function such as supporting, and it is the major component of bone. It carries the upper part of the body and protects the spinal cord. Is embedded in the pelvis at the same time providing a place attachment leg bones. To meet this requirement the backbone must be strong and yet flexible and mobile in many ways. Provide the required strength of the vertebrae massive shafts designed to carry weight, and flexibility and mobility: intervertebral joints – intervertebral discs, ligaments and muscles. The human spine is a complex peculiar biomechanical system, because it is like a rod made of rigid segments (vertebrae) separated by flexible segments – intervertebral discs and ligaments. Layout ligament of the spine is under constant tension and prevent peel strength of intervertebral discs. Because of the state "voltage before overload" spine has a high degree of stability, further enhanced the action of external forces to stabilize – spine and torso muscles, chest and abdominal cavity. State of mechanical equilibrium is possible only with the existence of physiological muscle, ligaments, and bags and correct the accuracy of intervertebral discs. Even isolated and deprived of muscles of the spine is able to keep the vertical position, with a load of 20 kg. Of course, the real ensure stability muscles. If there are problems in the mechanical balance weave of causes and effects occur at the end to show pain. The most common causes of back pain are just the mechanical damage to the muscles, intervertebral discs, ligaments, articular surfaces:

- 1) obesity and related disorders biomechanics of the body, including the pelvis tilt,
- 2) progressive muscle weakness, especially those responsible with the correct posture,
- 3) muscle contracture within the ilio-lumbar (sedentary),
- 4) harmful exercises,
- 5) performing works much overloaded building spine structure,
- 6) failure to comply with the principles of biomechanics and ergonomics of the body motion,
- 7) stress and psychogenic factors affecting muscle tension.

Sometimes painful symptoms associated with disorders of the spine or mechanical overload may have their causes in other diseases, adjacent organs, therefore it is very important differentiating diagnosis. Feeling the pain is really a reaction to signals transmitted throughout the body. These signals are sent from the source of pain. For example back pain, the nerves in the spinal cord send information to the brain, where they are perceived as pain. The spine is composed of many elements, some of which are more and others less innervat-

ed. Source of pain may be the nerve roots, nerves and other anatomical structures innervated located in the spinal canal or next to it. The pain may originate from receptors located in the periosteum, joints, ligaments, vessels, meninges, casings nerve, muscle, and above all in the fibrous ring of intervertebral disc, whose elements are the greatest wear and degeneration process. Otherwise known as nociceptive pain receptor or peripheral pain is the most common and natural pain because it arises from irritation of the physiological components to such a function, it is also referred to as physiological pain. It is necessary for the proper functioning of the organism, indicating the risk or damage and ensuring continuity of the tissues. Pathologic neurogenic pain is pain resulting from irritation or damage to the roots or nerves. It arises after a shingles infection, after nerve injury, and acts as a dominant symptom in a band or disc disease, commonly called discopathy, when the body may fail to direct root compression, or by defect gelatinous mass of the nucleus. The pain comes from arthritis synovial sacs between vertebrate and sacroiliac joints, where changes can be encapsulated imaging methods. Narrow spinal canal is making itself felt in the form of clinical syndrome and radicular claudication is visible in the measurement of the width of the spinal canal well visible computed tomography. Narrowing of the channel does not always give pain. Muscle pain is quite often the cause of acute and chronic pain in the lumbar-sacral. The share of the muscles in maintaining posture is as important as the structures of bone-ligament-articular. Muscular origin of pain has long been taken into account in the pathogenesis of pain in this area and is mostly localized in the vicinity of the spine. There can be distinguished from acute pain, congestion and chronic spinal muscles, considered as a symptom of fibromyalgia syndrome, or fascia and muscles. Fascia and muscle pain is local pain, located in one or more muscles. These muscles are painful and cause a restriction of movement. It causes decreased mobility of the spine, lateral curvature of lordosis and alignment. The pain symptoms, such as disc disease, muscle is the reaction to pain, which often leads to resign or reduction in pain as a result of reflexively defensive posture adopted.

Piriformis muscle syndrome is local pain in the buttock. The may be the cause of sciatica, often falsely present as the discs. Sciatic nerve runs right under him and sometimes passes through this muscle, which – if it is thickened or tight – can cause tightness. This is called neuro-muscular conflict.

There are many types of pain, and often the characteristics depend on the cause. Not all cases of pain in the spinal overload disease may be suitable for use MTT training. However, if the disease is not so far-fetched, in order to cause pain in the performance of the same classes as I can used as secondary prevention in the treatment of spinal pain syndromes possibilities to inhibit recurrence of symptoms. It is also a good method for primary prevention, that is, when the effects of consciously want to prevent overloading of the spine, which, unfortunately, in today's world can not be excluded from everyday life. The final decision on whether this form of rehabilitation in this case can be applied to take the doctor.

Muscles play a vital role in the statics and dynamics of the spine, which are responsible for maintaining the upright posture and stabilization to other parts of the body (or limb, head) could make a move or movement in the spine in various planes and axes. To enable the assessment of muscle during dynamic and static phase allows the observation of phenomena and biomechanical behavior of the same muscle in motor stereotype. Czech Janda neuroorthopaedist

Table 3. The main characteristics differentiating postural muscles and phase operations

Muscle postural	Phase muscles
<p>On the rear surface of the body: muscles of short cervical-cranial: straight and oblique, levator blades, part of the upper trapezius muscle (trapezius), part of the cervical and lumbar spine flexor, quadrilateral lumbar muscles, pear-shaped muscle, tensioners muscle fascia lata, semitendinosus muscles and semimembranosus, two-headed muscle of the thighs.</p> <p>On the front surface of the body: masseters muscle sterno-cleido-mastoidei, muscles sloping smaller pectoral muscles, pectoral muscles bigger – part of the bridge and ribbed oblique muscle abdominal ilio-lumbar muscles, short adductor muscles of the thighs, slender muscle, simple thigh muscles.</p>	<p>deep neck flexors, pectoralis major – clavicular part, muscles of the front rack, the lower part of the trapezius muscle, muscles parallelogram, part of the thoracic spine rectifier, rectus abdominal, medium buttock muscles and large, long adductor muscles of the thighs, muscles extensive medial, lateral thigh and indirect (head of the quadriceps muscle).</p>

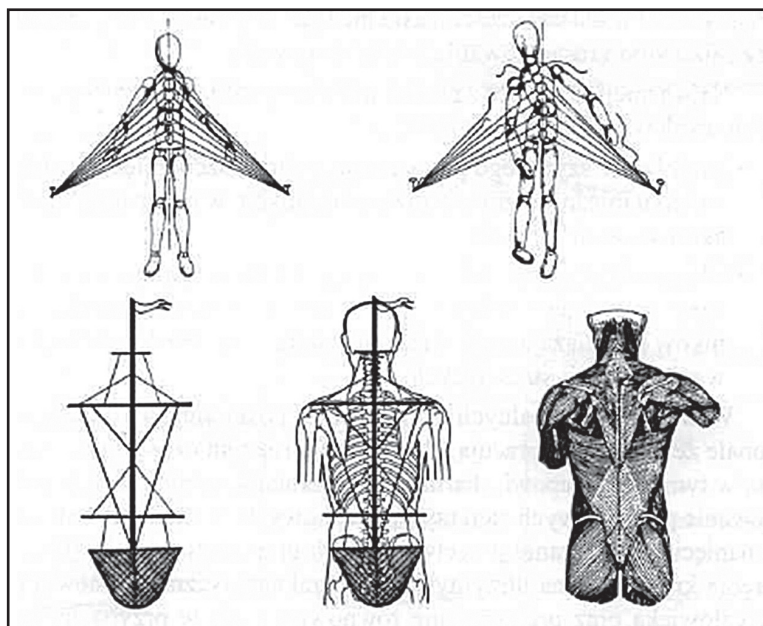


Fig. 1. Scheme showing rule of spine muscles' tension equilibrium [7]

Vlastimir subdivide the phase muscles whose primary function is dynamic and postural muscles of the function static.

In man, the two groups intermingle in some respects, the morphological and functional. For clarity, however, were written down the major differences (shown in Table 2).

The ideal conditions collaborate postural muscles and allows different parts of the phase of locomotion system, including spines, smooth out its functions in maintaining normal motor stereotypes. The most important thing is to preserve symmetry of muscle tension, since they do not force muscle tension around the spine is important, but it is that these forces are compensated. Muscular system becomes in itself the cause overloads in the spine, and not only if at least one muscle acts with a force ill to others. This may be the explanation for why the back pain also appear in people trained who would seem that the muscles are strong enough to protect it.

MTT is a therapy where the patient is still actively participates in therapy. As one of the stages of therapeutic rehabilitation of medical practice can contribute to consolidation results obtained in its initial stages. In part, it might resemble the activities mini gym. The presence of strength equipment, weights and barbell initially make such an impression. These and other instruments and accessories, and most of all appropriately selected training schedule aimed at restoring or maintaining the standards at the appropriate level of motor skills such as, strength, endurance, coordination, possession of which is necessary every day for the unimpeded functioning. Such training is beneficial for people of working age, which, after trauma or orthopedic surgery they want to shorten the way to the efficiency of allowing a return to work or previously practiced sport. For people suffering from chronic back pain, where the number of year-on-year increase, it appears that massage, physical therapy or medication is their only salvation against ailments. Sometimes everything is limited only to symptomatic treatment. However, it may just be enough to strengthen the appropriate muscle groups neglected by a sedentary lifestyle, or on the contrary, congested by too much load and the problem becomes smaller or disappears altogether. MTT is a form of therapy that not only can assist the rehabilitation of the patient and the best possible return to health, but also establish a pillar of the health behavior prevention that its positive effects can act indirectly on the financial budget lighten your health care. One of the most important characteristics of the MTT is regularity. The important thing is to continue training their own, even after completing the order. There is no age limits, so the aim of preventing recurrence of symptoms, or simply to maintain the best possible performance to end of life should continue this practice, and the only reason for failure may be only loss of the exercise of self-inflicted possibility.

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Chosen New Methods of Rehabilitation in Multiple Sclerosis

Nowe wybrane metody rehabilitacji chorych na stwardnienie rozsiane

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Abstract

Multiple sclerosis is a chronic, inflammatory, demyelinating disease of the central nervous system. It seems to be the autoimmune disease, however, the metabolic background and the significance of viral infection are considered to be reasons of arise of the illness. In spite of persisting research, the causal treatment has not been worked out yet. Therefore the complex rehabilitation and care of specialized group consisting of a neurologist, a nurse, a psychologist and a physiotherapist are so important. This article concentrates on physiotherapist's methods of work with patients suffering from SM. It raises an issue of the physical effort as a factor which improves the patient's condition. Particular attention is paid on another procedure and physiotherapeutic methods which could be helpful with combating fatigue and malaise. It also presents the chosen helpful therapies in fighting with after-effects of the disease, for example: Low-DoseNaltrexone therapy and diet support treatment.

Key words: multiple sclerosis, physical effort, LowDoseNaltrexone.

Streszczenie

Stwardnienie rozsiane jest przewlekłą, zapalną, demielinizacyjną chorobą ośrodkowego układu nerwowego. Uważa się, że jest to choroba autoimmunologiczna, jednak rozważa się też czynniki metaboliczne oraz rolę zakażeń wirusowych jako przyczynę powstawania choroby. Mimo trwających badań, leczenie przyczynowe nie zostało jeszcze opracowane. Dlatego tak ważna jest kompleksowa rehabilitacja i opieka specjalistycznego zespołu złożonego z lekarza neurologa, pielęgniarki, psychologa i rehabilitanta. Praca skupia się na przedstawieniu metod pracy rehabilitanta z chorymi na SM. Porusza kwestię wysiłku fizycznego jako czynnika poprawiającego stan chorego. Zwraca uwagę na inne zabiegi i metody fizjoterapeutyczne pomocne w walce ze zmęczeniem i złym samopoczuciem. Przedstawia też wybrane terapie pomocne przy zwalczaniu skutków choroby, m.in. terapię LowDoseNaltrexone oraz leczenie wspomagające za pomocą diety.

Słowa kluczowe: stwardnienie rozsiane, wysiłek fizyczny, LowDoseNaltrexone.

Introduction

Multiple sclerosis is one of the most frequent neurological diseases diagnosed between 20 and 40 years old. The etiology is not known. The disease appears when the myelin localized around nerves in central nervous system is damaged. This state causes slowing down or even inhibiting the transmission of information from the brain to the other parts of the body; in consequence, it brings lots of symptoms followed by the problem of constraint – physical activity by the patient – akinesis.

Rehabilitation in Multiple Sclerosis

Objects and Tasks in Rehabilitation

The main objective of rehabilitation in MS is to maintain patient's agility at the maximal high level, so to improve patient's competence, balance (keeping stability of body), coordination, to reduce muscle tone and to reeducate the walk.

There is no pattern of disease's course existing in MS. In each person's case it different syndromes are noticed, changing in intensity and length of prevalence.

During last years scientific research which are connected with MS has been focused on immunomodulatory treatment. Unfortunately, the causal treatment is not known, yet. At the same time only a small attention has been given to rehabilitation and fight against spasticity, weakness, trembling, ataxia, fatigue or neuralgia and pain.

In the preceding decade the patients with multiple sclerosis were advised to avoid physical exercises because of the risk of accretion their symptoms with increasing the temperature of the body. In addition, the excessive fatigue after the physical effort provoked even the fear of disease exacerbation. On the other hand, the lack of activity favors weakening of the muscle. Nowadays it is known that balanced physical effort has a great influence on the state of a patient.

The rehabilitation in multiple sclerosis demands all-round care and thorough, continuous analysis of the state of a patient, to respond immediately to change of the symptoms and needs pattern. What is important – none of the existing symptoms has been treated as an individual aim to physiotherapy. Every symptom is

Table 1. The forms and the most frequent symptoms in MS

Forms	Cerebral	Cerebellarostemy	Spinal
Symptoms	<ul style="list-style-type: none"> • hemiparesis • paresis of the limb • flaccid paresis • mental diseases • pseudobulbar palsy • aphasia • convulsive disorder 	<ul style="list-style-type: none"> • ataxia, aphasia • coordination disorder • balance disorder • adiadochokinesis • scanning speech • ocular symptoms • intention tremor • dysmetry • "naval walk" 	<ul style="list-style-type: none"> • spastic paresis • bathyesthesia diseases • urogenital diseases

a part of the physical deficiency and occasionally exists alone; besides, all of the pathological symptoms pervade in each others. For example- pathological muscles tense accompany with paresis; it causes fatigue, coordination disorders, and finally movement scope constraint. Therefore resorts, methods and forms of physiotherapy have to be matched to affect the positive result [7]. Physiotherapist, in his job, should follow the rule of the difficulty gradation.

As a serious and incurable disease, the multiple sclerosis often brings the complete destruction of the present lifestyle. Therefore a patient has often got deep psychological problems and nervous breakdown. It is important to ensure adequate psychotherapy [5]. Besides, the plan of all therapy must be discussed with the patient. In this way he will be motivated to cooperate. It is particularly important in the initial phase of rehabilitation, when the exercises are difficult and connected with high effort.

How to Plan Methods in Physiotherapy in MS

Physiotherapy is a part of rehabilitation process and it has to consider also the aims that have been set by the interdisciplinary team. The basis of physiotherapist actions is working on getting the basic functions back by the patient, maintain the passive movement range and maintain of muscle strength. Through the exercises patient should gain some practical abilities such as turning from side to side, sitting on the border of a bed with their legs on the floor, walking with instruments or by themselves, eating by themselves etc. Active exercises should be done in low positions, and passive in perpendicular body positions (sitting, standing position), to maintain on the certain level of postural muscle tension, activate other body segments, interact spasticity (or decreased muscle tensivity) and influence on balance [4].

Sick of MS Rehabilitation Estimation

The programme of rehabilitation is dependent on the level of inefficiency estimated in Kurtzki motoric insufficiency range – EDSS (Expanded Disability Status Score). It is 10 level range, according to the estimate:

- from 0 to 4 it says about the lack of paresis or low paresis and a sick is an independent person,
- 5 and 6 points tell us that there is a medium paresis in which the sick uses the one or two side orthopedic support to move by oneself,
- 7–8 points mean that a person has a significant paresis, the sick is limited to bed or armchair, moves only by use of two side device on a few meter distance [6].

It's very important to estimate the functions of a sick – mainly by use ADL scale (Activities of Daily Living) and estimation of muscle strenght of lower limbs in Lovetts scale, to have a full image of patient's state and rehabilitation progress.

Physical Exercises Interaction Mechanisms on Patient

Nowadays, it is possible to separate two basic physical exercises interaction mechanisms on sick with SM, which make sense and are complementary:

- a) Releasing effect or reserves and behaviour compensation – it is controlling the motoric activity of a patient in a way, which can enable the stronger parts of the body to take the weaker systems' functions. Physiotherapist's task is the choice of appropriate compensation strategy with the consideration of

paralysis level, topography, time and intensity of the training. The choice of improper compensation and overloading one of the segments, complexes or systems are the major threats.

- b) Releasing of compensational phenomena within the nervous system – modulation of changes in central nervous system through appropriate control of external and internal stimuli. Flux maintaining motoric activity by the sick on a certain level which creates flux plastic changes in the brain is important [4].

Physiotherapeutic Procedures with the Sick of SM

In rehabilitation physical procedures and kinesitherapy have substantial meaning. They're helpful in softening the symptoms of disease and improvement of patient's mood. They have to consider the period of a disease exacerbation and remission.

In the choice of procedures unfavourable heat action, which could intensify certain symptoms should be remembered. The sick should avoid using sauna, warm showers and other heat procedures.

Table 2. Physiotherapy in MS [1]

Spasticity	electrotherapy (cathode galvanism, tonolysis), loosening-up massage, water massage, loosening-up exercises (Schultz training, or Bobaths technics, Vossa technocs, Knoth technics, Kabat technics), exercises in counterbalance, music therapy, hippotherapy, cryotherapy and hydrotherapy
Ataxia	frenkl exercises, hippotherapy, occupational therapy
Fatiguability	gradual physical exercises, exercises in counterbalance, batching rest, music therapy, loosening-up exercises, curative bath (brine bath, with: sulphur, magnesium, chlorine, potassium, iron, phosphorus, manganese derivatives ions)
Disfunction of urine bladder function	general exercises, Kegl's exercises, electrostimulation of bottom pelvis or bladder jet
Sensation disorders, parasthesia	hydrotherapy, massage, exercises with different sort of material – determination of a kind of material, structure of surface, temperature, size, shape, etc
Periodic movement and sensation symptoms	electrostimulation branch of V nerve; laser therapy, cryotherapy
Problems with coordination	coordination and balance exercises in different body positions with their eyes open and closed
Pains	classic massage underwater massage, physical exercises, anode galvanism, diadynamic electrodes, magnetronics, therapuls, laser

In the period of aggravation we often use position changes (on average every 2–3 hs), breathing exercises and careful passive exercises and self-service exercises in bed. In the period of remission we can use physical procedures softening the symptoms of the disease and physical exercises by complying the general rehabilitation principles.

The physical exercises used in the Multiple sclerosis consist of:

- stretching exercises that improve muscles' dictensibility and the range of mobility in joints as well as decreasing spasticity,
- dynamic exercises, increasing muscles' strength, improving tissue nutrition through strengthening of the muscular pump, improving general form, efficiency and immunity of the organism,
- breathing exercises, improving the efficiency of the respiratory system, loosening, relaxing and strengthening the effectiveness of dynamic exercises,
- balancing exercises, that improve balance, faciliating self control over the organism and stability while moving,
- coordination exercises that improve the movements coordination that facilitates moving and eliminates the overuse of energy caused by the lack of coordination [8].

Patients point AT the positive impact of the water environment on multiple sclerosis symptoms. The sick who constantly suffers from balance disorder and contracture, during hydrotherapy has a feeling of better control over their body because water stops sudden and uncontrolled movements. What is more, the patient while in the water seemingly loses their weight and therefore can move easier and needs less power to keep balance. The temperature of water should be adjusted to the individual needs of each patient. However, best effects are reached while exercising in water having 23–26 degrees Centigrade. It is not suggested exceeding 30 degrees – the sick gets tired faster. Exercises in water should be repeated once or twice a week and they should last for 10 to 20 minutes.

Therapies Supporting Treatment

LowDoseNaltrexone Therapy

In the last several years there have been created many methods that are more or less effective in multiple sclerosis treatment. Most of them bring effects supporting medicines the others apply to nutrition methods or predict the full modification of the lifestyle, changed by the illness, anyway.

One of them is LowDoseNaltrexone Therapy that assumes taking small dozes of Naltrexone (1.75–4.5 mg per day) [3]. This medicine is opiates blocker and has been used since 1950s (in the dose 50 mg per day) in the fight with alcoholism and drug addiction [3]. When used before sleep, it blocks endomorphine production for a short time and in effect it causes its greater production by an organism. Because endomorphine is a hormone centrally engaged in supporting and regulating of the immune system, the natural growth of its production increases an organism immunity [2].

The idea of using Naltrexone in smaller dozes for multiple sclerosis treatment was introduced by dr Bernard Bihari, the neurologist from New York. He began prescribing LDN to his patients in 1985. All the sources indicate LDN has

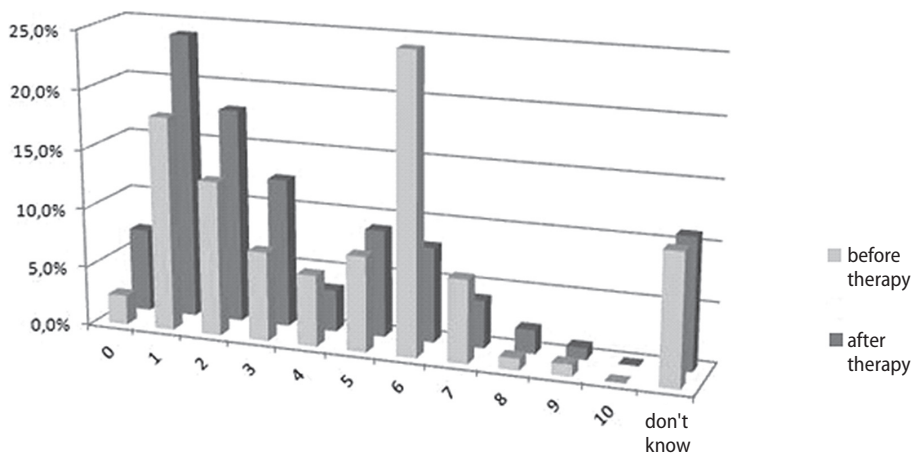


Fig. 1. Comparison of the EDSS before and after using LDN (survey done on the group of 156 people after at least three months of using the therapy) [9]

almost no side effects, is not addictive and the cost of daily dose is several times lower than in case of standard treatment [2].

One should add, however, LDN is not recognized by the FDA as the method of multiple sclerosis treatment in Europe. Today it is used as the supportive method of treating cancer and AIDS.

Actually, there are no contraindications to take LDN apart from pregnancy. It should not be used jointly with taking interferone-beta (unlike Naltrexone it blocks immune system) and with roids. LDN annuls efficiency of painkillers such as morphine or Tramadol through blocking opiate receptors.

According to surveys and research done in the Great Britain, low doses of Naltrexone influence such syndromes as spastics and tiredness. But positive effects can be noticed also in case of paresthesia, sight disorders and depression. In many cases during the use of LDN such a symptom did not reappear [2].

Figure 1 compares the extent of movement incapability EDSS of the sick using the LDN therapy for at least 3 months. The results indicate the great improvement of the group of people who had been classified as level 6 and 7 of EDSS before.

In the same survey while answering the question “What do you think about the development of the illness since you started taking LDN?” 38% of the respondents mentioned improvement and the next 35% – that the illness had stopped [9].

In August 2004 the LDN Research Trust was established. Thanks to the support of the group of multiple sclerosis patients who had been helped by LDN, the actions were undertaken to collect funds for the initiation of the clinical tests of LDN. Year 2010 has brought research results that indicate the efficiency of LDN in improvement of several aspects of psychical live quality. What is interesting, they have been first tests on the multiple sclerosis medicine that were sponsored by the partakers themselves and not the medical industry.

In Poland there has existed a forum since 2005 gathering people who are interested in or using LDN therapy. As for today, 115 people have been regis-

tered who began the therapy. 28 stopped it and out of them 11 have returned to taking Naltrexon.

Dr C. Kousmine Therapy

As mentioned before, the reason for arise of multiple sclerosis has not been recognized, yet. Dr C. Kousmine, basing on her 30-year practice has come to conclusion the illness is caused by the bacterial, virus or chemical poisoning of the intestine origins that are so serious that could not be neutralized by the regular immune mechanisms.

She has created a special method of treating multiple sclerosis with the use of diet and therapies, cleaning intestines from toxins with enema. Bringing a great number of vegetables and fruit into nutrition, limitation or even elimination of meat and fish is supposed to prevent rotting processes in intestines. What is more, a diet decides upon supplementation of vitamins from groups B, A, E and C and magnesium.

Doktor Kousmine shows examples of several people in the advanced stadium of multiple sclerosis who have benefited significantly or even reached a total remission of the illness after having used this diet.

Hipotherapy

Hipotherapy is only a valuable complementation of the classical methods of physiotherapy as well as brings to the sick a pleasurable and valuable experience. Horses should be calm, so called "cold-blooded". They must be also properly trained. The patient sits on the horse without the saddle. In this way, the animal's movement is transmitted directly to the rider. The therapy can be run only by the specialist and the patient must be controlled all the time.

Horse riding reduces muscle tenseness, helps training balance and strengthens self-confidence and brings a certain motivation to further exercising. It should be noticed, that contact with horses as such has calming and relaxing effects.

Conclusion

In the whole world there live 2.5 mln people who suffer from multiple sclerosis, including 55 thousand in Poland. It needs to be added multiple sclerosis is not a lethal illness. Usually patients live as long as people who do not suffer from multiple sclerosis. However, lives of these people is often dramatically hard and experiences deriving from this illness – not present at any other sickness.

Movement and constant physical activity is an important element of the therapy at every stage of the illness. Different researches of the recent years have indicated that patients, even when their state worsens, should be encouraged to the regular oxygen training. Exercises can be helpful with reducing spasticity.

They provide patients with examples alternative strategies of motoric behaviours. Lastly, and maybe most significantly, exercises help motivate the sick and reduce the physical deficit.

The constant education of the patient is invaluable, either as well as search for other methods of dealing with the illness. It should be remembered that every newly introduced method must be consulted with the doctor.

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The Use of sEMG in Physiotherapeutic Practice Based on Individual Studies

Zastosowanie sEMG w praktyce fizjoterapeutycznej na przykładzie badań własnych

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Abstract

Surface electromyography is more and more common instrument that is used in physiotherapeutic practice. In researches sEMG – particularly NeuroTrack™ ETS with software was used. This device was utilized to assess muscle tension of gastrocnemius muscle after kompresiotherapy application. In this therapy various types of bandages were used. sEMG was also applied in evaluation of muscles sequence of hamstrings and gluteus muscles, during extension in hip joint. Similar move pattern assessment in hip joint by sEMG was conducted in patients with coxarthrosis – before and after total hip replacement, and after rehabilitation. Additionally sEMG was used to estimate the influence of classical massage on gastrocnemius muscle tension in order to objectivization of massage effects. The exploitation of sEMG in stress urinary incontinence seems to be interesting and it may be used to assess pelvic floor muscle tension in women as well as in men.

Key words: surface electromyography, physiotherapy.

Streszczenie

Elektromiografia powierzchniowa staje się coraz popularniejszym narzędziem wykorzystywanym w praktyce fizjoterapeutycznej oraz w badaniach naukowych. W badaniach wykorzystano sEMG firmy NeuroTrac™ ETS wraz z oprogramowaniem komputerowym. Badanie elektromiograficzne użyto do pomiaru napięcia mięśnia brzuchatego łydki po zastosowaniu kompresjoterapii, gdzie korzystano z różnego typu materiałów kompresyjnych. sEMG użyto również do oceny kolejności włączania się mięśni grupy tylnej uda i mięśnia pośladkowego wielkiego w ruchu prostowania w stawie biodrowym. Podobną analizę wzorca ruchowego w stawie biodrowym zastosowano u osób z zaawansowanymi zmianami zwyrodnieniowymi przed i po endoprotezoplastyce oraz po rehabilitacji. Badano ponadto wpływ masażu klasycznego na średnie napięcie mięśnia brzuchatego łydki w celu obiektywizacji skutków masażu. Ciekawe wydaje się także wykorzystanie sEMG do oceny napięcia mięśni dna miednicy u kobiet i mężczyzn z wysiłkowym nietrzymaniem moczu.

Słowa kluczowe: elektromiografia powierzchniowa, fizjoterapia.

Introduction

Surface electromyography (sEMG) is gaining the popularity and is often used in many researches. They may constitute a source of knowledge, about how to use the sEMG in physiotherapy practice. It is simple to perform, objective and noninvasive method, which can greatly facilitate the diagnosis of musculoskeletal disorders. It seems that the sEMG is also applicable when we are planning, monitoring and evaluation the physiotherapy. Visualization of results in graphical form and archiving of data allow analysis of the results. This paper demonstrates the characteristics and examples of application of sEMG in own researches. Researches concern to different areas of modern physiotherapy. Efforts have also been attempted to identify how this scientific research can be used in physiotherapist practice.

Characteristics of sEMG

Electromyography provides a measurement of bioelectric signals generated in the muscles, sensory and motor fibers of peripheral nerves. Depending on the used electrodes we can distinguish: needles electromyography (EMG routine, SFEMG, macro EMG, conduction motor and sensory fibers) or a surface [8].

All these scientific study can lead through two-channel surface electromyography NeuroTrac™ ETS. sEMG (Table 1) is used to record bioelectrical potentials of muscles. The instrument is equipped with a measurement function at rest and during movement. Measured can be: the work/rest averages, onset contraction and muscle release times, peak values, work/rest average deviations and others. The relevant registration and analysis of obtained results is possible through appropriate equipment. Consists of: surface electrodes, signal amplifiers, filters, appropriate computer software allowing for data archiving. Received signals generated by muscle potentials have a range of amplitudes from 0.2–2000 μV , at frequencies from 2 Hz to 100 Hz. Sensitivity of the instrument is fixed at 0.1 μV (accuracy 4% of reading ± 0.3 mV at 200 Hz). The possibility to set filter to filter out heart rate. This limits the impact of cardio artifacts. Analog signal recorded by the electrodes is amplified and filtered, then is converted into a digital signal. This signal facilitates statistical analysis of the obtained results and allows the presentation of data in graphic form.

Table 1. Specifications sEMG

Specifications sEMG	
Amplitude range	0.2–200 μV
Sensitivity	0,1 μV
Frequency range	2 Hz–100 Hz
Work/Rest periods	2–99 sec
Number of trials	1–99
Dimensions	13.4/6.9/3 cm
Weight	0.18 kg

Factors to be taken into account during the recording of bioelectrical activity of muscles this for example: properties of the tissue located between the muscles and the electrode, distance electrode from the source (the thickness of the skin, fat), kind of electrodes, the type and number of muscle fibers that are recording electrodes in the area and changes in muscle length during the exercise motion.

To research can be used self-adhesive electrode (size 50 x 50 mm) with hypoallergenic gel, individually connected to two channels (channel A and B), however in the treatment of urinary incontinence endorectal and engovaginal electrodes. Location of electrodes should be designated according to the manufacturer, as well as the general principles prevailing in electromyography.

Locations for the electrodes must be properly prepared. The skin should be shaved and chipped gauze soaked with disinfectant. Need to exclude interference network. They affect the bioelectric signals recorded from muscles (artifacts or electromagnetic interference). Source of interference are charger of laptops, mobile phones etc. It is necessary to reduce the artifacts resulting the placement of electrodes close to blood vessels (cardio artifacts). It is important to reduce the artifacts, using a grounding electrode. All tests should be carried out under constant conditions (application of electrodes, place of research) [3–8].

Motor Pattern (MP)

It seems that the use of sEMG may be an effective method to evaluate movement patterns. Movement patterns (MP, motor patterns) are part of the manual therapy or methods of PNF. Karel Lewit describes many normal and pathological patterns in the books with manual therapy [11, 12]. The correct movement patterns are essential for the use of low energy in movement and the maintain balance in muscle tone. MP is forming a lifelong. During human development are changing factors that are affecting patterns of movement. Age, weight, performed type of work, physical activity clearly are affecting the formation of MP and then we talk about the Individual Movement Pattern (IMP). Movement patterns also arise from trauma. This is called abnormal pattern movements. In addition, there are many other reasons of occurrence of a defective MP such as invalid muscle function, prolonged pain, chronic fatigue, faulty posture [11, 12, 20].

Research on the assessment of movement patterns using sEMG are conducted at the Institute of Physiotherapy in Public Higher Medical Professional School in Opole. For example, the assessment of muscle recruitment during the time straightening motion of the hip. They were analyzed sequence of activation of

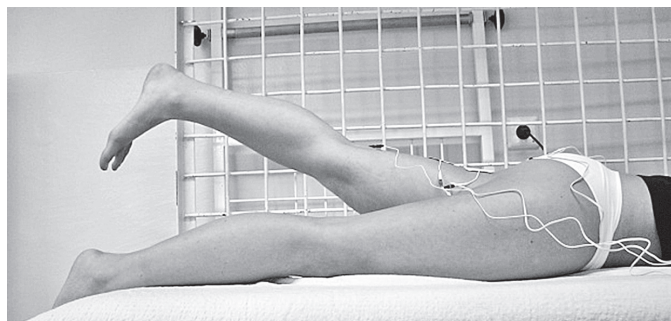


Fig. 1. Heading to the classic test of muscle around the hip

the hamstring muscle's and gluteus maximus muscle (Fig. 1). The first muscles, which include the straightening motion in the hip joints, are the hamstring, gluteus maximus muscle, then at the end the erector spinae occurs [12]. However studies show, that we are often dealing with disturbed MP.

A similar methodology can be used in the diagnosis of patients with advanced osteoarthritis [9]. Subjects were stratified into alloplasty. In the initial studies was evaluated the recruitment of muscles in the time of straightening motion in the hip joint. The assessment was carried out before and after arthroplasty and after rehabilitation. Results showed how the muscle tension was changed after surgery. This allows to see the way of rehabilitation. Knowing, that the muscles are weakened we choose the appropriate therapy. It seems to be not without a significance, that EMG is controlling the programme therapy. Concerns the distribution and strength of muscle tension. Electromyogram examples (Fig. 2.) are showing how does look like muscle tension before and after surgery and after rehabilitation in a patient (aged 63) qualified for the hip replacement. Figure 2 shows an increase and normalization of muscle tone.

Classical Massage

Objective evaluation of classical massage by surface electromyography can be successfully used by muscle tension measurement. Muscle tension is an important physiological phenomenon, where massager activities are significant in obtaining particular effects. Generally there can be distinguished a resting tension, which gives the value of the muscle or group of muscles in isokinetic and isometric phase (e.g. lying position – immobility), as well as functional tension ex-

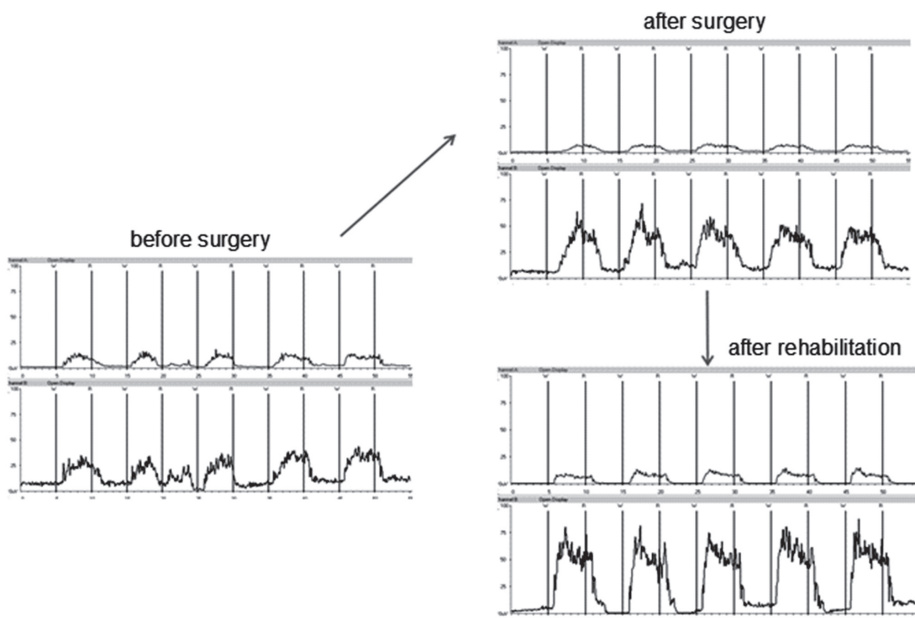


Fig. 2. Electromyogram's patient tested before and after hip replacement surgery and after rehabilitation (upper graph – gluteus maximus, lower graph – hamstring muscles's)

pressed in dynamic state of muscle fibers (e.g. standing position, run – mobility). Surface electromyography is the most common method to examine the muscle resting tension, because there is smaller risk to make some measurement mistakes [3, 4]. In massage context, the patient during should be both, in treatment, and sEMG measure procedure in maximum relaxed psychical and physical position accordingly biomechanics rules of human body. To achieve above mentioned aim – relaxation, professional and appropriate rollers and wedges are helpful, which correct topography on massage table provides to optimal relaxation of patients' whole muscular – fascial – ligemental mechanism [2].

The very essence of massage is the conscious use of physical factors (i.e. mechanical) as elastic deformation tissues and organs, that creates possibility to restore their the most optimal spatial system (i.e. homeostasis). Available literature, with a view to the dynamic mechanism of movement system, reports about following advantages as a result of massage: increased efficiency (durability and strength), elasticity of healthy muscles, normalization of muscle tension sate and others [14].

Objective evaluation of biomedical effects as a result of single or series massage interventions may cause common problem. This is the reason of that the better part of benefits and health aspects described in accessible literature till now could have suspects character, guesses and objective unconfirmed premises. The fact is, that many of therapeutic effects, including changes in muscle tension as a specific loosening and/or relaxation, have subjective character. This situation makes that reliable clinical evaluation in patients' rehabilitation process is significantly difficult. Surface electromyography allows to precise and objective the evaluation of muscular system changes in expression of intensified reduced or normalized tension. Electromyography study gives the opportunity for effective and reliable evaluation of massager actions and patients individual reactions under the influence of applied mechanical impulse. Electromyography makes chance to measure the evaluation and systematic control of physiotherapeutic process. EMG measure allows, in each time, to monitor massaged muscles ten-



Fig. 3. Electrodes topography on gastrocnemius muscle

sion values, before and after massage therapy, as well as after some time to estimate its long – term effects. Finally, EMG equipment enables the verification, that if executed massage, was effective and conscious (purposefulness of massage techniques selection), or its therapeutic effects are insignificant either none [7]. Pilok et al. [13] undertook the initial researches in objectivization of classical massage effects direction on lower legs example (Fig. 3.). Preliminary reports were shown in casuistic paper. In the age of evidence based medicine and physiotherapy, there is the necessity to introduce objective control – measurement – diagnostic methods, which clearly allow to check and explain the impact of classical massage on humans body, particular tissues, organs and systems.

Compression Therapy

Compression therapy is a physical method consisting on adequate external power adaptation as graduated compression, obtained by using compression materials and techniques of their application. In clinical practice there is applying usually elastic and non – elastic bandages and stockings, pantyhose, knee – length socks with special compression properties. According to actual applicable standards (fixed by Polish Phlebology Society and Polish Wound Treatment Society) compression therapy is in the foreground plan, the factor in chronic venous insufficiency and its complications prevention treatment and in postphlebitis episodes after surgery intervention prophylaxis. Biophysical principle of compression therapy is that local increase pressure production exerting on tissues, accordingly with Laplace physical law. That has an impact on hemodynamic results and thermal conditions improvement, as well as it seems to have the influence on muscle pump function rationalization. Muscle pump is creating by lower leg muscles from talocrural joint extensors group (especially studied by our research team gastrocnemius muscle) [19].

Examination from the range of surface electromyography can be used in biophysics rating of compression therapy in reference to gastrocnemius muscle resting tension changes (Fig. 4.). As the research problem can be placed hypothesis that: muscle tension changes affecting on muscle pump function. EMG measure served to objective inflammation of gastrocnemius muscle rest tension, before and after compression therapy in example wide range of compression materials: short and long stretch elastic bandage, stockings with compression class two can be used. In control group materials with slight compression properties as simple dressing bandage and simple female stockings can be used (quasi – compression therapy). Studies should include healthy people initially, so presence of disease likes: chronic venous insufficiency, diabetes mellitus, arteriosclerosis, hypertension, rheumatoid arthritis, fresh movement organ traumas, eczema and skin infections should be excluded among them. Pregnant women or these ones who took oral contraception shouldn't take part in research. After an initial evaluation of discussed parameters in physiological conditions, patients with some vessels pathologies can be included, where compression therapy has treatment significance (e.g. chronic venous insufficiency and venous leg ulcers) [18].

Essential should be fact, that there is no interchangeable research, which talk about compression therapy inflammation on muscle pump functioning. Taradaj et al. [17] undertook introductory studies, but it will be continue because of re-



Fig. 4. Lower leg bandaged agreeably with Sigg methodology

search principals low quantity and relatively compression material were conducted in short time application. Myoelectrical potentials analysis can provide to lower legs muscle pump activation and lead reserercgers to discussion if physical therapy could have directly impact on these muscles tension changes. Nevertheless that subject must be verified undoubtedly.

Incontinence

Using sEMG in urinary incontinence (UI) to assess the tension of the pelvic floor muscles (PFM) seems to be interesting. Definition of UI says that it is uncontrolled, involuntary urine loss, objectively confirmed, which is social and hygienic problem [1]. On UI suffer about 17–60% women and 10% men. The most often type of UI is stress urinary incontinence (SUI), that can be a result of childbirth, hormonal deficiency related with menopause cycle, congenital defects (e.g. connective tissue), surgeries passed in urogenital area, radiotherapy. The most often cause, among men population is the surgery intervention of radical prostatectomy [15, 16]. Diagnosis of PFM can be done by using applicable endovaginal (Fig. 5) or endorectal electrodes (Fig 5). In people with SUI the muscle tension is expressly decreased. Adequate programmed and performed therapy allows to increased the average PFM tension. As a result in objective suspender test allows to significant decrease of loosing urine quantity. According to the patients, correction of pathological state associated with SUI transposing on the improvement of quality of life, too. Performed control examination by usage of sEMG during therapy, seems to be necessary to reliable attempt of healing methods efficiency by therapeutics' estimation.

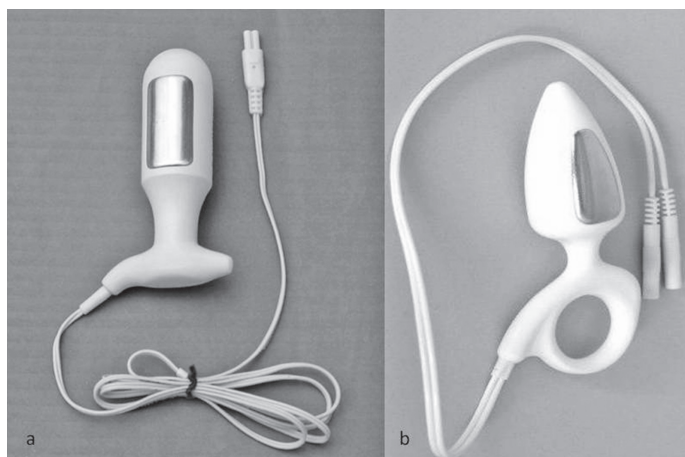


Fig. 5. Endovaginal electrode (a) and endorectal electrode (b)

Conclusions

EMG seems to be an interesting method, which can be used successfully in practice, in wide range physiotherapist fields. However, the new scientific and clinical researches, which can give the opportunity to examine more advantages and disadvantages demonstrate must be guide.

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The Role of Physiotherapy in Treatment People with Cystic Fibrosis

Rola fizjoterapii w leczeniu chorych na mukowiscydozę

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Abstract

The cystic fibrosis is one of the most popular genetic and incurable disease in the world. The symptoms of the cystic fibrosis are: a chronic bronchi-lungs trouble and an enzyme pancreas failure. CF is an incurable disease and an physiotherapeutic measures are aimed at slowing the process of disease and improving the comfort of a patient's life. The main goal of the paper is a survey of the physiotherapeutic procedures that are to applied to who suffer from cystic fibrosis. Depending on the patient's activity are applied the different forms of the kinesitheraphy and physical therapy. Basing on available literature the authors present a physiotherapeutic procedure with sick people, who should be tailored to the individual needs of each patient. The primary tasks of this treatment are: systematic removal of the secretion, holding an appropriate movability of the thorax, the increase strength of the muscles respiratory, increasing of the efficiency organism, improving of life's quality. In nowadays patients in Poland live average 11.5 years. It is said that patients who are appropriate treated will be lived 40 years.

Key words: cystic fibrosis, physiotherapy.

Streszczenie

Mukowiscydoza jest najczęstszą chorobą uwarunkowaną genetycznie, dziedziczącą się w sposób autosomalny recesywny. Objawia się przede wszystkim przewlekłymi dolegliwościami oskrzelowo-płucnymi oraz niewydolnością enzymatyczną trzustki. Jest chorobą nieuleczalną, a wszelkie działania fizjoterapeutyczne mają na celu jej spowolnienie i poprawę komfortu życia pacjenta. W zależności od kondycji fizycznej i aktywności chorego stosuje się różne formy kinezyterapii i fizykoterapii. Celem pracy jest przedstawienie postępowania fizjoterapeutycznego w mukowiscydozie. Autorzy pracy na podstawie piśmiennictwa przedstawiają postępowanie z chorymi, które powinno być dobrane indywidualnie do potrzeb pacjenta. Głównymi celami zabiegów fizjoterapeutycznych są: systematyczne usuwanie wydzieliny, zachowanie prawidłowej ruchomości klatki piersiowej, zachowanie odpowiedniej siły i wytrzymałości mięśni oddechowych, odpowiedniej wydolności fizycznej oraz poprawa jakości życia chorego w wykonywaniu czynności dnia codziennego. Szacuje się, że chorzy prawidłowo leczeni będą dożywać 40 roku życia.

Słowa kluczowe: mukowiscydoza, fizjoterapia.

Introduction

Cystic fibrosis caused by single gen mutation lying on the long arm chromosom's seven, which is coded protein CFTR. Wrong function or lack this protein cause disorder jon's Cl-transport. Through cells membrane and increase absorbtion Na⁺ and water, what lead to create densely secretion. Lying secretion in to lead canals cause renal impairment gland outside secretion, especially in the respiratory system and the food system. Disease is inherited by recessive autosom [1].

Epidemiology

Cystic fibrosis is the most frequently disease which is genetically determined through autosomal way of inheritance. It is estimated that in Poland cystic fibrosis appear in 1 per 2500 infants. In Poland every 25-th person is carried of wrong gen CFTR- responsible for the disease. Nowadays, it is know 1000 mutations. The most common and serious, disease is genetically determined among the white race in the USA [1].

Etiology

Respiratory System

Challenges in the respiratory system are created by lying densely secretion. The Healthy organism produce rare lignid and the organism without any problem remove secretion from respiratory system. In the cystic fibrosis densely, sticky secretion block bronchis. This is very good food for bacteriae. The bacteriae cause chronic an inflammatory condition which lead to damage bronchis walls and damage lungs function [9].

Pancrease

In the pancrease is produced too densely pancreatic juice and enzymes don't come to an intestine. It cause that the food is not digested and a huge part is elminated [9].

Liver

Wrong condition of liver is caused by blocked a bile canal. What leads to stop bile. It also can lead to cirrhosis liver [9].

Reproductive Organs

Abnormalities in the reproductive system are not in girls. The deferent duct are blocked by muscus and a semen which can't get to the urinary tract. It is a reason of infertility. The ability to u sexual initiation is not disordered [9].

Initially Diagnosis

The cystic fibrosis to diagnosed on grounds:

1. One or more symptoms disease
2. To burden medical history of the family
3. Positive results test screening infants indirection cystic fibrosis.

The diagnose should be proved by correct medical examination to detect mutation gene CFTR

1. A sweat test show how valuable are chlorides by sweat (Cl > 60 mmol/l) in the two separate to examine
2. To detect mutation in two allele gene CFTR.
3. What is a potential how value difference between membrane [10].

Clinical Symptoms

Symptoms in respiratory system (appear in over 90% ill):

- densely and sticky mucus lie in bronchus,
- to appear bothersome cough, sometimes difficult breathing,
- recurrent respiratory system infections, difficulty for to cure, carry to the bronchitis,
- chronic sinusitis,
- possibility of polyps nose,
- chronic infection *Pseudomonas aeruginosa* and *Staphylococcus aureus*,
- chronic obstructive pulmonary disease[9].

Digestive symptoms tract (appear in over 75% ill):

- densely and sticky mucus block pancreatic, food is not digested and absorbed,
- enlargement stomach, sometimes the rectum to fall out,
- intestinal obstruction,
- cirrhosis liver[9].

Other symptoms:

- a physical handicap,
- disability muscles,
- weak physical condition [9].

Abnormal Corvature of the Spine to Have Cystic Fibrosis and their Problems

In children abnormal corvature which have cystic fibrosis is a serious medical problem and rehabilitation. Appear to majority ill. The corvature is connected with the abnormally respiratory system. It is vicious of mechanism circle. Indicate it, disorder breath favours abnormal corvature and vice versa.

In children who have cystic fibrosis frequently to find:

- to raise and bend forward shoulder,
- plump back,
- concavity back,
- barrel vault chest.

These defects carry to the breathe not effective. Supplementary consequence is limited the diaphragm mobility. The chest stiffness to cause resistance in lungs by every to inhale. The muscles must be work with difficulty. The muscles fast to suffer and to accumulate of waste producte.

The moderne physiotherapy is that to keep: corect the chest mobility, strength muscles, physical condition, corect posture.

In ill pronounced the best tolerance effort in comparison with the person have different chronic pulmonary disease. To results this from a young age ill. Physical exercises should be regular component therapy. Physical exercises to ease dyspnoea and to improve condition physical [10].

Popular Reason of the Pain in the People who have Cystic Fibrosis

According to analysis accessible in database Cochrane, Koh JL and collaborators to prove, that in majority the pain concern stomach and pelvis cavity (50%),

chest (37%), headache (33%). In 46% ill's pain appeared one a week in children and adults. In analysis Ravilly S. and collaborators in children above the age of five reason chronic pain was: headache (55%), chest pain (65%), back and stomach pain (19%), limbs pain (16%). The pain in chest was origin musculoc-skeleton oder was resulted pleurisy oder to break rib [7].

Technique Physiotherapy

Lying Drain

In Poland it is the most popular physiotherapy technique used by 64% the sick 18 years old and 42% adults. Lying drain is practice with pressure and vibration of chest. Contraindications to practice the lying drain is stomach-reflux and dyspnoea. Pressure on chest should be make during longthen exhale. Patting should be stop in cuse of splititing blood. The time of the drain is about 15 minute.

In practice are used the various drain positions:

- to lie down on the stomach the head turns down,
- to lie down on the right side, the head turns down lie down on the back, the head – this position afford to remove discharge from the down part of lungs,
- to lie prostrale can remove secretion from the upper part of lungs,
- sitting position with light bend – upper part of lungs.

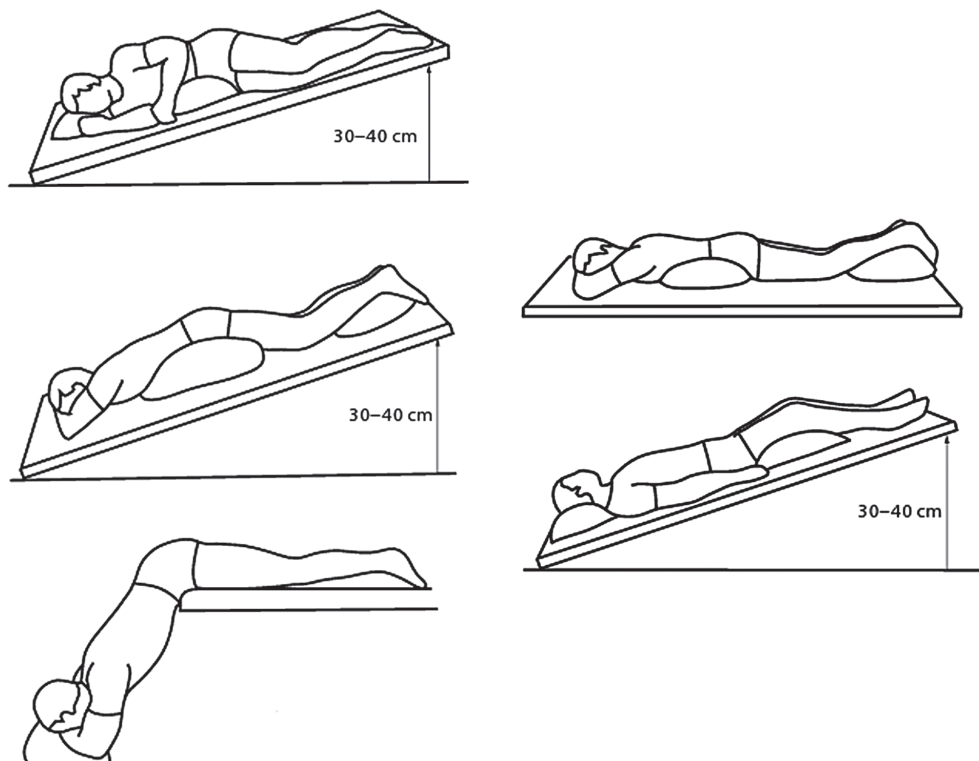


Fig. 1. Example positions

Technique of the Changable Exhale Pressure

It depends on the special use of equipment which can help patients remove secretion from bronchuses. The time of treatment 10–15 minutes. Patient should be relax and he shought to sit and support on his elbows at the table. The most important is also wash and dry equipment after use [3].

Technique of the High Eshale Pressure

It affords to remove the scretion from small bronchuses, which are difficult to clear by traditional physiotherapy methods. Patient wear PEP-mask, which durning exhale create on resistance causing increase pressure in the lungs. Mask should be preciselly upplied on the to face and after each using it must be wash and dry [3].

Technique of the Massive Exhale

This technique depends on 1–2 deep exhalations by open mouth with saying sound "H". Exhale should be long. In children we can use pipe in which diameter is about 3 cm, because it afford to wide open mouth [3].

Technique of the Active Respiratory Cycle

It depends on do specific activities in appropriate chronology. It means patting chest, shaking and exhale control [3].



Fig. 2. Methodology breathe

Cryterions Selection of Appropriate Physiotherapy Technique

Physiotherapy methods are selected for individually every patient. We chosse suitable technique we must include: age of ill, condition of an adrence disease symptoms overreactive bronchuses, level of ill motivation, preferences of ill with reference to appropriate technique.

The choice of appropriate physiotherapy technique should be depend ona few factors: patients preferences, his age and the level of disease.

Regularly physiotherapy can delayed acces of disease and can save very long appropriately lungs function [1].

Resistance Gymnastic

Primary rules what about we have to remember durning do exercises.

- nose inhale, mouth exhale,
- long phase of exhale,
- resistance exhale through a mouth to squint,
- association movement rhythm with breathe,
- appropriate number of repetitions in the exercise,
- appropriate time of exercise and systematic [5].

Physical Training

The physical training should be include developewide exercise and spreading exercise. People who are ill cystic fibrosis ought to be encouraged to physical exercises, do sports and recreation. Especially they should do sports which a child must move, work by hands and deep breath for instance volleyball, swimming, running. It was reseached the group of 30 ill adults, who do individual exercise upper and lower limbs 3 times per week. After finished research was very important results of training which was connected with frequently of heart rythm after exercise lower limbs.

Example Exercises Breathe



Fig. 3. The cross-legged position, hands on chest to force the exhale pressure of chest and forward bends [9]



Fig. 4. To lie on the stomach, arms interweave at the back. Move: to raise the trunk in the up [9]

Condition of Bints and Bones

People ill cystic fibrosis are proned to reumatology diseases and other joints diseases. Some of them attacks episode osteoarthritis are repected. People with outsidedischarge of pancrease hypofunction and 90% people in cystic fibrosis have disorder of absorbtion witamin which leads to decrease concentration of wit. D in organism and disorders of bones development.

Physiotherapy

The most used physiotherapeutical treatments in physithery disease and disorder of respiratory system have be mentioned: inhalations, lighttreatment, electrotreatment, ultrasounds, masage (classical or underwater).

The natural methods of inhalations are:seaairbreathing, in microclimate of salt excavation or drift.

Problems of Physiotherapy Connected with ill Cistic Fibrosis in an Adult Age and Teenage in Poland

That problems can be present with 3 groups:

1. Lack of knowledge and acces to drain techniques to self – apply.
2. Passive attitude of sill person to wards to physiotherapeutical treatments.
3. Aversion to use physiotherapy or uncorect use.

Equipment

The Vest

The system of cleaning respiratory tract – The Vest. It is a unique system. The system consist of blow vest connected by cubles with air impuls generator. The vest therapy treat each lobes of the lungs equally and it is independet to this technique.

Roll of Physioroll

It has got an ideal application in therapy and rehabilitation especially in people who have problems with balance and coordination. A unique shape of a ball allow to physiotherapist and patients sit on the same ball and support his move.

Example Exercise:

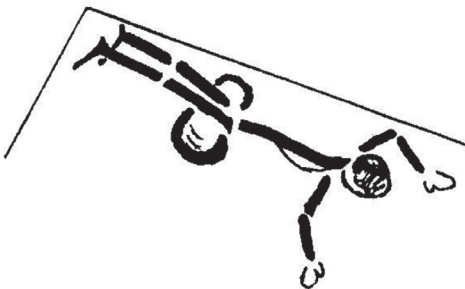


Fig. 5. To roll on cylinder a forward and a back [4]



Fig. 6. To lie on the back, to roll a forward and a back [4]

Conclusion

Modern treatment significantly contributed to longer live of ill people. Nowadays in european counties and North American 50% people can live 30 years. Nowadays an average age of polish population reach 11.5 year. It is estimated that in people who are conect treated can live 40 year of live. The physiotherapy which is lead properly and consider to all disease aspects afford to reach patients good condition of life.

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Kinesiotherapeutic Procedure in Urinary Incontinence

Postępowanie kinezyterapeutyczne w problemach nietrzymania moczu

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Abstract

Urinary Incontinence (UI) limits activities of daily living, occupational activity, social life and recreational activities. It often causes discomfort or shame feeling. The procedure in UI should be complex and include behavioral therapy, physical therapy and kinesiotherapy. Very important is kinesiotherapy. Through systematic exercises it is able to improve quality of life and patients' comfort. The purpose of therapy is to achieve correct pelvic floor muscle (PFM) tension (at rest and during contraction) as well as correct relaxation. The therapist should take into consideration elementary principles of kinesiotherapy that include intensity of effort and technique of performed exercises. Patients must realize and learn correct isolated PFM contraction. Effort dose ought to be well-matched with particular level of symptoms. Exercise intensity may be regulated by changing time of contraction, fixing positions from lower ones to higher, correcting the number of repetitions and frequency of exercising. The therapy should comply functional exercises, biofeedback and exercises with accessories. Patient's education seems to be very important and includes the ability of controlled contraction of PFM (e.g. during sneezing, coughing), force training that improve both on PFM tension and muscles that have an influence indirectly on PFM. Exemplary exercises were divided into: the education of isolated PFM contraction, exercises with stretching phase of PFM and exercises which influence on PFM indirectly.

Key words: urinary incontinence, kinesiotherapy.

Streszczenie

Problem nietrzymania moczu (NTM) ogranicza czynności życia codziennego, aktywność zawodową, towarzyską, sportową, często powoduje uczucie dyskomfortu lub poczucie wstydu. Postępowanie w NTM powinno być kompleksowe i obejmować terapię behawioralną, fizykoterapię i kinezyterapię. Dużą rolę odgrywa kinezyterapia. Przez wykonywanie systematycznych ćwiczeń można walczyć z nietrzymaniem moczu, poprawiając tym samym jakość życia i samopoczucie. Celem terapii jest osiągnięcie prawidłowego napięcia mięśni dna miednicy (MDM) (spoczynkowego i skurczowego) oraz ich rozluźnienia. Terapeuta powinien kierować się podstawowymi zasadami kinezyterapeutycznymi, obejmującymi intensywność wysiłku oraz technikę wykonywania ćwiczeń. Pacjent powinien uświadomić sobie zasady prawidłowego wyizolowanego skurczu MDM i się go nauczyć. Program terapii musi być indywidualnie dobrany, z odpowiednią do

stopnia nasilenia objawów dawką ćwiczeń. Intensywność ćwiczeń można regulować, zmieniając czas trwania skurczu, ustalając pozycje z niższych do wyższych, korygując liczbę powtórzeń i częstość wykonywania ćwiczeń. W terapii należy uwzględnić ćwiczenia czynne, biofeedback oraz ćwiczenia z użyciem przyborów. Bardzo ważna jest edukacja pacjenta dotycząca umiejętności kontrolowanego napięcia MDM (np. podczas kichania, kaszlu), treningu siłowego poprawiającego napięcie MDM oraz mięśni działających pośrednio na MDM. Przykładowe ćwiczenia zostały podzielone na naukę wyizolowanego skurczu MDM, ćwiczenia z fazą rozciągnięcia MDM oraz ćwiczenia pośrednio działające na MDM.

Słowa kluczowe: nietrzymanie moczu, kinezyterapia.

Introduction

Urinary Incontinence (UI) according to ICS – Interantional Continence Society, it is uncontrolled, involuntary leakage of urine, which proclaims social and hygienic problems [1].

It concerns more and more people in Poland as well as in the world. This fact may result from progress in diagnostics, which has accomplished during last few decades, but also from increased level of awareness of those, that are suffering from urinary incontinence. By peoples' conciousness, better health care and quality of life is possible.

Mechanism of Urinary Incontinence

This symptom may occur in women, men and children. The reason of urinary incontinence lies in impairment of function of sphincter system or in excessive, involuntary – for the sufferer – spasmodic activity of detrusor muscle, that is increasing the pressure in bladder to values, that are to high for sphincter muscles, which is resposible for urethra closing. Quoting of Górecki, we can state generally, that “urinary incontinence is a consequence of lack of sphincter functional activity, that causes urethral resistance against high intrabladder pressure”. Intrabladder pressure, in turn, is an outcome of destrusor muscle pressure (P_{det}) and intraabdominal pressure (P_{abd} – pressure in abdominal cavity, generated by muscles of: abdomen, diaphragm and pelvic floor) [2].

Etiology and Epidemiology

Incontinence (different designation of urinary incontinence) more frequently refers to women than men. It can appear in women in pregnancy, women after natural childbirth, after gynaecological surgeries and, what is the most common – in women undergoing the menopause. These muscles can also be weakened by obesity and constipation [3]. Furthermore, reasons of this ailment are: genetic factors (particulary in connective tissue), abnormally frequent urinary tract infections, but also bad diet, smoking and depression. It has been estimated that urinary incontinence affects 9–72% od women ages 17–79 years [4]. In men, urinary incontinence affects about 10% of the population, and usually, it is a symptom after underwent radical prostatectomy surgery. In that case, urinary incontinence can be reported even in 80% of patients that are 6 months after surgery, 69% after 12 months and 68% after 24 months after operation [5].

Prevention and “the Conservative Treatment”

The growing interest of patients and therapists in urinary incontinence, creates the necessity to plan some kind of proceedings, particularly in prevention and conservative treatment. The primary form of physiotherapy, which is used first of all in prevention, and in first stages of this disease, is kinesiotherapy. We can add to kinesiotherapy many different methods, from e.g. physical therapy, like electrotherapy and magnetic therapy [6]. Very useful in physiotherapeutic diagnostics, as well as in therapy programming is biofeedback with EMG. The lack of any improvement is an indication to surgical treatment, after which kinesiotherapy is still needed, in order to retain all effects of treatment.

Types of Incontinence

Particular therapeutic methods, from both conservative treatment and surgical treatment should be matched dependently on type of incontinence. There are five types of urinary incontinence: stress incontinence, urge incontinence, overflow incontinence, mixed incontinence and functional or environmental incontinence. Stress incontinence is the most common type of urinary incontinence and happens when a person leaks urine when they cough, sneeze, exercise or do anything that puts pressure on the bladder. Urge incontinence occurs when the bladder muscles are too active. People with urge incontinence lose urine as soon as they feel a strong desire to go to the bathroom. Overflow incontinence is the feeling of never completely emptying the bladder. Mixed incontinence is the combination of stress and urge incontinence. Functional or environmental incontinence occurs when people cannot get to the toilet or get a bedpan when they need it. The urinary system may work well, but physical or psychological disabilities prevent normal toilet usage [2].

Programming the Therapy

Because of slowly process of disorders in urinary incontinence and late reveal of clinical symptoms, physiotherapy should take into consideration two (earlier mentioned) stages – prevention and conservative treatment. The whole therapy should be complex, so that is why it should take into account behavioural therapy, physical therapy and kinesiotherapy [7]. The aim of this paper is to present theoretical basis of kinesiotherapy in urinary incontinence and to show few exemplary exercises that might be useful in this disorder.

Kinesiotherapeutic Rules

The first rule, which can be used in our work with patient, it is, that essential element, which conduct to increased muscle tension, may be phase of stretching of those muscles. Active contraction with passive stretching may lead to increased resilience strength. It seems that the usage of this rule, may be significant in functioning of pelvic floor muscle. First example of exercises that consider stretching is e.g. tightening the pelvic floor muscles in lying position, with one leg bent in hip and knee joint (arms are holding legs) with second leg lying straight (Fig. 1).

Second exercise in half-splits position (Fig. 2), in which patient is tightening pelvic floor muscles. Different example has been showed on the Fig. 3.

Another factor which has an influence on pelvic floor muscle tension is the increased pressure that has an impact on those muscles. Increased pressure can be obtain by exhalation phase or positions that are decreasing abdominal in-



Fig. 1. Exercise in lying position – example



Fig. 2. Exercise in half-splits position – example



Fig. 3 Position with stretching phase – example

tegument. We can use this rule in inversely way – applying positions that are increasing abdominal integument, we can achieve alleviation of pelvic floor and its relief. Next rule – is exercising in positions beginning from low levels to high levels (from lying to standing). For this purpose we can use positions as an increasing level of difficulty. Firstly using positions in lying (Fig. 4), then in sitting (Fig. 5), and finally achieving standing (Fig. 6), which may be some kind of exercise with resistance [8].

Next aspect of the exercises choice is the proportion of muscles fibres in pelvic floor. Those muscles are 70% slow-twitch muscle fibres and 30% fast-twitch muscle fibres. This is why it seems to be correct to carry out – slow, long, strong, contraction for slow-twitch fibres training, and fast, short contraction for fast-twitch fibres. The main aim of this therapy, is to achieve the growth and strenght of pelvic floor muscles [6].

Stages of Exercises

In prevention as well as in conservative treatment, very important is to keep particular parts of the training. Where first step is connected with patient's education, and include the ability of controled, isolated muscles contraction. Basically it is instruction how to identify particular muscles. It has grate significance, especially during heightened, sudden "load" on pelvic floor, while sneezing, coughing or laughing. Second step is related with pelvic floor muscle training, which provides to its reinforcement, and in the third step we focus on training of muscles which has an influence on pelvic floor muscles indirectly – according to tensegration law – in general, transferring the muscles tension from one muscle to another, which is in structural connection [9].



Fig. 4. Low position in lying



Fig. 5. Position in sitting



Fig. 6. Position in standing

“Exercise Dose”

In correct, individual selected therapy, initial patient's health state, its possibilities of holding the constant pelvic muscle tension, and the type of urinary incontinence, should be taken into consideration. According to Strupińska, in the first stage of therapy, consequently with kinesiotherapeutic rules, submaximal tension and not full time of possible muscle contraction, should be applied in training. It has been evidenced, that training with 50% of maximal effort does not cause the significant changes in muscle structure, with 80% of maximal effort causes the growth in muscle structure, and with 100% – reduces the mass of muscle by slenderizing the muscle fibres [6]. Similarly, if our patient is able to maximal contraction over 10 sec, the exercise that we can put into practice, should last e.g. 6–7 sec with submaximal contraction. We also need to remember, that muscle after work, must have at least two times longer break. With obtaining by patient consecutive skills, we need to increase the standard of difficulty of the therapy. We can to extend the time of contraction, enlarge numbers of series of contraction and relaxations and modify the frequency of the training during the day [8].

Biofeedback with EMG

Very helpful in physiotherapeutic therapy of continence disorders, is biofeedback with EMG, which apart from precise physiotherapeutical diagnose, that defines the level of resting tension and muscles “work” possibilities, can also effectively teach the patient how to contract pelvic floor muscles. Biofeedback therapy uses computer graphs (electromyograms) as a teaching tool to help the patient identify and learn to control the correct muscles. Registered signal is from electrodes which are in women – endovaginal (similar to a tampon) and in men are endorectal. It helps to locate the pelvic muscles by changing the graph when patient tightens the right muscle. It gives to patient the visual information about the status of the pelvic muscle function. Biofeedback can help measure the pressures achieved by the patient. It can both help to strengthen the pelvic floor, as well as teach the appropriate muscle group to use. It is a successful treatment for urinary incontinence. Biofeedback therapy is also useful in motivating the patients, to be actively involved in therapy, and be able to follow directions.

Physical Therapy in Urinary Incontinence

In connection with the growing problem of urinary incontinence, many different methods of therapy has been discovered. The most effective procedure should take into consideration the association few therapeutic methods inclusive earlier mentioned kinesiotherapy, physical therapy and behavioural therapy. Physical therapy for the purpose of healing, uses physical stimulus, concretely – we can utilize electrotherapy and magnetic therapy [10].

Electrical Stimulation

In general, electrical stimulation is an effective physiotherapeutical method and it is often referred to as pelvic floor muscle electrical stimulation (PFES) or *functional* electrical stimulation. It is used to treat urinary incontinence by sending a mild electric current to the pelvic muscles. How electrical stimulation works is not well understood. The stimulation may make the muscles contract, producing an effect similar to Kegel exercises, which strengthen the muscles by

contracting them frequently. The stimulation may also provide to the growth of muscle fibre and nerve cells that cause the muscles to contract. To this procedure alternating current is used in the form of a number of differently shaped, different duration impulses and breaks between them. Electrical stimulation for the first time has been adapted in 1965 by Caldwell, to cure urinary incontinence in women. According to Strupinska, longterm stimulation conduct to muscle growth abd simultaneously to increased pelvic floor muscle resting tension. Additionally it has an influence on the rebuilding skeletal muscles. It provides to longer contraction and fatigue resistance. It has been proved that electrical stimulation is able to change the attribute of muscle fibre – from fast-twitch muscle fibre, to slow-twitch muscle fibre. The voltage oscilates from a couple to a dozen of volts and mostly it is set fabrically. The intensity should not exceed more than 100 mA and ought to be individually matched to patient's sensitivity. Very important is the frequency of the cuurent. Higher values are better for sphincter muscles and lower values for destrusor muscle. The intermediate value of frequency is 25 Hz [11]. Very importnat in therapy are contraindications for pelvic floor electrical stimulation. Persons with the following conditions should not use electrical stimulation: complete denervation of the pelvic floor (will not respond), dementia, demand cardiac (heart) pacemaker, unstable or serious cardiac arrhythmia, pregnancy or planning/attempting pregnancy, broken/irritated peri-anal skin, rectal bleeding, active infection, unstable seizure disorder, swollen, painful hemorrhoids [12].

Magnetic Therapy

Several small studies have been conducted using electromagnetic stimulation in patients with urinary incontinence. The premise of this studies is that by seating individuals into a chair, which has imparted a magnetic coil, electromagnetic pulses can be created which induce contractions of pelvic floor muscles. A procedure of therapy may involve up to two 20-minute treatments per day over eight weeks. The available studies have not been randomized, placebo controlled, or adequately blinded, and the number of involved patients has been small. Therefore, even if the initial results are promising, better quality studies are necessary.

Conclusions

Physiotherapy which embraces kinesiotherapy, physical therapy and behavioural therapy both in women and in men, is acknowledged and established method that supports farmacological and surgical treatment in urinary incontinence. In treatment of clinical symptoms, the achievemnt of positive results, we can obtain by implementing individual program of rehabilitation, which is well-matched to patient's health state. The priority of the physiotherapist in therapy of urinary incontinence should be prevention, which is related with education and particular exercises. We cannot forget, that we are struggling with disorder that has negative impact on patient's psyche. Suffering people are isolating themselves, locking themselves. The incontinence decreased level of quality of life significantly. That is why our action must be focused on motivating the patient to wrok, because only systematical exercises and dicipline may help to improve patient's health and frame of mind [13].

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Estimation of the Life Quality of Elderly People Taking Physical Exercise

Ocena jakości życia osób starszych objętych gimnastyką ogólnousprawniającą

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Abstract

Old age and ageing are natural, common and irreversible processes, which apply to all the nature and surrounding us world. Due to growing awariness of the human population, physical exercises are taken up not only by young people but also by those who are called „seniors”. Physical exercise has positive effect on both person’s physical and mental health. The aim of this research was to estimate the effect of physical exercises on the quality of elderly people’s lives. Majority of people taking part in the tests are retired, which means that the amount of physical activity in their everyday life is insufficient. In the research, a group of 50- to 80-year-olds taking part in 45-minute classes 2–3 times a week were tested. People subject to the tests confirmed health improvement, greater energy for dealing with everyday tasks, improvement of their relationships with people around them, resulting from either better state of mind or pain/ailment reduction.

Key words: ageing, old age, physical exercise, health.

Streszczenie

Starość i starzenie się są to procesy naturalne, powszechne i nieodwracalne, obejmują całą przyrodę oraz otaczający nas świat. W związku z coraz większą świadomością populacji, wysiłek fizyczny często jest chętniej podejmowany przez osoby nie tylko młode, ale i określane mianem seniorów. Gimnastyka ogólnousprawniająca ma pozytywny wpływ zarówno na polepszenie kondycji fizycznej, jak i psychicznej. Celem przeprowadzenia badań była ocena wpływu gimnastyki ogólnousprawniającej na jakość życia osób starszych. Większość poddanych badaniom już nie pracuje zawodowo, co często jest przyczyną niewystarczającej ilości ruchu w codziennym życiu. Badania zostały przeprowadzone na grupie kilkudziesięciu osób w wieku 50–80 lat, które regularnie uczęszczają na zajęcia średnio 2–3 razy w tygodniu, po 45 minut jednorazowo. Osoby poddane badaniom przyznają polepszenie stanu zdrowia i wykazują większe chęci do podejmowania zadań dnia codziennego oraz poprawę relacji z otoczeniem wynikającą z lepszego samopoczucia lub zmniejszenia dolegliwości bólowych.

Słowa kluczowe: starość, starzenie się, gimnastyka ogólnousprawniająca, stan zdrowia.

Introduction

Why do we age, why can not we be immortal – many stout minds have tried and still tries to answer this question. Arose on this subject much thought.

We conclude that old age is a natural process, inevitable and most importantly – irreversible, which covers the whole of nature and the world around us. It is a dynamic phenomenon, impossible to stop or withdraw.

Man, irrespective of gender with wekiem subject to many physiological changes, physical and mental. Speed and progressive they depend largely on the past life and genetic factors. However, irrespective of factors causing changes in a gradual decrease in capacity and efficiency of the organism.

Old age – a static condition, which occurs in the lives of everyone. The basic features of old age shall be deemed to fall adaptability, self-limiting progressive life and related depending on the environment [1, 2, 4].

According to WHO, there are three main stages of old age:

- 1960 to 1975, with old age (early retirement),
- 1975 to 1980, with old age (late old age),
- 90 years and above – the venerable age (ie longevity).

However, in practice meets the division into four periods of old age:

- 60–69 years early retirement age,
- 70–74 years – the age of transition between old age and the age of initial limited physical and mental fitness,
- 75–84 years – the age of advanced age,
- 85 years and more – infirm old age.

Each user of any equipment knows that each of its parts are destroyed at different rates. The same is true with the more complicated-man. Some of his organs and tissues are particularly hard time bite tooth. Others are aging more slowly, and only a few remain in good shape by the end of our days.

This process is shaped by various factors outside of both the systemic and intra-systemic. The most visible, external symptom of the aging of our skin is reflecting the length of our earthly life. Who would not want a beautiful, smooth skin for a lifetime? Unfortunately, over the years, each of its three layers (epidermis, the skin correct, the subcutaneous tissue) losing the original properties. Consequently, it is wrinkle, roughness, lack of flexibility. Sweat and sebaceous glands also grow old as a result the skin becomes thinner, drier and less stretchy.

The human skeleton is completely exchanged every 7 years. This is due to interaction of osteoclasts with osteoblasts. The increasing dominance of first cell over another is a symptom of aging. The content of minerals in bone (predominantly calcium) begins to decline after 1940 was desired. Change is building bone, decreasing their mechanical strength and elasticity and increases their fragility.

Ligaments, articular capsule articular cartilage and most important, yielding changes in age, contribute to the development of degenerative-deforming processes, particularly in the spine and hip joints. Comes to osteoporosis – a condition characterized by progressive loss of bone mass, increased susceptibility to collapse.

Enough attitude reflects the aging of the musculoskeletal system and is characterized by an increase in thoracic kyphosis and lumbar lordosis reduction, shifting center of gravity, reducing mobility of the spine and joints. Muscles are remarkably plastic and susceptible to environmental influences, as well seen in

bodybuilders. Their strength remains constant up to 50, with. After this period, followed by a slow decline in muscle strength and speed. Fibres are slowly shrink quickly because it is the degeneration of the deterioration of blood supply, decrease the efficiency of mitochondrions, no stimulation of the nervous system.

The brain is the most complicated organ acting as a “center” monitoring the adoption, interpretation and management of sensory information throughout the body. The aging of the brain starts gradually decreasing the number of neurons and connections between them. About 60 begins to fall, with the number of Purkinje cells in the cerebellum (which results in impaired motor function).

Following the aging process, there are changes in the myocardium, especially in the arteries (hardening of the arteries due to atherosclerosis). Often the elderly meet with hypertension, which may be a substrate of atherosclerosis.

In the respiratory tract (the lungs) are changes that cause the decline in physical fitness, reduce flexibility of lung tissue, restricted mobility of the chest. Decreases, therefore, vital capacity of the lungs, worse is the diffusion of oxygen in the lungs.

Aging is inevitable. Are born, mature, reach the peak capacity, then we grow older. From the perspective of the nature we live in order to ensure the continuity of the species. The undeniable fact is that “old age” reaches everyone. May, however, sometimes self-realization, which wrote Antonia Kepinski “Like may be the most beautiful autumn season, so the age may be the best time of your life” [1, 3, 5].

Gymnastics streamline pan, containing a gym exercises affecting the efficiency of the body and helps enhance strength, flexibility and flexibility of muscles, and thus improves overall physical and mental health of man. Gymnastics wide to streamline may be in the gym and outdoor exercise can be performed using the gear, instruments or partner. It is important that the practitioner had loose motions not embarrassing dress. Exercise is chosen according to the principle “from easiest to hardest,” starting from the high position and ending with the low [4].

Wide exercises to improve operated on the basis of the course of a lesson, which includes the three parts:

- Introduction-used in the exercises to prepare the trainees and their body to exercise.
- Stem-containing harder, causing more physical exercises

End-of-is designed to reassure practitioners and help regenerate and therefore consists mainly of breathing exercises and relaxing.

The main objectives for improving gymnastics wide are:

- maintaining and strengthening the muscle strength,
- improving the overall efficiency and effectiveness by improving the body’s respiratory function, circulatory and nervous systems,
- maintain or improve the proper motion in the joints,
- healthy weight control,
- the overall improvement of human mental.

In the elderly decreases the efficiency of mechanisms to regulate and adaptation to changing environmental conditions, decreasing resistance to psychological stress, as well as to harmful bacterial and viral agents. Gerontological studies have shown that patients with lack of physical activity is progressing rapidly aging and its effects are more troublesome and tiring for humans [4].

Through systematic gymnastics wide to improve, in the elderly undergoing positive changes at the level of the internal organs and all systems. They are stimulated to greater activity, which makes their work more effectively [4].

a) in the respiratory system:

- to improve ventilation,
- to deepen the breath,
- the release of respiratory rhythm and change of distribution of blood flow through the lungs,
- steps to improve the respiratory diaphragm;

b) in the motor system:

- the increased blood circulation and joint nutrition,
- to strengthen muscles and mobility of joints,
- to improve range of motion of the spine,
- for better nutrition of the bones (increased resistance to mechanical injuries);

c) in the circulatory system:

- a reduction in pulse rate and stress,
- a reduction in blood pressure,
- a better supply tissues with nutrients and oxygen,
- the increase in muscle myoglobin,
- the increase in the number of red blood cells and hemoglobin content,
- an increase in aerobic capacity of the organism;

d) in the nervous system:

- to improve visual perception and coordination disorder,
- to improve the conductivity (a beneficial effect on improving memory and mental processing all),
- the endorphins secreted during exercise have an impact on reduced pain and a deeper feeling of satisfaction and good mood after the completion of the effort;

e) in digestive system:

- the increased consumption of glucose by the working muscles,
- a reduction in body weight in obese patients,
- to reduce the risk of cardiovascular disease,
- a better metabolism of carbohydrates, proteins, fats.

In the elderly is very important to external interference in the work of the circulatory system mainly because he is aging quickly. Therefore, an older man moves with much more effort than the young, also decreases blood supply of the bodies and they work less efficiently. How to give researchers up to eight times more likely to die of cardiovascular disease a person with a weak physical condition than those who regularly carry out exercises.

In view of increasing public awareness of the importance of physical activity more elderly people in accordance with the order "movement slows the aging process" back on the various ways this type of activity. Does not change the fact that many people remain among the elderly is the current stereotype of saying that the boat and motor games are intended solely for young people and children, while the Television and chair for older people. Contributes to this lack of mobilization of the exercises, exaggerated and unjustified health care, and the pursuit of the younger generation to drive the elderly to rest [2, 4, 6].

Most elderly spend their free time watching TV, listening to the radio, younger seniors spend their time while working on the plot, but with age the percent-

age of people who like this kind of leisure time decreases. Gymnastics wide streamline should find a place in daily life.

However, before proceeding to exercise the elderly person should consult a physician to determine the appropriate type of physical activity especially if you suffer from a chronic disease, she feels chest pain or suffer from asthma, hypertension or diabetes.

The intensity and form of physical activity for seniors may be adapted to their overall health status, should not reach the breaking point because it is improving well-being, and not aggravate them. Exercise is chosen depending on your age, state of the locomotor system, cardiovascular, respiratory, and comorbidities.

During the exercise between the more intensive exercises should include breathing exercises, during which the practitioner will be able to rest and gather strength for further exercises. Do not be either push or permit to fatigue [2, 4].

Exercises that require sudden changes in body position such as bending violent, quick sit-ups, there should be, because they can cause dizziness, imbalance and loss of consciousness.

The purpose and effect of gymnastics wide to improve older people is primarily:

- production of natural resistance to the efforts,
- increasing the efficiency of respiratory-circulatory,
- stimulation of general metabolism,
- to improve neuromuscular coordination,
- inhibiting the progress of changes related to aging,
- mental relaxation,
- fill free time in a valuable and enjoyable,
- renewal of social relations through regular meetings at gymnastics,
- mobilization of the elderly to leave the house and meet with other people, it leads to increased self-esteem and makes it easier to neutralize the effects of aging.

In view of the prevailing stereotype that physical activity is for young people, help to overthrow this theory is to organize to improve exercise carried out in the wide group of senior citizens [6].

It has been proved that the group exercises are a very important role in improving the elderly, because they create appropriate conditions for psychotherapeutic impact on those less active.

Exercises to improve pan can be performed in the gym, but a very good alternative for them are exercises in the open air [4].

In addition to the standard exercises in the open air, you can make also very popular in recent marches with sticks called. Nordic Walking.

The benefits associated with this type of physical activity include increased muscle strength muscle mainly the upper limbs, chest, back and abdominal muscles, which are necessary to maintain proper body posture. Sticks used during the march relieve the impact on joints and maintain normal and stable posture. Protect from falling even while walking on uneven ground, making seniors feel more secure and fear of falling is not a barrier against the march. Recently become very popular group exercises led by a specially equipped for this task a person is an instructor of kinesioogerontoprophyllaxis. During the exercises with the instructor there are exercises that contain simple choreography per-

formed to the music, you can develop a better orientation and coordination, which deteriorates with age [7].

Undeniable conclusion is that talking about the positive impact of exercise wide to improve, the quality of life of older people. Regular exercise lasting 30-60 minutes gives better results than some think as passive rest.

In this connection it should be even more to encourage people of all ages to develop the habit of active rest, because: "Many medicines can be replaced by traffic, but traffic can not be replaced any medicine".

Aim

The aim of this research was to estimate the effect of physical exercises on the quality of elderly people's lives.

Material and Methods

The study was conducted on a group of 40 people between the ages of 50 to 80 years. These people regularly attend the gym 2-3 times a week for 45 minutes at one time. The method of study was an anonymous survey, which was designed specifically for this purpose. The survey included questions on basic information about respondents, such as age, sex, education, and questions regarding the effect of exercise on their body.

The questions provide us with knowledge of illnesses, physical, psychological and overall self-assessment of his life by persons examined.

Respondents in addition to closed questions can comment in writing on a few open questions, which included a survey.

Conclusions

Respondents answering a series of questions provided information about their feelings regarding the effect of exercise to improve their wide body.

Respondents evaluated the impact of exercise on physical and mental health.

The summary of responses that were given to show that the vast majority of grants to improve the physical condition (Fig. 1), i.e. 87% of respondents felt improving, deteriorating physical condition has not seen any of the people surveyed, while 10% felt the did not any change in health status.

Referring to the improvement of mental status (Fig. 2), 63% of respondents felt the marked improvement, 10% strongly indicated that this condition has not improved, while 30% did not notice major changes.

The persons tested were asked to assess mood immediately after the completion of the exercise classes (Fig. 3).

Answers surveyed surprised us very positively, because respondents felt equally positive, but how different interpretations of that experience.

Almost half of respondents stated a very good feeling, some people admitted being good, a large proportion of respondents out of the class relaxed and full of optimism.

Regarding the problems faced by the respondents that motivates them to regularly attend the gym (Fig. 4), We can confidently say that such a large turnout in the classroom is due to a desire to improve their physical condition. People surveyed also give back pains, problems with osteoarthritis of different joints, or obesity, indicated that 8% of respondents.

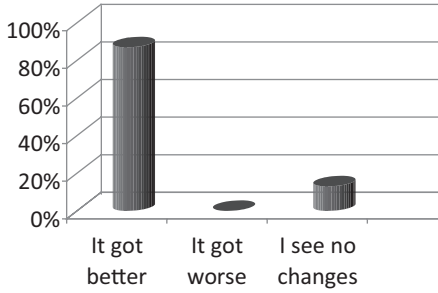


Fig. 1. Physical condition of patients after wide to improve gymnastics

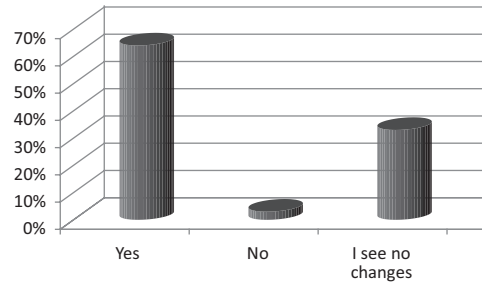


Fig. 2. Mental status of patients after gymnastics wide improvements.

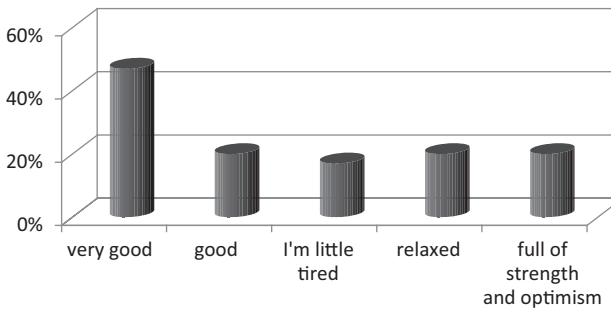


Fig. 3. The graph shows the scores being interviewed immediately after the gymnastics wide improvements

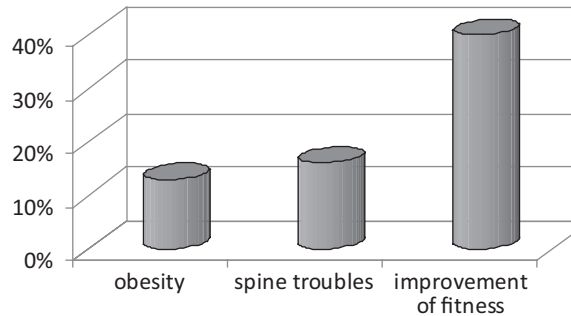


Fig. 4. The graph shows the answers of respondents to the question about motivation to attend the gymnastics wide improvements

According to our task, which was designed to evaluate the quality of life of older people to improve gymnastics pan, we prove that people attending the gym to improve pan suffer significant improvement in health status, increased willingness to take on tasks of everyday life, and improving relations with the environment resulting from relief.

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Evaluation of a Lifestyle of Students of Physiotherapy and of Students of Physical Education – Section of Handball Players

Ocena stylu życia studentów fizjoterapii i studentów wychowania fizycznego – sekcji piłkarzy ręcznych

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Abstract

Physical activity, balance diet, regular eating meals, appropriate amount of the dream, knowledge about its state of Health it only from some factors which influence a lifestyle of each of us. Behaviour correct of proportion influences a determined lifestyle "with healthy lifestyle". An evaluation of a lifestyle of students which subject is obliging to the acquaintance of pro-health behaviours was a purpose of the work. 60 persons were provided with the questionnaire survey: 30 students of the physiotherapy of a school of medicine and 30 students of the Academy of the physical education of handball players. Received results aren't presenting important differences in the lifestyle of both groups, persons actively and regularly practising sport aren't characterized by a bigger care about "healthy life", however frequent eating alcohol is a worrying result.

Key words: students, lifestyle, nourishment, physical activity.

Streszczenie

Aktywność fizyczna, zbilansowana dieta, regularne spożywanie posiłków, odpowiednia ilość snu, wiedza o swoim stanie zdrowia to tylko kilka z niektórych czynników, które wpływają na styl życia każdego z nas. Zachowanie prawidłowych proporcji wpływa na styl życia określany „zdrowym stylem życia”. Celem pracy była ocena stylu życia studentów, których kierunek studiów obliguje do znajomości zachowań prozdrowotnych. Badaniem ankietowym objęto 60 osób: 30 studentów fizjoterapii Akademii Medycznej oraz 30 studentów Akademii Wychowania Fizycznego – piłkarzy ręcznych. Otrzymane wyniki nie przedstawiają istotnych różnic w trybie życia obu grup, osoby czynnie i regularnie uprawiające sport nie charakteryzują się większą dbałością o „zdrowe życie”, niepokojącym wynikiem jest natomiast częste spożywanie alkoholu.

Słowa kluczowe: studenci, styl życia, odżywianie, aktywność fizyczna.

Introduction

A Healthy Life Style – What does it Mean?

In the common sense it is the absence of disease. However in this light it indicate prophylactic and therapeutic activities only. Experts consider this definition as inadequate and too simple. New proposals for defining health refer to suggestions of WHO but are more specific and dynamic. Health is treated as a disposition what is well illustrated by definition „process of continuous adjustment of person to the changing demands of living in physical, mental and social aspects and organism’s ability to efficiently respond to challenges”. Health in this light may seem as general ability of organism to comprehensive developing and responding to current challenges [4].

A healthy lifestyle has many factors, mainly healthy nutrition. Reasonably healthy nutrition is one that takes into account body’s requirement for all the important nutrients for health and energy depending on sex, age and type of work. The one of the fields of science dealing with the rational nutrition is dietetics. Thanks to research conducted by dieticians it is possible to identify the risks arising from improper diet, review of existing views and identify specific recommendations and diets to maintain our health the best. In societies with the highest development of civilization the most common cause of illness and death is because of metabolic disorders like: diabetes, atherosclerosis and cancers. One of the main reasons of their formation is too large consumption of high caloric foods containing fats and proteins. Clinical medicine treats the effects of these diseases, nutritionist provides information to develop the principles of healthy eating which in combination with fit lifestyle are the most effective method of preventing diseases of civilization.

It is important that certain principles are abided in order to live healthy. Here I present the 10 principles of healthy nutrition:

- Eat a variety of foods.
- Make sure that your food is rich in carbohydrates.
- Eat more fruits and vegetables.
- Maintain a health body weight and the right *frame of mind*.
- Eat moderately, *reduce portion* sizes in meals – do not neglect your meals.
- Eat regular meals.
- Drink plenty of fluids.
- Start now and make changes gradually.
- Remember! There is no “good” or “bad” food. There is just good or bad diet.
- Move a lot [1, 2].

Habits and lifestyle of individual person include smoking or not smoking, drinking or limiting consumption of alcohol, coffee, abusing various drugs, especially psychotropic and being addicted to drugs.

Equally important for a healthy lifestyle is a daily hygiene, which is an educated style of daily life, which aims to ensure appropriate conditions for human healthy physical development and proper sleep, which allows you to make your body well-rested and regenerated for the next day. Night rest contributes to the well-being, improves productivity and without doubt affects the quality of life [5].

If you provide proper nutrition you can also: increase your mental sharpness, enhance your memory, increase your physical energy, control your weight

better and reduce the risk of disease. Low calorie diet and controlling the quantity and frequency of food intake is a prerequisite for longevity [5].

Very important for healthy lifestyle is physical activity. Physical activity is regarded not only as an important factor in the development, but as a positive measure of human health. Physical activity is essential for the proper psychological and physical development. Relaxing body prevents malformations and movement disorders. Changes that occur in the body under the influence of exercises, which are regularly performed are really good for you in many ways. Physical activity improves motor features such as: strength, speed, stamina. Increased physical activity improves the body's muscle structure, which also is of great importance for the stabilization of the skeletal system. In addition, it increases the immune system and improves the process of respiration. Doing exercises frequently you help your heart to adapt to your body's new needs. The effective fight against addiction is other additional benefit of physical activity [3].

Health can not be taken for granted. We can affect and improve it. But it is possible only when Health can be formed, to improve, but also gain, increase, multiply – but aware of its operation is possible only when we recognize health as a value worthy of these actions. If we lead a healthy lifestyle – we are healthy [2].

Aim

Evaluation of life style of students of Physiotherapy, Wroclaw Medical University and students of University School of Physical Education in Wroclaw.

Check whether there is a correlation between physical activity and healthy lifestyle among students of both universities.

Material and Methods

Evaluation of student's lifestyle was conducted in March 2010. Department of Health Sciences, Wroclaw Medical University and Department of Physical Education of Physical Education Academy in Wroclaw were chosen for this. Thirty students of Physiotherapy Faculty of Health Sciences Department, Wroclaw Medical University and thirty students of Physical Education Academy in Wroclaw belonging to the section of the handball players were surveyed. They are students first, second and third year, 24 women and 36 men. Age of respondents is diverse and it ranges from 19 to 30 years old.

The study was conducted based on the anonymous questionnaire consisting of 27 closed questions. Questionnaire asked about: the way of eating, physical activity, the use of pharmaceuticals, use of drugs, spending free time, going for a medical examination.

The obtained results were statistically analyzed with the help of Statistica program.

Results

The Way of Eating

After analysing the survey results it can be seen that 87% of students did not use any special diet. Another important thing to be noted is the fact that 15% of students did not eat breakfast. In addition, 68% of students eat food fast-food. On the other hand, 29% said that they eat fruits and vegetables daily, 35% often, while 22% rarely and 15% eat them occasionally.

Table 1a. The use of special diets

Responses	Number of responses	Response rate (%)
No	52	86.67
Yes	8	13.33
No answer	0	0.00

Table 1b. Frequency of consumption of fruits and vegetables by students

Responses	Number of responses	Response rate (%)
Occasionally	9	15.00
Rarely	13	21.67
Often	21	35.00
Every day	17	28.33
No answer	0	0.00

Table 1c. Eating fast-food meals

Responses	Number of responses	Response rate (%)
No	19	31.67
Yes	41	68.33
No answer	0	0.00

Table 1d. Eating breakfast

Responses	Number of responses	Response rate (%)
No	9	15.00
Yes	51	85.00
No answer	0	0.00

Physical Activity

Table 2a. Doing sport by students

Responses	Number of responses	Response rate (%)
No	8	13.33
Yes	52	86.67
No answer	0	0.00

Table 2b. Participation in gymnastics classes

Responses	Number of responses	Response rate (%)
No	30	50.00
Yes	30	50.00
No answer	0	0.00

Table 2c. Self-assessment of their own physical activity

Responses	Number of responses	Response rate (%)
High	11	18.3(3)
High-performance athlete	23	38.3(3)
Moderate	23	38.3(3)
Low	3	5.00
No answer	0	0.00

Based on the survey shows that 87% of students declare doing sport. 50% take part in gymnastics classes. 38% of respondents consider themselves athletes and 38% rate their physical activity as moderate, 18% as high, and 5% believe that their physical activity is low.

Use of Pharmaceutical

Table 3a. Consumption of vitamins in the form of pharmaceutical

Responses	Number of responses	Response rate (%)
No	34	56.67
Yes	26	43.33
No answer	0	0.00

Table 3b. The use of painkillers

Responses	Number of responses	Response rate (%)
Often	4	6.67
Ocasionally	3	5.00
Rarely	21	35.00
Only in the cese of very severe pain	32	53.33
No answer	0	0.00

Table 3b. The use of painkillers

Responses	Number of responses	Response rate (%)
Often	4	6.67
Ocasionally	3	5.00
Rarely	21	35.00
Only in the cese of very severe pain	32	53.33
No answer	0	0.00

The frequency of use of two different types of pharmaceutical products were surveyed: vitamins and painkillers. The use of vitamins admitted 43% of the respondents. Frequent use of painkillers declared 7%, 5% occasionally, 35% rarely, while as many as 53% use them only in case of very severe pain.

Use of Stimulants

Table 4a. Frequency of drinking coffee

Responses	Number of responses	Response rate (%)
Often	20	33.33
Rarely	11	18.33
Occasionally	21	35.00
I do not drink coffee	8	13.33
No answer	0	0.00

Table 4b. Frequency of alcohol consumption

Responses	Number of responses	Response rate (%)
I do not drink at all	4	6.6(6)
Rarely	10	16.6(6)
Occasionally	31	51.6(6)
Often	15	25.00
No answer	0	0.00

Table 4c. Cigarette smoking by students

Responses	Number of responses	Response rate (%)
No	46	76.67
Yes	14	23.33
No answer	0	0.00

Another issue that was investigated was the use of stimulants in the form of coffee, alcohol and cigarettes. Coffee consumption by the respondents is as follows: frequently drinks coffee 35% of students, rarely 18%, occasionally 35%, and do not drink coffee at all 13%. When it comes to alcohol consumption the most of students drinking alcohol occasionally, it is 52%. In addition, 17% rarely drink alcohol, 7% do not drink at all, and as many as 25% of students admitted to frequent alcohol consumption. In the case of cigarette smoking situation is vice versa. As many as 77% of students do not smoke cigarettes.

Leisure time

Table 5a. How free time is spent by students

Responses	Number of responses	Response rate (%)
Rather passively (watching TV. reading)	20	33.33
Rather active (walking. swimming. cycling)	40	66.67
No answer	0	0.00

Table 5b. Number of hours students spent daily watching TV

Responses	Number of responses	Response rate (%)
Any	30	50.00
About 2 hours	24	40.00
About 4 hours	4	6.6(6)
About 6 hours	1	1.6(6)
More	1	1.6(6)
No answer	0	0.00

Table 5c. Number of hours daily students use a computer

Responses	Number of responses	Response rate (%)
Any	3	5.00
About 2 hours	32	53.33
About 4 hours	22	36.67
About 6 hours	3	5.00
No answer	0	0.00

It shows that the highest percentage of students, as much as 67%, spend free time in an active way: walking, swimming or cycling. Students who spend free time in a passive way do it at the computer the most time, of which 53% use computer about 2 hours, 37% four hours, and 5% of students about 6 hours. 50% of students said they do not watch television, and 40% of respondents said that they watch TV about 2 hours a day.

Going for a Medical Examination

Table 6. Going for a prophylactic medical examination

Responses	Number of responses	Response rate (%)
No	32	53.33
Yes	28	46.67
No answer	0	0.00

The results showed that as many as 53% of students do not go for a prophylactic medical examinations.

Conclusions

The results do not show significant differences in lifestyle of both groups. People actively and regularly practicing sport do not pay attention to “healthy lifestyle”. Despite paying attention to the purchased products large proportion of respondents eat irregularly and do not pay attention to the caloric content of products, and eat “fast food”. A worrying result is the frequency of drinking alcohol and neglecting of prophylactic medical examinations. Too small proportion of respondents have a proper eating habits.

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Sports Women After Mastectomy

Uprawianie sportu przez kobiety po mastektomii

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Abstract

The loss of the breast, which for many women is synonymous of femininity and motherhood leads to distortion of the identity, the feeling of being “the inferior and defective”. Physical activity gives a chance to make new friends, to find a new life purpose, enables to regain the confidence in own strength and capabilities. The paper presents the significant impact of sport on a patient after mastectomy and its huge role in a successful struggle and final victory over the disease which affects not only the physical health, but also the emotional and mental sphere. Sport activities are an often unfairly overlooked way to return to full physic strength and self realization for responsible ladies. The paper discusses the proper stimulation of muscle mill work, the techniques that should be used for the benefit of the training woman, the adjustment of the proper form of activities such as skiing and Nordic walking, tennis, badminton, bowling, golf or endurance sports as well as the sport equipment in order to not charge too much the operated side. By applying certain rules, the sport exercising is an excellent form of rehabilitation and it is difficult to prohibit a priori the practice of one of the disciplines. Probably the sport training is not an ideal solution for every woman, but for many of sport activities would bring several benefits, which ought to be regarded seriously by treatment of patients after mastectomy.

Key words: mastectomy, sports, breast cancer.

Streszczenie

Utrata piersi, która dla wielu pań jest synonimem kobiecości i macierzyństwa, prowadzi do zachwiania tożsamości, poczucia bycia „tą gorszą i niepełnowartościową”. Aktywność fizyczna daje szansę nawiązania nowych znajomości, wyznaczania sobie nowych celów, pozwala uwierzyć we własne siły i możliwości. W pracy przedstawiono, jak istotny wpływ na pacjentki po mastektomii ma uprawianie sportu i jaką rolę pełni on na drodze do zwycięstwa nad chorobą, której skutki mają ogromny wpływ nie tylko na sferę fizyczną, lecz również emocjonalną i psychiczną. Czynne uprawianie sportu jest często niesłusznie pomijanym sposobem powrotu do pełni sił, samorealizacji przeznaczonym dla odpowiedzialnych i uważnych kobiet. W pracy omówiono, jak odpowiednio stymulować pracę tłoczni mięśniowej; jakie chwytty zastosować, aby uprawiana dyscyplina była pożytkiem dla kobiety; jak dostosować formę aktywności, np. narciarstwo i nordic walking, tenis, badminton,

kręgle, golf czy sporty wytrzymałościowe oraz sprzęt, by nie obciążać zbyt mocno stopy operowanej. Przy stosowaniu pewnych reguł zachowań i ćwiczeń jest znakomitą formą rehabilitacji. Trudno z góry zabronić uprawiania jednej z dyscyplin. Prawdopodobnie sport nie jest idealnym rozwiązaniem dla każdej kobiety, ale dla wielu z nich może być korzystny, co warto wziąć pod uwagę przy kontynuowaniu leczenia pacjentek po mastektomii.

Słowa kluczowe: mastektomia, sport, nowotwór piersi.

Introduction

The participation in sport activities can be one of the best ways to regain the self-confidence by restoring the inner peace and balance, which are of crucial meaning for the phase after defeating the cancer. Sport lifts up the competitive and combative spirit, changes the self-perception and helps to find the meaning of life. The sport activities are an integral part of the recovering process, but they can be also a pleasure and an opportunity to meet new people and make friends. Regardless of the prior physical activity or a lack of it the post mastectomy women can or even ought to participate in sport activities. It is essential to know and use the security measures, to keep the proper breaks during and after the training, to register and respond to the impulses sent by the body of the training person. Every person after mastectomy has to accept the circumstances in which she would need more time in order to regain her strength and reactivity. The development of the physical abilities will be progressive, the recovering person will have to accept a gradual development of her health condition. Sport training should take place after consultations with a doctor, physiotherapist and a professional trainer. The training usually starts with the same warm-up for all participants and in the 2nd phase the following exercises are changing, accordingly to the practiced sport discipline and the difficulties the training person may face. The practicing of such exercises can be undertaken only at the moment of a very good realization of the warm-up exercises and after building up an appropriate muscle strength [2, 11, 6].

The sport training can be divided into following phases:

- PHASE – Basic Warm-up,
- PHASE – The Ultimate Movements,
- PHASE – Sports Warm-up.

The Basic Warm-up

The Basic Warm-up is a set of short general exercises suited for everybody practiced daily before starting practicing sport disciplines. Accordingly to the needs of patient's body there are certain exercises addend to the Basic Warm-up in order to:

- regain the fibre elasticity,
- eliminate the pain,
- raise up the spirit by a demotivated patient,
- stimulate the emotional recovery,
- reduce the swelling of limbs,
- develop the balance,

- reduce the effects of menopause,
- stimulate femininity,
- provide the proper physical activity after the breast reconstructions.

In order to start a new phase of exercises it is essential to have successfully passed all the previous exercises in order to be able to practice them without any pain of other difficulties [4].

The Ultimate Movements

It is a 30 minutes long programme, exercised three times a week, forming a center of the recovery process enabling the full restoration of physical activity. The long-term aim by a person after mastectomy is the obtaining of a high level of physical performance.

The Ultimate Movements phase can be divided into three different types of exercises, followed by 5 minutes long subprogram with elements of dance and healing visualization:

- the base for upper body parts – 14 exercises in the standing position for arms, shoulders, chest, back and neck. A series of positions splaying gently the scar and improving the circulation;
- the base for lower body parts – 8 exercises in the sitting position focused on belly, nates and legs. Such a series helps to stabilize the physical strength and to amend the balance;
- build-up of strength and resistance – 7 isometric exercises influencing specifically the upper body parts, exercised with the expander.

In the circumstances when problems, i.e. pain, shoulder paraesthesia, swelling it is required to move back to the phase I. Also in the situation when there was a break in exercising the activities should be also started from the phase I.

The elements of dance – 5 minutes long part of exercises during which the patient allows herself to express herself and her emotions dancing to the music of her favorite artist. The correctness of the movements is not Essentials here, the movements should be flowing and painless.

Healing visualization – the patient sits in a comfortable position, spinal column straightened, eyes closed, regular breathing (breathe in through the nose, breath out through the mouth) analyzing her body from the top of her head to the toes, contemplating its beauty, listening to its needs. Then she moves to her emotional sphere, tries to give her emotions a name, tries to define the emotions which she experiences and the emotions her body needs now. The next part is coming into the patient's mind, analyzing her thoughts – are they condemning, frightening, alarming? Or are they clear and peaceful? It is important that she is able to describe what is happening in her mental sphere. If the person is leading a spiritual or religious life, it is also a time for prayer, meditation, thanksgiving and request. The aim of the visualization is to perceive the beauty in the person herself, in the surrounding and the people around her. It should result with relaxation, joy, positive emotions. It is important that At the end of the meditation every woman say to herself three times: "Today I live, I will be living as good as I can". Even if for every single of the them the sentence has a completely different meaning [9, 10, 12].

The Warm-up in the Sport Disciplines

Regards the exercises for a concrete sport discipline.

Every single of the disciplines listed below can be exercised by a responsible women after mastectomy with a developed sensitivity for her own body needs and responses after consultations with experts and multi-phase preparation.

Exercises preparing to the sport activity:

SP – start position, M – move,
AA – arms, RA – right arm,
LA – left arm, LS – legs,
RL – right leg, LL – left leg,
T – torso.



Exercise 1:
SP: stride position,
AA: arms moving
similarly as by crowl
swimming.
Number of repeti-
tion: 4.



Exercise 2:
SP: stride position,
AA: arms moving up
with simultaneously
bending knees, then
arms moving back by
simultaneously straight-
ening knees.
Number of repetition: 4.



Exercise 3:
SP: stride position,
AA: arms circulating
with a subtle hips
rotation.
Number of repeti-
tion: 4.



Exercise 4:
SP: stride position,
AA: along the torso,
RA: a slow waving with the
hand lateral above the head,
the hand palm outwards,
LL: leaning on the left leg,
T: bowing left, the body
height leaning on the left
leg.
Number of repetition: 4.



Exercise 5:
Exercise with gym stick.
SP: stride position,
AA: two side gym stick
grip, AA: arms moving
frontally up,
T: bowing laterally right.
In this position two
deep breaths should be
taken, then returnig to
the SP.
Number of repetition:
2. The same exercise to
be done to the left side.



Exercise 6:
SP: stride position.
AA: along the torso,
A1: AA moving frontally up,
hands together, hand palms
turned outwards,
A2: AA straightening in the
elbow joints,
A3: Breathing in trough the
nose and stretching the
body upwards,
A4: Breathing out through
mouth and returning to the
SP. Number of repetition: 4.



Exercise 7:
 SP: stride position,
 AA: along the torso,
 A1: AA moving frontally up, hands together, hand palms turned outwards,
 A2: AA straightening in the elbow joints,
 A3: T bowing to the right,
 A4: returning to the SP.
 Number of repetition: 2.
 The same exercise to be done to the left side.



Exercise 8:
 Exercise with gym stick.
 SP: stride position,
 AA: two side gym stick grip placed along the spinal column. RA on the head height.
 RA on the height of the lumbar column A1: 4 deep breaths,
 A2: T bowing to the left,
 A3: returning to the SP.
 Number of repetition: 2.

The same to be done to the other side while keeping in mind the change of arms position [1, 6, 7].



Exercise 9:
 Exercise with elastic tape.
 PW: stride position,
 AA: along the torso, two side tape grip, expander on the back side of the body,
 A1: AA moving laterally up to 80 grades angle, streaking the expander located on the bra height,
 A2: AA moving frontally, straightening in the elbow joints,
 A3: the expander pulling

AA gently back with the elbows straightened and chest stretched,
 A4: returning to the SP.
 Number of repetition: 4.



Exercise 10:
 SP: stride position,
 AA along torso,
 AA: consecutively moving frontally up and down.
 Number of repetition: 4 [4, 5, 6].

Bowling

Bowling is a sport discipline, involving all the body parts, including neck and head. Arms waving in the whole movement area and lifting the freight of the bowling ball is a huge effort for a past mastectomy woman. It is very important that the patient should have finished successfully and completely the exercises focused on muscle strength and endurance.

The post mastectomy women ought to face no difficulties in doing all the muscle developing exercises, before starting to make any efforts to lift the bowling ball. During the play a high sensitivity for the body's impulses such as pain, tiredness, swelling, pins and needles in the hand or arm. If such symptoms appear the training should be stopped immediately and the patient ought to rest. It is highly recommended that during the play the throws will be done once with the one, once with the other hand.

Tennis

Tennis is a very fast and energetic play in which all muscle parties of the body are involved. It is a very solid work-out for the entire body turning the running on the tennis court and brings a specific effort of arm, chest and hand. In case of the post mastectomy women some special measures are required. Before they start playing tennis they must dispose of the entirely recovered strength and functionality of hand muscles. Tennis is not recommended for the patients still in treatment or fast after it because there is a time needed for healing the wounds and the scarf as well as for a complete restoring of the movement range before coming back to tennis. At the moment when all the conditions are fulfilled with a successfully finished warm up exercises the training should be started with the very gentle putting the ball on the net and after a longer period of such exercising the training with another person can be started. If the swelling appears a compressor hand scarf should be used. The consultation with the experts is essential in order to know which factors may cause the discomfort and how to manage the eventual consequences. As in any other disciplines if the player feels tired or discomforted, pins and needles in arm or hand appear the play ought to be stopped immediately. The practicing women has to decide independently how much time she will spend weekly on tennis and how long the break should take and also how to play less aggressively. For the people doing competitive sports giving up tennis is extremely difficult but their good health is more important than their sport habits. In the case when tennis is their hobby it is very helpful to take the forhand and backhand with both hands [3, 8, 9].

Golf

Golf is one of the biggest challenges for the post mastectomy women because the biggest effort is done by the upper body parts, i.e. the weakest point of the body. Arms waving requires the whole movement range and are done aggressively with much energy. The patient has to be strongly convinced about the proper muscles preparation, about their strength and stamina before hitting the ball. A special attention ought to be paid to the scarves because of their sensitivity for tension and quick movements. A too little movement range or fibre elasticity limitations are contraindications for starting playing golf. It is also very important to consult the health condition with the doctor to ensure that everything is all right [1, 6, 7].

Aerobics

This sport enables excellent functioning of the cardiovascular system because of activity of arm, shoulder and chest muscles. However, it may also cause some problems connected with the lymphatic system. If such a tendency occurs, this type of activity may be an oedema trigger factor. Together with blood pressure increase during exercising the impaired lymphatic system has to work harder. Movement in aerobics is repeatable and causes muscle tension.

Prior to commencing practicing aerobics, the woman must necessarily have well developed muscle strength and be sensitive to the signals her body sends her. The moment the feeling of heaviness, pain or numbness in the arm within the part operated on occur, the patient must take a rest immediately. Failure to

react to such symptoms might be harmful to the patient's health. Exercise should be performed carefully and following consultation with physical therapist or a physician.

Skiing

Skiing is a sport discipline in which all the muscle parts of the entire body are involved. Arms waving must be possible in the entire movement range. The work mill stimulates the lymphatic system and lymph flow. The ski poles should be laid back and the strength used to work with them should be no bigger than 50%. Skiing should be preceded by consultation with the doctor and the instructor prepared to work with post mastectomy women in order to prevent arising of the inappropriate movement patterns.

Nordic Walking

A recently very popular sport discipline in which ca. 90% of muscles are involved, especially the uprill. The active work of hands and feet stimulates the lymph flow and the circulation and diminishes the swelling. By moving the poles maximally the half of the strength should be used and the poles should be laid back. Such work stimulates the work mill. By this discipline a whole movement range in the shoulder joint by an appropriate muscle strength and stamina is required. Important is also the consultation with the doctor and the cooperation with the trainer instructed in working with post mastectomy women [6, 13, 14,].

Conclusions

The mastectomy is a huge intrusion in woman's body and psychic. The rehabilitation is not only the restoration of body functions but also of the inner balance. There appears also a need of conversation, education and overcoming the obstacles. The physiotherapy ought to be held in a close cooperation with the psychologist and the leading doctor. It is a responsibility of the physical therapist to convince the patient about the importance and the purpose of exercising and leading an active lifestyle, as it seems to be the cure of the 21st century. The therapist ought to keep in mind that the first rule of post mastectomy women treatment is *primum non nocere*. Sport activities have a positive impact on the muscle structure, blood circulation and respiration. It stimulates the work of the entire body. For many women sport provides a new meaning of life, a possibility for opening up for new experiences and contacts. It is also a chance for restoring the self confidence and will of life. It is a moment of saying to patient herself: "I am strong. I am beautiful. I am a woman. I am brave. I am somebody more than a survivor. I am flourishing. Dr Michelle Holmes from Boston states that doing sports by patients with diagnosed breast cancer has a positive impact because they have less chances for complications or recurrence of the illness. Regular exercising reduces the production of estrogen which hormone is responsible for some kinds of cancer. Recently practicing sport by post mastectomy women has more and more followers. This conception, however innovative for Polish circumstances is not only recommended as form of treatment, rehabilitation and prevention but also as straightening of self confidence and self reliance.

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Ambulatory Cardiac Rehabilitation and Quality of Life in Patients with Implantable Cardioverter-Defibrillator (ICD) Preliminary Reports After 11 Months of Outpatient Group Program of Rehabilitation of Patients with ICD

**Ambulatoryjna rehabilitacja kardiologiczna
i subiektywna ocena jakości życia u pacjentów
po zabiegu implantacji kardiowertera-defibrylatora (ICD)
Doniesienia wstępne po 11 miesiącach realizacji programu
grupowej ambulatoryjnej rehabilitacji pacjentów z ICD**

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Abstract

Development of cardioelectrotherapy was the cause of a substantial increase in the number of patients who had cardioverter-defibrillators – ICD implanted, which is currently the most effective method of prevention (primary and secondary) of sudden cardiac death (SCD). These patients affected by numerous problems in the sphere of both physical and psycho-social activity. A well-planned ambulatory cardiac rehabilitation should improve the condition and quality of life of patients in both mentioned areas. The aim of this research was to determine the quality of life of patients with ICD, and to demonstrate, that the ambulatory rehabilitation of patients in this group is effective and safe. The study group consisted of 20 patients with ICD (1 woman and 19 men) aged 21–72 years old (average – 54 years old, SD = 10.68), included in the program of ambulatory cardiac rehabilitation group. Control group consisted of 15 patients with ICD (2 females and 13 males) aged 44–75 years old (mean age 60 years old, SD = 9.64) non of which attended for rehabilitation. Assessment of quality of life was made using the questionnaires: general – The Short-Form Health-Related Quality of Life (SF-36) and the specific MacNew Heart Disease Health-Related Quality of Life Questionnaire (MacNew). The occurrence of anxiety disorders and depression was measured using the modified Scale for the Evaluation of Anxiety and Depression HADS-M (Hospital Anxiety and Depression Scale). The results show that ambulatory cardiac rehabilitation for these patients brings many advantages in the physical sphere, what can be seen in the increase of the maximum load obtained during the electrocardiographic stress test and in the well-tolerated burden during cardiovascular well-tolerated during endurance

training on ergometers. Also the rehabilitation shown good results on psychosocial sphere, since a higher subjective quality of life, lower levels of anxiety and depression were observed among patients attending a rehabilitation.

Key words: implantable cardioverter defibrillator – ICD, ambulatory cardiac rehabilitation, quality of life.

Streszczenie

Rozwój kardioteleterapii przyczynił się do znacznego zwiększenia liczby pacjentów, którym są implantowane kardiowertery-defibrylatory (ICD), będące obecnie najskuteczniejszą metodą prewencji (pierwotnej i wtórnej) nagłego zgonu sercowego (SCD). Pacjentów tych dotyczą liczne problemy w sferze aktywności fizycznej i psychospołecznej. Dobrze zaplanowana ambulatoryjna rehabilitacja kardiologiczna powinna poprawić stan i jakość życia pacjentów w obu tych sferach. Celem pracy była ocena jakości życia pacjentów z ICD oraz wykazanie, że ambulatoryjna rehabilitacja pacjentów w tej grupie jest w pełni efektywna i bezpieczna. Grupę badawczą stanowiło 20 osób z ICD (1 kobieta i 19 mężczyzn) w wieku 21–72 lat (średnia wieku – 54 lata, SD = 10,68), włączone do programu grupowej ambulatoryjnej rehabilitacji kardiologicznej. Grupę kontrolną stanowiło 15 osób z ICD (2 kobiety i 13 mężczyzn) w wieku 44–75 lat (średnia wieku 60 lat, SD = 9,64), które nie uczęszczały na rehabilitację. Oceny jakości życia dokonano za pomocą kwestionariuszy: ogólnego Short-Form Health-Related Quality of Life (SF-36) oraz specyficznego MacNew Heart Disease Health-Related Quality of Life Questionnaire (MacNew). Występowanie zaburzeń lękowych i depresyjnych mierzono na podstawie zmodyfikowanej Skali do Oceny Lęku i Depresji HADS-M (Hospital Anxiety and Depression Scale). Wyniki świadczą, że ambulatoryjna rehabilitacja kardiologiczna przynosi tej grupie chorych wiele korzyści w sferze fizycznej, co uwidacznia się przyrostem maksymalnego obciążenia uzyskiwanego w czasie testów wysiłkowych i obciążeń dobrze tolerowanych podczas treningów cykloergometrycznych. Efekty są widoczne również w sferze psychospołecznej, gdyż wyższą subiektywną jakość życia, mniejszy poziom lęku i depresji mieli pacjenci uczęszczający na rehabilitację.

Słowa kluczowe: wszczepialny kardiowerter-defibrylator – ICD, ambulatoryjna rehabilitacja kardiologiczna, jakość życia.

Introduction

Implantable cardioverter defibrillator (ICD) in addition to cardiac pacemakers is one of the greatest achievements of modern cardioelectrotherapy. This is an implantable medical device designed to stop potentially life-threatening arrhythmias and restore heart sinus rhythm [10]. Currently, ICD implantation is one of the most effective methods of prevention (both primary and secondary) of sudden cardiac death (SCD). Patients after ICD implantation often avoid any kind of physical activity, mainly due to fear of ICD discharge, or worsening of arrhythmias. However, most of them can be safely involved into rehabilitation programs. The effect of training in this group may be not only an increase in physical capacity, but also reduce anxiety and depressive symptoms and thus improve their quality of life.

Aim

The purpose of this research was to demonstrate that the ambulatory rehabilitation of patients with implantable cardioverter-defibrillator (ICD) is effective, which means resulting in a significant improvement in health status within the meaning of somatic, on the other hand safe, that is, not causing adverse cardiovascular events. An additional objective was to determine the quality of life and to check, if amongst study group there are anxiety disorders and/or depression.

Material and Methods

The study group consisted of 20 patients after cardioverter-defibrillator implantation (1 woman and 19 men) aged from 21 to 72 years old (average age – 54 years, SD = 10.68) attending the ambulatory cardiac rehabilitation at the Pro-Corde Cardiology Centre in Wrocław. 11 out of the 20 patients had an ICD implanted as the primary prevention of sudden cardiac death, 9 as the secondary prevention. Mean ejection fraction – EF, in the group stood at 40.7%, SD was 17.53. An average number of trainings in the study group was 24 training units (workouts at the gym, cycloergometrics monitored trainings with a load dozed to the calculated pulse, static trainings on aerobic tools). Physical exercises are conducted according to the principle that the limit of training heart rate should be 20 hits per minute lower than the programmed frequency of ventricular fibrillation, which occurs when the ICD discharges. Moreover, patients in the framework of a comprehensive rehabilitation could benefit from a dietitian advice, meetings with a psychologist (which includes relaxation exercises, including Jacobson's training, support talks, psychoeducation on coping with stress, diagnosis of cognitive functions – Bender). In addition, patients took part in a series of lectures on health education. After completing the first stage of rehabilitation, patients could have taken a second extra stage with the same exercise program. Examined patients walked on electrocardiographic stress test on the track CASE General Electric at the beginning of improving process and as a summary of the rehabilitation process. Control group consisted of 15 patients with an ICD (two women and 13 men) aged from 44 to 75 years old (mean age 60 years, SD = 9,20), which did not attend the ambulatory cardiac rehabilitation. In both groups the time of implantation was approximately four months. Assessment of quality of life in both groups was made using the questionnaires: general Short-Form Health-Related Quality of Life (SF-36) and the specific MacNew Heart Disease Health-Related Quality of Life Questionnaire (MacNew). Occurrence of anxiety disorders and depression was measured using modified Scale for Anxiety and Depression Rating HADS-M (Hospital Anxiety and Depression Scale).

Survey Tools

Short-Form Health-Related Quality of Life (SF-36). This questionnaire is a tool for assessing the overall quality of life dependent on health conditions. It was created during the survey Medical Outcomes Study (MOS) to assess the health status of different groups of respondents [14]. This questionnaire consists of 36 questions, which are grouped into eight dimensions: relating to the physical and social functioning, role of the individual, in addition to the sense of their own mental health, general health, vitality, pain or physical discomfort. These

dimensions are further grouped into two summary scales: physical (Physical Component Summary – PCS) and mental (Mental Component Summary – MCS) [7]. Specific questions include: Physical functioning – PF, role limitations due to physical problems – RP, bodily pain – BP, general health perception – GH, vitality – VT, social functioning – SF, mental health – MH, role limitation due to emotional problems – RE. Way of dealing with the various groups of questions varies from dichotomous (“yes” or “no”) to 6-point Likert scale [15]. The SF-36 has proven and satisfactory psychometric parameters.

MacNew Heart Disease Health-Related Quality of Life Questionnaire (MacNew) is a tool that was created by modifying the Quality of Life Questionnaire after Myocardial Infraction – QLMI. It is a specific questionnaire, designed to evaluate the quality of life in patients with cardiac disease. The tool consists of 27 questions grouped in three domains: physical, emotional and social. Responses are evaluated according to the seven step Likert scale [5].

HADS-M (Hospital Anxiety and Depression Scal). Original version of HADS was developed by A. Zigmont and R. Snaith in 1983 in order to test the level of anxiety of depression in patients treated in hospital. The modified questionnaire used in the study consists of seven items examining anxiety, 7 items related to depression and the two positions defining irritability, aggression. Responses are evaluated according to the four-point Likert scale [1].

Results

During exercises in the rehabilitation center there has been no single cardioverter – defibrillator’s intervention. Two patients experienced three inadequate interventions outside the center during excessive, not guarded exercise (cycling on the ground, dance, pumping well water) – two patients had chronic atrial fibrillation diagnosed, intervention in the area of ventricular fibrillation occurred at too rapid share chambers and resulted in a permanent return to sinus rhythm. Soon after the end of rehabilitation one of patients suffered for a electric storm¹ with lots of power ICD discharges.

¹ The concept of an electrical storm is determined three or more episodes of ventricular tachycardia, which occurred within 24 hours [6].

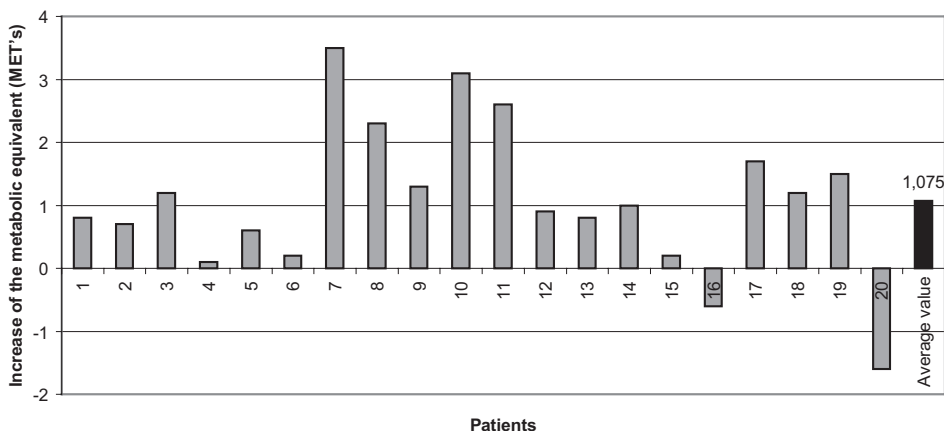


Fig. 1. The increase in coronary reserve (MET's) in the study group

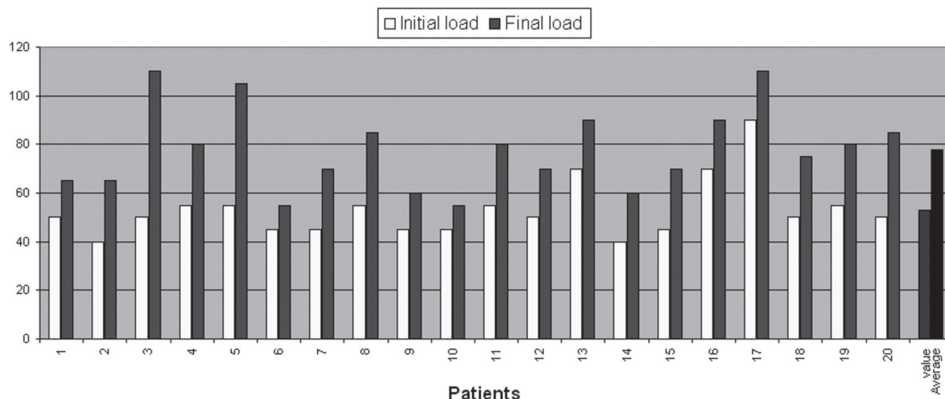


Fig. 2. The increase in training loads

In patients attending the rehabilitation oxygen consumption determined indirectly in the MET's units before rehabilitation program was 5.95 MET's, after completing the rehabilitation – 7.03 MET's. The average increase in coronary reserve was 1.08 MET's, which accounted for 25.11% of baseline with a standard deviation equal 1.20. Fig. 1 shows the increase of the metabolic equivalent (MET's) for individual patients in group under rehabilitation.

Increase of well-tolerated burdens during the cycloergometrics training was a median 25 W (ranging from 10 to 60W), which was an average of 49% of the load from the first training (Fig.2).

Average quality of life according to SF-36 questionnaire in the group attending rehabilitation was 55.04 (SD = 9.99). The highest quality of life was acquired by patients in the social functioning dimension (SF) – at 64.38. The lowest result was measured in general health perception (GH) – 37.90. In the control group the average quality of life was 47.50 (SD = 8.82). The highest quality of life of patients in this group was also achieved in the SF domain – 59.17, the lowest in the GH domain – 36.53. Graphic representation of average values in different dimensions of the SF-36 in both groups is shown in Fig. 3 below. Patients attending rehabilitation reached a higher quality of life in all dimensions of this questionnaire.

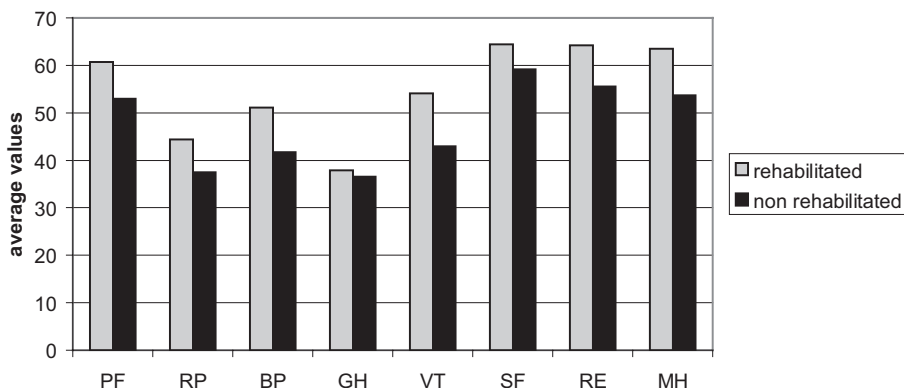


Fig. 3. Average values in different domains of the SF-36 questionnaire for both groups

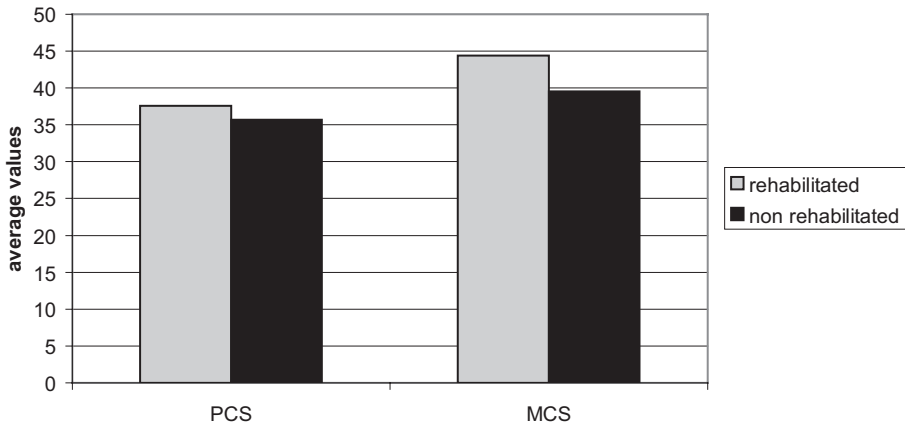


Fig. 4. Mean values of the level of physical activity and mental fitness for the two groups

The final measurement includes two summary scales: physical (Physical Component Summary – PCS) and mental (Mental Component Summary – MCS). Physical scale is obtained by adding the physical components (PF, RP, BP, VT). Mental scale by adding the mental components (SF, RE, MH, GH). The average value obtained by patients from group that attended the rehabilitation in the total scale of the physical scale was 37.62 and in mental – 44.42. Among the group that was not subjected to rehabilitation results were lower and equaled to 35.70 and 39.54.

The overall index for quality of life in the MacNew questionnaire in examined group averaged 4.68 points. Summary of average values obtained in the different domains in his group is presented in Table 1.

In the control group average total quality of life index was 3.97 points. Summary of average values obtained in the different domains of the MacNew questionnaire for the control group is shown in Table 1.

The lowest average value obtained in both groups was in the physical domain, while the highest in the emotional domain.

Graphical summary of the results obtained in both groups is shown on Fig. 5. Patients who attended a rehabilitation achieved higher results in all domains of the MacNew questionnaire.

In the study group subjectively determined lack of anxiety disorders – determined using HADS-M survey – was occurred with 65% of patients. Subjective

Table 1. Average values in different domains of the questionnaire MacNew

	Rehabilitated group	Control group
Emotional domain	4.84	4.17
Physical domain	4.48	3.74
Mental domain	4.81	4.01

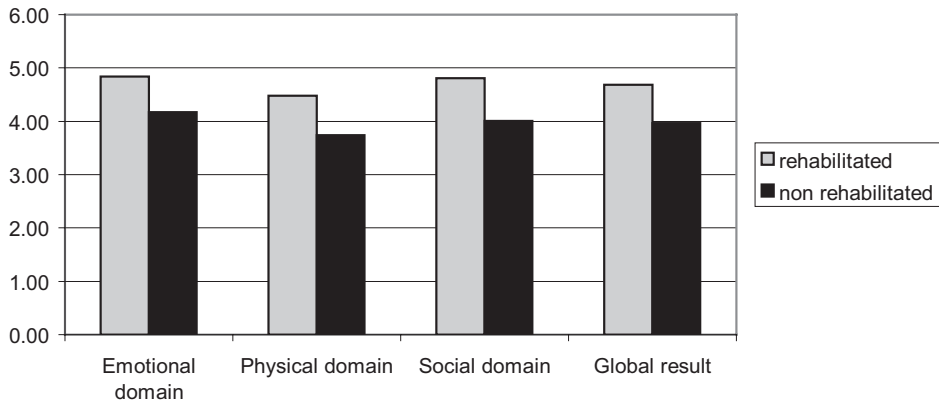


Fig. 5. Average values in the different domains of the questionnaire for both groups MacNew

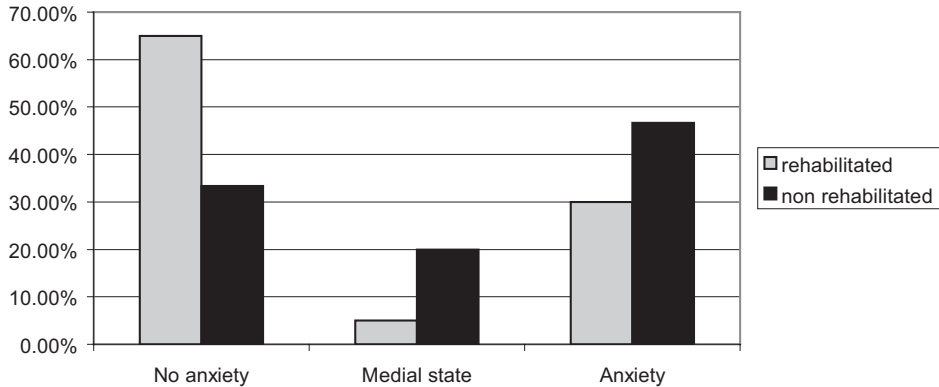


Fig. 6. Anxiety disorders for both groups

anxiety disorder was seen at 30% of this group. In the control group anxiety disorder were not discovered for 33.33% of the patients, and anxiety occurred with 46.67% patients. Graphical presentation of HADS-M survey results in the area of anxiety for both groups is seen in Fig. 6.

In the group of patients under rehabilitation 70% of the test group and 46.67% of the control group showed no depressive disorder. Depressive disorders occurred more frequently in non rehabilitated group (over 50% of patients). Graphical presentation of HADS-M survey results in the field of depressive disorders for both groups is shown on Fig. 7.

The results were analyzed from the statistical point of view. Comparisons of quality of life, assessment of anxiety and depression for both groups were done with usage of the Student's t-distribution. Analysis of this test confirmed the hypothesis that cardiac rehabilitation improves the quality of life of patients with the ICD, it reduces the level of anxiety and depression in this group. However, the differences between the results for the two groups are not statistically significant, and therefore research should be continued on larger patients group.

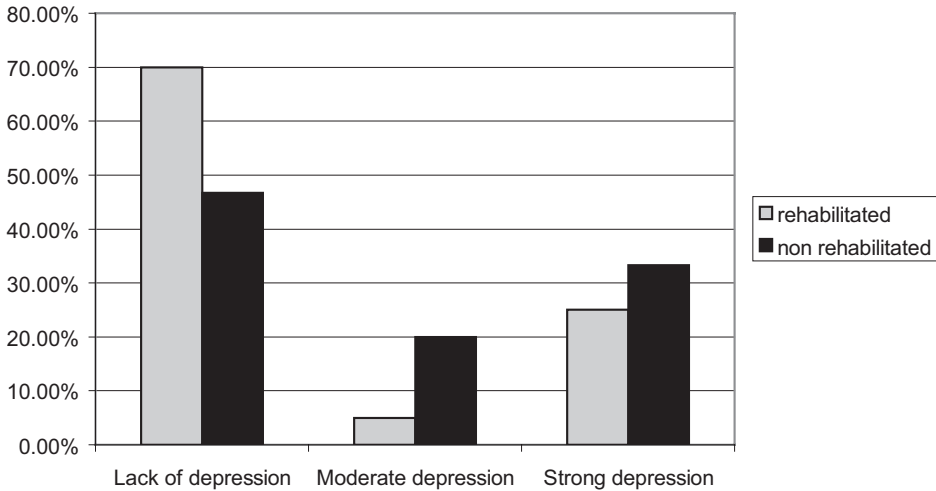


Fig. 7. Depressive disorders for both groups

Discussion

Over the past several years a dynamic development of new approaches to treatment, taking into account the patients quality of life is seen. This period brought many research about quality of life dependant on health condition, both in Poland and worldwide [12]. The interest in the patient's subjective feelings regarding illness and treatment is rapidly growing. An important factor is not only to lengthen the life, but also the possibility of re-entry into every day family and working life [11].

From the numerous studies on the quality of life in patients with an ICD a conclusion can be inferred that the tolerance of treatment is good – especially with comparison to potential alternatives, sudden arrhythmic death, and that these patients have higher quality of life than those who were treated with antiarrhythmic therapy. For example, in the Canadian Implantable Defibrillator Study (CIDS), 317 patients were evaluated using two questionnaires: Mental Health Inventory – MHI and the Nottingham Health Profile – NHP. Higher quality of life was reported with patients with an ICD implanted than with patients receiving antiarrhythmic drug Amiodaron [7]. In another study, Herbst et al. [4] compared the quality of life in patients with ICD (n = 24), patients receiving antiarrhythmic drugs (n = 35) and a group of people with an ICD simultaneously treated with antiarrhythmic drugs (n = 25). Then, these groups were compared with the general cardiological population (n = 73). Questionnaires used in this research were: SF-36 scale and 3 researches examining sleep, family functioning, sexual problems and relationships in marriage. There were no significant differences in quality of life in different groups – even after taking into account age, gender, disease and duration of treatment. But the adverse impact of antiarrhythmic drugs on quality of life was observed – independently of the presence of the ICD, demonstrated by physical limitation, weakened potency, emotional problems, sleep disturbance and increased stress.

To prevent the patient's withdrawal from existing forms of activity after ICD implantation, the appropriate prevention and various forms of training and rehabilitation should be applied. Controlled physical exercise can have positive influence in many ways on this group of patients, reducing or even minimizing the fear of effort, by modelling the activities of autonomic nervous system, stimulating the patients to be more active in everyday life [13]. According to literature, rehabilitation after implantation of cardioverter-defibrillator appears to benefit in many ways for patients and their families in the physical, psychological and social domains. Patients that were treated with a comprehensive cardiac rehabilitation have lower levels of anxiety, higher self-esteem and level of automotivation [2]. These parameters are improved during rehabilitation, and their satisfactory level is maintained up to several years after the end of therapy [9]. Since the differences between rehabilitated and non-rehabilitated groups were similar after several years, it seems advisable to implement a comprehensive program of late post-hospital rehabilitation in order to sustain the positive effects of hemodynamic, biochemical, psychological and related effects on the autonomous nervous system, made during its earlier stages.

The aim of our research was to demonstrate that the out-patient rehabilitation of patients with implantable cardioverter-defibrillator is effective and safe. In addition, to examine whether patients attending a rehabilitation have a higher quality of life and lower levels of anxiety and depression than patients who do not attend such rehabilitation. According to studies, patients attending out-patient cardiac rehabilitation are characterized with higher subjective quality of life than patients in the control group and the anxiety and depressive disorders in the study group were less likely than in the control group.

On average, 38% of people with an ICD, according to our research had anxiety disorders. Patients often declared fear for the discharge, or so-called ICD "shock" regardless on whether they experienced it earlier or not. Depressive disorders in both groups on average were showed with 42% of the respondents. According to relevant literature, depression affects 20-30% of patients with cardiovascular system diseases. Anxiety accompanies the cardiac arrhythmias and related symptoms. Patients with an ICD are part of this population. They are distinguished by recurrent, paroxysmal, life-threatening ventricular arrhythmias or high probability of its occurrence and ICD usage. Its purpose is obviously to reduce the risk of sudden cardiac death, but the device is causing intracardiac electrical discharges commonly referred to as "shocks" that cause considerable discomfort. Repeated discharges are triggering specific for this group anxiety disorders. Psychiatrists argue that patients with an ICD are a model population for research on the development of anxiety leading to panic attacks and a significant reduction in activity resulting from fear of discharge [3]. It seems that the psychological component plays a decisive role in the adaptation to the life of patients with ICD and substantially modifies the quality of life of patients [8].

Conclusions

Ambulatory cardiac rehabilitation in patients with implantable cardioverter-defibrillator brings many benefits to this group in the physical realm, which is reflected by the increase of the maximum load obtained during exercises as well as loads during training.

Properly programmed rehabilitation and carried out under constant control is safe and necessary.

Positive effects of rehabilitation are also visible in the psycho-social field. Higher subjective quality of life, according to both the SF-36 and MacNew questionnaire, is reported by patients attending the outpatient cardiac rehabilitation. These patients also have lower levels of anxiety and depression.

Thus, targeting patients to ambulatory cardiac rehabilitation after ICD implantation should be done by default, as is done in patients after acute coronary syndromes (ACS). Particularly preferred is creating separate training groups dedicated to patients with an ICD.

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Evaluation of Quality of Life in Rheumatoid Arthritis Patients in Respect to Administered Treatment

Ocena QoL chorych na reumatoidalne zapalenie stawów w zależności od zastosowanej formy terapii

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Abstract

At present Methotrexate considered a first-choice drug when treating rheumatoid arthritis (RA). It reduces clinical symptoms and hinders development of radiological changes. On the other hand, long-term administration of glucocorticosteroids in RA treatment is controversial since it may cause a significant adverse effects. The aim of this work is to estimate RA patients' quality of life (QoL) depending on an administered form of therapy, and to determine factors influencing patients' QoL. 60 RA patients were examined. Group A (n = 30) were treated with methotrexate; group B (n=30) with methotrexate and additionally with a glucocorticosteroid (GCS). The estimation was conducted using general questionnaire WHO Quality of Life-BREF (WHOQOL-BREF) and specific Health Assessment Questionnaire (HAQ). HAQ showed higher level of QoL in group A. However, WHOQOL-BREF showed a higher level of QoL in group B in all four domains. In group A, there was a significant statistical correlation between HAQ and the patients' age, Body Mass Index, duration of the illness, marital status, and education. In group B, such dependence occurred between HAQ age and marital status. When using WHOQOL-BREF questionnaire, group A showed correlation between: marital status and somatic domain; age, illness duration, BMI, marital status and psychological domain; age, BMI, marital status, duration of the illness and social domain; marital status and environmental domain. In group B no relation between socio-demographic and clinic factors has occurred. When a specific questionnaire was used, QoL showed to be better in group A – these patients had more satisfaction regarding treatment and suffered from fewer complications in comparison to the group with added GCS. When estimating QoL of patients with exacerbated RA, specific questionnaires should be used, since they show more adequately patient's actual state.

Key words: quality of life, rheumatoid arthritis, therapy.

Streszczenie

Metotreksat jest obecnie uważany za lek pierwszego rzutu w leczeniu reumatoidalnego zapalenia stawów (r.z.s.). Zmniejsza objawy kliniczne choroby oraz opóźnia postęp zmian radiologicznych. Natomiast przewlekłe stosowanie glikokortykosteroidów w leczeniu r.z.s. jest kontrowersyjne, gdyż może powodować poważne objawy niepożądane. Celem pracy była ocena jakości życia (QoL) i funkcjonowania chorych na r.z.s. w zależności od zastosowanej formy terapii oraz określenie czynników determinujących jakość życia. Badaniom poddano 60 pacjentów chorych na r.z.s.: grupa A (n = 30) to leczeni metotreksatem oraz grupa B (n = 30) leczeni metotreksatem i dodatkowo glikokortykosteroidem. Oceny jakości życia dokonano za pomocą kwestionariusza ogólnego WHOQoL – BREF i kwestionariusza specyficznego HAQ. W QoL kwestionariuszem HAQ wyższa jakość życia wystąpiła w grupie A. Jakość życia natomiast mierzona kwestionariuszem WHOQoL – BREF była istotnie wyższa we wszystkich 4 domenach grupy B. W grupie A stwierdzono istotną statystycznie zależność między kwestionariuszem HAQ a wiekiem ankietowanych, wartością wskaźnika BMI, czasem trwania choroby, stanem cywilnym i wykształceniem. W grupie B statystyczna zależność wystąpiła między HAQ a wiekiem i stanem cywilnym. W pomiarze dokonywanym kwestionariuszem WHOQoL – BREF w grupie A zależność stwierdzono między: stanem cywilnym a domeną somatyczną, wiekiem, czasem trwania choroby, BMI i stanem cywilnym a domeną psychologiczną, wiekiem, BMI i stanem cywilnym i czasem trwania choroby a domeną socjalną i stanem cywilnym a domeną środowiskową. W grupie B nie obserwowano istotnych zależności między czynnikami socjodemograficznymi i klinicznymi. Jakość życia została korzystniej oceniona w grupie A, gdy zastosowano specyficzne narzędzia. Chorzy ci byli w większym stopniu zadowoleni z leczenia i odczuwali mniejszą liczbę powikłań w porównaniu z grupą, której dołączono GKS. Do oceny jakości życia pacjentów z zaostrzeniem choroby reumatycznej należy stosować kwestionariusze specyficzne, które adekwatnie odzwierciedlają rzeczywisty stan pacjenta.

Słowa kluczowe: jakość życia, reumatoidalne zapalenie stawów, terapia.

Introduction

Rheumatoid arthritis (RA) is chronic and progressive disease of unknown etiology. Inflammation of growing number of joints causes nagging pains in an early phase of the disease and progressive impairment of their function, as the inflammation destroys joints' structure. The fastest progress of destructive changes occurs during first three years of the disease [1].

In Poland, there are more than 400 000 people suffering from RA. The disease attacks most frequently people 30 to 50 years old, and three out of four patients are female. RA is one of the most common rheumatoid illnesses and a serious social and economical problem. Improper treatment may lead to disability and the ill health approximately 7 to 10 years earlier. Research results show also what is most problematic in RA patients: aside from the access to effective treatment and rehabilitation, they complain mostly of pain and fitness reduction [2].

The need of holistic approach to treatment and the necessity to monitor RA patients' mental, physical and social condition are the source of the interest of their quality of life, and have become an important topic of scientific researches. The new concept of medicine tries not only to lengthen lifespan in a biological sense, but also to help ill people to remain as active as they were before [3].

Nowadays, it is well known how crucial is to set a diagnose quickly and to start treatment with Disease Modifying Antirheumatoid Drugs (DMARD). If the results are not satisfactory, new modifying drugs can be introduced to monotherapies or combination therapies.

Standard RA therapy involves administration of methotrexate (MTX) in doses depending on its effectiveness and tolerance. Such an approach is recommended also by National Adviser in state Consultant for Rheumatology Expert Panel of the National Consultant for Reumatology. According to them, MTX is a preferable modifying drug and only in the case of severe intolerance the administration of a second-choice drug is recommended. If MTX is not fully effective, it is recommended to combine it with other DMARDs [5].

According to statistics, about 50 percent of RA patients are treated with DMARDs. Unfortunately, (about 40%) at patients do not respond to the treatment, suffer from adverse side-effects (nausea, hair loss) or the medicine gradually loses its effectiveness. That is why administration of other drugs or combination therapy may be necessary [1].

Finding an effective therapy is often time-consuming. The basis is medicines, which should be chosen individually, depending on the patient's age and health, progression and course of the disease. The drawback of modifying drugs is that they take effect after 2–6 months and various side-effects. They have some contraindications: serious liver disorder, alcoholism, obesity, pregnancy. However, many patients are afraid of DMARDs because of their long list of adverse effects.

When patient's condition worsens, there may be need to combine modifying drugs with small doses of steroids. Steroids stop the inflammation giving quick relief (they lessen swellings and ease the pain). However, they also have serious side-effects. They may cause bone mass loss, hypertension, depressions and diabetes.

Aim

This work was to estimate Quality of Life of RA patients in respect to administered forms of therapy, and to determine factors influencing QoL in the group treated with methotrexate and in the group treated with DMARD added to a glucocorticosteroid therapy.

Material and Methods

Sixty RA patients were examined, all of them met criteria of diagnosis set by American College of Rheumatology (ACR) in 1987. Patients were divided into two groups: group A ($n = 30$), was treated with DMARDs (specifically: methotrexate); and group B ($n = 30$), treated with DMARD and additionally glucocorticosteroid (specifically: methylprednisolone). All patients had been informed about the aim of this study and agreed to participate.

Clinical activity of the RA patients was measured using Disease Activity Score 28. Pain intensity was measured using Visual Analogue Scale.

Estimation of QoL was based on 2 questionnaires: HAQ to estimate functional disability of the disease and WHOQOL-BREF questionnaire to evaluate subjective quality of life in four domains: psychological, somatic, social and environmental.

HAQ is a specific questionnaire, for assessment at patients' disability and comfort, treatment side-effects, difficulties with every-day activities during the week before the assessment, level of answering questionnaire patients' activity and degree of disability in each of them (in a three-degree scale) [5]. HAQ features high repeatability, regardless language version used [6]. This is a helpful and inexpensive method of monitoring patient's therapy [7]. Many studies has showed a correlation between the progression of the disease and a low QoL estimated with HAQ [8, 9]. There is a direct proportional correlation between the illness duration and the value of HAQ index [10].

Following predictor variables of QoL were used in this study: social and demographic factors (such as: age, sex, marital status, education, living conditions and domicile); clinical factors (number and the degree of affected joints, duration of the disease, smoking, duration of morning stiffness, BMI, DAS 28, administered treatment and accompanying conditions). Patients were asked their health to in a 4-degree scale (1 – bad, 4 – perfect) and compare to previous year. As well as how his or her current state is limiting their professional and social activity (1 – serious limitations, 3 – no limitations), and support received from their families (1 – no support, 3 – strong and dedicated support).

Statistical Analysis

STATISTICA 7.0 software (by StatSoft) was used for statistical analyses. The type of distribution was checked for all tested variables. The Shapiro-Wilk test was used. $P = 0.05$ was assumed as the critical level of statistical significance.

Arithmetic mean, standard deviation, medians and extreme values were calculated for all measurable variables. Occurrence frequency (in percents) was calculated for all qualitative variables. In the analysis of the qualitative variables, cross tabulations and chi-square test were used.

The U Mann-Whitney test was used in comparing quantitative variables in two independent groups (e.g. F vs. M). In dependent groups, Wilcoxon signed-rank test was used. Kruskal-Wallis test was used to compare average values of variables which do not meet criteria for analysis of variance.

The Spearman's rank correlation coefficient was used to measure strength and direction of correlations between tested variables (between QoL indicators and some of the clinical factors) because of their abnormal distribution. For all pairs of variables the Spearman's correlation coefficient was calculated, with $P < 0.05$ accepted as statistically significant.

All answers from WHOQOL-BREF questionnaire and obtained absolute results did not have normal distribution, which was proven with the Shapiro-Wilk test.

Results

Patients in the study group had been hospitalized in Academic Clinical Hospital in Wroclaw between November 2007 and March 2008. Group A ($n = 30$), consisted of 20 women, average age – 49.9; group B ($n = 30$), including 22 women, average age – 54.3. The characteristic of both groups are presented in Table 1.

Table 1. Data describing both tested groups

	Group I	Group II	Group III	Results
Number of people N	30	30	31	$\chi^2_{v=2} = 3.28$ p = 0.194
In it: females	20 (66.7%)	22 (73.3%)	16 (51.6%)	
Age:				H = 3.75 p = 0.154
the mean \bar{x}	49.9	54.3	46.3	
standard deviation s	18.1	14.3	20.0	
median x_{med}	48	56	46	
the lowest value x_{min}	23	24	18	
the highest value x_{max}	79	79	90	
BMI [kg/m ²]:				H = 2.85 p = 0.241
the mean \bar{x}	25.0	26.1	24.3	
standard deviation s	4.9	3.8	4.0	
median x_{med}	23.6	26.4	23.9	
the lowest value x_{min}	16.4	18.9	15.7	
the highest value x_{max}	35.7	31.6	33.3	
Marital status:				$\chi^2_{v=2} = 6.61$ p = 0.158
single	11 (36.7%)	4 (13.3%)	7 (22.6%)	
married	11 (36.7%)	18 (60.0%)	19 (61.3%)	
widowed	8 (26.7%)	8 (26.7%)	5 (16.1%)	
Domicile:				$\chi^2_{v=2} = 9.84$ p = 0.043
the country	9 (30.0%)	7 (23.3%)	3 (9.7%)	
town	12 (40.0%)	15 (50.0%)	24 (77.4%)	
city	9 (30.0%)	8 (26.7%)	4 (12.9%)	
Education:				$\chi^2_{v=2} = 4.80$ p = 0.569
primary	4 (13.3%)	6 (20.0%)	4 (12.9%)	
vocational	7 (23.3%)	10 (33.3%)	8 (25.8%)	
secondary	13 (43.3%)	13 (43.3%)	15 (48.4%)	
tertiary	6 (20.0%)	1 (3.3%)	4 (12.9%)	

53.3% patients of group A were simultaneously treated for hypertension, 23.3% for ischemic heart disease and 30% for stomach ulcer. Ation group B, it was respectively 42.3%, 33.3% and 20.2%. Moreover, 13.3% of group A and 10% of group B had suffered from diabetes.

The average illness duration of group A was: 5 years or less (36.7%), 6–10 years (30%), 11–20 years (26.7%), more than 20 years (6.7%). In group B:

5 years or less (30%), 6–10 years (43.3%), 11–20 years (16.7%), more than 20 years (10%). It was a following hospitalization for 90% of group A, and 86.7% of group B.

The analysis of QoL using HAQ has showed better quality of life in group A (1.4 vs. 1.6) ($p < 0.0001$). However, QoL measured with WHOQOL-BREF was statistically significantly higher in all four domains in group B. Somatic domain 1.6 vs. 1.4 ($p = 0.061$), psychological domain 83.1 vs. 82.8 ($p < 0.0001$), social domain 39.3 vs. 36.4 ($p = 0.006$) and environmental domain 95.7 vs. 91.7 ($p = 0.001$). Disease Activity Score was statistically significantly higher valued in group B (15.5 vs. 13.8) ($p < 0.0001$). Pain intensity, measured with Visual Analogue Scale, was more intense in group A (50.1 vs. 43.9) (ns).

Morning stiffness duration was one of the diagnostic criteria. Longer stiffness (more than 2 hours) was pointed in group B (33.3% vs. 13.3% in group A). In group A, that lasted for: 0.5 h or less (30%), 0.5–1 h (20%), more than 1.0–1.5 h (10%), 1.5–2 h (26.7%). In group B, it was respectively: 16.7%, 26.7%, 20%, and 3.3%. The therapy duration was similar in both groups (group A: 4.1 years, group B: 4.3 years) (ns). More patients in group A had experienced an improvement of their state (43.3% vs. 36.7%), whilst a huge number in group B (30% vs. 23.3%) felt no improvement at all. The frequency of treatment complications was greater in group B: skin complications (70%), gastric problems ones (53.3%), blood count (63.3%), other complications (90%). In group A it was: skin c. (60%), gastric c. (56.7%), in the blood image (20%), other c. (83.3%).

Patients has estimated their health themselves and 53.3% of group B described it as “bad” (group A: 30%) ($p < 0.005$). Similarly, a large part of group B (66.7% vs. 53.3%) said that their state had worsened over the year ($p < 0.008$). For both groups (86.7%, $p < 0.0001$) treatment was a burden for their home budget. Patients in group B more often said that the disease had limited their professional activity (70% vs. 56.7%) ($p < 0.0001$). However, the limitation of social activity was similar in both groups (56.7% in group A vs. 53.3% in group B) ($p < 0.0001$). In both groups 30% of the patients felt no support from their relatives ($p = 0.036$).

In group A there were a statistically significant ($p < 0.05$) correlation between HAQ and the patients’ age, BMI, duration of the disease, marital status and education. In group B the correlation occurred between the questionnaire and age, and marital status.

Using WHOQOL-BREF, there were following statistically significant correlations in group A: between marital status and the somatic domain; between age, duration of the disease, BMI, marital status and the psychological domain; between age, BMI, marital status, duration of the disease and the social domain; between marital status and the environmental disease.

In group B, no significant correlations between social-demographic or clinical factors and the WHOQOL-BREF results were observed.

Statistically significant correlations in living conditions were found more often in group A (between the humidity in rooms and the HAQ and the WHOQOL-BREF parameters in the social domain). In group B, there was a correlation between the floor number of storeys and the HAQ results and between the humidity in rooms and the social domain in the WHOQOL-BREF questionnaire.

Moreover, there was a statistically significant correlation between patients' estimation of their health in group A, limitation of professional and social activity, lack of social support and HAQ in all domains of the WHOQOL-BREF questionnaire. In group B, such a correlation was only observed between health evaluation, social and professional activity limitation and HAQ.

The matrix of Spearman's coefficients of correlation between QoL indicators and some of the analysed parameters of the 30 RA patients (group A)

	Sex	Age	BMI	Marital status	Education
HAQ	0.000	0.619	0.386	0.484	0.630
Somatic	-0.016	-0.245	-0.354	-0.457	-0.113
Psychological	0.016	-0.369	-0.437	-0.612	-0.141
Social	-0.057	-0.490	-0.387	-0.616	-0.210
Environmental	-0.127	-0.343	-0.311	-0.441	-0.211

The matrix of Spearman's coefficients of correlation between QoL indicators and some of the analysed parameters of the 30 RA patients (group B)

	Sex	Age	BMI	Marital status	Education
HAQ	0.022	0.512	0.321	0.390	0.340
Somatic	0.340	-0.186	0.082	0.023	0.139
Psychological	0.359	-0.361	-0.074	-0.189	-0.075
Social	0.035	-0.325	-0.041	-0.088	-0.100
Environmental	0.262	-0.305	0.218	0.151	-0.036

The matrix of Spearman's coefficients of correlation between QoL indicators and some of the analysed parameters of the 30 RA patients (group A)

	Humidity in rooms	Flat/ house	Number of storeys	Duration of disease	Nicotine
HAQ	0.383	-0.045	0.111	0.385	-0.310
Somatic	-0.097	0.123	0.061	-0.317	-0.236
Psychological	-0.276	-0.049	0.192	-0.476	-0.062
Social	-0.508	0.119	-0.078	-0.489	-0.014
Environmental	-0.271	-0.061	0.163	-0.294	-0.023

The matrix of Spearman's coefficients of correlation between QoL indicators and some of the analysed parameters of the 30 RA patients (group B)

	Humidity in rooms	Flat/house	Number of stores	Duration of disease	Nicotinism
HAQ	0.234	0.333	-0.392	0.269	0.069
Somatic	-0.047	-0.074	0.130	-0.143	-0.014
Psychological	-0.043	-0.260	0.199	-0.034	0.137
Social	-0.365	-0.210	0.241	-0.091	0.008
Environmental	-0.086	-0.093	0.137	-0.140	0.121

The matrix of Spearman's coefficients of correlation between QoL indicators and some of the analysed parameters of the 30 RA patients (group A)

	DAS28	VAS
HAQ	0.323	-0.044
Somatic	-0.400	-0.330
Psychological	-0.210	-0.270
Social	-0.162	-0.113
Environmental	-0.268	-0.294

The matrix of Spearman's coefficients of correlation between QoL indicators and some of the analysed parameters of the 30 RA patients (group B)

	DAS28	VAS
HAQ	0.372	-0.222
Somatic	0.145	0.081
Psychological	-0.016	-0.077
Social	0.053	-0.047
Environmental	-0.083	-0.109

Results

Methotrexate is presently considered a first-choice drug in treating rheumatoid arthritis. It lessens clinical symptoms of the illness and slows down the progress of radiological changes. After 2 years of MTX treatment it is continued in 55–81%, after 5 years in 46–62%, and after 10 years in 30% of all examined cases [11]. On the other hand, a long-term glucocorticosteroids administration in treating RA is controversial. Because of serious side effects, although many rheumatologists consider them safe and effective in small doses.

In our research we compared quality of life and its determiners between patients treated with MTX and with MTX and GCS at a time. Patients from group B had been ill longer, whilst patients from group A had more concomitant conditions. There is no doubt that RA patients' accompanying conditions

can further worsen their quality of life, influencing the disability and the overall state of their health [12, 13].

The analysis of QoL using HAQ showed better results in group A in spite of higher intensity of pain, measured with VAS and longer duration of the morning stiffness (longer than 2h for 33.3% of patients). When the WHOQOL-BREF questionnaire was used, QoL was higher in group B in all four domains, in spite of higher activity of the disease (measured with DAS 28). Although the questionnaire showed that QoL was higher, 53.3% of patients from group B described their condition as “very bad”, 66.7% of them also said that it was much worse comparing to previous year and the administered therapy had not helped. Regarding patients from group A, the questionnaire has showed lower QoL values, they gave a positive subjective opinion of their health and, in contrast to group B, fewer patients felt no improvement after the therapy. Bad health condition manifested itself in greater limitations in social and professional activity in group B. Both groups equally complained about the lack of support from the society. Despite an intense pain and long morning stiffness, the specific questionnaire showed higher QoL in the group treated with MTX. In spite of negative opinions about their health, the progress of the disease and the ineffective therapy. In the group treated with MTX and GCS, QoL was higher when general WHOQOL-BREF questionnaire was used. It is possible that general questionnaires used to examine such a specific group of RA patients are not sensitive enough to assess individual health discomfort, which however can be measured by HAQ. In research by Sierakowska et al. the RA patients' QoL was estimated using the WHOQOL-BREF questionnaire in the following domains: physical, psychological, social and environmental. It has showed that the ill persons rated the physical and the environmental domain lowest in the scope of freedom, psychological safety, accessibility and quality of the healthcare. According to Sierakowska, two-thirds of the examined were not satisfied with their health status [14].

Factors Affecting the Evaluation of QoL

The functional disability (expressed with HAQ results) is one of the most important factors independently influencing QoL, and leading to disability in the first five years of the illness [15]. The information provided by HAQ is concerned mostly with physical functionality of patients and is the best source for predicting incapacity for work [16], death rate [17] and quality of life of RA patients [18].

In the tested group A there was a statistically significant relation between HAQ and the following social-demographic and clinical factors: BMI, duration of the disease, marital status, education and living conditions (humidity in rooms). A statistically significant correlation was also present in the limitation of professional and social activities, and the lack of social support in both HAQ and in all domains of the WHOQOL-BREF questionnaire. In group B, there was a statistically significant relation with HAQ in: age, marital status, living conditions floor number, lack of family support, limitation of professional and social activities.

Similarly, in research conducted by Bączyk [19], the overall estimation of QoL fits in average ranges. The good QoL values were a result of the support from RA patients' family members and friends. The bad values were a result of

a limited ability to fulfil everyday activities. This was connected with joint pains, difficulties in walking and bending, anxiety and susceptibility to depression.

With the QoL values in the somatic, psychological and social domains of the WHOQOL-BREF questionnaire, they correlated in group A with: the aforementioned limitation of professional and social activities and the lack of support, and age, marital status, BMI, living conditions and duration of the disease. In group B, when WHOQOL-BREF was used, there were no significant correlations between QoL values and the socio-demographic and clinical factors (the only exception was living conditions in the social domain).

In the literature, it is often shown that drugs used in RA therapies have many side effects. Our research also touches upon this issue. All kinds of complications (including: skin, stomach and blood) were present in both examined groups but occurred more frequently in group B.

The group treated only with MTX had generally better results in our analyses. These patients had higher QoL values (when using HAQ) and fewer complications and described their health status more positively and noticed benefits of the administered therapy. Analysing statistical correlation between QoL and clinical or socio-demographic factors, in this group the significance was higher. Similar research was conducted by Tugwell et al. [20]. Methotrexate, administered in full dose as monotherapy or in combination with other drugs in case of an incomplete effectiveness, can achieve remission in 42% of cases [21], and a significant (i.e. 70%) improvement in slightly more than 70% of cases [22].

In the group treated with MTX and GCS, the analysis showed lower values in HAQ, but higher QoL values in WHOQOL-BREF. Patients complained about their health status and effects of the treatment. Fewer socio-demographic and clinical factors statistically significantly influenced the results.

An influence of the administered therapy was analysed in the published works [23]. There were visible distinctions between the examined groups (to the disadvantage of patients treated with MTX) in scope of the advancement of the disease and the indicators of the inflammation intensity. An average time of the observation was 6 years. During the research 15% of the patients died.

Conclusions

When the specific questionnaire was used, the estimation of QoL was better in group A. In comparison to the group where a GCS was administered, these patients were more satisfied with the therapy and suffered from fewer complications, which may suggest the necessity to make the use of GCS as short as possible.

Specific questionnaires should be used to estimate RA patients' Quality of Life, because they present the patient's actual state of health adequately.

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Diagnostic Imaging of Scoliosis

Diagnostyka obrazowa skolioz

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Abstract

Scoliosis, which is one of the most common causes of bad posture, despite its common name – lateral curvature of the spine, it's not just a lateral curvature but it is a disorder on all three planes. The deformation of the spine does not only have an effect on the human skeleton, but also has an effect on the respiratory and circulatory systems as well as certain internal organs and therefore should be regarded as a systemic disease. This paper presents a method of diagnostic imaging of scoliosis (X-ray, CT, MRI). Diagnostic imaging is an area dedicated to imaging the human body through various methods. Its main and oldest method is radiology, which today includes computed tomography and magnetic resonance imaging in addition to conventional radiological examinations. Currently the most popular methods of diagnosis are ultrasounds and nuclear medicine [9].

Key words: diagnostic imaging of scoliosis, conventional radiology study.

Streszczenie

Skolioza, będąca jedną z najczęściej występujących wad postawy, mimo powszechnej nazwy – boczne skrzywienie kręgosłupa, nie stanowi wyłącznie bocznego skrzywienia, ale jest zaburzeniem we wszystkich trzech płaszczyznach. Zniekształcenie to nie dotyczy tylko układu kostnego, ale przez wieloukładowe skutki na przykład w układach oddechowym i krążenia oraz w narządach wewnętrznych, należy ją traktować jako schorzenie ogólnoustrojowe. W pracy zaprezentowano metody diagnostyki obrazowej skolioz (RTG, TK, MRI). Diagnostyka obrazowa jest to dziedzina zajmująca się obrazowaniem ludzkiego ciała za pomocą różnych metod. Jej główną i najstarszą metodą jest radiologia, która współcześnie zawiera oprócz konwencjonalnego badania radiologicznego, także tomografię komputerową oraz badanie rezonansem magnetycznym. Do współczesnej diagnostyki obrazowej należy także ultrasonografia i medycyna nuklearna [9].

Słowa kluczowe: diagnostyka obrazowa skolioz, konwencjonalne badanie radiologiczne.

Introduction

Radiological examination is the most important test in the diagnosis of scoliosis. After a basic examination of the patient which is the functional test, a radiological study confirms and illustrates the real structural changes and the severity

of the disease. In modern physiotherapy it is required that the therapists has the ability to evaluate X-rays mainly in order to accurately diagnose the type of scoliosis, also to be able to propose the appropriate model and type of rehabilitation. The X-ray can serve as an objective assessment of the effects of rehabilitation and to monitor the progression of the curvature.

Physical and Technical Basics of X-ray Study

Diagnostic radiology is used for imaging X-ray beam radiation despite overwhelming progress of modern technology, this diagnostic method which was discovered back in 1895 by Wilhelm Roentgen did not lose its usefulness. The main benefits of using this technology are its universal availability, affordable price and the speed of obtaining results. Conventional X-ray tests are primarily used to examine the human skeleton, internal organs, chewing system and after the administration of contrast media which is used to better absorb radiation in poorly absorbing tissue, the tests can be used to image the urinary tract and upper or lower gastrointestinal tract. Radiographs are formed due to the ability of X-rays to pass through many materials and blackening of photographic film. The radiation is produced by the X-ray tube and the detector can be an X-ray film, memory boards are used in recording analogue or digital video recordings. The object (the patient's body) is placed between the X-ray tube and the cliché (Fig. 1). The level of radiation is weakened whilst passing through the X-rayed object. The level depends on the thickness of the tissue, its nature and construction creating an image, which is a two-dimensional projection of the spatial distribution created by the ability to absorb photons of radiation. The weakening of the radiation after passing through the patient's body depends on factors such as the wavelength of radiation, the exposure conditions chosen by the electroradiology technician performing the test, the effective atomic number (average atomic number of elements making up the tissue), the density of the test structure, the thickness of the test object.

The resulting image is negative. Light areas in the pictures represent a radiation-absorbing hard tissue like bone. However, dark spots are formed by radiation that reached the membrane after penetrating tissue encountered along the

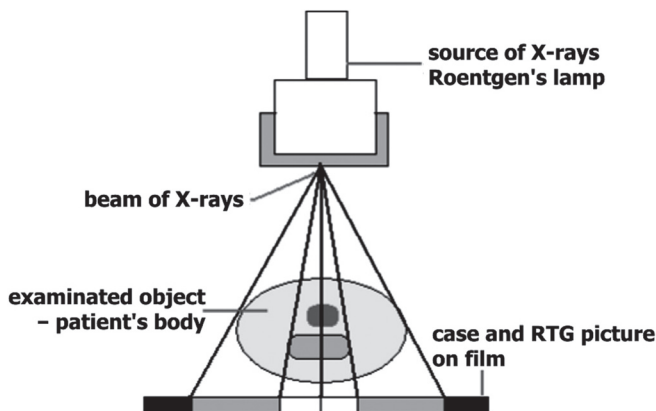


Fig. 1. Schematic X-ray studies (according to Miękisz) [7]

way with a low absorption of radiation such as lung, adipose tissue [7, 9]. Photos show the test area in one dimension, so for a proper assessment two projections are made and are generally aligned at an angle of 90° . These are usually pictures in anteroposterior projection (AP-anterior-posterior) and posterior anterior (PA-posterior-anterior) and lateral picture (LAT-lateralis) [1, 10].

X-rays are capable of adverse effects on living organisms. Ionizing radiation causes radiolysis of water, which as we all know is an essential cell mass. Radiolysis products are very active molecules of HO_2 and H_2O_2 that reacts with molecules of DNA and cellular proteins, which lead to damage or even destruction. The sensitivity of cells to ionizing radiation is higher the greater their proliferative activity and the smaller is the differentiation of tissue. Particularly vulnerable are the hematopoietic organ, gastrointestinal tract, muscles and reproductive epithelium of the epidermis, gonads, lens of the eye. Overexposure can have many side effects that include skin-rashes, ulcers, cataracts in the eye, infertility, changes in reproductive organs, pneumonia, emphysema and even secondary cancers. In order to protect the radiologist and the patient from the side effects of X-rays used in the methods of research are radiation protection rules, which reduce time and dose of radiation to a minimum, and the use of fixed guards and personal [3].

Anterior-Posterior Radiograph of the A-P

The basis of diagnosis of scoliosis is a picture in the anterior-posterior projection (AP), which should be performed on a patient with no underwear and shoes, standing in a relaxed position with their back to the cassette film. Standing position allows the activation of the force of gravity on the axis of the spine, and therefore allows a more functional assessment of the distortion and prevents the occur-



Fig. 2. X-ray of the spine in the anterior-posterior projection (AP) [13]

rence of passive correction of scoliosis, which could happen if the patient were lying down. The patient should braid his hands on his shoulders in order to avoid sinking of the upper limbs to test the surrounding area and thus obscure the structures evaluated. Radiation Exposure is performed on a patient's breath-hold to prevent out of focus images because of the commotion on the respiratory movements. You can perform X-rays of individual sections of the spine on separate plates, but for the diagnosis of scoliosis an image of the entire spine is preferred on the film. A radiograph can be performed on the membrane with dimensions of $43\text{ cm} \times 35\text{ cm}$, but preferably on a longer format with dimensions of $90\text{ cm} \times 30\text{ cm}$, so it is possible to cover the entire cervical spine, thoracic and lumbar spine, chest, pelvis and hip joints on a single photo (Fig. 2). Such

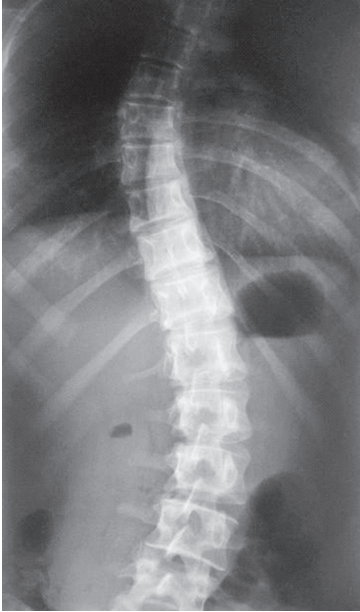


Fig. 3. X-ray in the anterior-posterior projection of a 15 year old girl before being fitted with a corset [14]



Fig. 4. X-ray in the anterior-posterior projection of the same 15 year old girl in a corset [14]

imaging allows assessment not only of the line of the entire spine, but also distortion and decompensation of the chest. It is also possible to identify differences in the length of the lower limbs due to a raised femoral head. If there is any inequality of the lower limbs the image should be taken using a cushion pad under the foot with an appropriate height [1, 9].

Front Image: Rear images are only preformed after the surgical treatment of scoliosis and after a corset has been customized and fitted to the patient's torso in order to assess the effects of the treatment. (Fig. 3, Fig. 4).

Lateral Radiograph

When performing lateral images the patients entire spine is positioned sideways to the cartridge, the upper limbs should be placed behind the neck or on a supporting side table. It is recommended to set the patient's scoliosis convex closer to the cartridge in order to reduce the image distortion resulting from the increased distance from the film. The rest of the rules remain the same as the implementation of the anterior-posterior image.

Lateral radiograph is used in addition to the anterior-posterior radiograph allowing the assessment of the space between vertebrates, curvature of the spine in comparison to the sagittal plane and the position of the sacrum. It can be made on a single film using a single exposure of radiation, but it is usually performed as X-rays of individual sections of the spine (Fig. 5, Fig. 6) [1, 3].

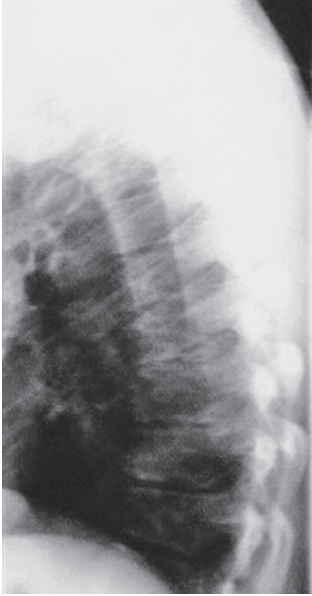


Fig. 5. X-ray of thoracic spine in lateral projection [14]

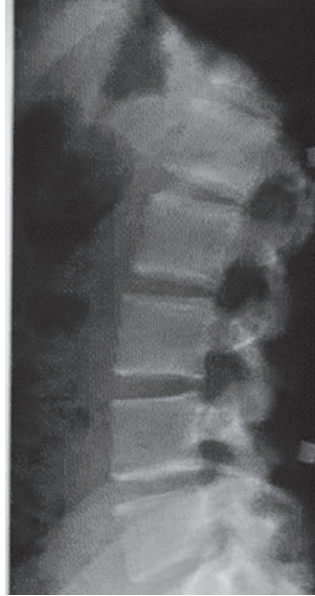


Fig. 6. X-ray of the lumbar spine in lateral projection [14]

Lateral Radiographs in a Bent Position

Lateral radiographs are a rare type of imaging, performed only if requested by a specialist. It serves as an assessment of the spine and intervertebral discs prior to the operative treatment of scoliosis. The test is performed in a standing position or lying down position to the maximum possible deviation of the patient.

The evaluation of the passive state of scoliosis is made possible by performing a radiograph while stretching the spine. Such testing requires the proper application of tensile force under the supervision of a physiotherapist [1, 6].

Cobb method of measuring the curvature Cobb method is the most common way of determining the angle of curvature of the spine. It involves the appointment of a simple perpendicular to the line passing through the upper surfaces of the upper range limit and the lower surface of the lower range limit, so as to be crossed at right angles to each other. The angle between them determines the amount of curvature (Fig. 7) [2, 4, 5].

The Raimondi method used in determining the rotation of the spine vertebrates. In healthy humans the shadows formed on the radiograph by the epiphyses arc circles are symmetrical and spaced at equal distances from the sides of the vertebral body. The position of the epiphysis arcs on X-rays is useful in assessing the degree of vertebral rotation. We can distinguish four degrees of rotation:

- first degree: base of the arch on the side of the convex curve is shifted towards the axis of symmetry of the circle, and the opposing base is applied to the edge of the vertebral body;
- second degree: the arc on the base of the convex side is very close to the axis of the symmetry of the circle, the base of the concave side is almost invisible;

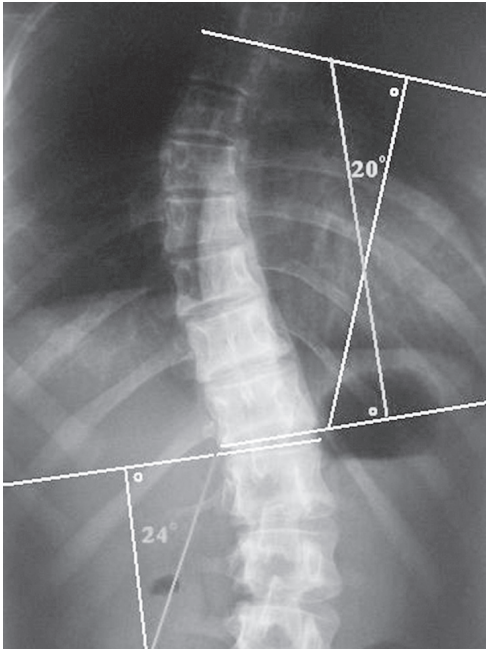


Fig. 7. The method of measuring the Cobb angle of curvature [13]

- third degree: the arc on the base of the convex side is in the region of the axis of the symmetry of the circle, the base of the concave side is invisible;
- fourth degree: the base side of the convex curve crosses the axis of symmetry of the circle, the base of the concave side is invisible.

Raimondi's method is very accurate when measuring the degree of rotation of the circle, the error value is only 0.5° . In this method you can use a normal ruler with a centimetre scale or Raimondi's special ruler that in addition to the centimetre scale has the scale of the degree of rotation, distance from the edge of the circle to the base of the arch and the scale of the width of the circle. For measuring the rotation of the circle, it is necessary to determine the width of the vertebral body and the distance between the side of the vertebral body and the centre of the base of the vertebral arch. The result is read from a table developed by Raimondi [5].

Risser's Test

The evaluation of bone maturity in patients with scoliosis is of particular importance because of the risk of rapid progression if scoliosis is detected while the bone development is not yet complete. The prognosis of the bone age plays a big role in determining the treatment and rehabilitation that should be used.

Risser's test takes into account the simultaneous completion of the development of the spine and pelvis. An X-ray can easily assess the level of completion of the development of the pelvis because the hip ridge plates will have characteristic ossification band. They begin to appear on the front upper iliac spine, and when the ossification band fuses with the iliac crest in the vicinity of the upper posterior iliac spine, then it is considered that the increase in the spine and pelvis has been completed (Fig. 8) [5].

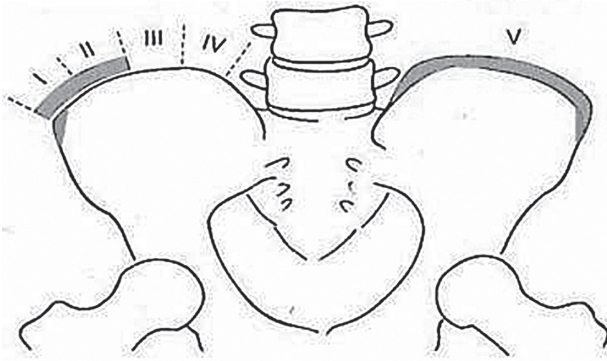


Fig. 8. Risser's test schematic degrees [11].
 I – 25% of ossification of the iliac crest, II – 50% of ossification of the iliac crest, III – 75% of ossification of the iliac crest, IV – complete ossification, V – anastomosis of the iliac crest of the ilium

RACHIS – Computer Analysis of Radiograms

In the modern age of computers, a new method has been found of analyzing the radiographs which provides certain information regarding the bending of the spine without the need for additional tests. The computer program RACHIS uses two-dimensional coordinate's of the two radiographs images: anterior-posterior and lateral. Through mathematical calculations it is possible to obtain a three-dimensional reconstruction, and such other information as the Cobb angle, degree of rotation angle peak (AVR-apical vertebra rotation), and the centre of gravity of the vertebra.

Three-dimensional imaging of the spine shows the distortion and compensation in all planes. This proves that scoliosis is a three-dimensional deformation [6].

Computed Tomography

Computer tomography (CT) is listed as one of the methods used to obtain an image of organs and tissue with a high level of accuracy. This method is used to display the layers of the human body through the use of a thin, fan-beam X-rays. Radiation source and detectors move around in a circular motion perpendicular to the long axis of the patient. After passing through the body of the patient, the detectors measure the strength of the weakened radiation. During the test, the patient is placed on the table which is moved into the so-called gantry, inside which there are X-ray tubes and detectors of radiation (Fig. 9) [7].

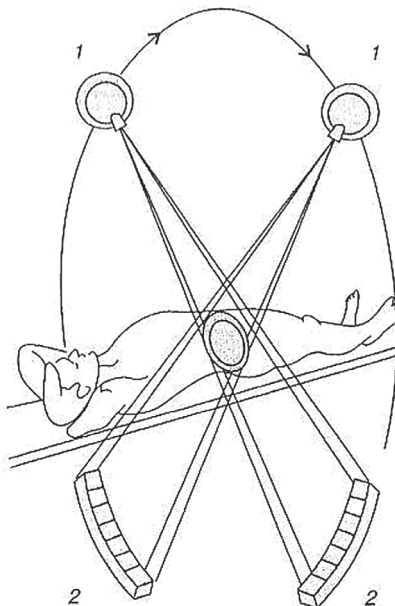


Fig. 9. Principles of computed tomography: 1 – X-ray tube, 2 – radiation detectors [9]



Fig. 10. Rotation measurement of the vertebra of a 60 year old patient with scoliosis [12]

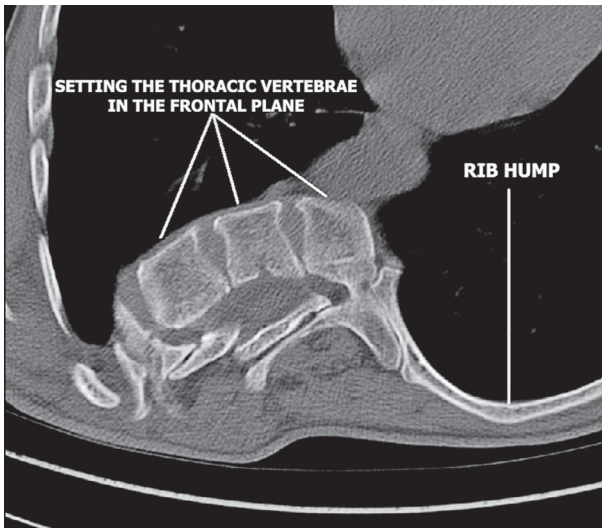


Fig. 11. Cross section through the chest in a 47 year old man as to reveal rib hump and setting the thoracic vertebrae in the frontal plane [12]

A complete CT scan consists of multiple parallel layers of images. The information obtained is recorded in computer memory and can then be used after the computer has analyzed the information. The computer is able to reconstruct a two and three dimensional image of any part of the body. The capabilities of these imaging methods are also very useful in the evaluation of scoliosis. It can be used to observe deformities such as the rotation of the vertebrae (Fig. 9) as well as deformities of the trunk and chest (Fig. 10, Fig. 11).

Of course, the visibility of the entire torso and spine for scoliosis requires the implementation of many layers, which significantly exposes the patient to ionizing radiation. Therefore, in order to reduce the radiation dose, cross-section

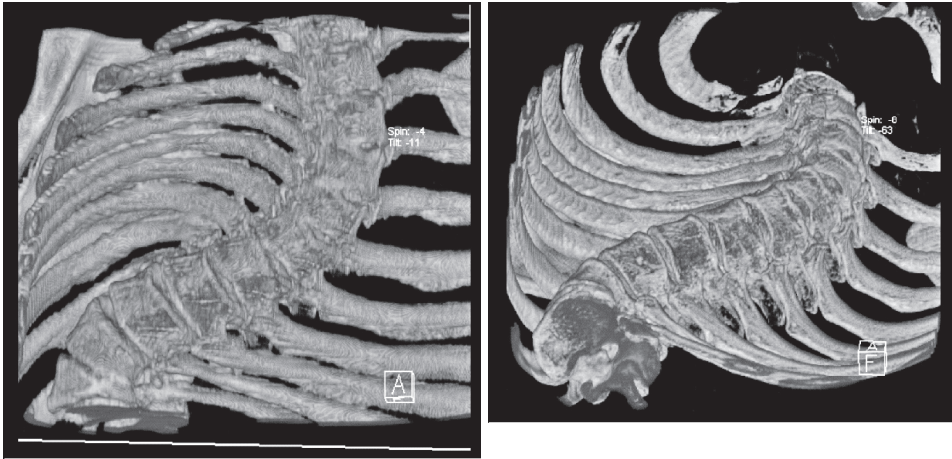


Fig. 12. 3D reconstruction of the chest in a 47 year old man. Front view (AP) and top (cranio-caudal) [12]

images (scans) can be performed on the border of each vertebra from the atlas bone to the pelvis. Thanks to the initial tomography test which is like the X-ray of the spine in the anterior-posterior projection in two-dimensional of the body in the frontal plane, it is possible to perform measurements according to the Cobb angle of curvature, the Raimondi degree of rotation of the vertebra as well as the Rissera test. The CT method is also used to visualize the implants used during the surgical treatment of curvatures of scoliosis patients [9].

Magnetic Resonance Imaging

Another method of diagnostic imaging is magnetic resonance imaging (MRI, MRI – magnetic resonance imaging). This technique is based on the phenomenon of nuclear magnetic resonance, namely the absorption of radio frequency electromagnetic waves by the nuclei of atoms contained in the magnetic field. During the test, the patient is placed lying flat on a table surrounded by a big electromagnet similar to that of a CT scan. The patient is subjected to a series of electromagnetic pulses, which leads to excitation of hydrogen nuclei in the tissue which leads to the release of energy in the form of radio frequency pulses. Similarly to the computed tomography system, the detectors around the patient measure the energy released by the by the tissue. The resulting image is a reflection of the intensity of the signal emitted by the tissue. Areas that emit higher intensity signals are brighter and less intensive signals are darker [7].

Images produced by the magnetic resonance imaging method do not require the use of potentially harmful X-rays and is particularly useful for detecting lesions in the soft tissues, especially in concealed bones. The MRI scan is particularly useful when scanning nervous system such as the brain or medulla oblongata, which is not visible when using conventional radiological studies. In the case of scoliosis: MRI is useful in detecting defects of the nervous system such as syringomyelia and spinal cord herniation (Fig. 13). It is particularly useful in the diagnosis of neuropathic scoliosis. This test can not be performed in patients with ferromagnetic implants [1, 6].

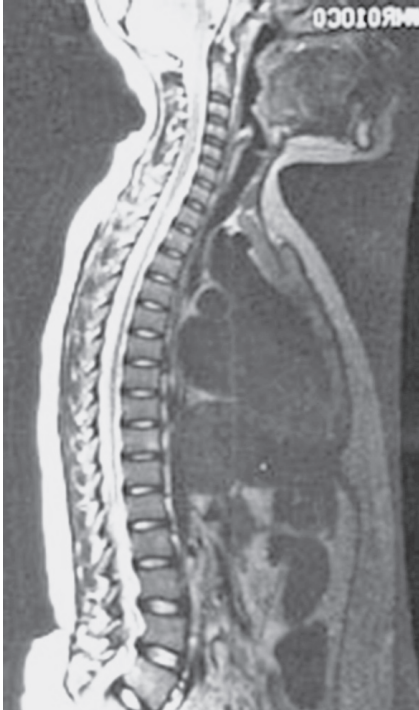


Fig. 13. Side-Scan (cross section) MRI of the spine of a 7-year-old boy with 30° scoliosis [11]

The biggest disadvantage of computed tomography and magnetic resonance imaging is that the test is conducted while the patient is lying down. This position eliminates the force of gravity and control of posture controlled by deep sensory receptors. Another disadvantage is the distortion of images caused by pressure exerted on the rib hump, lumbar shaft and spine while lying on back, as well as rib hump compression while lying on front. An additional difficulty in performing these studies is the scarce availability compared to conventional radiology and quite a big expense. The large advantage is its accuracy, the ability to obtain three-dimensional reconstruction, and the ability to extract a detailed picture of bony structures or soft structures [1, 6, 9].

Conclusions

It is very important that all diagnostic imaging methods are repeatable and have a very specific set of testing conditions which is undoubtedly lead to excellent standardization [1, 6, 9]. Scoliosis is a systemic disease because its effects are not only in the motor system, but also in internal organs and in the cardio-respiratory system. Although the literature on this subject is very broad and much research on it is conducted, the underlying causes are not fully explained. It is also difficult to clearly identify the best method and instrument to use when diagnosing scoliosis. Due to the complexity of the problem of providing a lateral curvature of the spine, generally a specialized diagnostic is required. There are many methods of diagnosing patients with scoliosis. Some of them seem to be around for many years such as the primary clinical trial, in an interview, a visual assessment of posture, or functional clinical tests. With the ongoing advances in

science and technology, more accurate instruments and methods are being developed to enable a fair and real assessment of the structure and deformation of the human body. Among the additional tests the most important is the imaging of deformations of the musculoskeletal system and body, complemented by the tests which diagnose the physical capabilities of the patient. Thus a comprehensive diagnosis provides a better and more accurate indication of the therapy to use, which greatly increases its effectiveness.

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Factors in Sensory Integration Disorder in Children

Czynniki wpływające na zaburzenia integracji sensorycznej u dzieci

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Abstract

Sensory integration by A.J. Ayres is a neurological process, which organizes sensory information from the body and environment and enables the creation of appropriate adaptive reactions. The aim of this study was to assess risk factors of sensory integration disorders in children aged 3–12. In the assessment, factors connected with pregnancy and labour, child's development in the first year of life were taken into account, as well as factors such as presence of allergy, head injuries, vision and hearing defects etc. The study demonstrated that antepartum and labour course are significant risk factors of sensory integration disorders. One of the most important factors is labour by caesarean section. Also disturbances in child's development in first year increase the risk of SI disorders in future. Newborn's lower Apgar score also affects sensory integration – the lower score, the greater risk of occurrence of SI disorders.

Key words: sensory integration, development, children, pregnancy.

Streszczenie

Integracja sensoryczna według dr A.J. Ayres jest procesem neurologicznym, który organizuje wrażenia płynące z ciała i środowiska tak, aby mogły być wykorzystane w celowym działaniu. Celem pracy była ocena czynników mających wpływ na zaburzenia integracji sensorycznej u dzieci w wieku 3–12 lat. Ocenie poddano czynniki związane z przebiegiem ciąży, porodem, rozwojem w pierwszym roku życia oraz czynniki takie, jak: urazy głowy, alergie, wady wzroku i słuchu. Wykazano, że nieprawidłowy przebieg ciąży i porodu jest wysoce istotnym czynnikiem ryzyka wystąpienia zaburzeń SI u dzieci. Jednym z najważniejszych czynników ryzyka jest poród za pomocą cesarskiego cięcia. Nieprawidłowy rozwój w pierwszym roku życia również zwiększa prawdopodobieństwo wystąpienia zaburzeń SI. Gorszy stan noworodka po porodzie w skali Apgar także wpływa na zaburzenia SI u dziecka – im niższa punktacja, tym większe ryzyko wystąpienia zaburzeń.

Słowa kluczowe: integracja sensoryczna, rozwój, dziecko.

Introduction

According to Anna Jean Ayres, sensory integration is a neurological process that organizes sensory information within the body and from the environment enabling effective use of the body and appropriate action [1–3, 9]. The process involves segregation, recognition, interpretation of all the sensory information which also has to be integrated and connected with the previous experiences in order to generate appropriate responses as demanded by the environment. Przyrowski defined it as the process of brain's organization of sensory input as part of adaptive behaviour to the environment [7, 8].

In daily activities we can observe various changing sensory configurations (tactile, proprioception, kinesthesia, visual, auditory, labyrinth) which have to be integrated into a pattern at a given moment. From practical point of view, this enables people to perform certain activities without visual control (for instance, fishing for keys in a bag) or with visual control but in coordination with other senses (for instance, writing from hearing) or to react to sudden stimuli (for example, car horns in the street) [4–6].

Sensory Integration Disorders

Various classification schemes were proposed for sensory integration disorders SID, which changed as the concept was better understood. Current classification is presented in Table 1.

Table 1. Sensory integration disorders (developed by the researchers)

	Sensory integration disorders		
	sensory modulation disorders	sensory based motor disorders	sensory discrimination disorder
Proprioceptive and vestibular system	vestibular hypersensitivity: <ul style="list-style-type: none"> • gravitational insecurity • motor intolerance vestibular hyposensitivity and hyposensitivity to deep touch	postural and ocular motor disorders: <ul style="list-style-type: none"> • balance disorders • postural reactions disorders in the background • dystonia • reflex integration disorder • ocular dysfunction • shortened post-rotatory nystagmus 	disturbed ability to differentiate stimuli: <ul style="list-style-type: none"> • visual • auditory • tactile • gustatory • olfactory • motor
Tactile system	<ul style="list-style-type: none"> • tactile defensiveness • tactile hyposensitivity 	developmental dyspraxia	

The Aim of the Study

The objective of the study was to evaluate risk factors for sensory integration disorder in children aged 3–12 years and to determine association between particular risk factors and different types of disorders.

The aim of the study was to: to determine the influence of antepartum and intrapartum risk factors for sensory integration disorder in children, to demonstrate the association between abnormal development in the first year of life and the increased risk of sensory integration disorder, to determine the association between lower Apgar score after delivery and development of sensory integration dysfunction, to determine the association between allergy, vision and hearing defects, head injuries, epilepsy and the increased risk of occurrence of sensory integration disorder in children.

Material and Methods

The participants of the study were 37 children with intellectual norm in the age range 3–12 years, 16 girls and 21 boys. The study group consisted of 14 children (10 boys and 4 girls) with sensory integration disorder diagnosed and treated in Sensi Sensory Integration Laboratory in Wrocław (Białowieska 26 a/10, 54-234, Wrocław). The controls were 23 children from 2 kindergarten in Myszkowo (Pułaskiego 7a, 42-300 Myszków). Data collection in the study group and controls was conducted by means of questionnaires and “The Questionnaire of sensomotor development of the child” developed by Z. Przyrowski [17]. The questionnaire consisted of 30 questions regarding parents’ age, education, residence, pregnancy and labour, Apgar score of the newborn, child’s development in the first year of life and other factors of increased risk of sensory integration disorder. The questionnaire included 91 multiple-choice questions with possible answers: yes, no, don’t know. It precisely determined the type of disorder affecting child in question. The score was calculated on the basis of selected answers applying to disorder of choice in accord with the key. Over 50% of answers yes and no in a given category, in accord with the key, gave answers about the risk. The data was analyzed with Excel by Microsoft Office.

Results

The Association Between Antepartum Course and Incidence of SI Disorder

Table 2. The course of pregnancy in the study group and control group

Pregnancy course	Group		χ^2 Test	
	control	study	χ^2	P
Incorrect	7	13	13.65	0.0002
Correct	16	1		

Conclusion: in the study group, almost in all cases (93%) antepartum course was abnormal. At the same time, in the control group, in most of the cases (70%) pregnancy was normal. The association between antepartum course and incidence of SID is highly significant ($p < 0.001$).

The Correlation Between Intrapartum Course and Incidence of SID

Conclusion: the correlation between intrapartum course and incidence of SID is similar as the correlation between antepartum course and incidence of SID (Table 3). Complications during labour significantly increase the risk of occurrence of SID in future.

Table 3. Intrapartum course in the study group and in controls

Labour	Group		χ^2 Test	
	control	study	χ^2	P
Complicated	8	13	11.96	0.0005
Spontaneous labour	15	1		

Table 4. Labour complications in the study group and controls

Labour complications	Group	
	Control	Study
Prolonged labour	2	2
Pharmacologically induced labour	1	1
Risk of still birth	2	2
Abnormal fetal heart rate	1	0
Green amniotic fluid	1	0
Manual delivery	2	1
Caesarean section	6	11

Conclusion: although complications such as prolonged labour, risk of still birth or abnormal fetal heart rate occurred in both groups with the same frequency, there were almost two fold more deliveries by caesarean section in the study group (Table 4).

The Correlation Between Psychomotor Development in the First Year of Life and Incidence of SID

Table 5. Psychomotor development in the first year of life in the study group and control group

Psychomotor development in the first year of life	Group		χ^2 Test	
	control	study	χ^2	P
Abnormal	1	7	10.70	0.0011
Normal	22	7		

Conclusion: the incidence of abnormal psychomotor development in the first year of life was calculated as 50% in the study group. In the control group there was only one case of abnormal development (4% of the group). The association between SI disorder incidence and psychomotor development disorders in the first year of life is of high significance.

Table 6. The correlation between psychomotor development disorders in the first year of life and antepartum, intrapartum cours

Psychomotor development in the first year of life	Pregnancy		Labour	
	abnormal	normal	complicated	spontaneous
Abnormal	7	1	8	0
Normal	13	16	13	16
χ^2	4.60		7.78	
P	0.032		0.005	

Conclusion: abnormal psychomotor development in the first year of life can be a consequence of labour complications or abnormal antepartum course, as shown in Table 6.

Both correlations demonstrated in Table 6 are significant. Abnormal antepartum cours and labour complications are factors increasing the risk of abnormal psychomotor development in the first year of life.

Apgar Score of a Newborn and Future Sensory Integration Disorder

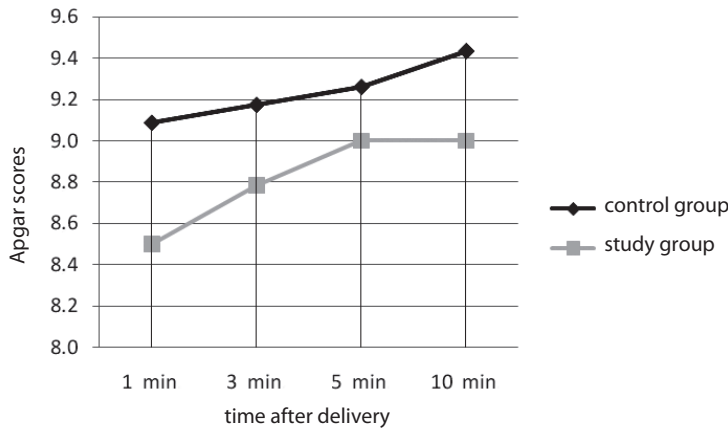


Fig. 1. Mean Apgar scores in the first 10 minutes after delivery in the study group and control group

Conclusion: in the study group, mean Apgar scores recorded in the first 10 minutes after delivery were lower than in the controls (Fig. 1).

Lower mean Apgar scores in the first 10 minutes after delivery recorded in the study group may signal future sensory integration disorders in children.

Conclusion: it wasn't possible to determine statistical significance of differences in mean values in Fig. 1 due to great values of standard deviation (in comparison with values of the differences). Therefore further studies on greater number of subjects are required to determine the effect of lower neonatal status immediately after delivery on the incidence of SI disorders.

Table 7. Comparison of mean Apgar scores in the first 10 minutes after delivery between the study group and controls

Minutes after delivery	Control group		Study group		Student Test	
	mean	standard deviation	mean	standard deviation	<i>t</i>	P
First	9.1	1.2	8.5	2.0	1.109	0.275
Third	9.2	1.2	8.8	1.3	0.943	0.352
Fifth	9.3	1.1	9.0	1.2	0.699	0.489
Tenth	9.4	0.8	9.0	1.2	1.308	0.199

Sensomotor Development Rate and Incidence of SI Disorders

Table 8. Comparison of average ages (in months) at which children from the study and control group started sitting, crawling, standing up and walking

Age at which children started to:	Control group		Study group		Student Test	
	mean	SD	mean	SD	<i>t</i>	P
Sit	6.0	1.6	7.7	1.1	3.39	0.0017
Crawl	7.2	1.6	9.9	1.4	3.39	0.0018
Stand up	9.4	1.3	11.8	1.8	4.68	< 0.0001
Walk	11.3	1.3	14.4	3.0	4.33	0.0001

Conclusion: on average, children in the study group started sitting up, crawling, standing up, walking later than controls. Differences in mean values in all cases are of high significance (Table 8).

Table 9. Degree of motor development of children in the study group and controls (on the basis of 6–13 Sensomotor development questionnaire)

Question number	Symptoms determining degree of child's psychomotor development	Group (number of children per %)	
		control %	study %
6	Short stage of crawling or lack of crawling stage	52	57
7	Sitting up earlier than peers	43	0
8	Standing up unassisted earlier than peers	48	0
9	Walking unassisted earlier than peers	52	7
10	Prolonged crawling period	9	36
11	Sitting up unassisted later than peers	9	57
12	Standing up unassisted later than peers	9	50
13	Walking unassisted later than peers	17	57

Incidence of SI Disorder Risk Factors

Table 10. Incidence of SI disorder risk factors in the groups

Risk factor	Group		χ^2 Test	
	control	study	χ^2	P
Allergy	5	5	1.57	0.210
Kinetosis	0	3	4.70	0.030
Ear infection	1	2	1.15	0.283
Vision defect	2	1	0.06	0.805
Epilepsy	0	1	1.62	0.204

Conclusion: risk factors were identified in 12 children from the study group and in 8 controls (Table 10). There weren't many cases of presence of risk factors, therefore any differences in incidence between the groups are of no significance (except for motor sickness).

Types of Sensory Integration Disorder in Accord with the Questionnaire in Relation to Groups (Study and Control)

Table 11. Sensory-based motor disorders in the study group and controls

Sensory-based motor disorders	Control group		Study group		Student Test	
	mean	SD	mean	SD	<i>t</i>	P
Postural disorders	14.9	4.9	21.2	6.7	3.28	0.002
Developmental dyspraxia	6.3	4.2	14.4	5.0	5.31	< 0.001

Table 12. Sensory modulation disorder in the study and control group

Sensory modulation disorder	Control group		Study group		Student Test	
	mean	SD	mean	SD	<i>t</i>	P
Tactile defensiveness	17.7	4.9	20.7	5.5	1.73	0.092
Gravitational instability	4.7	2.7	8.9	3.9	3.84	0.001
Sensory defensiveness	17.0	6.2	21.7	5.0	2.41	0.021

Table 13. Body image disorder and spatial orientation disorder in the study group and controls

Other SI disorders	Control group		Study group		Student Test	
	mean	SD	mean	SD	<i>t</i>	P
Body image and spatial orientation disorder	4.0	2.5	7.9	3.3	3.97	< 0.001

Conclusion: by analyzing data in accord with the Questionnaire key (calculating a sum of adequate Yes and No answers) it was possible to determine intensity with which various types of integration disorders occurred in the groups. For all types of disorders, the incidence was significantly higher in the study group (Table 11–13).

Types of Sensory Integration Disorders and Selected Risk Factors

Table 14. Mean values of assessment of likelihood of occurrence of various types of sensory integration disorder when particular risk factors are present

Type of sensory integration disorder	Abnormal pregnancy	Complicated labour	Allergy	Alarming behaviour	Disturbed psychomotor development
Postural disorders	0.63	0.62	0.57	0.66	0.77
Developmental dyspraxia	0.41	0.39	0.38	0.43	0.53
Tactile defensiveness	0.46	0.49	0.50	0.51	0.54
Gravitational instability	0.39	0.40	0.39	0.44	0.54
Sensory defensiveness	0.44	0.46	0.46	0.49	0.53
Disturbed body image	0.41	0.40	0.36	0.44	0.55

Conclusion: the risk of occurrence of a given type of sensory integration disorder can be calculated adding up Yes and No answers to questions regarding given type of disorder and dividing the number by the number of questions. This procedure allows to create common scale for different types of sensory integration disorders through elimination of differences in question numbers. The value 1 indicates certitude of occurrence of a given type of disorder and 0 means lack of disorder. Thereby, likelihood of occurrence of a given disorder can be calculated. Correlations between different types of sensory integration disorders, evaluated on the basis of the Questionnaire, and selected risk factors were determined on the basis of mean values of findings of the likelihood assessments. The greater mean values, the bigger correlation with a type of risk (Table 14).

This was a qualitative analysis as significance of differences could not be evaluated. Practically all of the evaluated risk factors are associated with postural disorders. The first year of life is the time of the greatest risk of occurrence of postural disorders when psychomotor development is disturbed, as well as of gravitational instability, body image disorder and spatial orientation disorder. Pregnancy and labour complications are linked with the greatest risk of development of postural disorders.

The second method used by the researchers to determine associations between different types of sensory integration disorder and risk factors was correlations analysis. It was applied to such data as newborn's Apgar score, timing of developmental stages.

Table 15. Spearman rank correlation coefficient of various types of sensory integration disorders with newborn's status in the first minutes after delivery

Type of sensory integration disorder	Newborn's status in the first 10 minutes after delivery			
	1 st minute	3 rd minute	5 th minute	10 th minute
Postural disorder	-0.13	-0.19	-0.17	-0.12
Developmental dyspraxia	0.01	-0.05	-0.02	-0.06
Tactile defensiveness	<u>-0.33</u>	<u>-0.41</u>	<u>-0.43</u>	<u>-0.37</u>
Gravitational instability	0.02	-0.04	0.01	-0.07
Sensory defensiveness	-0.19	-0.27	-0.27	-0.26
Body image disorder	-0.06	-0.15	-0.11	-0.14

Significant correlation coefficients on the level of $\alpha = 0.05$ were highlighted.

Conclusion: newborns Apgar score in the first 10 minutes after delivery significantly correlated only with tactile defensiveness (Table 15). Correlations coefficients are negative, which means that higher Apgar score correlates with lower probability of occurrence of tactile defensiveness.

Table 16. Spearman rank correlation coefficient for various types of sensory integration disorder with timing of different motor stages

Type of sensory integration disorder	Age (in months) of:			
	sitting	crawling	standing up	walking
Postural disorder	0.28	0.31	<u>0.43</u>	<u>0.53</u>
Developmental dyspraxia	<u>0.41</u>	<u>0.41</u>	<u>0.62</u>	<u>0.65</u>
Tactile defensiveness	0.27	0.11	0.24	<u>0.36</u>
Gravitational instability	<u>0.44</u>	<u>0.40</u>	<u>0.54</u>	<u>0.62</u>
Sensory defensiveness	<u>0.41</u>	0.24	<u>0.40</u>	<u>0.51</u>
Body image disorder	<u>0.36</u>	<u>0.34</u>	<u>0.61</u>	<u>0.57</u>

Significant correlation coefficients on the level of $\alpha = 0.05$ were highlighted.

Conclusion: positive correlation means that the more advanced age of initiation of various motor activities the greatest probability of occurrence of various types of sensory integration disorders. The strongest correlation was observed between the age of initiation of walking and gravitational instability and motor intolerance. This type of disorder is most likely to occur in children who start walking unassisted later.

Conclusions

1. Abnormal antepartum course and labour complications are factors increasing risk of occurrence of sensory integration disorder in future.
2. Complicated labour through caesarean section increases risk of sensory integration disorder in children.
3. Lower Apgar score after delivery increases risk of sensory integration disorder in children.
4. Child's abnormal development in the first year of life as far as motor stages are concerned (developmental milestones) increases risk of occurrence of sensory integration disorder in future. The strongest correlation was observed between the age of walking and gravitational instability. The more advanced age of walking, the greater risk of occurrence of gravitational instability.
5. High incidence of sensory integration disorder in the control group indicates that the screening for the disorder should be more wide swept in the population.

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