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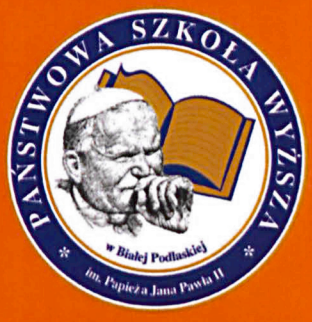

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CONTENTS

CONCENTRATION OF SOME AMINO ACIDS IN BLOOD PLASMA AND STUDY RESULTS OF LUMBOSACRAL BONE SYSTEM COMPUTER TOMOGRAPHY

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Wójcik G., Sokołowska B., Borzęcki A. (2015), *Concentration of some amino acids in blood plasma and study results of lumbosacral bone system computer tomography.* Health Problems of Civilization, 3 (9), p. 5-11.

Summary: Introduction and objective: Back pain are the most common ailment within the human locomotor system. Because of their prevalence, they were classified as diseases of civilization. The aim of the study was to attempt to assess the concentration of selected amino acids in plasma and correlating the results of laboratory tests with the occurrence of backaches.

Material and method: The study group included 188 patients presenting for CT scan administering as the cause of their symptoms low back pains. All of these patients gave the blood samples from which the concentration of free amino acids was estimated by ion exchange chromatography using an automated amino acid analyzer AAA 400 from INGOS Praha. The control group consisted of patients who underwent testing using computed tomography and there were no primary or secondary changes associated with degeneration in the lumbar spine.

Results: Patients on the basis of research carried out by computed tomography were divided into five groups according to disease entity. Analyzing the average concentration of essential amino acids in the blood plasma of patients of each group, it was found that it is higher in the case of lysine for each considered disease entity. The average concentration of methionine in all disease entities does not deviate from the average values in the control group. Analysis of the average concentration of selected essential amino acids revealed that in the case presented disorders underwent their level of variation. Average concentrations of selected amino acids have proven to be very similar in both groups. Slightly higher values proved to be in the control group for proline and lysine.

Conclusions: The concentration of amino acids varies with the severity of degenerative changes in the connections as well as in interbody joints. The highest increase in the concentrations of all tested amino acids are present in root bands. Decrease in the concentrations of all tested amino acids appears in cancer.

Keywords: amino acids, chromatography, computed tomography, lumbar spine

Introduction

The structural changes of spine are closely linked to the aging of the organism, however, overloads to which is the lumbar spine is subjected will accelerate the rate of degenerative changes, resulting in faster formation of pathology (Ciejka, Wójtowicz 2009). The man using the benefits of civilization and technological progress wants to live more comfortably, and in turn this has a negative impact on the entire musculoskeletal system, its weakening leading to irreversible structural changes known as degenerative joint disease (Jens Ivar Brox et al. 2008, Borenstein 2013).

Back ache in the lumbar-sacral part apply each year to about half of the adult population in the world (Borenstein 2013). Epidemiological studies have shown that over 50% of elderly people suffer from low back pain. According to many authors, lower back pain is the most common cause of absence from work of people under 45 years of age (Jens Ivar Brox et al. 2008).

Computed tomography is an indirect method of obtaining an image of the examined parts of the musculoskeletal system. This allows for imaging of both bone structures, as well as muscular and ligament

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Tables: 5 Figures: 0 References: 24 Full-text PDF www.hpc.edu.pl **Indexation:** Index Copernicus, AGRO, ProQuest, Polish Medical Bibliography, Polish Ministry of Science and Higher Education.

(Nemsadze et al. 2011, Carberry et al. 2013). The technique involves performing imaging studies on successive layers of the body in a plane transverse beam perpendicular to the long axis of the patient (Carberry et al. 2013).

Objective

The aim of the study was to attempt to assess the concentration of selected amino acids in plasma and correlating the results of laboratory tests with the occurrence of backaches.

Materials and method

The study involved 188 patients administering the cause of their symptoms as low back pain. The average age was 55.7. The group consisted of 107 women patients, whose average age was 56.9, while a group of men consisted of 81 patients, whose average age was 54.6. Men accounted for 43% of respondents, while women accounted for 57% of the examined group of patients. All patients underwent diagnostic tests of lumbar spine-cross using multi-row spiral CT scanner Toschiba Aquilion 16 Radiologic evaluation of CT multiplanar reconstructions were performed in the MPR (Multi Planar Reconstruction). Depending on the diagnosis posed on the basis of imaging and clinical studies respondents were assigned to groups corresponding to the five disease units (Wójcik et al. 2013).

Clinical material for the study was collected from the blood of patients diagnosed with the pain of the lumbar spine. Plasma for the implementation of biochemical analysis was obtained from the blood collected into heparinized tubes from patients during the laboratory tests performed in computer tomography. Blood was collected from a vein in the arm in about 6 hours after breakfast. Free amino acid concentrations were determined by ion exchange chromatography using an automated amino acid analyzer AAA 400 from INGOS Praha. Determination of the concentrations of free amino acids in plasma was carried out at the Department of Medical Chemistry, Medical University of Lublin.

Amino acids were separated in a single column by column system of about 3 mm by 200 mm, filled with ion exchanger resin Ostion LG FA. Five amino acids of lithium citrate buffer were used to separate, pH: 2.9, 3.1, 3.35, 4.05, 4.90. The eluted amino acids administered to a Teflon capillary reacted with the inflown ninhydrin to form colored compounds.

The separation of acidic and basic amino acids proceeded at 38-390C, while of the neutral amino acids at a temperature of 59-600C. The concentrations of the individual amino acids are given in micromoles per 1 cm^3 of blood.

Determination of the concentrations of the individual amino acids in the blood plasma control group revealed its own standard for concentrations of individual amino acids.

Summarizes of the average concentrations of the individual amino acids and standard deviation of the control group patients were performed.

Tests were carried out after a favorable opinion of the Bioethics Committee, and subjected patients were informed about the purpose of the study and gave their written consent to participate in them.

The control group included 36 people aged 18 to 46 (average age 35.6).

The control group consisted of patients who underwent testing using computed tomography and there were no primary or secondary changes associated with degeneration in the lumbar spine.

Results

Patients, on the basis of research carried out by computed tomography, were divided into five groups. The first group (I) included patients diagnosed with osteoporosis. The second group (II) was composed of patients diagnosed with spondyloartrosis. The third group (III) was formed of the patients that had radicular syndrome. Patients with cancer and metastases to the bones of the spine formed the fourth (IV). Patients with vertebral fractures which occurred as a result of trauma formed the fifth (V). (tab1) (Sierakowski et al 2002).

Table 1. Characteristics of the groups of patients subjected to examination

Group	Characteristics of the group
I	Patients with osteoporosis
II	Patients with spondyloartrosis
III	Patients with radicular syndrome
IV	Patients with cancer and metastases to the bones of the spine
V	Patients with vertebral fractures which occurred as a result of trauma

The study included 188 patients from whom 33 patients were classified into a group with osteoporosis, 64 to a group of spondyloartrosis, 61 to a group of radicular syndrome, 14 to a group of cancer patients and exposed bone metastases, and 16 people to a group where due to an injury occurred fractures of the spine in the lumbar-sacral (Table 2).

Table 2. Number of patients according to disease entities

	GROUPS OF PATIENTS				
	I	II	III	IV	V
(n) number of patients	33	64	61	14	16

Pawelski and Maj (Pawelski, Maj 1987) developed tables of normal levels of free amino acids in plasma. They conducted research on the Polish population. Their results were used to create a nationwide group. Comparisons were made of the nationwide group with the control group as well as with diseases: osteoporosis, spondyloartrosis, radicular syndrome, cancer of metastatic bone and spine injuries and fractures in the lumbar-sacral paryt of spine.

On the basis of the analyzes it was shown that the concentration of methionine in the nationwide group and the control group was identical. In the nationwide group slightly higher concentrations were observed as compared to the control group in the case of arginine and glycine. Amino acids such as lysine, histidine, proline had a slightly higher concentration in the control group. The control group showed a significantly higher concentration in the case of aspartic acid, glutamic acid and taurine (Table 3).

Table 3. Comparison of concentrations of selected amino acids (μmol/cm3) in the tested nationwide and control group

Amino acid	Nationwide group		Control group	
	M	SD	M	SD
lysine (LYS)	0.186	0.005	0.199	0.040
histidine (HIS)	0.080	0.005	0.090	0.013
arginine (ARG)	0.085	0.008	0.073	0.068
aspartic acid (ASP)	0.004	0.001	0.064	0.017
glutamic acid (GLU)	0.050	0.001	0.175	0.084
metionine (MET)	0.021	0.004	0.021	0.006
proline (PRO)	0.185	0.003	0.195	0.063
taurine (TAU)	0.060	0.005	0.148	0.038
glycine (GLY)	0.280	0.007	0.268	0.071

Analyzing the average concentration of essential amino acids in the plasma of patients of each group it has been found that it is higher in the case of lysine for each considered disease entity. Only average values of lysine in patients with cancer were slightly lower than in the control group. In contrast, the average concentration of methionine in all disease entities does not deviate from the average values in the control group (table 4).

When analyzing the average concentration of selected essential amino acids it has been shown that in the case of presented disorders their level underwent variation.

In osteoporosis, the average concentrations of all tested endogenous amino acids were higher than in the control group. Aspartic acid was an exception that in both groups showed similar values.

In spondyloartrosis the average concentrations of essential amino acids such as histidine, glycine and aspartic acid showed no fluctuations in comparison to the control group, whereas in the case of amino acids such as arginine, proline and glutamic acid higher values than those obtained in the control group were found. Only in the case of taurine concentrations were lower than in the control group.

In radicular syndrome average concentrations of all tested endogenous amino acids: histidine, arginine, glycine, proline, taurine, aspartic acid and glutamic acid were significantly higher than the average concentrations of endogenous amino acid in the control group.

In cancer the average concentrations of histidine, glycine, proline, taurine, aspartic acid and glutamic acid had lower values than in the control group. Only arginine was characterized by a higher concentration compared to the control group.

Table 4. Comparison of concentrations of selected amino acids (μmol/cm3) in disease units

Amino acid	Osteoporosis		Spondyloartrosis		Radicular syndrome		Cancer		Injuries and fractures	
	M	SD	M	SD	M	SD	M	SD	M	SD
Lizyna	0.231	0.050	0.213	0.057	0.268	0.082	0.191	0.080	0.214	0.068
methionine	0.023	0.007	0.021	0.006	0.028	0.008	0.019	0.007	0.020	0.008
histidine	0.096	0.029	0.093	0.022	0.112	0.025	0.071	0.026	0.089	0.027
arginine	0.130	0.119	0.125	0.111	0.171	0.171	0.114	0.183	0.148	0.116
glycine	0.327	0.107	0.261	0.072	0.373	0.084	0.246	0.119	0.290	0.103
proline	0.272	0.114	0.241	0.079	0.292	0.090	0.183	0.052	0.250	0.114
taurine	0.160	0.040	0.139	0.047	0.175	0.069	0.144	0.069	0.146	0.056
aspartic acid	0.067	0.026	0.063	0.016	0.080	0.035	0.055	0.026	0.062	0.038
glutamic acid	0.259	0.127	0.199	0.101	0.275	0.147	0.158	0.078	0.259	0.141

In the group of injuries and fractures the average concentrations of histidine, aspartic acid and taurine correspond to average concentrations in the control group. Average concentrations of arginine, glycine, proline and glutamic acid showed higher values than in the control group (table 4).

Using the Student's t-test, a comparison of concentrations of free amino acids in the blood plasma of patients in the various disease entities was made.

Comparison of the concentration of free amino acids in the blood plasma of patients in the control group with the concentration of free amino acids in the blood plasma of healthy subjects (nationwide group) showed significantly higher values for taurine, histidine, aspartic acid and glutamic acid.

Average concentrations of selected amino acids have proven to be very similar in both groups. Slightly higher values proved to be in the control group for proline and lysine. In one case involving arginine higher concentrations of this amino acid were in the nationwide group (table 5).

Table 5. Concentrations of free amino acids (μmol/cm3) in the nationwide and in the control group

Amino acid	TESTED GROUPS		STATISTICAL SIGNIFICANCE
	NATIONWIDE	CONTROL	
PROLINE	0.185 ± 0.003	0.195 ± 0.063	ns
TAURINE	0.060 ± 0.005	0.148 ± 0.038	0.05
LYSINE	0.186 ± 0.005	0.199 ± 0.040	ns
METIONINE	0.021 ± 0.004	0.021 ± 0.006	ns
ARGININE	0.085 ± 0.008	0.073 ± 0.068	ns
GLYCINE	0.280 ± 0.007	0.268 ± 0.071	ns
HISTIDINE	0.080 ± 0.005	0.090 ± 0.013	0.05
ASPARTIC ACID	0.004 ± 0.001	0.064 ± 0.017	0.05
GLUTAMIC ACID	0.050 ± 0.010	0.175 ± 0.084	0.05

Discussion

Back pain syndrome is one of the most common health problems associated with ailments within the human locomotor system. Because of its prevalence, it was classified as a disease of civilization. According to many researchers, back pain affects not only the elderly but also young people, manifesting its beginning even at the age of 20 (Borenstein 2013).

The most common reason for the occurrence of complaints from the spine are overloads and lack of adequate physical activity weakening all the elements of the locomotor system. Movement and stillness affect the rate of biochemical changes occurring in every living organism. All proteins which are essential in building blocks of cellular structures wear out and degrade (Umulis, Othmer 2013).

It would seem that a passive organ motion is mainly bones having little in common with proteins, but it is often forgotten that it is the protein that form a network of collagen binding in the minerals responsible for bone density. With age there is a disturbance between the processes of synthesis and protein breakdown. In young individuals dominate the processes of biosynthesis, biodegradation processes in the elderly, while in the middle the two processes are in balance (Fratzl-Zelman et al. 2013).

Spinal disorders affect the functioning of the whole organism. They can have an effect on the metabolism of proteins, and especially on changes in the concentration of free amino acids in the blood (Mathieson et al 2013).

Maintaining normal levels of serum amino acids depends on the balance between AA supplied and used by the body. Each disease causes disruption of homeostasis of the organism to varying degrees. Structural disorders of the lumbar spine also affect the functioning of the whole organism. Determination and comparison of the concentrations of free AA in the blood plasma of patients with osteoporosis, spondyloartrosis, radicular syndrome, bone tumors and patients with spinal injuries and fractures was the subject of this work.

The study included 188 patients examined by computed tomography due to back pain in the lumbar-sacral part of spine. Their average age was 55.

The study found significant differences in the concentrations of amino acids in the studied disease entities.

Studies of plasma amino acid concentrations showed that extending back pain with degeneration of bone segments and soft tissue are characterized by increased levels of all amino acids tested. A different result gave the research conducted on a group of patients with cancer, in which cancer metastases to the bones of the spine were determined. In this group, as in the only one, there was recorded a significant decrease in the level of all tested amino acids compared to the control group.

In the course of many diseases, there is a varying extent of the use of a pool of free amino acids. The concentrations of free amino acids in the blood plasma are the basis for determining the homeostasis of the organism. Transfers concentrations of free amino acids in the blood may serve as a prognostic indicator in assessing the severity of osteoarthritis (Fratzl-Zelman et al 2013).

Amino acids which are neurotransmitters, such as glutamic acid (Glu), aspartic acid (Asp), taurine (Tau), and glycine (Gly) are widely distributed in biological fluids and tissues and have important physiological functions, such that the evaluation of their concentration in the body plays an important role in physiology (Zinellu et al 2013).

Glutamic acid is an important neurotransmitter that is the compound that allows conduction of nerve impulses. Its main task is to stimulate action in the cerebral cortex of mammals.

The transformation of normal cells into cancer is associated with changes in the concentrations of amino acids (Inbar et al. 1971).

Ibrachim et al conducted studies in mice by injecting them benzopyrene to induce lung cancer, then the mice were dosed mixtures containing vitamins and amino acids such as lysine and proline. In its conclusions, he reported that mixtures are protective with the ability to suppress cancerous changes and allow you to restore normal biochemical and histopathological parameters (Ibrachim et al 2013).

Research shows that mixtures with proline and lysine have a protective effect and may contribute to the improvement of the final therapeutic effect.

Reducing the concentration of proline and lysine was observed in our study in the case of metastases of the bone. This may indicate the compound concentration shifts / AA in the direction of deficiency in the case of developing cancer. Neoplastic disease appears to be a factor in reducing the biosynthesis in the living body.

Lysine is overexpressed in many tumor types including ovarian cancer that has metastases to the bone (Konovalov, Garcia-Bassets 2013).

Carregaro et al reported that small proline-rich proteins may be associated with increased proliferation of tissues in the case of tumor processes. However, their role in the pathophysiological processes remains unclear, which requires further research (Carregaro et al. 2013).

Intracellular free amino acids are involved in the regulation of metabolic pathways and control the build up of muscle proteins. Depletion of intracellular content of amino acids such as arginine or glutamine reduction can affect and cause their activation neuromotoric disorders (Sales et al. 2013).

In humans and other mammals, endogenous glucocorticoids are necessary to adapt to physiological stress. However, when the concentration of glucocorticoids is increased for a long period of time, the central nervous system is predisposed to the development of disorders and neurological diseases formation. Canteros in his work shows that arginine may counteract the neurotoxic effects of glucocorticoids (Canteros 2013).

Similar findings are presented by Dorniak-Wall et al and they pay attention to the neuroprotective effect of arginine for neural tissue (Dorniak-Wall et al. 2013).

Rai and Penn emphasize the importance of proline in defensive reactions to the stress of living organisms. This has a tangible meaning when considering back pain in terms of suffering, both physical and mental. Increasing the concentration of proline can play in this case a protective role (Rai, Penna 2013).

Taurine has a substantial effect on the proliferation of inflammatory cells resulting in reduced concentrations of histamine. It also has a significant impact on the processes associated with the formation of collagen. Taurine influences the strength of the soft tissues by increasing their resistance to noxious agents (Dinçer et al. 1996).

Taurine is found in high concentrations in bone cells enhancing bone formation and inhibiting its loss. Osteoporosis is a disease associated with increased bone stiffness is characterized by a thinning of traffic camera stabilizing structure whereby even the low-energy injuries cause significant damage. The concentration

of taurine in the case of osteoporosis is higher than normal, however, metabolic incorporation prevent building of the collagen in so-called bone matrix (D'Eufemia et al. 2010).

Methionine s heavily involved in the processes of cartilage formation, but in the case of the increasing changes associated with the spondyloarthropathy reduction in the concentration of this amino acid is observed (Vijayan et al. 2013).

Conclusion

1. The concentration of amino acids varies with the severity of degenerative changes in the joints and intervertebral discs.
2. In osteoporosis and radicular syndrome occurs the growth of all the tested concentrations of amino acids and cancer decrease in the concentrations of all tested amino acids.
3. The highest increase in the concentrations of all tested amino acids is present i radicular syndrome.

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THE EVALUATION OF TOPOGRAPHY *BORRELIA BURGDORFERI* BY ATOMIC FORCE MICROSCOPE (AFM)

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Tokarska-Rodak M., Kozioł-Montewka M. (2015), *The evaluation of topography* Borrelia burgdorferi *by atomic force microscope (AFM).* Health Problems of Civilization, 3 (9), p. 12-15.

Summary: The aim of the present work was to evaluate the topography of spirochetes' cells *Borrelia burgdorferi* s.s. B31 in atomic force microscope (AFM). Results: The length of spirochetes *B. burgdorferi* has ranged between 15.38-22.68μm. The cells of spirochetes do not constitute structures of a fixed diameter and height. Thus, in order to identify real parameters of cells, the horizontal distance and vertical distance have been used in the measurements. The average value of a spirochetes' diameter has been estimated by taking series of measures and it is 0.40 μm. The average value of a spirochetes' height has been estimated by taking series of measures and it is 70.14 nm. The analysis of a relation between measured parameters of spirochetes: diameter and height revealed that along with the growth of diameter of a bacteria cell, its height also grows. The average value of a fibers' diameter has been estimated by taking series of measurements and it is 0.09 μm and the average height of fibers was 7.91 nm. Conclusions: The atomic force microscope (AFM) is a modern tool with a broad spectrum of observatory and measure abilities and is a technique which has been used in biology and microbiology to investigate the topography of surface and in the evaluation properties of cells.

Keywords: *Borrelia burgdorferi* s.s B31, AFM, spirochetes' cells

Introduction

Atomic force microscope (AFM) is an experimental technique which recently has been used in biology to investigate of cells (Velayati et al. 2011). The use of the AFM in microbiology has progressed significantly throughout the years since its first application as a high-resolution imaging instrument. Modern AFM setups are capable of characterizing the nanomechanical behaviour of bacterial cells (Aguayo et al. 2015). Understanding the fundamental forces involved in the adhesion of microbial cells is important not only in microbiology, but also in medicine and biotechnology. Rapid progress in AFM techniques has made it possible to measure the forces driving cell-cell in biofilm formation, biofilm infections and cell aggregation (Dufrêne 2015). Owing to its versatility, atomic force microscopy has become a popular tool to study in microbiology.

The aim of work

The aim of the present work was to evaluate the topography of spirochetes' cells *Borrelia burgdorferi* s.s. B31 in AFM.

Materials and methods

Reference strain of *B. burgdorferi* s. s. B31 (ATCC 35210) was used in the study. To cultivate spirochetes, 0.1 ml of strain was inoculated into 5 ml of BSK-H medium Complete. Strain was incubated in 5% CO_2 atmosphere at 35°C for 7 days, to a cell density of 10^7/ml (Pollack et al. 1993). *B. burgdorferi* s.s. B31 in BSK-H medium was centrifuged for 10 min at 2.500 rpm. The supernatant was removed from the precipitate of bacteria. Bacteria samples were prepared according to the procedure given by Zdybicka-Barabas (Zdybicka-Barabas et al. 2012;

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Zdybicka-Barabas et al., 2013). In order to release the fibers part of the bacteria samples washed in deionized water (repeated three times). The supernatant was removed from the precipitate of bacteria. The samples were applied on the surface of mica disks and allowed to dry at 28 °C before imaging. The length, height and diameter was analyzed in AFM NanoScope V, multiMode 8 type (Bruker), PeakForce QNM technique in air using the NanoScope Analysis 1.40 (Bruker).

Results

The bacteria isolated from the growth medium have been observed individually in AFM by approximating in subsequent stages the selected areas of their surfaces. During next stages of study, the spirochetes' cells have been measured in their length, height and diameter. The length of spirochetes *B. burgdorferi* has ranged between 15.38-22.68µm. The cells of spirochetes do not constitute structures of a fixed diameter and height. Thus, in order to identify real parameters of cells, the horizontal distance and vertical distance have been used in the measurements. The cross-section of a bacteria cell, which has been made in the particular place, is graphically portrayed in a file of a fixed height and width. The vertical graphic lines have been used to measure the diameter of cells, which on the graph they outline the place of junction between bacteria edges and foundation (mica). The distance measured between the lines determines the diameter of a spirochete in the particular place (Fig. 1). The average value of a spirochetes' diameter has been estimated by taking series of measures and it is 0.40 µm (min. 0.314 µm – max. 0.52 µm; SD 0.048). The change of boundary lines' setting allows measuring the height of a spirochete and thus one of these lines delineates the place of junction of the edge of bacteria with mica, and the other its highest (peak) point (Fig. 2). The average value of a spirochetes' height has been estimated by taking series of measures and it is 70.14 nm (min. 59.19 nm – max. 77.32 nm; SD 4.802). The analysis of a relation between measured parameters of spirochetes: diameter and height revealed that along with the growth of diameter of a bacteria cell, its height also grows.

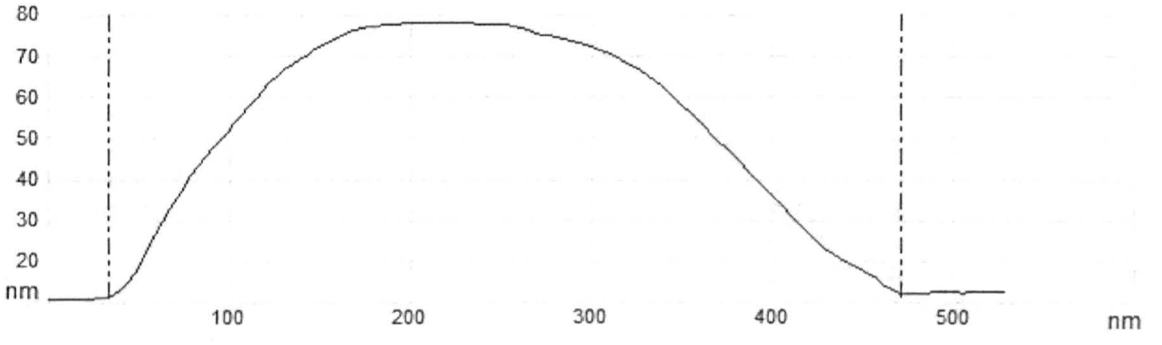

Figure 1. The measures of diameter of *Borrelia burgdorferi* s.s. B31 cells (NanoScope Analysis 1.40; Bruker)

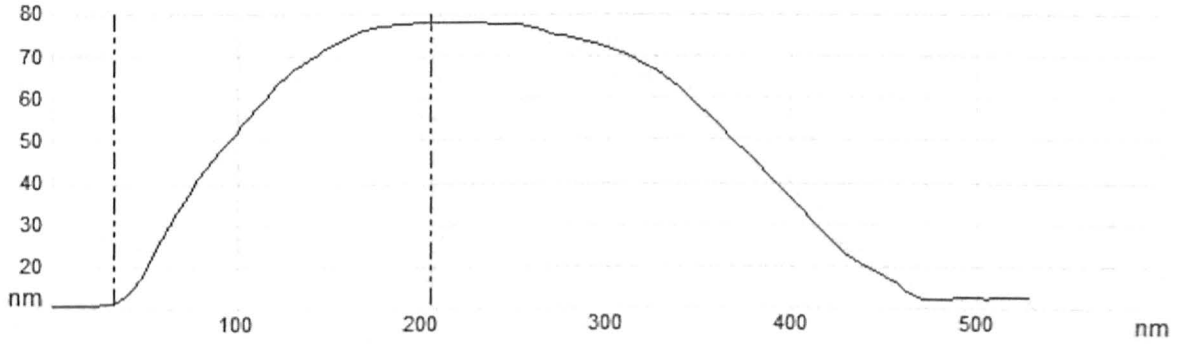

Figure 2. The measures of height of *Borrelia burgdorferi* s.s. B31 cells (NanoScope Analysis 1.40; Bruker)

The part of a cell of *B. burgdorferi* s.s. with visible fibers lying on the border of a junction between the edge of bacteria and foundation has been presented in Figure 3. The average value of a fibers' diameter has been estimated by taking series of measurements and it is 0.09 µm (min. 0.07 µm – max. 0.1 µm; SD 0.014) (Fig. 4). The average height of fibers was 7.91 nm (min. 5.269 nm – max. 11.08 nm; SD 1.418) (Fig. 5).

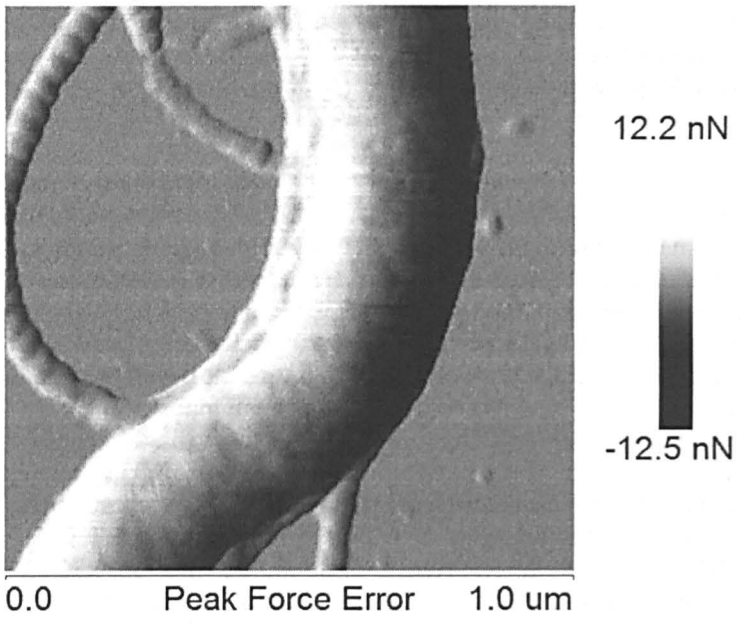

Figure 3. *Borrelia burgdorferi* s.s. B31 spirochete with visible fiber-like structures (AFM NanoScope V, multiMode 8 type, Bruker)

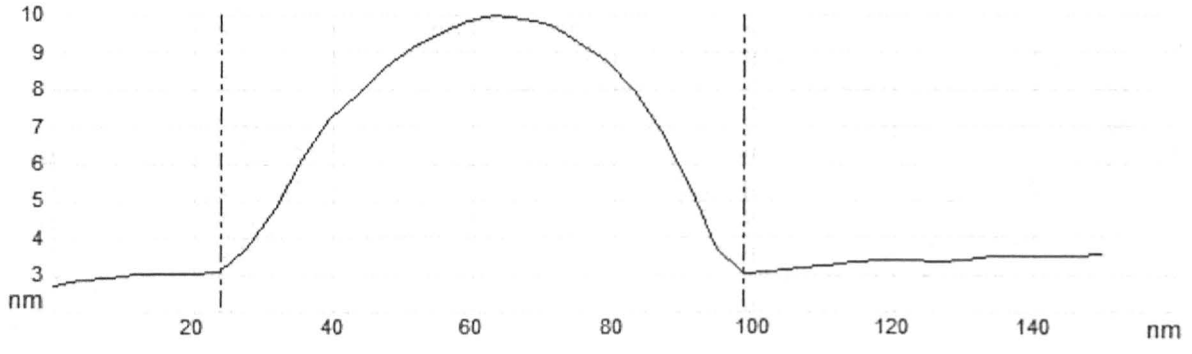

Figure 4. The measurement of fiber diameter observed among *Borrelia burgdorferi* s.s. B31 cells in AFM (NanoScope Analysis 1.40; Bruker)

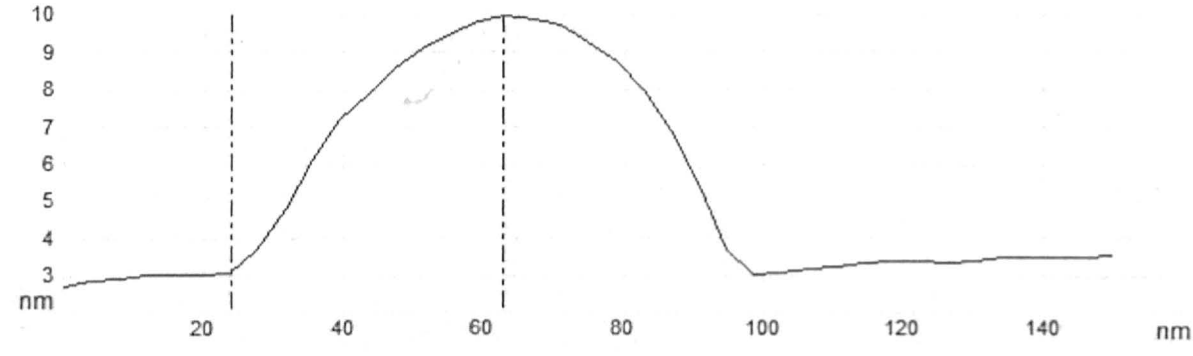

Figure 5. The measurement of fiber height observed among *Borrelia burgdorferi* s.s. B31 cells in AFM (NanoScope Analysis 1.40; Bruker)

Discussion

The atomic force microscope is one of the most modern tools with a very broad spectrum of observatory and its significance in the study of pathogens is immense (Sapi et al. 2012; Zdybicka-Barabas et al. 2013).

The cysts *B. burgdorferi* exist in nerve and glial cells were observed in AFM by Miklossy (Miklossy et al. 2008). The observations of spirochetes *B. burgdorferi* s.s. B31 in AFM conducted within the scope of own study, have contributed to the estimation of the basic parameters such as length (15.38 μm -22.68 μm), diameter (0.31 μm – 0.52 μm) and height (59.19 nm – 77.32 nm). The obtained results of measurements has confirmed literature data according to which *B. burgdorferi* is bacteria of a length of 10-30 μm and diameter within the range of 0.2-0.5 μm (Alban et al. 2000). As far as diameter parameter is concerned to be commonly used in the morphological description of bacteria, the height parameter is usually omitted. Both parameters can contribute to a better visualization of bacterial cells.

Endoflagella of spirochetes, in contrast to other bacteria, are covered by an outer sheet or outer membrane. They are winding around the cell body and are fixed on both ends of the cell in insertion pores. Miklossy et al. observed the effect of the osmotic shock of spirochetes *Borrelia* generated under the influence of distilled water (Miklossy et al. 2008). Following osmotic shock the outer membrane of the spirochete can be disrupted, thereby releasing their endoflagella. The occurrence of a described phenomenon enabled to measures for fibers which are invisible for bacteria in the physiological conditions. The presence of structures was observed in a direct vicinity of *Borrelia burgdorferi* s.s. B31 cells. These structures are alike long fibers, which are directly connected with the bacteria surface and are situated on the verge of cell junction with the foundation. It is impossible to observe these structures with the optical microscopes due to their low diameter identified within the range of 0.07 μm – 0.14 μm and height of 5.26 nm – 11.08 nm. Atomic force microscopy (AFM) analysis showed rolled *Borrelia* spirochetes inside of a cyst covered by a thin outer membrane. Miklossy observed bleb formation, connected to *Borrelia* spirochetes by a fine stalk, in two *Borrelia* strains (Miklossy et al. 2008).

Conclusions

The atomic force microscope (AFM) is a modern tool with a broad spectrum of observatory and measure abilities and is a technique which has been used in biology and microbiology to investigate the topography of surface and in the evaluation properties of cells.

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NEW ASPECTS IN THE TREATMENT OF HYPERTENSION

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Summary: Hypertension is currently the leading cause of cardiovascular complications (heart attack, stroke) and the resulting deaths of patients. Reduced morbidity and mortality from cardiovascular complications is the main goal of treating patients suffering from high blood pressure (BP). To achieve target BP levels in the arsenal of physicians are five major classes of antihypertensive drugs: angiotensin-converting enzyme inhibitors, angiotensin II receptor blockers, calcium channel blockers, β-blockers, diuretics. The choice of antihypertensive drug in concrete clinical situation often complicated and determined by complex factors. Among these presence of risk factors; target organ damage; associated clinical conditions, metabolic syndrome, diabetes, comorbidities; possible individual patient response to antihypertensive drugs of different classes in history; the likelihood of drug interactions; socio-economic factors, including the cost of treatment of hypertension. Promising is the use of angiotensin II receptor blockers - drugs with pleiotropic pharmacological properties that have a multicomponent antihypertensive efficacy, good tolerability, diverse organoprotection that are safe, able to enhance remote prognosis for patients with hypertension. Azilsartan medoxomil is a competitive reversible angiotensin II type 1 receptor antagonist. Azilsartan developing hypotensive effect faster, prolonged and pronounced compared to other sartans (valsartan, candesartan and olmesartan). In addition to antihypertensive action azilsartan medoxomil shows a number of additional pleiotropic effects. These include antithrombotic, antiproliferative and antyfibrotic action. It demonstrates the improvement in glucose tolerance and tissue insulin sensitivity, improves endothelial function, reduces the progression of albuminuria, proteinuria.

Keywords: hypertension, angiotensin II receptor blockers, azilsartan medoxomil

Introduction

Hypertension is an epidemic affecting one billion people and is the commonest risk factor for death throughout the world. Increased attention to hypertension based on the results of large-scale epidemiological and clinical studies have repeatedly demonstrated adverse effects of elevated blood pressure (BP) on the risk of cardiovascular events, including death from cardiovascular causes (Dyadyk et al. 2014, Mancia et al. 2013).

Limited comparable data are available on the prevalence of hypertension and the temporal trends of BP values in different European countries. Overall the prevalence of hypertension appears to be around 30–45 % of the general population, with a steep increase with ageing (at least 60% of people over the age of 60-65 years have high BP or receiving antihypertensive treatment). Among persons aged 55-65 years, the likelihood of developing hypertension, according to the Framingham study, is more than 90%. The World Health Organization (WHO) considers hypertension as the most important preventable causes of worldwide death. Hypertension is associated with increased cardiovascular mortality and risk of cardiovascular events in all age groups; among the elderly degree of risk has a direct relationship with the level of systolic blood pressure and feedback to the level of diastolic blood pressure. A close relationship between prevalence of hypertension and mortality for stroke has been reported. The incidence and trends of stroke mortality in Europe have been analysed by use of WHO statistics. Western European countries exhibit a downward trend, in contrast to eastern European countries, which show a clear-cut increase in death rates from stroke (Mancia et al. 2013, New therapeutic possibilities of control of hypertension: a modern angiotensin receptor antagonist Edarbi (azilsartan medoxomil) 2014).

Search of therapeutic approaches that can prevent the patient consistent transition from one stage of cardiovascular continuum to the other, is now a priority in cardiology. The most significant positive result in this task can be expected from an effective intervention in the early stages of the mentioned pathological process

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that involves the impact on risk factors, including normalization of blood pressure (Svischenko et al. 2012, Ostroumova et al. 2010). Reduced morbidity and mortality from cardiovascular complications is still the main goal of treating patients suffering from high blood pressure. To achieve target BP levels in the arsenal of physicians are five major classes of antihypertensive drugs: angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), calcium channel blockers, β-blockers, diuretics. The results of a multicenter randomized trials proved that none of them has significant advantages in terms of severity of antihypertensive effect. The choice of antihypertensive drug in concrete clinical situation often complicated and determined by complex factors. Among these presence of risk factors; target organ damage; associated clinical conditions, metabolic syndrome, diabetes, comorbidities; possible individual patient response to antihypertensive drugs of different classes in history; the likelihood of drug interactions; socio-economic factors, including the cost of treatment of hypertension (Mancia et al. 2013, Chazova et al. 2011).

According to modern concepts activation of the renin-angiotensin-aldosterone system (RAAS) plays a critical role in the regulation of blood pressure. Angiotensin II (AT II) as a key effector hormone of the RAAS via vasoconstriction, an increase in left ventricular afterload, retention of sodium and water increases BP and helps to stabilize hypertension. Long-term effects of elevated levels of angiotensin II, especially in tissues, leading to cardiac and vascular remodeling, kidney disease, which also contributes through organ violations increased risk of cardiovascular disease and renal failure (Chazova et al. 2011, Korost et al. 2014).

The first drugs that block the RAAS was nonselective peptide antagonist of AT II receptor, which was called "saralasin". This peptide structurally similar to AT II, acted as a competitive inhibitor of angiotensin. The drug did not become widespread because it is only administered parenterally. It could only be used for short courses and also it causes a dose-dependent angiotensin II-similar effect. The negative experience of saralasin application slowed down searching of AT II receptors blockers for many years. At the same time studies of another class of drugs angiotensin-converting enzyme rapidly gaining turnover. The first drug of angiotensin II, approved for clinical use "losartan" was synthesized in 1995. It is a derivative of imidazole and not peptide derivative with high selectivity to the AT1 receptor. The class of drugs known as "sartans" (Zaharova et al. 2011, Shilov 2014).

Currently, the ARBs class (sartans) is represented by 8 drugs (losartan, valsartan, candesartan, telmisartan, eprosartan, irbesartan, olmesartan, azilsartan). Based on the results of large clinical trials, the presence of general sartans' class-effects can be considered. Chief among them is stable and sustained blood pressure control. In addition, across a range of studies have been received additional angiotensin-independent organ protective effects of sartans: cardioprotection (LIFE, JIKEI-HEART), nephroprotection (IRMA II, IDNT, MARVAL, RENAAL, DETAIL), neuroprotection (MOSES, ACCESS), improvement of glycemic control (VALUE, LIFE, ALPINE, NAVIGATOR) (Mancia et al. 2013, Kirichenko 2012).

The structure of most sartans is imidazole ring which provides the basic antihypertensive class-effect. Class-effects of drugs associated with blockade of physiologically significant influences of AT II, which are implemented through the AT1-receptors. The specific antagonistic action relative to AT1-receptors by the negative feedback mechanism increases the concentration of renin and AT II, aldosterone concentration decreases in plasma. ARBs II do not inhibit ACE and thus have no effect on the metabolism of bradykinin, do not cause cough. Sartans can be divided into two groups: prodrugs with active metabolites and drugs. Prodrugs include losartan, candesartan, olmesartan, and azilsartan (Chazova et al. 2011, Zaharova et al. 2011).

A very important property of sartans is the ability to reduce the degree of ventricular hypertrophy and cause regression of its remodeling, which are among the main predictors of early cardiovascular morbidity and mortality. The presence of electrocardiographic evidence of left ventricular hypertrophy increases risk of coronary heart disease 3-5 times, congestive heart failure - in 6-17 times regardless of blood pressure (Svischenko et al. 2012). ARBs increasingly used in the treatment of patients with paroxysmal atrial fibrillation (AF), except antiarrhythmic drugs in recent years. Reducing the risk of AF in the application of angiotensin II receptor blockers also ensured through their positive effects on sympathoadrenal system, heart rate variability, cardiac conduction system of the heart and systemic and intracardiac hemodynamics. With the ability of ARBs II to reduce the frequency of AF paroxysms can link the most pronounced reduction in the risk of stroke (up to 49 %) in patients with AF. It was also established in some studies that sartans slows the progression of coronary atherosclerosis, demonstrates advantage over ACE inhibitors on restenosis prevention and new lesions in coronary arteries in patients after stenting (Tseluyko et al. 2014). Equally important are nephroprotective properties of ARBs II. Clinical studies ROADMAP, MARVAL, PRIME, IDNT, DETAIL, PROTECTION and others had shown that treatment with ARBs II slows the progression of chronic kidney disease in patients with hypertension and type 2 diabetes, reducing the risk of microalbuminuria, distancing approach of terminal renal failure and increasing the duration of predialysis period (Shilov 2014, White et al. 2011).

One of the important aspects of drug-specific application of sartans is reduction in the incidence of type 2 diabetes. ARBs II are partial agonists of PPAR-γ (peroxisome proliferatoractivated receptor-γ) - central regulator

of insulin and glucose metabolism that increases the insulin sensitivity. Due to the stimulating effect increase the plasma level of adiponectin, decrease the severity of fatty liver steatosis, and dyslipidemia. Also described cerebroprotective properties, anti-inflammatory effects of sartans that are realized through reduction of proinflammatory cytokines tumor necrosis factor α and interleukin-6 in plasma of patients suffering from type 2 diabetes combined with hypertension (Ambrosova et al. 2010, Sirenko 2012).

Pharmaceutical company "Takeda" that created the drug candesartan, has developed a modern angiotensin II receptor blocker possessing improved pharmacokinetics, drug azilsartan medoxomil under the trade name edarbi.

After oral administration azilsartan medoxomil is converted to the active form azilsartan, highly selective ARBs, by ether hydrolysis in the gastrointestinal tract and the liver. Bioavailability is 60 %, it reaches maximum concentration in the blood for 1.5-3 hours. The half-life accounts for 11 hours, which allows the drug to be taken 1 per day. More than 99 % of the drug is bound to plasma proteins, mainly serum albumin. Azilsartan metabolized by cytochrome CYP2C9 via the formation of two inactive metabolites (MI and M-II). 55 % of the drug is excreted from the body through the gastrointestinal tract, 42 % - by kidneys (Savustyanenko 2014, Azilsartan medoxomil (Edarbi) the eighth ARB 2011).

Azilsartan is a competitive reversible antagonist of AT1 receptors. Azilsartan medoxomil showed minimal compared to other sartans medium inhibitory concentration (IC50), required for 50 % inhibition of connection with receptor in experiments (Zaharova et al. 2011). This almost completely eliminates the possibility of angiotensin II binding to AT1 receptors, leading to pronounced inhibition of the renin-angiotensin-aldosterone system. As a result, azilsartan developing hypotensive effect faster, prolonged and pronounced compared to other sartans (Tseluyko et al. 2014, Kajiya et al. 2011). According to the clinical measurement of blood pressure and diurnal blood pressure monitoring showed statistically significant superiority in reducing BP compared to valsartan (White et al. 2011, Sica et al. 2011), candesartan (Rakugi et al. 2012) and olmesartan therapy (White et al. 2011, Bakris et al. 2011). The amount by which azilsartan medoxomil lowers blood pressure compared with the listed drugs may range from 1.2 to ≈ 5 mm Hg. This decline has some clinical significance: reduced systolic blood pressure by 2-5 mm Hg could potentially reduce mortality from coronary heart disease in 4-9 %, stroke - by 6-14 % (Mancia et al. 2013, Savustyanenko 2014, Baker et al. 2011).

Azilsartan acts quickly: within 2 weeks of therapy with edarbi leads to the same reduction in blood pressure as valsartan therapy for 4 weeks (Tseluyko et al. 2014, Sica et al. 2011, Baker et al. 2011).

In clinical use as a starting dose of azilsartan medoxomil 40 mg 1 per day is recommended. With the lack of efficacy, the dose may be increased to 80 mg/day. In patients with mild/moderate renal impairment dose adjustment is not required. In elderly patients (≥75 years) patients with mild/moderate hepatic impairment or low blood volume starting dose should be 20 mg/day. In severe hepatic insufficiency drug use is not recommended, in severe renal insufficiency used with caution. The drug is not excreted in hemodialysis. To pregnant women drug is not administered due to its penetration through the placental barrier (Savustyanenko 2014, Kajiya et al. 2011).

The main trend in the treatment of sartans class preparation is the use of the drugs in high doses, the maximum tolerated permitted. For example, during recent clinical studies of azilsartan comparative effectiveness and safety in patients with hypertension were applied dose of azilsartan 80 mg, olmesartan 40 mg and valsartan 320 mg (Zaharova et al. 2011).

In addition to antihypertensive action azilsartan medoxomil shows a number of additional pleiotropic effects. These include antithrombotic, antiproliferative and antyfibrotic action. It demonstrates the improvement in glucose tolerance and tissue insulin sensitivity, increasing the expression of PPAR-γ and adiponectin (Baker et al. 2011), improves endothelial function, reduces the progression of albuminuria, proteinuria (Shilov 2014, Savustyanenko 2014).

To enhance the antihypertensive action azilsartan medoxomil may be combined with other antihypertensive agents, such as chlorthalidone, hydrochlorothiazide, amlodipine, etc. (Dyadyk et al. 2014, Baker et al. 2011).

Conclusions:

1. The current strategy of high blood pressure correction provides effective blood pressure control with decreased risk of cardiovascular complications, lethal outcomes, improvement of the state of organs targets.
2. ARBs II - drugs with pleiotropic pharmacological properties that have a multicomponent antihypertensive efficacy, good tolerability, diverse organoprotection (improvement of cardiovascular, cerebrovascular and renal status), is highly safe, it can improve the remote prognosis for patients with hypertension. Sartans make up worthy competition with ACE inhibitors - a standard RAAS-acting drugs, but is dominated by recent criteria of safety, tolerance, ability to provide organoprotection.

3. The high antihypertensive activity and a favorable safety profile of azilsartan medoxomil may provide better long-term compliance with therapy and optimal control of blood pressure in patients.
4. Promising is the use and further development of angiotensin II receptor blockers, as well as new classes of inhibitors of the RAAS: AT II-vaccines and vasopeptidase inhibitors.

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MORPHOLOGIC CHANGES IN THE NODULAR GOITRE INDUCED BY THE LIGASURE HIGH FREQUENCY CURRENT GENERATOR

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Yermakova T. (2015), *Morphologic changes in the nodular goitre induced by the LigaSure high frequency current generator.* Health Problems of Civilization, 3 (9), p. 20-23.

Summary: Today, surgical dissection and tissue coagulation with both monopolar and bipolar coagulation as well as LigaSure high frequency current generator (HFCG) are the surgical modalities of choice in the treatment of thyroid pathology. However, the question of the high frequency current effect on the morphofunctional condition of the post-hemithyroidectomic parenchyma is still disputable.
The goal of the research is a thorough histological analysis of the surgically removed thyroid tissue specimen.
The nodular goitre of 50 patients was subject to the histological study. The surgery was performed with the LigaSure HFCG. The 1.0x0.5 thyroid tissue specimens were excised from three areas.
Hemithyroidectomy lasted for 40-50 min and thyroidectomy – 120 ± 4.2 min. In both procedures, the blood loss was within 70-150 ml, no haemorrhage being observed in both intra-and postoperative period.
The zonal effect of high frequency current on the thyroid structure was determined morphologically, namely coagulation necrosis in the site of direct action, intensified secretory response of the thyroid tissue to the extremal factor in the perifocal area, and typical structure of the nodular goitre with the signs of impaired microcirculation in the remote area.
Morphologic changes of the thyroid gland, with high frequency current used as a dissector, are distance-dependent.

Keywords: nodular goitre, thyroid gland, LigaSure

Introduction

Nodular goitre is prevalent thyroid pathology, the morbidity being estimated today as 30-40 cases per 100 000 population. Of them, 70 per cent are diagnosed as benign and 10 per cent – as malignant (Witzel 2007, Chaudhary et al. 2006). Both conservative and surgical methods of the treatment are used, the postoperative complication rate ranging from 2.5 to 5.0 per cent (10-th World Congress of Endoscopic Surgery 2006, Sadler 2006). This is mostly due to imperfect haemostasis as well as the damage to adjacent organs, firstly the nerves. Wide application of the latest techniques provided notable decrease of both intra-and postoperative complication rate (Vassilios et al. 2005, Shen et al. 2005, Rosato et al. 2004). Today, surgical dissection and tissue coagulation with monopolar and bipolar coagulation as well as LigaSure high frequency current generator (HFCG) are the surgical modalities of choice (Andreas 2004, Foster 1978, Dionigi et al. 2006). However, these methods are not free from shortcomings, in particular with regard to the damaging effect on the surrounding tissues and homeostasis areas, thus conditioning the need of morphologic substantiation of their application in thyroid surgery. The effect of high frequency current on the morphofunctional condition of the post-hemithyroidectomic parenchyma is an open-ended question. Besides, the nature of pathologic process can be mostly determined on the basis of a thorough histological study of the dissected tissue, and it should be taken into account that high frequency current can alter its manifestations. The above-mentioned unclear morphologic aspects of the high frequency current coagulative effect on the thyroid necessitated this study.

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Materials and methods of investigation

Surgically excised thyroid or its lobe was used for the morphological analysis. The surgical intervention was performed on 50 patients (their mean age being 45 years) with the nodular goitre under general anaesthesia and artificial pulmonary ventilation with myorelaxants, by using LigaSure HFCG. The thyroid tissue was fixed in 10 % neutral formalin solution and then studied both macro-and microscopically in accordance with the Agreement on theoretical and practical co-operation between the State Higher Education Institution "I.Y. Horbachevsky Ternopil State Medical University" and Ternopil regional pathologicoanatomic bureau. The 1.0x0.5 thyroid tissue specimens were excised from three areas: first – at the site of high frequency current application; second – in the perifocal area, 0.5 cm from the electric coagulation site; third – 1.0-2.0 cm from the electric coagulation site. Dewaxed slices were stained with haematoxylin and eosin as well as with Hart and Malory fuxelin. Histological specimens were analyzed with the use of SEOSCAN and Lumam P-8 microscopes at various magnifications. To obtain documentary photographs, microscope images were taken to the computer monitor with the VISION Color CCD Camera and the Inter video WinDVR.

Results and discussion

Hemithyroidectomy procedure lasted for 40-50 min and thyroidectomy – 120 ± 4.2 min. In both procedures, the blood loss was within 70-150 ml, no haemorrhage being observed in both intra-and postoperative period.

Histological study revealed local coagulation necrosis at the site of LigaSure high frequency current application that was confirmed by folliculi outlines with unstained structures, soaked in patches with haemolytic erythrocytes (Fig.1). Both thyrocytes' cytoplasm and intercellular tissue were eosinophilic, the nuclei poorly defined.

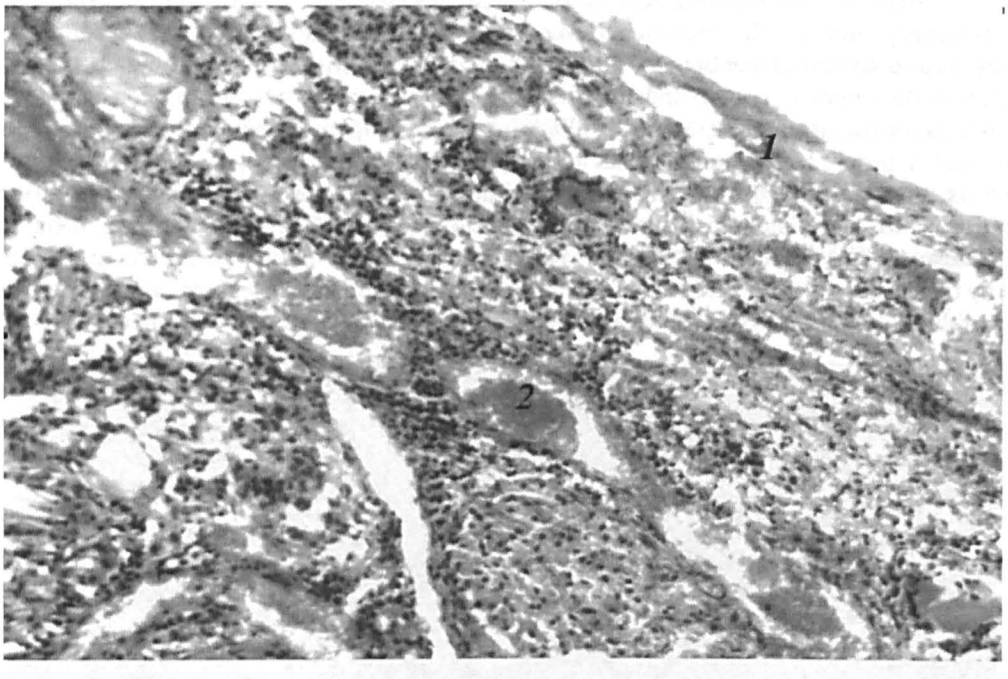

Figure 1. Coagulation necrosis in the area of high frequency current action (1).
Capillary plethora (2). Staining with haematoxylin and eosin. X 80.

Despite the short-term effect of high frequency current, adaptive processes at the background of marked microcirculation disorders were found. Thyrocytes changes revealed themselves in necrotic and dystrophic processes in the form of cytoplasm swelling and clearing, nuclear pyknosis, desquamation of thyroid epithelium into folliculi lumen as well as impaired colloid eosinophilia and basophilia, together with increased number of microvesicles on the epithelium surface. (Fig.2)

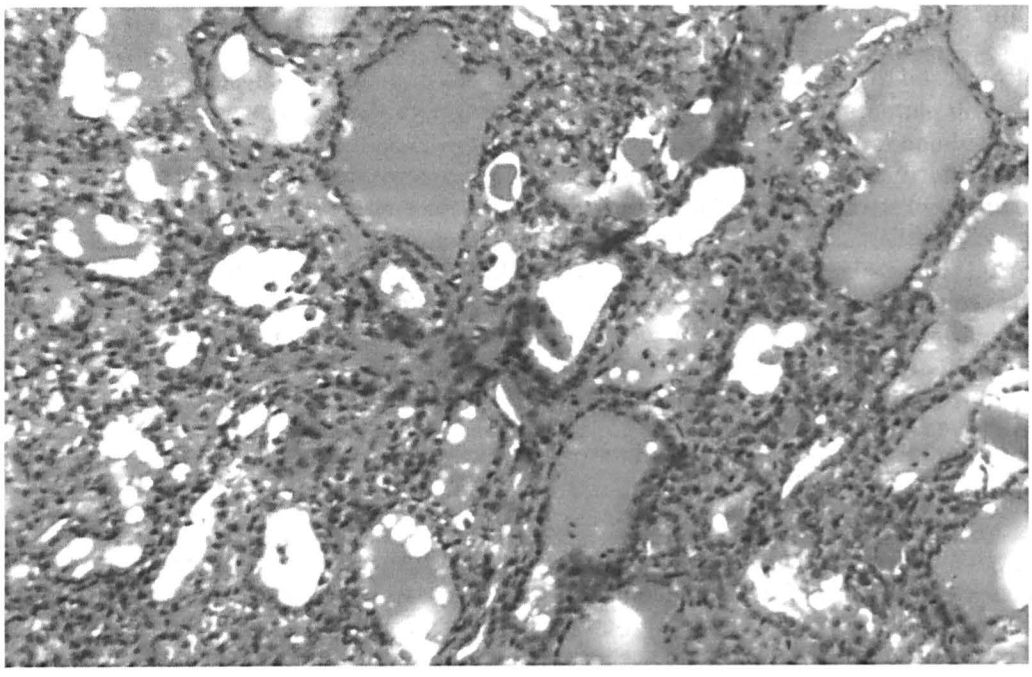

Figure 2. Increased thyroid tissue secretory activity. Staining with haematoxylin and eosin. X 80.

These changes can be reasonably regarded as "emergency" response of the thyroid secretory function to the effect of high frequency current. The current action reveals itself in partial changing of thyrocyte folliculi nuclei, vascular myocytes and stroma. They become oblong-shaped and are intensively stained with haematoxylin.

Microcirculation disorders were non-specific and revealed themselves in differing degree of shock organ re-organization, namely stromal oedema, acute capillary plethora, diapedetic haemorrhages and colloidorrhagias. In most segmental arteries, the subendothelial interlayer is thickened owing to plasmatic impregnation and erythrodiapedesis, the inner elastic membrane having the signs of breakdown and fragmentation. In addition to plethora, red thrombi and plasma coagulants are found in the vascular lumen. Changes of the nodular goitre chronic manifestations were detected in the areas remote from coagulation necrosis. The thyroid parenchyma is characterized by the clusters of large and small folliculi separated by the interlayers of connective tissue. The stroma enlargement is of diffuse type, occupying large area in patches with "immured" thick-walled vessels. (Fig.3).

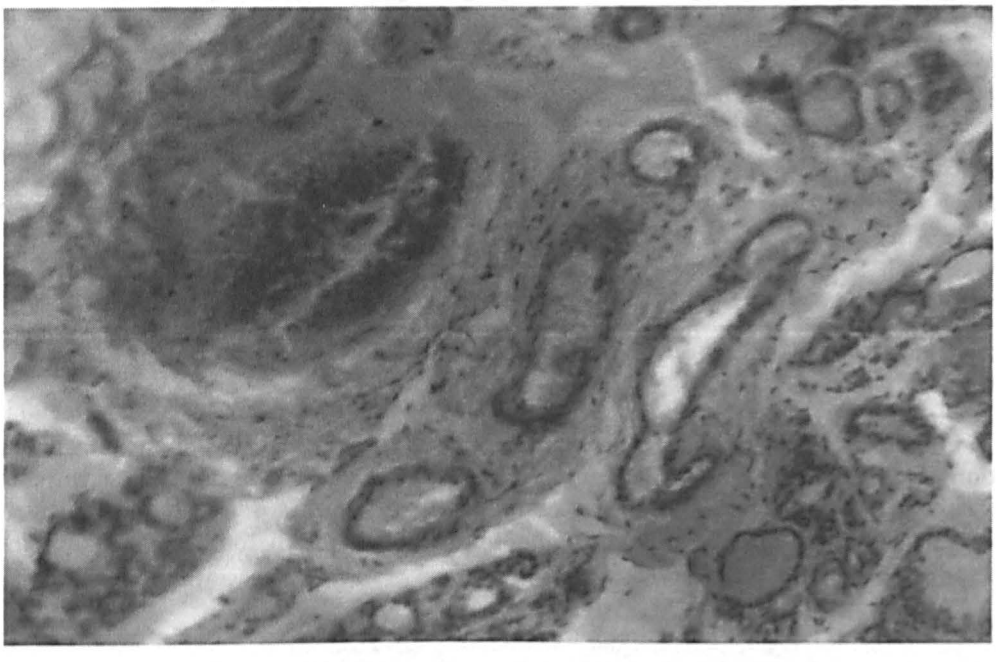

Figure 3. Connective tissue oedema. Vascular thrombosis. Staining with haematoxylin and eosin. X 80.

In these vessels, endotheliocytes swelling and desquamation as well as dissection of myocytes with plasmorrhagia and perivascular haemorrhages occur. Thrombi appear in the lumen alongside with plethora. These changes are likely to be the manifestations of the bloodstream shock reaction to the stress effect of high frequency current.

In folliculi, both large and small, the colloid is basophilic. Resorption vacuoles are scanty. Thyrocytes differ in height, being high in small folliculi and flattened – in large that is indicative of their different functional activity.

Conclusions

1. The effect of high frequency current as a dissector on the course of morphologic changes in the gland is distance-dependent, the changes corresponding to structural shock characteristics.
2. When applied directly, high frequency current causes coagulation necrosis in the thgyroid gland; in the perifocal area it results in intensified secretory response of the thyroid tissue to the extremal factor whereas in the remote area the typical structure of the nodular goitre with the signs of impaired microcirculation is evident.

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NON-SURGICAL AND SURGICAL TREATMENT OF LUMBAR DEGENERATIVE DISC DISEASE IN THE COURSE OF PERIPHERAL NEUROPATHY

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Summary: The aim of this article is to review current reports pertaining the effects of treating patients with diagnosed degenerative disc disease in the lumbosacral section of the spine.
Materials and methods: the method of descriptive analysis was used. The research was conducted on the basis of materials from MEDLINE and EMBASE databases from the last ten years. The cases of patients with sciatic neuritis caused by degenerative disc disease undergoing conservative treatment, and similar group of patients treated surgically, were analysed.
Conclusions: Conservative treatment lowers the intensity of pain, but does not improve the functional abilities of the spine. Surgical treatment gives good and quick therapeutic results, but its long-term effects do not seem better than in the case of conservative treatment. Moreover, surgical treatment may result in serious complications.
In rare cases the condition results in a severe impairment of motor functions in legs and sphincter paralysis. Such patients should undergo immediate surgical treatment.

Keywords: degenerative disc disease, sciatic neuritis, surgical treatment, conservative treatment

Introduction

Degenerative disc disease, especially in the lumbar section, is the most common condition of the spine in persons with involvement or impairment of the neural system. In about 90% of the cases, sciatic neuritis is caused by disc herniation with a compression of the nerve root (Koes et al. 2007).

In the beginning of the last century (1909) Oppenheim and Kruze published a report on two cases of spine surgery caused by lumbar degenerative disc disease (Stienen et al. 2013). It was then proven that there is a correlation between the tearing of the intervertebral disc and the irritation of nerve structures inside the spinal canal (Rüttimann 1990). In their reports, Mixter and Barr underlined the inseparable link between the herniation of the nucleus pulposus and sciatic neuritis, explaining the etiopathogenesis of neurological symptoms (Mixter, Barr 1934).

The tearing of the intervertebral disc, leading to its bulging, is usually connected to a genetic deficiency that results in a low quality of sulphur bondings in collagen fibres forming the annulus fibrosus of the intervertebral disc (Zhang 2008).

The bulge on the intervertebral disc compresses the nerve tissue inside the spinal canal and causes its mechanic irritation, which leads to impairment of the blood flow and, consequently, to swelling. Degenerative disc disease results in repeated compression of the nerve roots. The roots are not surrounded by a protective layer of connective tissue which would increase its resistance to mechanic factors. Even minor compression

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causes impaired blood flow inside the root, which compromises its function. The symptoms occur in a specific place. Patients experience problems with functioning of the root forming the sciatic nerve, and pinpointing the location of the symptoms can help in evaluating the extent of damage (Faleiros 2009). Pathology of the intervertebral disc is most commonly a cause of spinal pain, though abnormalities may occur also in ligaments, muscles and tendons. The dehydration of the intervertebral disc results in degeneration of the annulus fibrosus. In time, that leads to tearing, first in the external, and later on in the internal layers of the annulus, which allows for the dislocation of the nucleus pulposus, herniation, or even sequestration. The anatomical changes resulting from degenerative disc disease cause symptoms such as pain in the lumbar section of the spine, prevertebral pain and pain radiating to the lower limb peripheries (Fuso et al. 2013).

Treatment is based on many factors, but mainly on the clinical state of the patient and the extend of neurological damage. However, at all times the treatment is preceded by proper medical diagnosis of the disorder (Lichert 2013).

Main symptoms of degenerative disc disease are connected to the occurrence of:

1. pain in the lumbosacral section of the spine (the first and dominating symptom). The onset of the disease is quite acute, and later passes into a chronic form;
2. pain originating in the nerve root – the neuralgia of sciatic nerve – which is experienced along the entire length of the nerve, starting around the buttocks, through the thigh, knee, calf and down the side of the foot all the way to the toes;
3. pain accompanied by feeling impairment, usually superficial and in the form of paraesthesia, but also weakening along the area of distribution of the damaged nerve root;
4. weakening of the tendon reflexes and symptoms of muscular dystrophy, reflected by a reduced circumference of the affected limb;
5. increased tension of prevertebral muscles on the side where nerve roots are compressed;
6. pain between the scapulae or even in the neck, created, so to speak, by the relocation of the inflammatory reaction along the dural sac, from the lumbar section towards the neck. This symptom is rare;
7. central or one-sided pain resulting from the mechanic compression of the dural sac and the nerve root. This symptom occurs usually in younger patients.

A previous damage or long lasting strain may exacerbate the symptoms or quicken the sudden onset of the disease. The course of the disc disease is rather typical, and begins with an abrupt pain resulting from a sudden movement or lifting an object more than 10% heavier than the patients weight, with an additional rotation of the spine (Wójcik et al. 2013). Degenerative disc disease is often connected with the impairment of the spine's mobility, which results in an increased fatigability of the spine. The disease is often accompanied by different types of pain, often dull, extensive, hard to identify. After a while, however, the pain concentrates and is evidently experienced around the lumbar section of the spine.

Acute and sub-acute phase of the disease is accompanied by pain radiating along the length of the sciatic nerve. The extensiveness of the radiation depends on the level of damage to the nerve root. This may be evaluated during a clinical trial by pressuring Valleix points and judged by the level of movement restriction in the leg caused by pain during the positive Romberg's test (Orłowski 2003). Resting in neutral spine position, with bent hips and knees reduces the pain in the lumbosacral section. In rare cases a severe impairment of motor functions in the legs and sphincter paralysis may occur in the course of the disease. Such patients should undergo immediate surgical treatment (Celik et al. 2012).

Conservative treatment

Above all, proper treatment of sciatic neuritis requires identifying the source of irritation of the root of the sciatic nerve through imaging examination of the lumbosacral section of the spine, such as CT (computed tomography) or MRI (magnetic resonance imaging) (Khyzhniak et al. 2013).

Conservative treatment of sciatic neuritis is based mainly on pharmaceutical treatment, in which NSAIDs (Nonsteroidal anti-inflammatory drugs) and other analgesics are used. Conservative treatment involves also suitable rehabilitation – manual therapy or neuromobilisation. Some passive methods of treatment, such as applying strain-relieving positions of the spine, are also employed.

Like in the case of many other disorders, methods such as acupuncture, acupressure, massage, gymnastics and relaxation – e.g. yoga, are used widely in the treatment of sciatic neuritis. Despite the lack of unequivocal clinical research asserting their effectiveness, they can be used additionally with some patients because of their apparent harmlessness.

Acupressure and acupuncture – those two techniques of massage are very similar, and they originated in

Chinese medicine. The basis for those methods is vital energy qi, as well as yin and yang. They help not only to relieve muscle tension, but also to treat some disorders. Acupuncture consists in piercing specific points on the body with very thin needles. Acupressure consists in pressuring those points. In case of degenerative disc disease, both those methods have a purely analgesic effect (Yeh et al. 2009).

Through a set of stretching and posture-improving exercises, yoga can improve the elasticity and mobility of postural muscles and some other muscles, e.g. the piriformis muscle, which is a common cause of sciatic neuritis. Relaxation, which is a part of yoga, may also help to reduce the perceived pain. Yoga may help retain motor functions, reduce the intensity of pain, and treat depression, which is very important in treating chronic diseases (Jeng et al. 2011).

General cryotherapy has become popular in recent years. It consists in exposing the entire body of the patient to very low temperatures (-160 to -100°C) for a short period of time (maximum 3 minutes). Contrary to local cryotherapy, properly executed general cryotherapy does not damage tissue. This method is also called cryostimulation, because its aim is to put the organism under physiological stress (Gusarova et al. 2000).

Using ultrasounds on the paraspinal space brings reasonably good results. It causes the soft tissue to relax, and increases the blood flow in the treated region thanks to deep heat penetration. This improves the tissue nutrition and helps flush out metabolic waste (Licciardone 2013).

Magnet therapy has been used for some time in treating diseases of the lower section of the spine. It consists in exposing live tissue to an alternating magnetic field, which causes changes in the ionic balance. The result of that is a very positive change in metabolism, which is used widely in treating medical conditions such as chronic low back pain (Khoromi et al. 2007).

Transcutaneous Electrical Nerve Stimulation (TENS) is a method used in conservative treatment of degenerative disc disease. Electrical Stimulation is a clinically attested, non-invasive, non-pharmaceutical and effective method of treating pain. It is widely used to alleviate both chronic and sharp pain. TENS consists in using electrodes to send electrical impulses of low amplitude through skin to peripheral nerves, which are responsible for perceiving temperatures. Through those nerves the signal is carried on to the synapses of the spinal cord, where it serves two purposes:

1. As a signal that blocks a nerve impulse, which conveys information to the brain about pain so that the brain does not receive any data of location or the intensity of pain. This effect is caused by high-frequency TENS impulses. Blocking of pain impulses does not damage a nerve structure but it "deceives" the pain information mechanism. The blocking mechanism of a nerve impulse, conveying a signal about pain, was scientifically approved in the 1960s as the gate control theory of Melzack and Wall. Group C nerve fibres convey a signal from an electrostimulator faster than group A nerve fibres so that the signal from a stimulator wins in the contest for an access to the hypothalamus.
2. As an initiator of formulation of natural analgesics, beta endorphins, which have an analgesic effect similarly strong as morphine (or other opioid compounds). This mechanism is caused by low-frequency or bursts impulses.

TENS does not heal causes of pain but it significantly relieves them and an analgesic effect lasts longer (Liebano 2013).

Chiropractic is, on the other hand, a form of a manual therapy, which can be also helpful in treatment of sciatica. To put it in simple terms, it uses certain manoeuvers that reflect the anatomical shape of the spine.

Surgical treatment

In a case of a hernia or an inner canal protrusion, in the majority of patients with lumbar discopathy one of the most effective methods of surgical treatment is a typical fenestration. Such an operation enables not only a hernia or a sequestrum removal but also a revision of intervertebral space. A wide surgical access enables a full decomposition of a nerve root on his relatively long course, an excision of sometimes present steophytes and also allows the execution of foraminotomy associated with a stenosis of the foramen (Silva et al. 2013).

In case of degenerative disc disease, hemilaminectomy is performed less frequently. It also allows decompression of the nerve tissue but it is associated with damage to bone tissue and thereby extends time of patient's full recovery (Liu et al. 2013).

Currently available methods of surgical treatment:

- standard removal of the intervertebral disc - all intervertebral disc removal techniques give comparable results. It seems to be of importance to appropriate classify noslogical image to the right kind of neurosurgery;
- microsurgical removal of the intervertebral disc involves the use of an optical microscope that significantly improves accuracy and precision of the procedure. The method is less useful in the presence of additional pathology that requires a wider field of a surgical intervention;

- percutaneous techniques impacting on the structure of the intervertebral disc - different methods based on the US laser technology, high-frequency waves mainly used for the type of relentless spine pain syndrome of a fibrous ring of the intervertebral disc. Methods do not apply in the case of herniation of the spinal canal stenosis developed in discopathy and in patients with a visible sequestration of fragments of the nucleus pulposus in diagnostic imaging;
- dissolution of the intervertebral disc by injection of an enzyme - a method virtually abandoned due to new technologies, but mainly because of dangerous complications related to the destructive action of chymopapain not only on the structure intended for removal;
- numerous methods with use of ceramic, polymer, carbon, fixed or mobile implants are a subject of plentiful clinical observations. After many years of observation, however, it cannot be said they are better than previously used techniques and they are definitely far more expensive for the health care system.

Indications for surgical treatment

Absolute indication for surgical removal of herniated nucleus pulposus, even on-call duty, is its sudden onset, massive pain syndrome undergoing the symptoms of paralytic seizure and confirmed the light of the spinal canal for diagnostic imaging. (Khyzhniak et al. 2013). The indications for a planned surgery is complete diagnostic imaging and ineffective conservative treatment or progressive symptoms of pain and neurological symptoms. Conservative treatment in such cases should last at most a few weeks or months (Iversen et al. 2013).

Relative indications for surgical removal of the intervertebral disc concern patients with evident symptoms of pain, occurring, however, periodically and relatively seldom, e.g. 2 - 3 times a year. A similar dilemma arises in case of established, yet limited sensory neurological deficits, less frequently in motor deficits. A significant problem occurs, however, in patients with natural conversion of hernia nucleus pulposus into degenerative changes with a reoccurrence of stenosis, which further involves a long duration that significantly worsens prognosis even in the event of surgical treatment (Willems 2013).

Aim of the study

The aim of this study is to review the current literature on the effects of treatment of patients diagnosed with discectomy in the lumbo-sacral spine.

Material and methods

A method of descriptive analysis was used. The study was conducted on the basis of an analysis of literature from the MEDLINE and EMBASE database available in the last ten years. Cases of conservative treatment in patients with sciatica caused by discectomy and a similar group of patients undergoing surgery were analysed.

Discussion

The intervertebral disc degeneration allows for a dislocation of the nucleus pulpous with formation of a hernia but it also leads to secondary lesions within the same vertebrae and intervertebral joints. In course of a longstanding pathological process it comes to an irreversible formation of osteophytes, which cause spinal stenosis and intervertebral foramina, thus to so-called secondary stenosis.

In the case of both conservative and surgical treatment the goal is to reduce or to remove pain and increase functionality of the spine, which directly translates into an increase in overall physical fitness. Both criteria were taken into account when analysing the material.

Traditional "open" surgery of the spine has been used since the 1930s. In Poland, it is one of the most popular methods of surgical treatment. However, it is much more invasive and after such a surgery a patient returns much longer to full physical fitness.

Surgical treatment of disc disease in the lumbar spine is in the present times associated with microdiscectomy. (Kimbal 2013). Discectomy with implantation of a spinal stabilization system is reserved for the most advanced forms of slipped disc. Minimally invasive percutaneous treatment of intervertebral disc degeneration raises many doubts among surgeons treating degenerative disc disease. An important advantage of percutaneous methods is shortened time of hospitalization and rehabilitation. By reducing scope of interference in paraspinal tissue and spinal canal structures the possibility of deepening instability of the spine is minimized and the risk of postoperative scar formation is reduced. Minimally invasive percutaneous treatment of discopathy is

becoming more and more popular among both patients and surgeons. As in any method of treatment, the clinical effect is dependent on correct classification. Percutaneous methods are used for treatment of less advanced forms discopathy. As a result of increasing prevalence of diagnostic imaging, discopathy is detected in the early stages of development. In order to qualify for a surgery procedure, conservative methods of treatment must be exhausted. Many authors consider 6-month ineffective rehabilitation for a basic eligibility criterion. Minimally invasive percutaneous treatment of discopathy should not be considered as an alternative to the conventional spinal surgery. They often come between the classical conservative treatment and surgery of the spine. Due to various clinical indications for percutaneous and classical surgery, often debated demand to conduct prospective studies, comparing effects of treatment, seems to be more and more difficult to achieve (Manchikanti 2013).

Most of authors reported that after the conservative treatment of patients with lumbar discectomy with sciatica, 20% of patients needed to again contact a doctor about a relapse within 12 months of health improvement. The analysis showed that aggravation of symptoms before treatment is an important factor affecting the recovery rate. According to current studies, satisfactory short-term results of conservative treatment in patients with symptoms of a lumbar herniated disc support the possibility of their return to physical activity. Results of the conservative treatment were not dependent on the intensity of pain. Subjective symptoms before treatment seem to be a key factor in qualification for conservative treatment (Iwamoto et al. 2011).

The Dutch randomized study was conducted using the Roland Morris Disability Questionnaire, the visual analogue scale (VAS) for the lower limbs and the back and the individual Likert scale helpful in the evaluation of full recovery. Despite at least 6 months conservative treatment, 46% of patients were qualified for surgery due to intensification of pain in lower limbs and disability. Prolonged conservative treatment may be an opportunity for patients to reduce pain and disability but it also constitutes risk of delayed surgery after long suffering associated with sciatica. An age of 40 and strong back pain radiating into lower limbs support implementation of surgical treatment (Lequin et al. 2013).

Prognostic factors that qualify to surgical treatment of patients with sciatica include obesity and advanced age. (Jensen et al. 2013).

There are discrepancies in the literature as to whether pain increases or decreases in the elderly and whether it is related to gender. There is no definite proof that the prevalence of pain radiating to lower limbs is associated with age. Complementary therapies have proved to be of certain efficiency among the elderly, including acupuncture, transcutaneous electrical nerve stimulation (TENS) and massage (Abdulla et al. 2013).

The comparison of a combination of physiotherapy and traction with physiotherapy used alone or traction compared with other treatments resulted in very weak evidence that traction can affect the intensity of pain, physical fitness of a patient or the improvement of peripheral nerves conduction. These results indicate that traction, either alone or in combination with other treatments, have little or no effect on the intensity of pain, functional status of a patient and general improvement of peripheral nerve conduction. The effects observed in this study are small and not clinically relevant. (Wegner et al. 2013).

On the basis of a randomized clinical trial conducted on 141 patients suffering from neuropathic pain diagnosed with sciatica, effects of adjuvant drug therapy on the conservative treatment were analysed. In case of neuropathic pain, pharmacological treatment is the treatment by choice, traditional conservative treatment is, however, a complementary method which allows to achieve better therapeutic efficacy (Di Piero, Settembre 2013).

The method commonly used in treatment of pain syndromes in the lower spine is a massage. The use of massage seems to have a positive impact on a reduction in disability, the effects of its use, however, are short-term but for majority of patients anti-depressant (Keller 2012).

Other studies have argued in favour of effectiveness of magnetic field in treatment of lumbar disc herniation. Forty patients suffering from lumbar radiculopathy were randomly assigned to one of two groups. The study group included 20 patients treated with a magnetic field therapy and the control group consisted of 20 patients treated with placebo. Both groups were assessed before treatment and three weeks after it with a use of the Visual Analogue Scale VAS, somatosensory evoked potentials for selected dermatomes and a modified Oswestry Disability Questionnaire (OSW). The group of patients undergoing magnetic field therapy achieved significantly better therapeutic effects. In addition to clinical improvement in nerve roots symptom, the magnetic field also appears to be effective in reduction in nerve root compression (Omar et al. 2012).

Grubisić and colleagues conducted research on the effectiveness of ultrasound therapy in patients with chronic lumbar pain lasting more than three months. Patients were divided into two groups, whereas one was treated only with kinesitherapy and the other with kinesitherapy and sonication treatment. The VAS and the Schober test were used in research. The analysis of the results before and after beginning of the treatment found that ultrasound therapy is effective in reduction in the intensity of pain but does not provide improvement in terms of the functional capability of the lumbar spine in patients with chronic back pain (Grubisic et al. 2006).

Croatian researchers conducted a retrospective analysis of the effectiveness of surgical and conservative treatment in 100 patients with lumbar radicular syndrome. The Lasègue test and the hybrid Lesegue test were performed in patients; neurological deficit was also evaluated. According to established criteria, all patients had indications for surgical treatment. However, 50 patients refused surgery and as a result were treated conservatively. Data were evaluated at the beginning of the treatment, after 2 months and then after 7 and 18 months. The results of the treatment in all periods supported surgery in majority of specialized research. Better results of the treatment were obtained in the group of patients who underwent surgery. Fast reduction in symptoms is the main advantage of this method. Patients whose pain is treated conservatively and do not have extensive neurological disorders may decide to delay surgery (Hadžić et al. 2013).

Other researchers also addressed the issues of the effectiveness of spinal surgery compared to conservative treatment of lumbar herniated disc. Of the 127 patients with lumbar discectomy, 72 were treated only conservatively, whereas the remaining 55 underwent microdiscectomy. Two years after the completion of treatment as well as before its beginning, the visual analogue scale (VAS) and the Oswestry Disability Index (ODI) together with the Short Form-36 Health Survey (SF-36) were used in both groups for the purpose of the analysis. In both groups, results of the treatment were more favourable compared to baseline values and fluctuated within similar limits. Statistical analysis showed that there were no significant differences between the groups. In conclusion, this study shows that both methods lead to equivalent clinical effects (Kafchitsas et al. 2014)

There were also attempts undertaken to evaluate pain of the lumbar spine and lower limbs by means of the visual analogue scale (VAS) in pre- and postoperative management of patients with sciatica. Intervertebral disc surgery resulted in a significant reduction in pain threshold in each patient. The whole group of patients was examined six months later after a surgery. In the study group, a full clinical improvement was achieved with the VAS within the normal range (Zub et al. 2013).

Conclusions

A review of the current literature on the effects of treatment of people diagnosed with discectomy in the lumbo-sacral spine shows that:

1. Conservative treatment reduces the intensity of pain but does not improve functional capabilities of the spine.
2. Surgical treatment gives a rapid reduction in symptoms but long-term effects of such a treatment do not appear to be superior to conservative treatment, surgery may furthermore be associated with serious complications.
3. Aggravation of symptoms is an adverse predictor for all methods of treatment.
4. The degree of symptoms aggravation before treatment is an important factor affecting the rate of patient's recovery.

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ACCEPTANCE OF ILLNESS AND SATISFACTION WITH LIFE AMONG PATIENTS WITH ARTERIAL HYPERTENSION

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Summary: The aim of this study was to determine and compare the degree of acceptance of the disease and the level of satisfaction with life among people with diagnosed hypertension. The research was carried out by means of a diagnostic survey. The study used the scale of AIS - Approval Illness Scale (Acceptance of Illness Scale). For measuring life satisfaction ladder Cantrill was used. It assessed satisfaction with life on a scale from 0 to 10. The study was conducted in June 2014 among the residents of Lubelskie and Świętokrzyskie voivodships. The study was anonymous. The approval of the Bioethics Committee at the Medical University of Lublin (KE-0254/176/2014) was received for carrying out the tests. The study included patients diagnosed with hypertension – total of 154 people. The study has shown the average degree of acceptance of the disease. Illness and healing therapy did not impact negatively the functioning of most respondents. The respondents described their adaptation to the limitations imposed by the disease in different degrees. The vast majority of respondents did not have any problems arising from the disease and did not abandon their favorite activities. Every third respondent with hypertension felt as being a defective person and dependent on other people. The relation between satisfaction with their own lives, and the level of acceptance of the disease was concluded in that study. The higher the degree of satisfaction with patients' lives, the higher the acceptance of illness. Studies have shown positive correlations between gender, age, place of residence, duration of illness and education, and acceptance of the disease. In contrast, there was no statistically significant association between marital status and the test subject.

Key words: acceptance, satisfaction, hypertension, illness

Introduction

Cardiovascular diseases are among the most serious health, economic and social threats of modern times (Block, Kawecka-Jaszcz 2005). One of the most common diseases is hypertension. Analysis of nationwide research dissemination and control of risk factors for heart disease in Poland (NATPOL 2011) showed that hypertension occurs in 32% of adult Polish citizens, which means that currently there are approx. 10.5 million people in the age group above 18 years who suffer from it (Matyjaszczyk, Hoffmann et al. 2011).

In the treatment of patients with hypertension, the acceptance of the disease is a very important aspect. The degree of acceptance of the disease significantly affects the adaptation to restrictions imposed by the disease, addiction to surrounding people or the consciousness of self-worth. These factors have an impact on the subjective assessment of the quality of life, as well as determining the level of their own activities (Kaczmarczyk 2008). The acceptance of your health is a way to function properly with the disease. People who accept their illness have an optimistic way of looking into the future, they have a hope to improve their health, they are guided by trust in relation to the health facility staff and the direction or method of treatment. The acceptance is manifested by a low level of negative emotions and positive reactions in relation to one's own illness. With the increase of the acceptance of the disease, the level of adaptation to the functioning of disease also increases and the feeling of deprivation of psychological comfort decreases (Niedzielski, Humeniuk et al. 2007). The acceptance of one's health status does not reflect the resignation or weakness. It provides a consistent potential and the strength

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Tables: 4 Figures: 1 References: 13 Full-text PDF www.hpc.edu.pl **Indexation:** Index Copernicus, AGRO, ProQuest, Polish Medical Bibliography, Polish Ministry of Science and Higher Education.

of people, reconciling the independent state of affairs of each other, making it very easy to continue living with the disease (Zawadzka, Kuźniewski et al. 2005). The aim of this study was to determine and compare the degree of acceptance of the disease and the level of satisfaction with life among people with diagnosed hypertension.

Material

The study was conducted in June 2014 among residents of Lubelskie and Świętokrzyskie voivodships. The study was anonymous. The approval by the Bioethics Committee at the Medical University of Lublin (KE-0254/176/2014) was received for carrying out the tests. The study included patients diagnosed with hypertension - 154 people. Detailed characteristics of the study group are presented in Table 1.

Table 1. Characteristics of the examined group with arterial hypertension

Sex	Number of respondents	%
Female	83	53.9
Male	71	46.1
Age	Number of respondents	%
18-25 years	34	22.1
26-40 years	33	21.4
41-60 years	55	35.7
61 years and more	32	20.8
Locality	Number of respondents	%
Town (more than 100 thousand inhabitants)	34	22.1
Town (less than 100 thousand inhabitants)	55	35.7
Village	65	42.2
Education	Number of respondents	%
Incomplete Primary	1	0.6
Primary	30	19.5
Vocational	20	13
Secondary	49	31.8
Vocational secondary	29	18.8
Bachelor's/Engineering	19	12.3
Higher MA	6	3.9
Marital status	Number of respondents	%
Miss/Single	26	16.9
Married	99	64.3
Divorced	6	3.9
Widow/Widower	8	5.2
Informal relationship	15	9.7
Material situation	Number of respondents	%
Very good	10	6.5
Good	127	82.5
Neither good, nor bad	12	7.8
Bad	5	3.2
Very bad	0	0
Living	Number of respondents	%
With family	136	88.3
With flatmates	12	7.8
Alone	4	2.6
Other	2	1.3
Duration of illness	Number of respondents	%
0-1 years	23	14.9
1-3 years	65	42.2
3-5 years	45	29.2

More than 5 years	21	13.6
Blood pressure control	Number of respondents	%
Regularly- at least one time per day	67	43.5
Sometimes – when I feel bad	60	39
Irregularly – as I recall	25	16.2
I don't control my blood pressure at all	2	1.3
Taking medicines	Number of respondents	%
Regularly – as prescribed by doctor	72	46.8
Sometimes – when I feel bad	40	26
Irregularly – as I recall	28	18.2
I don't take medicines at all	14	9.1

Source: own work

The largest percentage of respondents consisted of patients aged 41-60 years (35.7%), living in rural areas (42.2%), with secondary education (31.8%), married (64.3%). The majority of respondents (82.5%) assessed their financial situation as good. The vast majority (42.2%) are respondents suffering from hypertension from 1 to 3 years. Regular monitoring of blood pressure at least once a day, is carried out by the largest group of respondents (43.5%), and they also take medications on a regular basis, as recommended by the physician (46.8%).

Research methods

The research was carried out by mean of a diagnostic survey. The study used the scale of AIS - Approval Illness Scale (Acceptance of Illness Scale), whose authors are: B.J. Felton, T.A. Revenson, G.A. Hinrichsen. Polish version of this scale has been developed by Z. Juczyński. It includes 8 phrases depicting the consequences of mediocre health. Respondent assesses each statement, analyzing them in terms of their current state, using a five scale - from 1 to 5 (1 - strongly agree, 5 - strongly disagree). By adding up the scores achieved, within a range of 8-40 points, we conclude the level of acceptance of the disease - low figure suggests the lack of it, while high - to accept the current state of health (Matyjaszek, Sierżantowicz 2010).

For measuring life satisfaction Cantrill ladder, which assessed satisfaction of life on a scale from 0 to 10, was used. The scale includes three graphically presented ladders, and there is one point designated on each of their respective levels. Analyzing the meaning of the numbers: zero means the worst conceivable to imagine life situation, while 10 is the best. The respondents pointed satisfaction with their lives in order: before disease, now and how it is imagined in the future. It is expected that the test will determine the future life in a more favorable light than it is at present. On such basis it is concluded whether the patient has a hope to improve the health status or not. Life dissatisfaction is considered when the tested person imagines a future situation unchanged / worse than the current one (Motyka 2002).

The statistical analysis of empirical research was performed using SPSS 20.0 statistical program. Statistical analyses were performed using a 't' Student test for independent samples (when compared to the average of two independent groups), one-way analysis of variance ANOVA intergroup scheme (in comparisons of more than two medium originating from independent samples) and the appropriate post-hoc tests; chi-square test for one attempt Pearson and Pearson correlation coefficients (as a measure of the linear relationship between quantitative variables). On the basis of the values reported by the program statistics and significance levels, a comparison was made of the significance of empirical statistics from the assumed level of alpha = 0.05.

Results

Studies have shown different levels of acceptance of illness. The average sum of all points scored on a scale of AIS and the average values obtained from the individual theorems are presented in Table 2.

Table 2. Values obtained from individual claims on a scale of AIS in the examined group

Criterion scale AIS	average	median	minimum	maximum	Lower quartile	Upper quartile	Standard deviation
The sum of all points earned on the AIS scale	25.42	24.00	11.00	40.00	19.00	30.00	7.92
I've got problems to adjust to the limitations imposed by the disease	**3.1**	3.0	1.0	5.0	2.0	4.0	1.1
Because of my health condition I'm not able to do what I like the most	**3.1**	3.0	1.0	5.0	2.0	4.0	1.1
Sometimes illness makes me feel not needed	3.2	3.0	1.0	5.0	2.0	4.0	1.1
Health problems make me more dependent on others than I want	**3.1**	3.0	1.0	5.0	2.0	4.0	1.1
Illness makes me a burden to my family and friends	3.2	3.0	1.0	5.0	2.0	4.0	1.2
My state of health makes me feel I'm not full-worth man	**3.1**	3.0	1.0	5.0	2.0	4.0	1.3
I'll never be self-sufficient enough to the level I would like to be	**3.1**	3.0	1.0	5.0	2.0	4.0	1.2
I think people that spend time with me very often feel embarrassed because of my illness	**3.4**	3.0	1.0	5.0	3.0	4.0	1.0

Source: own work

Theories describing the consequences of hypertension in subjects in terms of constraints, lack of self-sufficiency, a sense of dependence on others or decreased self-esteem were very diverse. For the examined people it was often difficult to agree or deny those claims (score 3 on the scale).

The most often respondents disagreed with the statement that other people staying with them may make them feel embarrassed because of their disease (3.4 ± 1.0 pts.). More often they agreed with statements concerning the restrictions on self-sufficiency, a sense of dependence on others or decreased self-esteem (3.1 ± 1.0 points).

In the group there were 17 respondents (11%) who achieved a maximum number of points (40pkt.) That indicates that the disease in the opinion of those surveyed did not pose any restrictions. The minimum number of points was 11, which involved one respondent indicating that the disease is a consequence of bad health condition.

Studies have shown that patients accept their illness moderately. The average point value was 25.42 ± 7.92 points. Percentage distribution of the level of acceptance of the disease is presented in Figure 1.

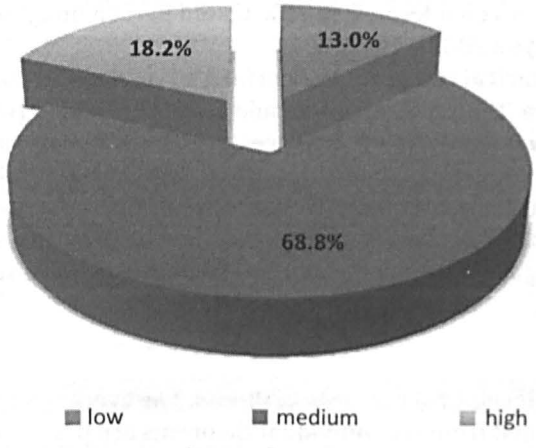

Figure 1. The level of acceptance of the disease according to the scale of AIS

Every third respondent with a hypertension says that he has a problem with adapting to the prohibitions connected with a disease, he is a burden for his family and friends, and is overly dependent on others. Even 36.4% of respondents claim that because of their health condition they are not able to do what they most like and ¼ of the test group (27.3%) experiences the feeling of being useless. Even 40% of respondents say they would never be self-sufficient enough and 39% of them have a low self-esteem due to their health condition.

In the course of the data analysis, it was examined whether sociodemographic factors, such as sex, age, marital status, place of residence and duration of the disease differentiate the degree of acceptance of the disease by the study subjects. See details in the table 3.

Table 3. The characteristics of the respondents and the level of acceptance of the disease – descriptive statistics

Variable		M	SD
Sex	woman	24.04	8.248
	man	27.03	7.243
Age	18 – 25 years	27.47	8.497
	26 – 40 years	26.55	8.097
	41 – 60 years	26.56	7.081
	61 years and more	20.09	6.326
	Together	25.42	7.918
Marital status	Single	28.54	8.778
	Married	25.22	7.604
	Divorced	25.17	3.251
	Widow/widower	19.50	9.813
	Informal relationships	24.53	7.190
	Together	25.42	7.918
Place of residence	Town - over 100 thousands inhabitants	28.82	8.505
	Town - up to 100 thousands inhabitants	25.11	7.620
	Village	23.89	7.416
	Together	25.42	7.918
Education	primary	20.42	5.685
	vocational	21.80	5.845
	secondary	27.16	7.028
	secondary vocational	26.17	8.984
	higher	30.20	8.088
	Together	25.42	7.918
Duration of the disease	0 – 1 years	26.22	6.403
	1 – 3 years	27.60	8.500
	3 – 5 years	23.04	6.509
	more than 5 years	22.86	8.627
	Together	25.42	7.918

Source: own study

The data above show that there is a certain difference between men and women in the degree of acceptance of the disease. To verify whether it is statistically significant, Student 't' test for independent samples was used. Test result $t_{(152)} = 2.372$; $p<0.05$ suggests that gender differences in the degree of acceptance of the disease are statistically significant. Men present a higher degree of acceptance of the disease (M = 27; SD = 7.24), than women (M = 24; SD = 8.25). Cohen's d value equal to 0,38 indicates an average strength of the observed difference effect.

It was also demonstrated that there is a correlation between age, place of residence, education, duration of the disease and the degree of the acceptation of the disease by the respondents. For this purpose, we compared the average results of people of different age groups, different marital status, place of residence, education and duration of the disease. To verify whether these differences are statistically significant, we performed the univariate analysis of variance ANOVA in the intergroup scheme and multiple comparisons by tests post hoc with Bonferroni correction. The result of the analysis of variance $F_{(3.150)} = 6.908$; $p<0.01$ means that age significantly differentiates the degree of the acceptance of the disease. The results of the multiple comparisons showed that people in the oldest age group above 60 years (M = 20.1; SD = 6.33) display the lowest degree of acceptance of the disease in relation to the other age groups.

The result of the analysis of variance $F_{(4.149)} = 8.45$; $p<0.01$ showed also that education significantly differentiates the degree of acceptance of the disease. People with primary education display lower degree of acceptance of the disease (M = 20.4; SD = 5.69) in comparison to people with secondary, secondary vocational

or higher education. Moreover, it was observed that people with vocational education show significantly lower degree of acceptance of the disease (M = 21.8; SD = 5.85) in comparison to those with higher education (M = 30.2; SD = 8.09).

The result of the analysis of variance $F_{(3.150)} = 4.029$; $p<0.01$ means that duration of the disease differentiates the degree of acceptance of the disease. The results of the multiple comparisons show that there is a significant difference in the degree of acceptance of the disease between people suffering from hypertension from 1 to 3 years and those suffering for more than 3 years (3 to 5 years). People suffering from 1-3 years show significantly higher degree of acceptance of the disease (M = 27.6; SD = 8.5) than those suffering from 3 to 5 years (M = 23; SD = 6.51).

On the other hand, marital status does not affect the severity of acceptance of the disease, which is supported by the results of the analysis of variance $F_{(4.149)} = 2.262$.

Satisfaction with one's own life is a factor that may significantly influence the acceptance of the disease. Cantril's Ladder was used to examine the above-mentioned element. Average values of the individual answers are shown in table 4.

Table 4. Satisfaction of life of the respondents based on the modified Catril's Ladder

Criterion	Average	Median	Minimum	Maximum	Lower quartile	Upper quartile	Standard deviation
Before the disease	7.1	7.0	3.0	10.0	6.0	9.0	1.8
Now	5.5	5.5	0.0	10.0	4.0	7.0	2.0
In 5 years	5.2	5.0	0.0	10.0	4.0	7.0	2.2

Source: own study

Satisfaction of respondents with their own lives in the period before the disease fluctuated around an average level of 7 (± 1.8). The same respondents with reference to the future placed their satisfaction on average at the level of 5 (± 1.8).

In the period before the disease was diagnosed, 121 of respondents (78.6%) were satisfied with their lives, whereas lack of satisfaction was demonstrated by 33 of respondents (21.4%). In the present time, both the number of respondents satisfied with life and those dissatisfied were at the level of 50%. It seems to be significant that respondents predict their future in 5 years as worse. Most of the respondents (52.6%) predict lack of satisfaction with their lives. It may indicate lack of hope for health improvement.

In the course of the analysis, also the connections between satisfaction with life and acceptance of the disease was verified. For this purpose, average scores of respondents in terms of the degree of acceptance of the disease with the self-assessment of their lives were compared.

It was demonstrated that there is a certain difference in terms of the acceptance of the disease between people with high and low life satisfaction. To verify whether it is statistically significant, we used Student 't' test for independents samples. The test results $t_{(75)} = 3.524$; $p<0.01$ show that the intergroup difference in terms of the disease acceptance is statistically significant. People with high life satisfaction show significantly higher degree of disease acceptance (M = 28.67; SD = 8.04) in comparison to people with low satisfaction with their own lives (M = 21.55; SD = 8.05). The value of Cohen's d coefficient 0.81 indicates a great strength of the observed difference effect.

Discussion

Hypertension is a disease of affluence, which is strongly connected with improper lifestyle. Nowadays, in Poland it is a cause of 50% of the total number of deaths, hospitalization and permanent inability to work. Hypertension causes patients to experience many negative emotions, limitations and complications. This state means for the patient the need to struggle with difficulties connected with symptoms or treatment throughout their whole life. An important factor allowing people to adjust to living with a disease is its acceptance (Wrona-Polańska 2000).

On the basis of the research, it was concluded that most of people were characterized by an average disease acceptance. The disease was accepted in a high degree by 18.18% of respondents, average by 68.83% and low by 12.99%. It can be assumed that such a distribution of factors is caused by a different advancement of the disease in respondents.

The research showed that most of the patients with hypertension did not have to change their professional and non-professional activity due to diagnosis (43.5%), and the disease did not affect negatively their social life (51.9%). The vast majority of patients did not report sleeping problems (73.4%) and the level of physical

activity did not change following the diagnosis (33.1%). It is also worth mentioning that every third respondent (33.8%) does not agree with an opinion that the pharmacological agents he receives are ineffective or adversely affect his health condition. Fogari and Zoppi (2004) in their research conclude that the disease and the medical treatment did not cause deterioration of functioning in most of the respondents, which is significantly improving the quality of lives of patients with hypertension, and thus substantially makes it easier to accept the disease.

According to our own research, a significant proportion of respondents feel they are dependent on others due to the disease (31.8%). Patients' self-sufficiency is also at the same level as almost 40% of respondents consider themselves to be not self-sufficient enough, whereas 37% of patients are of the opposite view. The research also shows that 39% of respondents has a low self-esteem due to their health condition and the same percentage of patients have a different view. The above-mentioned factors are important components predisposing to disease acceptance, which is confirmed by researches conducted by Niedzielski et al. (2007).

The conducted research also revealed the connection between satisfaction with life and disease acceptance. People who are satisfied with their lives demonstrated a significantly higher degree of disease acceptance (28.67 ± 8.04), than respondents dissatisfied with their lives (21.55 ± 8.05).

Analysis of the results of our own research showed that sociodemographic factors, such as sex, age, place of residence and the duration of the disease, influence the degree of disease acceptance.

On the basis of the obtained data, it is visible than men show a significantly higher acceptance for their health condition (27 ± 7.24), than women (24 ± 8.25). It is also confirmed by the research conducted by Kwaśniewska and Drygas (2005), in which it was proven that women in case of a chronic disease, such as hypertension, define their quality of life as low. The observed phenomenon is most likely caused by the occurrence of the so-called affect labelling. Likewise, a study by Woźnicka et al. (2008) demonstrated that men assess the quality of their lives more positively in comparison to women. This applies both to respondents with complicated and uncomplicated hypertension. Particularly noteworthy is the fact that in a group of patients with uncomplicated hypertension, men judge their health condition to be good, whereas women's assessment fluctuates between good and sufficient.

According to the research conducted by Klocek et al. (2005), the age of respondents is another factor differentiating the degree of acceptance in a group of chronically ill patients, e.g. with hypertension, especially after the age of 75. This is mainly due to the reported problems, especially in the case of pain or movement restrictions. Our own research showed a similar relationship. People from the oldest age group, after the age of 60 (20.1 ± 6.33), demonstrated a significantly lower degree of disease acceptance in comparison to other groups. After analyzing the results, we can assume that age is a factor that lowers the acceptance of the disease.

Researches show that the place of residence is significant in acceptance of living with hypertension. Inhabitants of big cities demonstrate a much higher degree of disease acceptance (28.8 ± 8.5) in comparison to villagers (23.9 ± 7.41). Therefore, we can assume that people living in larger urban centres can more easily understand their own health condition and adapt to a new, difficult situation.

The results of our own research suggest that the assumption regarding the impact of marital status on the degree of acceptance in patients with hypertension should be rejected.

On the basis of the conducted research, it can be observed that the duration of the disease is a significant factor influencing its acceptance. Comparing the results, we can conclude that there is a substantial discrepancy between the degree of disease acceptance in a group of people suffering from 1 to 3 years and those that suffer from hypertension for more than 3 years, but less than 5. Patients forming the first group show a significantly higher degree of disease acceptance (27.6 ± 8.5) in comparison to respondents from the second group. Despite the lack of materials confirming the connection between the duration of a disease and its acceptance, we can assume that patients suffering from hypertension for a shorter period of time have numerous problems with adjusting to their new health situation and with the acceptance of the disease. In case of people suffering for more than 5 years, a chronic disease, such as hypertension, can lead to many frustrations, dissatisfaction with life, depressed mood, decrease in energy, stronger emotional reactions, which results in lowering of the acceptance of their own health condition. It is confirmed by a research conducted by Coelho R. et al. (1999).

Conclusions

1. The respondents accept their disease to a medium degree.
2. The disease and medical treatment did not affect negatively the functioning of most of the respondents.
3. The respondents define their adaptation to the limitations imposed by the disease in varying degrees. The vast majority of respondents have no problems resulting from the disease and do not resign from their favourite activities.

4. Every third respondent with a hypertension feels defective and dependent on others.
5. There is a correlation between satisfaction with one's owns life and the degree of disease acceptance. The greater the satisfaction with life of the patients is, the higher the acceptance of the disease.
6. There have been demonstrated positive correlations between sex, age, place of residence, the duration of the disease and education on the one side, and the disease acceptance on the other. On the other hand, a statistically significant correlation between marital status and the examined issue has not been found.

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PHYSICAL ACTIVITY LEVEL OF THE YOUTH IN SELECTED COUNTRIES OF THE WORLD

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Wasilewska M., Bergier J. (2015), *Physical activity level of the youth in selected countries of the world.* Health Problems of Civilization, 3 (9), p. 39-46.

Summary: Physical activity is one of the most important elements of a healthy lifestyle, and its lack or insufficient amounts can lead to serious health disorders. There are many adult diseases which are associated with the behaviour, lifestyle during puberty, including physical inactivity. It was therefore decided in this study to present the physical activity of young people from six countries in the world in the context of different variables. The following countries: Brazil, Spain, Poland, Czech Republic, Norway and Nepal were selected for comparison. Although all studies used the same standardized research tool, ie. the International Physical Activity Questionnaire IPAQ, in the course of analysis, the authors encountered difficulties with comparability, associated with the usage of various methods and data processing, which could result in different or reduced comparability. Consequently, it was decided not to make a detailed comparative analysis of individual research results and the presentation of the key conclusions brought about selected studies worldwide. Analyses of studies which have been conducted in different cultural contexts, confirm once again the thesis of the decline in physical activity levels with age for both girls and boys. Gender quite substantially differentiated physical efforts in adolescents. Girls at the age of adolescence are less physically active than boys. It was also noted that the increase of sedentary behaviour among children and adolescents and their disastrous consequences have an impact on the health and life in this age group, the studies of sedentary lifestyle have become a very important subject of many studies. Girls are still "more sedentary" than boys. Many authors, in order to ensure the reliability and relevance of their research, complied with the objective instrument eg. accelerometer or metabolic analyzer.

Keywords: physical activity, youth, IPAQ

Introduction

Regular physical activity during adolescence can greatly affect the healthy lifestyle, not just during this period, but also in adulthood, reducing the risk of developing non-infectious diseases (Hayman et al. 2013 Twisk et al. 2000). There are many adult diseases which are associated with the behaviour, lifestyle during puberty, including physical inactivity (Hallal et al. 2006). Studies have shown that young people regularly engaged in physical activity are less exposed to smoking cigarettes, watching TV or being overweight. In contrast, it is more likely that these people will eat healthy food (Patrick et al. 2004, Steptoe et al. 1997).

A sufficient amount of physical activity in youth is associated with weight loss, improvement of metabolic parameters, reduction of blood pressure, insulin resistance, predisposition to maintain physical activity in adulthood, lower risk of diseases of cardiovascular system and consequently, increased lifetime (Hayman et al. 2013). Young people who exercise regularly also have better mental health, better perception of their own health and their own physical fitness (Thorlindsson et al. 1990). Furthermore, they are less exposed to the risk of depression, as well as having a higher assessment of their values (Raglin et al. 2007). Physical activity also plays an important role in shaping attitudes related to achieving the desired objectives and to rivalry (Hassandra et al. 2003). The health benefits of regular physical activity in adolescents and children have been repeatedly highlighted in previous studies (Janssen, LeBlanc 2010). There are also many well-documented studies, confirming the thesis of physical inactivity as a risk factor for coronary heart disease (Armstrong, Simons-Morton 1994), obesity and other chronic diseases (Fletcher et al. 1996).

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Tables: 1 Figures: 0 References: 51 Full-text PDF www.hpc.edu.pl **Indexation:** Index Copernicus, AGRO, ProQuest, Polish Medical Bibliography, Polish Ministry of Science and Higher Education.

Knowing that the period of transition from childhood to youth age is characterized by an expressive decrease in physical activity (Armstrong, Welsman 2006) and while being aware of the positive impact of physical activity on health and life a number of countries, including the United States of America and the United Kingdom (Cavill et al. 2001, Welk 2002), have introduced their own guidelines or recommendations related to the recommended dose of physical activity in adolescence. The introduction of the guidelines helps the researchers to assess the scale of the changes in physical activity levels within the studied age group, as well as helps government institutions and private entities in working together to promote physical activity. According to Strong et al. (2005) adolescents are recommended the intense physical activity lasting at least 60 minutes for five (or more) days a week. According to the WHO guidelines, exercises must be adapted to the developmental age, and what is more, they should be varied and enjoyable. Youth is recommended to engage in such forms of activities like aerobics, strength training, or coordinative and flexibility exercises. At this age the priority should be the development of motor skills (www.ec.europa.eu ..... -physical-activity-guidelines 2008). Zaza et al. (2005) also claim that any action should be focused on school and sports activities carried out there, because children and young people spend a significant part of their time at and around of the schools.

With decreasing physical activity with age among children and adolescents, a big concern is the predominance of activities related to sitting. Until now, the problem was seen only in terms of lack of physical activity, or unfullfillment of the criterion of an appropriate level of activity. Recently, researchers have found that the sedentary behaviours such as spending time on sitting activities may have an important impact on health, regardless of the time devoted to more active operations. The problem of sedentary lifestyle has therefore also been a major topic of a lot of research (Hamar et al. 2009).

To better understand and promote physical activity and prevent the growing prevalence of sedentary behaviours, particularly in critical transitional life stages, accurate methods for assessing physical activity are needed. There are many techniques that are used to evaluate the physical activity of the population. However, the lack of comparability between them is a major limitation in studies on physical activity. This is due to, among other things, the usage of different methodological instruments and the fact that researches on participation in sport and recreation are carried out independently of each other. And that can lead to many differences in the research project, questionnaires, methodologies, or defining terms (van Bottenburg et al. 2005). The instrument which received positive recommendations of 12 countries from 6 continents is IPAQ – International Physical Activity Questionnaire. It allows you to obtain comparable data relating to routine physical activity of the population of a given country, taking into account both social and cultural context of the country (van Bottenburg et al. 2005).

If we look at studies focusing on physical activity in adolescents in Poland using the IPAQ questionnaire, we come to the conclusion that there is little such work on a relatively large material (for Bergier J. 2012: Stupnicki et al. 2014, Rozpara et al. 2008, Bergier J. et al. 2012). In addition to the Central Statistical Office (CSO) survey of 2008 there is a national investigating of some works on physical activity levels of the adult Polish population through the instrument of the IPAQ (Bergier J. et al. 2010, Biernat 2011, Nawrocka et al. 2013, Garbaciak et al. 2008). Among the studies comparing physical activity during the free time of the Poles and some other nations there have been so far only a few projects, namely Bridging the East-West Health Gap, including three Eurobarometers 213/62.0 and 72.3. and 412/80.2. Comparisons of the level of performance via Eurobarometer 183-6/58.2 with the level represented by the Polish respondents was also made by Piątkowska (2012), and comparisons to other studies of physical activity in Europe were conducted by Biernat and Piątkowska (2013).

The study of physical activity by school youth according to IPAQ

The aim of this study is to present the physical activity level of young people from six countries in the world in terms of different variables. For purposes of comparison the following countries located on three continents were selected: Brazil, Spain, Poland, the Czech Republic, Norway and Nepal (Table 1). The choice was preceded by a thorough analysis of the research papers available in electronic databases EBSCO, Researchgate, SAGE journals. Searched original papers examined the physical activity of adolescents (15-18) using the IPAQ questionnaire (the long version or the short). Because of the fact that there isn't a lot of research worldwide among people in this age group, it was decided to extend the boundaries between the ages of 12-19 years, but still without exceeding the bounds set by the WHO for the definition of adolescence[1]. Table 1 presents a summary of selected studies researching the descriptive physical activity depending on socio-demographic factors, anthropometric

1 WHO defines adolescence as a period of growth and human development, which appears after childhood, and before the period of adulthood. This framework sets at the age of 10 to 19 years. Biological processes are the lifeblood for many aspects of growth and development, including the onset of puberty, which marks the transition from childhood to adolescence. It should be noted also that the biological determinants of adolescence are quite commonly, however, the duration and defining parameters may vary over the years, the culture of a given community or socio-economic status. This period of human life in the last century has experienced many changes, namely prior the beginning of puberty, late age for marriage, urbanization, global communications or changes in attitudes and sexual behavior. http://www.who.int/maternal_child_adolescent/topics/adolescence/dev/en/ (accessed: 11.04.2015).

measures or sedentary behaviours of young people in Europe, South America and Asia. Each of the studies also differed regarding an ambitious objective. During the analysis, the authors have encountered difficulties with comparability, associated with the usage of various methods and data processing, which could result in different or reduced comparability. Consequently, it was decided not to make a detailed comparative analysis of individual research results, and the presentation of the key conclusions brought about selected studies worldwide.

Cocca et al. (2014) researched the physical activity of the age group ranging from 9-24 years of 3.672, hovewer, for the purposes of the study authors focused only on the age group of 14-17 years. Within the study of young Spanish participants two research tools were used: the IPAQ - short version and the Actigraph accelerometer (MTI Actigraph by Computer Science and Application, Inc.). In order to check whether the participants comply with the recommendations for health-enhancing physical activity, frequency analysis was applied. Within 1.365 participants, 56.4% of adolescents (average age 14.3) and 49.3% (average age 16.99) pupils completed with these recommendations. Results of a descriptive analysis of the physical activity levels calculated in minutes showed that the younger group of students was involved in a moderately-intense activities for about 123 minutes during the day, while the older group spent about 92 minutes a day actively. It should be emphasized that the downward trend was observed in terms of physical activity of the participants with the progress of their adolescence, which is fully confirmed in the literature (Armstrong, Welsman 2006, Dumith et al. 2011).

Similar results were achieved by Rangul et al. 2008 on a sample of Norwegian adolescents (13-18 years). The participants were divided into two age groups, although relatively small number, 13-15 years old (n = 42) and 16-18 (n = 29). The aim of the study was to determine the reliability and validity of the two tools of subjective assessment of the level of physical activity, the IPAQ - short version of the questionnaire and the WHO-HBSC for adolescents by using an accelerometer ActiReg (PreMed AS, Oslo, Norway) and metabolic analyzer Metamax II. The values of physical activity level (PAL stands for Physical Activity Level) for seven days differed significantly between the two age groups. Teenagers from a younger group (13-15 years) were more physically active than the youth from older group (16-18 years). Under the category of "MET <3" boys were physically active for less minutes compared to girls. In this area, younger group achieved less minutes of physical activity than older, while in the "MET 3-6" (minutes) the roles reversed.

Table 1. Summary of the selected international research on physical activity among the youth using the IPAQ

First author	Location	Year of publication	Year of research	Aim of research	Measuring tool	Conclusions	Age
Pelegrini A. [2014]	Brasil (Florianopolis)	2014	2007	Assessment of the sedentary behaviour, moderate, intense PA[1*] MVPA) and walking	IPAQ - short version	Boys more active than girls	14-17
Cocca A. [2014]	Spain (Granada)	2014	school year 2010/2011	Assessment of the level of PA with a use of two methods: IPAQ – short version and accelerometer, comparison of the results	IPAQ – short version, accelerometer-Actigraph	Approx. 50% of respondents fulfilled the HRPA[2**] recommendations	14-17
Bergier B. [2014]	Poland (selected regions)	2014	2011	Assessment of the level of PA and factors affecting it (sex, place of residence, sedentary behaviour, participation in PE classes)	IPAQ - short version	2.640 MET-boys 2.219 MET-girls	16-18
Mitáš J. [2009]	The Czech Republic (selected regions of the Czech Republic)	2009	Winter 2006	Assessment of the level of PA, sedentary behaviour depending on the school location	IPAQ – short version, accelerometer-Actigraph	Approx. 55% fulfilled the HRPA recommendations for intensive PA	14-15

Rangul V. [2008]	Norway (Nord-Trøn-delag)	2008	?	Assessment of the reliability and validity of two IPAQ questionnaires – short version and WHO HBSC	IPAQ – short version, WHO HBSC, acceler-ometer-Actigraph, metabolic analyzer Metamax II	Boys more active than girls	13-18
Paudel S. [2014]	Nepal (Nepalgunj)	2014	September 2013	Assessment of the PA in leisure time (LTPA) and seden-tary behaviour	IPAQ – long version	80% of boys, 50% of girls showed any LTPA[3***]	15-20 (on average 17 ± 1.2 year)

*PA – Physical Activity
** HRPA – Health Related Physical Activity
*** LTPA – Leisure Time Physical Activity

Source: own research

Although it is not the aim of this study, it should be mentioned that Rangul et al. (2009) came to conclusion that neither of the two examined subjective instruments measuring physical activity in youth met the validation criteria. WHO HBSC questionnaire proved to be an acceptable instrument when it comes to measuring cardio-respiratory condition in girls. The IPAQ (recoded into three categories) seems to be quite a good instrument. What is more, girls' answers turned out to be more reliable and accurate than boys' answers. It makes the IPAQ - short version reasonable and reliable to use, but more so in case of girls.

Studies on physical activity carried out among Brazilian youth (Pelegrini et al. 2014), evaluating the relationship between physical activity (walking, moderate and intense activity) and sociodemographic factors, anthropometric indices and sedentary behaviour showed higher values in walking ($p=0.014$) and intense physical activity ($p<0.001$) for boys than for girls. Girls demonstrated about 198 min/week less intense activity than boys. What is more, youth with high economic status showed higher average participation in intense activity, in comparison to those with mediocre economic status ($p<0.001$). What is interesting, ethnographic research involving teenagers demonstrated that boys receive greater encouragement to physical activity from family and society than girls (Goncalves et al. 2007 after: Pelegrini et al. 2014). This thesis is confirmed by international research (et al. 2007, Seabra et al. 2008, Riddoch et al. 2004) showing a higher probability of girls being physically inactive. Similar trend was observed in another research in Brazil (Ceschini et al. 2009), in which girls were up to 48% less active than boys.

Mitas et al. (2009) also stated that young girls are much more prone to sedentary behaviour, what was deduced from the results characterizing physical activity in the questionnaires. The research was carried out on a representative group of 302 young people, age 14-15, in three chosen regions of the Czech Republic with a use of two research tools the IPAQ –short version and accelerometer Actigraph. In the area of physical activity covering walking (30 minutes/5 days) minimally active was 28.5%, moderately 32.1% and highly active 12.9%. Recommendations for intense physical activity (20 minutes/3 days) were fulfilled by 54.6%. Interestingly, students who achieved the recommended level of physical activity simultaneously showed greater sedentary behaviour. It may result from many factors. One of them may be overstatement presented in the questionnaire data. Another possible explanation is the assumption that people who are physically more active need more time to rest. Especially if they are involved in activities with greater intensity.

In the research carried out by Bergier B. et al. (2014) in the selected regions of Poland on a representative group of 2,974 people aged 16-18, a correlation was found between sedentary behaviour and the level of physical activity. That is, people who spent more time sitting are also characterized by lower total physical activity. No statistical differences between two sexes were found in relation to the level of physical activity in youth, their participation in sedentary life style. The average time spent on sitting was 219.8 minutes, 217.7 minutes for boys and 221.4 for girls. Girls showed also higher (8.6%) level of low total physical activity than boys (6.17%). In the area of moderate total activity girls constituted 23.6%, whereas boys 17.6%. However, boys had a greater participation in the area of high activity: boys 76.2%, girls 67.8% respectively. A significant variation was observed on every level of physical activity in the structure of total activity in relation to sex. Girls showed a higher level of physical activity in the area of walking. The total level of physical activity in school youth expressed in the MET unit reached 2.387, and it was higher in boys (2.640 MET) than in girls (2.219 MET). In the context of physical activity the authors of this paper raised quite a serious problem of skipping physical education classes. This is particularly true for girls growing up and may be associated with processes which

take place in this period of life and which are connected with puberty. The results of the research demonstrated that young people participating in PE classes up to 5 times (5 lesson units) a week show a higher level of physical activity. It can thus be concluded, as the authors of the research state, that the physical education classes greatly affect the total level of physical activity, especially in boys, since the activity of girls is lower. Therefore, Zaza et al. (2005), who was quoted earlier in this paper, rightly recommend to focus all actions aimed at physical activation of youth within a school. Bergier B. et al. (2014) proved the validity of this view.

Another paper chosen by authors Paudel et al. (2014) estimates the level of physical activity and sedentary behaviour of Nepalese youth (n=405) aged 15-20 in their leisure time. Once again it confirms the thesis of greater inclination for sitting life style in girls than in boys. In a research examining physical activity in leisure time (LTPA – Leisure Time Physical Activity), a long version of the IPAQ questionnaire was used. Sedentary behaviour included sitting time spent at school and at home, travelling by various modes of transport, watching TV, playing video/computer games, working at the computer, etc. Out of 405 subjects, 67% showed any form of physical activity in their leisure time for more than 10 minutes without any break. It applied to 80% of boys and 50% of girls.

Among students from Nepalgunj, which demonstrated any form of physical activity in their leisure time, an average time spent on LTPA was 49 minutes a day. It was higher among male students (55 minutes) than among female students (38 minutes). The median MET – minutes/week achieved by students in the area of physical activity in the leisure time was 998, in boys 1314, in girls only 678. The total result of physical activity in leisure time comprised of activities such as walking (45%), then moderate activities (32%) and intense activities (23%). Boys' involvement in the intense activities (28%) was almost two times higher than in girls (14%)., whereas in girls the involvement was higher for walking and moderate activities. An average time spent on activities connected with sitting during the day was comparatively higher in girls (they mainly watched TV, met with friends or gossiped) than in boys. The research showed that only two thirds of the teenagers is involved in any form of physical activity in the leisure time. It may be caused by unavailability of parks and playgrounds in Nepal, the situation is even worse due to dangerous roads and hostile urban environment. What is more, children in Nepal are obliged to help their parents at work in agriculture or trade, and girls are responsible for housework, which greatly reduces their free time. As for activities connected with sitting, students spent on such activities on average 7-8 hours a day, whereas national research STEPS Nepal 2013 indicated that 2.5 hours for 15-29 age group is alarming. Students usually spent 4 to 5 hours at school, mostly sitting, what could also contribute to the longer time spent on this activity. It should be remembered that the research was carried out with a use of long version of the IPAQ, in which the question about time spent on sitting takes into account not only ordinary day of the respondent, as in the IPAQ -short version, but also weekend (Marshall, Bauman et al. after: Biernat 2013). Such a lack of distinction can be observed in the research by Paudel et al. (2014). Therefore, a great caution is needed when comparing with each other the results obtained from both versions of the IPAQ – long and short. Bergier J. (2013), referring to the Polish version of the IPAQ questionnaire, proposes to distinguish the time spent in the means of transport from the total time spent on sitting to be able to compare the data from two versions of the IPAQ questionnaire.

Summary:

1. Many previous studies pointed to a decline in physical activity in the period from early adolescence to young adulthood. Also, the analysis of the six global research selected by the authors, which were carried out in various cultural contexts, allows to confirm once again the thesis that the level of physical activity declines with age, both in girls and in boys.
2. Sex differentiated quite significantly undertaking physical efforts in adolescents. Growing up girls are physically less active than boys. The explanation of this phenomenon may be a "movement laziness", as Woynarowska (2010) calls it, which is especially evident in girls about a time of the first menstruation. According to the author, there is a hypothesis about a natural mechanism which was created during phylogeny and which protects maturing girl from the redundant usage of energy required for the proper development of the reproductive functions. Another negative explanation of lower physical activity in girls can be weaker encouragement for physical effort by family and society. It may be a manifestation of some cultural traditions in a given society and, as such, it would require further sociological research in this direction.
3. Along with an increase in sedentary behaviour among children and teenagers, and its disastrous impact on a health and life in this age group, the research on sedentary lifestyle have become a very important subject of many publications. Girls are still more sedentary than boys. And the current education system promotes activities connected with sitting for a long time of four, five or even more hours. This form of learning together with sedentary lifestyle and inactivity (watching television programmes, playing video/computer

games instead of exercising) lead to a decrease in physical activity during adolescence. It seems there is an urgent need for further research into the understanding of interdependent of sedentary lifestyle. Physical activity in this age group must be supported by actions that would reduce a bad influence which sedentary behaviour has on health.

4. To ensure the reliability and relevance of their research on physical activity, many authors, in addition to a subjective measurement by the IPAQ questionnaire, used also an objective instrument, such as accelerometer or metabolic analyzer. However, it should be remembered that questionnaire is the cheapest method of collecting data on a large number of respondents (national and international research) regardless of their sex, age or health condition (Paffenbarger et al. 1993, Mussino 1999 after: Biernat 2013). It was presented by Booth as real, the only possible test method to use both in the developed countries, such as those shown in this paper, Poland, the Czech Republic, Norway or Spain, as well as in Nepal, China or Brazil, which are still perceived as developing countries[2].

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Str. 2. i następne: Tytuł artykułu, streszczenie, słowa kluczowe, tekst główny.

Tytuł pracy wytłuszczony i zapisany drukowanymi literami.

Streszczenie (około 250 wyrazów), powinno składać się z następujących części: w artykułach naukowych: cel pracy, materiał i metody badawcze, wyniki oraz wnioski; w artykułach przeglądowych: wprowadzenie, cel pracy, skrócony opis stanu wiedzy, podsumowanie. Pod tekstem streszczenia należy umieścić 3-6 słów kluczowych. Wyrazy „słowa kluczowe:" i „streszczenie:" powinno być pogrubione i podkreślone. Wszystkie słowa po dwukropku piszemy małymi literami; na końcu ostatniego wyrazu nie stawiamy kropki; nie stosujemy wyróżnień słów - kursywy, podkreśleń, pogrubienia tekstu itp. Tekst główny prac badawczych powinien składać się z następujących części: wstęp, materiał i metody, wyniki badań, dyskusja, wnioski, podziękowania i wyrazy uznania (jeżeli potrzebne), przypisy (jeżeli występują), literatura. W publikacjach innego typu należy

zachować logiczną ciągłość tekstu, a tytuły poszczególnych części powinny odzwierciedlać omawiane w nich zagadnienia.

Zasady cytowania w tekście

- Odwołania do pracy jednego autora: (Nowak 2008);
- Gdy praca ma dwóch autorów, należy za każdym razem podawać obydwa nazwiska (jak wyżej), oddzielając je przecinkiem;
- Gdy praca ma więcej niż dwóch autorów, należy podawać tylko nazwisko pierwszego, dodając skrót „i in." np. (Kowalski i in. 1994);
- Cytowanie autorów o tym samym nazwisku wymaga używania za każdym razem inicjałów imienia;
- W przypadku dosłownego cytowania fragmentu tekstu należy stosować zapis: (Nowak 2008, s. 15);
- Cytując strony internetowe należy umieścić cytowany adres w nawiasie zwykłym w tekście artykułu.

Tabele i rysunki

- Tabele i rysunki powinny być numerowane i opisane; przykład: „Tabela 1. Zestawienie wyników", „Rysunek 1. Projekt budynku",
- Po opisie i podaniu źródła tabeli i rysunku nie stawia się kropki,
- Numer i opis tabeli umieszcza się nad tabelą,
- Źródło umieszcza się pod tabelą; przykład: „Źródło: opracowanie własne",
- W przypadku rysunku numer, opis rysunku i źródło umieszcza się pod rysunkiem.

Literatura

Wykaz literatury umieszczony na końcu artykułu, powinien być uporządkowany alfabetycznie i ponumerowany. Poszczególne pozycje literatury należy zapisywać według wzoru:

1. Kunowski S. (2003), *Wartości w procesie wychowania.* Oficyna Wydawnicza „Impuls", Kraków.
2. Ostrowska U. (2006), *Aksjologiczne podstawy wychowania,* W: B. Śliwerski (red.), *Pedagogika.* Gdańskie Wydawnictwo Pedagogiczne, Gdańsk, s. 391-415.
3. Rynio A. (2007), *Wychowanie osoby w nauczaniu Jana Pawła II.* Rozprawy Naukowe, t. I, Biała Podlaska, s. 11-32.

Strony internetowe

Jeśli pozycja literatury została udostępniona w Internecie, w wykazie literatury należy umieścić ją według następujących wzorów:

1. Kowalski J. (2008), *Tytuł pozycji literatury/książki.* Wydawca i miejsce wydania, www.adresinternetowy.pl, (data odczytu).
   Cytowanie w tekście (Kowalski 2008)
2. Nowak A. (2007), *Tytuł artykułu w czasopiśmie elektronicznym.* Tytuł czasopisma, numer wydania, www.adresinternetowy.pl, (data odczytu).
   Cytowanie w tekście: (Nowak 2007)
3. Kowalski C. (2006), *Tytuł artykułu w książce elektronicznej,* W: *Tytuł książki,* wydawca i miejsce wydania (data odczytu).
   Cytowanie w tekście: (Kowalski 2006)
4. Nazwa ustawy, raportu, rezolucji, itp., www.adresinternetowy.pl, (data odczytu).
   Cytowanie w tekście: (nazwa ustawy, raportu, rezolucji itp.)

Nie wstawiamy adresu jako hiperłącza - należy zastosować czarny kolor czcionki, bez podkreślenia. Spis stron internetowych powinien być ponumerowany i uporządkowany według daty odczytu. W przypadku, gdy cytujemy inny tekst ze strony internetowej, w tekście oraz w wykazie literatury należy umieścić cały adres, przy czym do wykazu literatury dołączamy datę odczytu.

Ocena pracy (zasady recenzowania publikacji)

Złożony artykuł zostaje poddany ocenie formalnej, która trwa do 3 tygodni, po akceptacji zostaje przekazany do oceny merytorycznej (recenzji), która trwa 3-6 tygodni.

Złożone artykuły podlegają anonimowej recenzji, przez co najmniej dwóch niezależnych recenzentów spoza jednostki.

Autor może podać nazwisko potencjalnego recenzenta, lecz Redakcja zastrzega sobie prawo o decyzji o jego wyborze. W celu przeprowadzenia anonimowej recenzji, do składanych artykułów należy dołączyć tzw ślepą stronę, zawierającą wyłącznie tytuł pracy. Recenzja posiada formę pisemną (formularz recenzencki podany jest na stronie internetowej czasopisma) i kończy się jednoznacznym wnioskiem, co do dopuszczenia artykułu do publikacji lub jego odrzucenia. W zależności od oceny recenzenta, Redakcja podejmuje decyzję o dalszym losie pracy. Decyzja Redakcji jest ostateczna.

Nazwiska recenzentów poszczególnych publikacji/numerów nie są ujawniane; raz w roku czasopismo podaje do publicznej wiadomości listę recenzentów współpracujących.

Korekta autorska

Po opracowaniu redakcyjnym praca zostanie przekazana do autora w celu naniesienia przez niego korekty autorskiej. Obowiązkiem autora jest odesłanie korekty w ciągu jednego tygodnia. Kosztami poprawek innych niż drukarskie będzie obciążony autor.

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