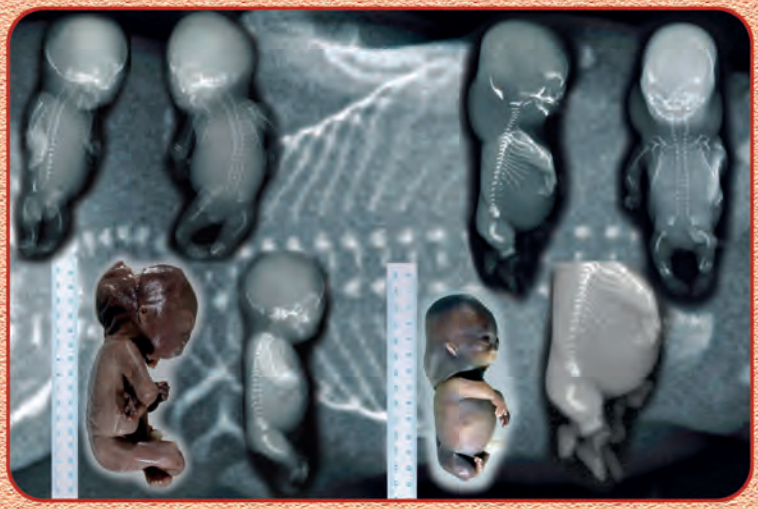
Pohybové ústrojí

Pokroky ve výzkumu, diagnostice a terapii



Vydává
Společnost pro pojivové tkáně ČSL J. E. Purkyně
Ambulantní centrum pro vady pohybového aparátu, s.r.o.
Odborná společnost ortopedicko-protetická ČSL J. E. Purkyně

ročník 20/2013 číslo 3-4

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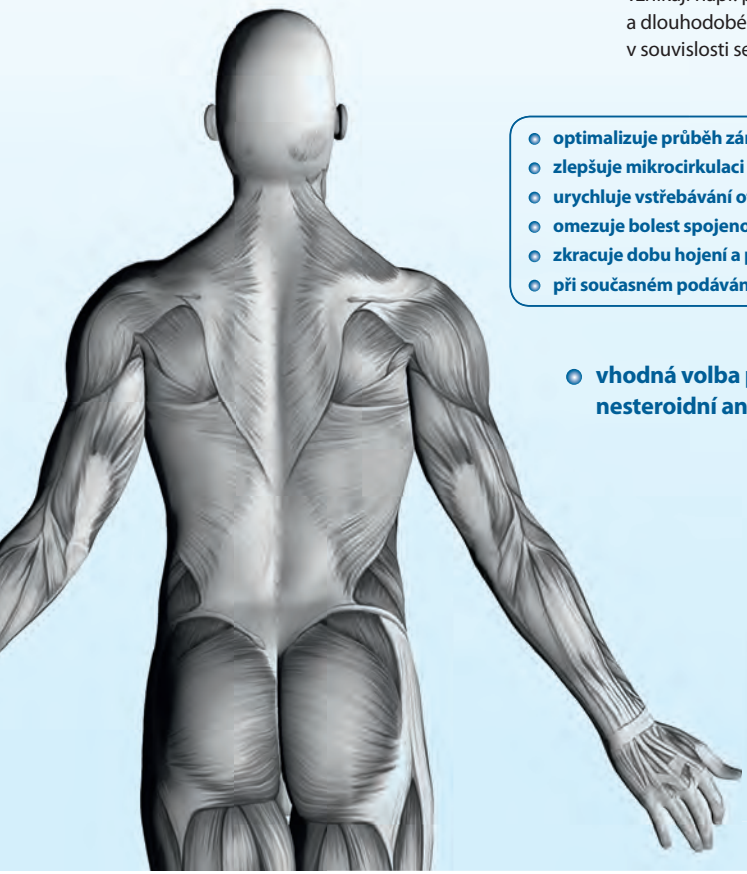

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Volně prodejný lék. Bez úhrady VZP. Datum poslední revize SPC: 30. 12. 2010.

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POHYBOVÉ ÚSTROJÍ

ročník 20, 2013, číslo 3+4
datum vydání 24. 2. 2014

Pohybové ústrojí. Pokroky ve výzkumu, diagnostice a terapii.
ISSN 1212-4575

Vydává Společnost pro pojivové tkáně ČLS J. E. Purkyně,
Ambulantní centrum pro vady pohybového aparátu, s. r. o.
& Odborná společnost ortopedicko – protetická ČLS J. E. Purkyně
Excerpováno v Excerpta Medica a Bibliografia medica Čechoslovaca.
Návrh a grafická úprava obálky Rudolf Štorkán a Pavel Lorenc.
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LOCOMOTOR SYSTEM
Advances in Research, Diagnostics and Therapy

Published by The Society for Connective Tissues, Czech Medical Association of J. E. Purkyně, Prague, Ambulant Centre for Defects of Locomotor Apparatus Prague, Ltd. & Society for Prosthetics and Orthotics, Czech Medical Association of J. E. Purkyně, Prague, Czech Republic

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Papers published in the journal are excerpted in EMBASE / Excerpta Medica and Bibliograhia medica Čechoslovaca. We prefer the manuscripts to be prepared according to Uniform Requirements for Manuscripts Submitted to Biomedical Journals (Vancouver Declaration, Brit med J 1988; 296, pp. 401–405)

Dvacátý ročník časopisu Pohybové ústrojí
je věnován životnímu jubileu

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Prof. MUDr. Josefa Hyánka, DrSc.
Prof. MUDr. Ctibora Povýšila, DrSc.
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POHYBOVÉ ÚSTROJÍ, 20, 2013, č. 3+4

Pokroky ve výzkumu, diagnostice a terapii

OBSAH

LOCOMOTOR SYSTEM, 20, 2013, No. 3+4

Advances in Research, Diagnostics and Therapy

CONTENT

PERSPEKTIVNÍ PŮVODNÍ PRÁCE

PROSPECTIVE ORIGINAL PAPERS

Vážení čtenáři, autoři a inzerenti,

děkujeme za Vaši pomoc při tvorbě mezioborového odborného recenzovaného časopisu *„Pohybové ústrojí – pokroky ve výzkumu, diagnostice a terapii (dále PÚ)“*.

Prohlubující se finanční a ekonomická situace ve zdravotnictví, stálé snižování úhrad zdravotnickým zařízením dopadá v posledních letech zvláště nepříznivě na ambulantní specialisty, ale i firmy podnikající ve zdravotnictví, a proto jsme museli přistoupit k radikální změně ve vydávání. Od roku 2013 je časopis vydáván pouze v elektronické formě. Pro současné odběratele časopisu PÚ a další zájemce doporučujeme přihlásit se na http://www.pojivo.cz/en/newsletter/, zadat jméno a e-mailovou adresu, na kterou bude časopis posílán. Na webové doméně SPT ČLS JEP http://www.pojivo.cz/cz/pohybove-ustroji/ naleznete ve formátu PDF všechna jednotlivá čísla a dvojčísla časopisu (včetně Suplement) vydaná od roku 1997 (bezplatný přístup).

Dvojčíslo časopisu 3+4, ročník 20 je věnováno významnému dětskému ortopedovi panu prof. Michaelovi Bellemorovi, MD, PhD z New Children´s Hospital v Sydney, členovi mezinárodní redakční rady časopisu PÚ a čestnému členovi SPT ČLS JEP a významnému kriminalistovi – t.č. rektorovi Vysoké školy kriminalistiky v Karlových Varech panu prof. JUDr. Ing. Viktorovi Poradovi, DrSc., Dr. h. c., kteří v tomto roce oslavili významné životní výročí.

V suplementu jsou publikována Abstracta referátů přednesených na mezinárodním The 15th Prague-Lublin-Sydney Symposiu, téma: Interdisciplinary Approach to Disorders and Defects of Locomotor Apparatus, St. Petersburg, Russia, 15th–22nd September 2013. Symposium mělo velmi vysokou odbornou úroveň, i společenskou díky obětavé spolupráci pana Assist. Prof. Alekseye Shashko, MD a Prof. Mikhaila Dudina, MD, PhD.

Pan RNDr. A. Lichý provedl aktualizaci webových stránek SPT – http://www.pojivo.cz, kde jsou uvedeny 1. informace o plánovaných akcích v roce 2014.

19. Kubátův den se bude jako každoročně konat v Lékařském domě v Praze, téma symposia je „Poruchy růstu, mezioborový pohled“.

Po velmi úspěšných mezinárodních symposiích v roce 2012 a 2013 se připravuje The 16th Prague-Lublin-Sydney-St. Petersburg Symposium v Lublinu, Polsko. Hlavní organizace se ujali General Direktor Zbigniew Kedzierski, MD s Prof. Tomaszem Karskim, MD, PhD a Assist. Prof. Jackem Karskim, MD. Téma symposia je „Disorders of growth and defects of growth epiphysis“. Symposium se bude konat 21.–24. září 2014, přihlášky k aktivní účasti je třeba poslat do 31. 5. 2014.

Při schůzce výboru SPT ČLS JEP a redakční rady časopisu PÚ dne 4. 11. 2013 bylo odsouhlaseno akceptovat do RR specialisty v rehabilitaci paní Mgr. Ivetu Pallovou, PhD a pana MUDr. Ivana Vařeku, PhD. Do Mezinárodní redakční rady časopisu PÚ byli navrženi a odsouhlaseni 4 noví členové, a to Assist. Prof. Jacek Karski, M.D. – dětský ortoped z Lublinu, Polsko, Prof. Mohamed Alam-Eldin – ortoped a traumatolog, proděkan univerzity v Sohagu, Egypt, dále Prof. Mikhail Dudin, MD, PhD a Assit. Prof. Aleksey Shashko, oba z Children's Rehabilitation Center of Orthopaedics and Traumatology“ Ogonyok, St. Petersburg, Russia.

Více než 2leté úsilí Odborné společnosti ortopedicko-protetická ČLS JEP prosadit postgraduální vzdělávání v oboru ortopedická protetika bylo úspěšné, obor je zařazen mezi obory s nástavbovou atestací (novela vyhlášky č. 185/2009 Sb., o oborech specializačního vzdělávání lékařů, zubních lékařů a farmaceutů a oborech certifikovaných kurzů, ve znění vyhlášky č. 361/2010 Sb.). Nástavbová atestace je otevřena pro specialisty z oboru ortopedie, chirurgie, rehabilitace, neurologie a úrazové chirurgie.

Jako v dřívějších letech je předmětem a hlavním posláním časopisu PÚ publikovat práce vycházející z výzkumu pojivových tkání, práce orientované na biochemickou, morfologickou, genetickou a molekulární diagnostiku a kostní metabolismus vrozených chorob pohybového ústrojí i získaných vad. Dále práce klinické, týkající se symptomatické léčby metabolických kostních chorob, osteoporózy, sekundární osteoporózy, osteo/spondyloartrózy, kostních dysplazií, končetinových anomálií, dysmorfických vad pohybového aparátu a genetických syndromů, ale i jiných chorob, které ve svých důsledcích negativně ovlivňují pohybové ústrojí v průběhu lidského života. Zvláštní pozornost je přikládána pracím z oblasti biomechaniky, neuroadaptivním změnám skeletu, řízené remodelaci pojivových tkání v závislosti na léčebných metodách (kalciotropní léky, rehabilitace, ortoticko-protetické a operační léčení), studiím muskuloskeletálních a neuronálních interakcí, v neposlední řadě sdělením antropologickým i paleopatologickým. Významné jsou především interdisciplinárně zaměřené práce. V anglickém jazyce jsou publikována sdělení zahraničních i našich autorů. Žádaným doplněním obsahu časopisu jsou zprávy ze sjezdů a konferencí. V rubrice zprávy zveřejňujeme oznámení o životním výročí členů RR časopisu, SPT ČLS JEP a významných osobností, sdělení o prioritních pozorováních, ze studijních a poznávacích cest aj.

Jako každoročně uvádíme směrnice pro autory příspěvků, kterým věnujte prosím pozornost při tvorbě Vašich vědeckých sdělení. Časopis PÚ byl v roce 2008 zařazen Radou pro výzkum, vývoj a inovace vlády ČR na Seznam recenzovaných neimpaktovaných periodik vydávaných v České republice. Souhrny prací publikovaných v časopisu jsou excerpovány v EMBASE / Excerpta Medica (od r. 1994) a v Bibliographia medica Čechoslovaca (od r. 2010).

K prosazení časopisu Pohybové ústrojí mezinárodně je velmi významné citovat práce uveřejněné v časopisu v příspěvcích posílaných do zahraničních časopisů. Pro zvýšení úrovně časopisu PÚ je nezbytné získávat původní kvalitní práce a kasuistiky, které doporučujeme publikovat v angličtině s cílem zvýšit zájem o náš časopis v odborném světě. Souhrny původních prací doporučujeme psát co nejvýstižněji, strukturovaně česky a anglicky (objectives, methods, results and discussion), s klíčovými slovy.

Těšíme se na Vaši tvůrčí spolupráci během roku 2014.

Redakční rada

OBRÁZEK NA TITULNÍ STRANĚ ČASOPISU DEMONSTRUJE

TITLE PICTURE DEMONSTRATES

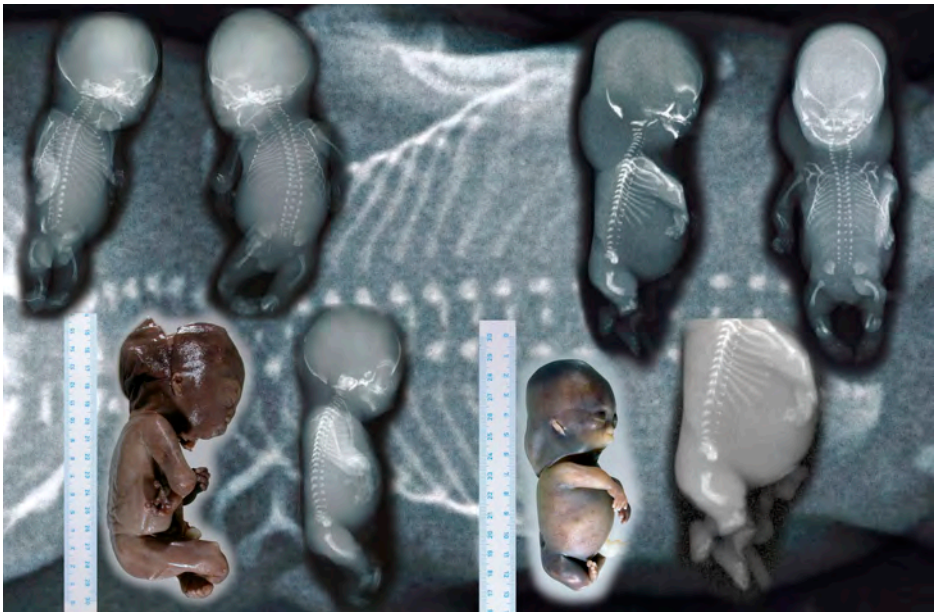
Obrázek na titulní straně demonstruje rentgenologické projevy těžké mesomelické dysplazie u dvou plodů z po sobě jdoucích těhotenství. Tato dysplazie byla spojena se zvýšeným šíjovým projasněním a **Fallotovou tetralogií** u jednoho plodu a **cystickým hygromem** u druhého. Patologické nálezy byly zjištěny v těhotenství pomocí ultrazvuku, vzhledem ke špatné prognóze se rodiče rozhodli k ukončení těhotenství. Analýzou klinických a RTG nálezů se nepodařilo stanovit diagnózu, odpovídající již známé skeletální dysplazii, proto se jedná s nejvyšší pravděpodobností o nový syndrom.

Plod 1

Je přítomná těžká mesomelická dysplazie. Jak předloktí, tak kosti bérců jsou hypoplastické/dysplastické, ale dobře osifikované. Femory jsou zakřivené a je přítomna platyspondylie dolní hrudní a bederní páteře.

Plod 2

Jsou přítomny obdobné změny jako u plodu 1. Předloktí a bérce jsou zkráceny asi na polovinu, ruce nasedají ve varozním postavení. Je patrný cystický hygrom.



Title picture demonstrates severe mesomelic dysplasia in two fetuses (from consecutive pregnancies), associated with increased neck translucency and **tetralogy of Fallot** in one and **cystic hygroma** in the other. Prenatal diagnosis was made by ultrasound. After analysis of clinical and radiological findings, we posit that these sibs have a distinct, previously unreported skeletal dysplasia.

Both fetuses have severe mesomelic dysplasia. The forearms and legs are hypoplastic/dysplastic but well ossified. The femora are bowed and there is platyspondyly in the lower thoracic and the lumbar spine.

Differential diagnosis

Only Nievergelt and Langer types of mesomelic dysplasias show such severe middle segment involvement. But radiological findings are different and by Langer dysplasia have both heterozygous parents dyschondrosteosis. The parents of our fetuses are normal.

Holt-Oram and Ellis-van Creveld syndromes have heart defect, but bony abnormalities are different. Achondrogenesis 2 is a very severe lethal bone dysplasia with typical radiological findings.

Genetics

The mode of inheritance could be autosomal recessive or X-linked recessive (both fetuses were male).

Reference

VSETICKA J., GATTNAROVA Z., MARIK I., KOZLOWSKI K. Ultrasound Diagnosis of Severe Mesomelic Dysplasia in Two Fetuses, Associated With Increased Neck Translucency and Tetralogy of Fallot in One and Cystic Hygroma in the Other. Am. J. Med. Genet., Part A, 125A, 2010, No. 4, p. 815-818.

ETIOLOGY, PATHOGENESIS AND PREVENTION OF ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS)

DUDIN M.G., PINCHUK D.YU., PECHERSKY V.I.

Children's Rehabilitation Center of Orthopaedics and Traumatology „Ogonyok", St. Petersburg, Russia

Human spinal column, with getting the status of Homo Erectus, from the stable double-bearing position turned into the less stable – a single one. This circumstance determined the new higher requirements to the functional state of the most important segment of the skeleton. It would not be an exaggeration to conclude that it was one of the reasons for the appearance of diseases and spinal deformities unique for a human being. But only with the invention of writing, they have been documented.

This article focuses only on the AIS. Meanwhile, it took thousands of years to distinguish this category of patients, from observations of physicians of ancient Egypt and Greece Asclepiads to interdisciplinary research due to XX–XXI centuries' technologies. But today there are no other disorders of the musculoskeletal system of a man, which would have caused so much joyous hopes of new discoveries and almost as many of the subsequent disappointments. There is no other problem, around which there are so much collective professional discussions with simultaneous personal reflections of a doctor about his impotence before the AIS, mutilating the body and destiny.

The emergence of AIS against the overall health and its high frequency in population, the visit of a child to a doctor only when appear 3D deformation symptoms and stereotypes in their views on the cause, the abundance of research results and other circumstances – all these allows to introduce the disease in a form of puzzle's details which you want to add for getting the required picture of cause-and-effect relationships. All this is necessary to answer the following questions: AIS – a disease or condition? Do all AIS – idiopathic? Under what conditions is going the transition of a healthy spine into a "scoliotic" one? Is there a prophylaxis of spinal column from disorder?

Professionals understand that to find the answers to these and other issues is required problem solution breakthrough that has no geographical boundaries. In this paper, briefly, as its volume is regulated by the publishing room, is given our experience along the way. The whole scope of our results in details is presented in the three books "Idiopathic Scoliosis: Diagnostics, Pathogenesis"(2009), "The Central Nervous System and Idiopathic Scoliosis" (2011) and "Idiopathic Scoliosis:

Neurophysiology, Neurochemistry " (2013) (the link/reference can keep saving mode: www.mirmed.ru).

Our first conclusion about the AIS, which hides behind numerous private parts in its clinical manifestation has mono form character. After all, any of these cases has only 3D deformation. Meanwhile, we revealed two variants of frontal arc changes in the horizontal and sagittal planes combinations. The first, typical or standard – when frontal arc (curve) is developing simultaneously with vertebra column lordosis (flat back) and vertebral bodies convex side rotation. The second, atypical or non-standard – frontal arc is combined with vertebra column kyphosis (round back) under conditions of vertebral bodies concave side rotation. Except for the differences in vertebra column macro-anatomy, these options are different also in their last stage of development (remember that AIS is a process!). In the first case (typical AIS) there is a possibility of the entire spectrum of development – from the "aggressive and progressive" to "non-progressive". In the second case (atypical AIS) – 3D deformation outcome never has catastrophic consequences, and the only remaining negative symptom may be a symptom of a round back. The maximum value of the frontal arc in atypical AIS, we've met in our practice, does not exceed 15º by Cobb. We believe that such a benign development of this version of AIS has just concealed the fact of its existence. It can be justly noted that W. Schulthess (**11**) in 1902 reported about vertebral bodies concave side rotation, and in a quarter of 20th century A. Steindler (1929), confirming the phenomenon, named it as "concave side rotation" (synonyms – "atypical pathological vertebral rotation" by M. Dudin (cited according to (**5, 6, 8**)) and "non-standard rotation" by G.W.D. Armstrong (**1**). About this version of pathological rotation wrote J.C. Risser (**9**). The further lack of attention to it can be explained only by the fact that both W. Schulthess and A. Steindler underlined in their works that «concave side rotation» in severe deformations were not observed.

Comparison of a quantity of clinical, radiographic, EMG data, as well as the results of radionuclide diagnostics of functional state of vertebrae bone tissue in children with typical and atypical AIS directly showed out that both versions of scoliosis are associated with the intensity of the cranio-caudal growth of the column formed by the vertebral bodies. In typical AIS this growth possesses an active character, while in atypical AIS has a reduced one.

These results have attracted our attention to the endocrine system, as the main osteogenesis regulator. As a subject of our study were taken osteotropic hormones – growth hormone (GH) and its functional antagonist – cortisol, as well as calcitonin and parathyrin. The first pair regulates the synthesis of bone tissue organic matrix, and the second – the synthesis of the mineral component. As a result, were obtained four typical profiles of these hormones in the blood serum of patients with AIS. At high levels of GH and calcitonin were observed typical AIS with progressive development. With the high level of their antagonists (cortisol and parathyrin) were diagnosed atypical AIS or non- progressive typical AIS. Under conditions of increased content of "GH – parathyrin" or "cortisol – calcitonin" took place only typical AIS with a sluggish, slow progression of the frontal arc.

During this phase of the comprehensive study of typical and atypical AIS the spondylograms of patients with the first

signs of 3D deformation were shown to our friends – experts in the field of theoretical mechanics. They drew our attention to what we clinicians have not been paying attention – at the very beginning of the development of scoliosis in typical AIS longitudinal axis of the projection of the spinal canal is straight (is not deformed), while in the column of vertebral bodies can be seen two "anti-circuits" (opposite direction twisting). In atypical AIS on spondylograms is observed the opposite pattern – two "anti-circuits" are formed in the spinal canal, while a column of vertebrae stay strictly vertical.

It turned out that such processes fully correlate with the fundamental laws of theoretical mechanics and originate in cases, when in a model consisting of two parallel columns closely related with each other, one begins to lengthen. In such case, to maintain the overall length of a model, the excess size of one of the columns must shift aside, what is realized in its twisting around the "short" column. Moreover, our friends have described this process as mathematical equation. It was of a great surprise when our rough estimates on spondylograms generally coincided with the accurate calculations results.

It has to be noted that these studies were carried out in the 70's and 80's of the last century. But, if atypical AIS became the "key" to the understanding of the fundamental laws of the vertebra column 3D deformation mechanogenesis process, then by virtue of its benign course it was of less interest than the typical AIS. At that time we could not answer the question – why the vertebral column is "twisting"? What triggers this process? Prompting was obtained M. Roth's work (**10**), who in the middle of the twentieth century (Roth M., 1968) on the "spring-string" model made the assumption of scoliosis as a result of the conflict in the longitudinal growth of the spine and spinal cord. He believed that scoliosis occur due to the neural structures functioning symmetry violation in the taut spinal cord. As many years passed after the publication of M. Roth work and today we have access to a new generation of diagnostic equipment, there was made a decision about intensive study of the central nervous system (brain and spinal cord).

As a result, we revealed strong evidence of the interest of the central and spinal neural structures in the pathogenesis of AIS. By the way, the analysis of Lonstein's (**7**) popular etiological classification data shows that in the vast majority of determined groups of scoliotic deformities is present a neurogenic factor.

In children with typical AIS data from the revealed are to be pointed out the following: the changes in the interzonal ties in the cerebral cortex under the standard EEG, the appearance of increased asymmetric bioelectrical activity in the area of stem and basal brain structures, as well as pineal gland chronobiology deviations (method 3DLocEEG) (**3, 4**). The study of postural asymmetry factors (arginine-8-vasopressin and oxytocin) has allowed establish their role in the initiation and support of the muscle tone asymmetry in the typical AIS subclinical period, which in turn gives us opportunity to set them the meaning of biological prognosis markers of idiopathic spinal deformation progression character.

As a result (including the analysis of information of the world's literature which is reflected in our monographs) there was formulated the following concept: AIS as 3D deformation of spine is a compensatory response to the spinal complex non-con-

jugation (realignment/de-synchronization) of the longitudinal growth of the spinal cord and its bone-ligament-muscular "case". There are many reasons for the occurrence of this phenomenon (the vast number of specialists nowadays agree with the fact of AIS polyetiology), but they all lead to one single circumstance, initiating the transition of healthy spine into a scoliotic one (AIS monoform character). It is excellently illustrated by the conclusion of K. Bagnall (**2**), who writes "AIS is the overall outcome of several different reasons, not just a single cause, the same in all cases".

Basing on current information about the embryogenesis of the spinal cord and bone spinal column, as well as data about age features in the regulation of longitudinal growth of each of them, it can be seen a wide range of etiological factors that create the conditions for the emergence of non-conjugation in a natural longitudinal development of the main components of the spinal complex: from congenital to infectious, from genetic to traumatic, from iatrogenic to population etc. So it is evident that the polyetiology character of scoliosis is an absolutely regular (natural) phenomenon, which is determined by a multiplicity of reasons, but each of them as a result of its influence eventually leads to the emergence of a single – initiating scoliosis – circumstance, i.e. to the fact of the above-mentioned non-conjugation of the longitudinal growth of the spinal cord and its "case" processes. This chain of events is similar to the law of neurophysiology described in "The Correlation of Reflexes and the Principle of the Common Path" (Ch.S. Sherrington, /1859–1952/, Nobel Prize – 1932) (**12**) and named "Sherrington's funnel". This figurative comparison reflects the convergence of multiple afferent inputs into a single anatomically limited efferent channel ("common path").

As the first result of this concept appeared a new classification of AIS. Its foundation was formed by three main reasons for the occurrence of the above-mentioned non-conjugation:

a) the deviations (congenital or acquired) in the hormonal osteogenesis regulation, leading to an excess in the longitudinal dimension of the spinal cord bone "case";
b) congenital and acquired deficiency of the spinal cord longitudinal growth relatively to the normal size of the bone "case";
c) violations of the stem and the brain central structures, whence can't be solved the task to synchronize the longitudinal growth of the most important vertebra column complex – the spinal cord and its bone "case". From these positions all AIS can be attributed mainly to the "hormonal", predominantly "spinal" and predominantly "central". A comparison of this classification with the popular classification of J.E. Lonstein (1995) revealed that all (not only AIS!) scoliosis may be classified according to one of three categories. The attentive reader can check this our conclusion.

Meanwhile, by all our logical concepts the problem remained unsolved. How a "healthy" spinal complex is transformed into a "scoliotic"one.

To accomplish the task, were re-analyzed data from clinical and instrumental diagnosis of children with various disorders of posture (computer digital optical topography or CDOT) in correlation with the results of surface electromechanical graph obtained in the same group throughout the paraverte-

bral region. Since the details of this work are in full range reflected in our monographs, we present only the conclusions:

1. To any clinical AIS manifestation has pre and sub-clinical stages.
2. Preclinical typical AIS stage is manifested in reserve usage defined in human physiological kyphosis, which "absorbs" the excess length of the bone "case", what is registered as a "flat back" in child's medical inspection. For atypical AIS the same stage is manifested in the increase of chest physiological kyphosis because of the insufficiency of the column length of vertebral bodies, which is registered as a "round back".

   We underline – this is the first clinical signs of "scoliosis risk group". Preservation of non-conjugation as in "flat back" (indicator of physiological sagittal reserve usage), and at "round back" (in this case physiological reserve is significantly higher) will lead to the next link of a compensatory response, which was detected for us by theoretical mechanics specialists – twisting of a long column around a short one, what we have called "sub-clinical stage of AIS", as there appears the first sign of scoliosis – vertebrae rotation leading as a result to the vertebra column torsion.
3. AIS subclinical stage is extremely rarely registered by physicians. It is manifested in vertebra column unidirectional torsion, which begins in the caudal region and increases in the cranial direction. This phenomenon is authentically recorded at CDOT and is confirmed by surface EMG in the lumbar region (mm. multifidi).

   Clinical manifestation of this phase is a violation of parallelism of front axes as lumbar so as shoulder belts.

   The differences in these stages for future typical and atypical AIS have not been yet found.
4. The clinical stage "begins" to restore the parallelism of the front axis of pelvic and shoulder girdles, which is required for normal functioning (it should be noted that the time limit between subclinical and clinical stages can be determined with great difficulty). At this stage takes place vertebral column cranial detorsion due to the bioelectric activity of the muscles of the rotator cranial area increase (m. semispinalis, mm. multifidi, mm. rotatores). The essence of this stage – the actual output compensation of the previous stage (violation of the frontal, physiologically normal, shoulder girdle position) and the angle of the mentioned detorsion has to ensure the restoration of the frontal position of the shoulder girdle (and head).

The clinical manifestation of this phase, in addition to "flat back" (typical AIS) or "round back" (atypical AIS), is vertebra column frontal arc, which is authentically recorded by CDOT.

In typical AIS these data are supplemented with an asymmetrical increase in the bioelectric activity of muscles (EMG) on the convex side apex curve frontal. In atypical AIS EMG records the rise of bioelectrical activity in the frontal curve concave side apex.

Further development for typical AIS is concerned with the liquidation (non-progressive) or retention (progressive) of the same non-conjugation between the growth of the spinal cord and its "case", as well as with the implementation of Hueter-Volkmann Law, which launches "circulus vitiosus" (**14**).

Non-progressive nature of atypical AIS we explain by the rotation feature (concave side rotation), in which the bodies of the vertebrae play the role of a "keystone", which can be seen in the arched bridge.

On the basis of these facts can be seen the directions of what we only dreamed of – AIS prophylaxis (prevention). To be more precise – not the prevention of its progression, but its origin.

The principles of AIS prevention are based on three basic and closely related factors. First – the knowledge of its pathogenesis. Second – the knowledge of "scoliosis risk group" features and the ability to detect them. Third – the availability of medical techniques and knowledge of the targets for their specific application.

We hope that, even briefly mentioned data, conclusions and the thoughts stay enough convincing (but opened for discussion!).

This implies that there is a reason for belief that there comes time when these factors from the category of "theoretical" are turning into the category of "practical".

The first factor – pathogenesis. We believe that Fortune smiled on our investigations and as a result we succeeded from many parts of "the puzzle" to develop and formulate the concept of AIS as a clinical manifestation of vertebra column complex compensatory reaction to the non-conjugation of spinal longitudinal growth and its bone-ligament-muscular "case". It is not only explaining the phenomenon of AIS monoform character along with its polyetiology, but has identified the conditions that are developed in the pre- and sub-clinical transition period of a healthy vertebra column into a "scoliotic" one.

The second factor – the risk group. The criteria for the inclusion of a specific child (not having symptoms of AIS!) in a scoliosis risk group is the described se-quence (coherence) of changes in the spinal complex on the pre- and sub-clinical stages (formation of "flat back" or "round back" and the subsequent development of unidirectional torsion of spine, what is fully confirmed by instrumental diagnostics). If in this period, the doctor is able to restore the conjugation of longitudinal growth of the spinal cord and then the transition to the category of a "patient" for this child will not occur as there won't be a need for a compensatory reaction in the form of AIS.

The third factor – treatment methods. It is evident that the main objective of any method for the prevention and treatment of AIS – is to restore the conjugation (synchronism) of spinal cord and its "case".

Our experience shows that at the present level of development of non-invasive medical procedures the most realistic way – is to reduce osteogenesis intensity in the vertebral bodies' column (it means growth of spine). Even if it is a "spinal" or "central" AIS, in which the excess length of the bone "case" is relative. Among the tested for the past 10 years techniques, allowing to achieve the specified target can be named the following:

a) non-medicamental and medicamental (non-hormonal drugs) correction of osteotrophic hormonal profile;
b) inhibition of vertebrae bodies growth zones by magnetic field;
c) improving the functioning of brain structures and spinal cord procedures by methods of their "polarization";
d) the elimination of imbalances in muscle bioelectrical activity by electrical and magneto-stimulation; e) under elaboration are the following tech-niques:

method of apophysis growth zones inhibition on the basis of laser therapy and method of factors of posture asymmetry neutralization that initiate the muscle's disbalance.

As a conclusion. We believe that today it is objectively comes the time when we begin to possess the knowledge to withstand AIS. We hope and believe that its' surgical correction won't be "damoclis gladius" / lat. / (Marcus Tullius Cicero, 106-43's BC.) and will start to leave the everyday child's vertebrology practice. High technology lies not in the operating tools and equipment, but in the minds of physicians.

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KINESIOTHERAPY PROGRAMS EFFICACY IN PATIENTS WITH SCHEUERMANN'S DISEASE AND DIFFERENT SAGITTAL SPINE ALIGNMENT

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ABSTRACT

Introduction. Different spine sagittal contours in classic and lumbar Scheuermann's disease are associated with various muscle imbalance.

Material and methods. A randomized controlled trial of the efficacy of kinesiotherapy programs in patients with Scheuermann's kyphosis and lumbar Scheuermann's aged 16–26 years (mean age 20.6 ± 0.3 years) was performed. We evaluated the mobility of the spine and hip joints, the roentgenometric magnitude of thoracic kyphosis and lumbar lordosis, the parameters of EMG of the lumbar part of the muscles erector spinae using surface electrodes. Patients interviewed on the visual analogue scale (VAS), on the Oswestry Disability Questionnaire, version 2.0 (ODI), on the Pain and Anxiety Symptoms Scale (PASS) – 20.

Results. After the treatment in groups with kinesiotherapy program was observed the increase of general spine mobility while bending forward, the increase of hip joint movements in sagittal plane and significant improvement VAS, ODI and PASS as compared with the control groups in the classic and atypical forms of the Scheuermann's disease, respectively.

Discussion and Conclusion. We associate the efficiency of the kinesiotherapy program with applying a differential approach to prescribing the exercises according to the variation of sagittal spinal alignment.

Keywords: Scheuermann's disease, sagittal spine balance, Kinesiotherapy programs.

INTRODUCTION

In Scheuermann's disease clinical course we differentiate between the classic and atypical form disease (**1, 4, 12, 19, 31**). The classic form involves a rigid thoracic or thoracolumbar kyphosis, vertebral pain during the beginning of the deformation is usually absent and can appear in the area of the deformity when the patient is in his 30–40s (**1, 3**). Atypical Sheuermann's disease is characterized by lumbar localization and persistent low back pain, which sometimes spreads to the lower limbs, and the absence of fixed thoracic kyphosis (**2, 4, 12**). For this very reason during the rehabilitation of Scheuermann's disease patients, we use medical gymnastics, the purpose of which is to correct the deformation, decrease the spine rigidness, improve the vertical posture, and we program physical exercises to relieve the low back pain (**3, 36, 39**).

It should be noted that in current medical literature the medical gymnastics examples for the Scheuermann disease patients are to be found only in few editions. Thus, in case of classic Scheuermann disease these programs aim to eliminate retraction and endurance of the extensor muscles in torso and hips. For the thoracic deformation passive and active hyperkyphosis redression exercises are used. They include the stretching of the back hip muscles and chest muscles (**4, 16–18**). For S-shaped sagittal spinal alignment with abundant thoracic kyphosis and compensatory lumbar hyperlordosis, as well as the localization of the thoracolumbar Scheuermann's disease exercises aimed at correcting the lumbar curvature were developed (**35**). For atypical form of Scheuermann's disease it is recommended to use the exercise program to low back pain management (18).

However, changes in the spine sagittal contour (peculiar to the patients with Scheuermann's disease) is accompanied by changes in the sagittal alignment of the body segments (**32**) with the redistribution of muscular effort required to maintain upright posture (**13, 15**) and the development of muscle imbalance with the change of tone as postural muscles, and antagonist muscles (**10**). Based on this, we believe that the basic program of physiotherapy for these patients should be different for different forms of sagittal postural balance, with a differentiated workload for the muscle groups and extensors and flexors of the trunk and lower limbs.

MATERIAL AND METHODS

The clinical and radiological study protocols of 100 patients with Scheuermann's disease (all – male) aged 16–26 years (mean age 20.6 ± 0.3 years) served as the materials for this research. Inclusion criteria are typical X-ray sings of classical and atypical forms of Scheuermann's disease (**1–4, 12, 19, 24, 31, 33, 34**): wedge deformity of the vertebral bodies, the criterion Sorenson (**30**) (wedge-shaped deformation of at least 5° three central spine at the top of kyphosis), irregular vertebral endplates with intranspongious Schmorl's nodes, increased of the vertebral body anterior-posterior diameter and height reduction of intervertebral discs.

Physiological values of thoracic kyphosis was considered 20° – 45°; lumbar lordosis – 50° – 65° (**9**).

Group A (n = 50) was composed of patients with the classic Scheuermann's disease with the thoracic hyperkypho-

sis. Patients with atypical Scheuermann's disease with normal or flattening spinal curves represented the group B (n = 50). Patients within each of the A and B groups randomly as divided into two groups of 25 people: study group Ast. and control group Acontr, as well as study group Bst. and control group Bcontr, Kinesiotherapy programs for patients in study groups Ast and Bst included the developed by us differentiated therapeutic exercises to correct muscle imbalance at spine different sagittal contour. The aim of the Kinesiotherapy programs was the correction of muscle tone of the flexors and extensors of the torso and hip joints depending on their postural activity and the degree of extension accordingly. To reduce the tone of hyperactive, tense muscles (usually extensors) was used in a mode of exercises post-isometric relaxation and toning their antagonists – isometric exercises in the stabilization mode. Required condition of the treatment programs were the exercises in post-isometric relaxation mode in a slow tempo, as the forced stretching tight muscles usually is accompanied by pain, does not lead to the expected elongation of muscles and can cause resistant retention or even increased of its tension.

Patients in control groups A_{contr} and B_{contr} apply the standard exercises program for the retraction of the extensor muscles of the torso and thigh and pectoralis muscles.

Kinesiotherapy programs for patients of all groups were performed within 14 days on an outpatient department and included one daily session of 14 exercises. In groups A_{st} and B_{st} we used 7 postisometric relaxation exercises and isometric stabilization; Group A_{contr} and B_{contr} used kyphosis redressation exercises, and for stretching the hamstring and pectoralis muscles.

In the study of orthopedic status we measured the overall mobility of the spine using the test "fingers -floor" with the distance-measuring from the fingertips to the floor with knees bent open, the mobility of the lumbar spine in flexion by method Schober (**21**), the amount of movements in the hip joints. The intensity of low back pain during daily activities in the past week was measured on the visual analog scale (VAS) (8). Disability due to back pain (ODI) during the past week was assessed by the Oswestry Disability Questionnaire, version 2.0 (**27**). The level of worry and anxiety associated with the expectation of pain during the past week was assessed by the Pain and Anxiety Symptoms Scale (PASS) – 20 (**20**).

The magnitude of thoracic kyphosis and lumbar lordosis was measured by lateral thoracic and lumbar spondylograms formed in standing position using the Cobb's method (**7**).

A spontaneous electromyography (EMG) of the right and the left lumbar part of the muscles erector spinae was performed on the dual-channel electromyography "NeuroEMG" ("Neurosoft", Russia) using surface electrodes in a standing position, to the interference of the curve according to the structurally-amplitude analysis examined the mean values of the amplitude and frequency bioelectrical muscle activity.

During the statistical research we used the T-criteria (Student's method), during the analysis the method of Pearson was used.

All studies were performed twice – at the initial examination before the treatment and after the treatment.

All the patients were monitored in the outpatient department of Vinnytsia Region Clinical Hospital named after N.I. Pirogov in 2012–2013.

RESULTS

The thoracic and lumbar pain intensity, level disability and anxiety and fear associated with the expectation of pain in patient groups were moderate.

The general mobility when bending the spine anteriorly to the test results "fingers-floor" was significantly better for the patients in both groups B_{st} and B_{contr}, whereas the mobility of the lumbar spine in flexion, as measured by the Schober's method (**21**), between groups A_{st} and A_{contr} as well as between groups $B_{st,}$ and B_{contr} did not differ significantly (**Tables 1–2**). Findings reflect the well-known fact about the presence of spinal rigidity in the presence of thoracic hyperkyphosis due to retraction of the muscles – spine extensors.

The range of motion in the hip joints in the sagittal plane was reduced in groups B_{st}, B_{contr} given that flexion in groups A_{st}, A_{contr} was limited. In the frontal plane revealed a restriction retraction in all groups; adduction and rotational movements – within the norm. See Tables 1, 2.

According to the roentgenometric studies the average thoracic kyphosis was 58.5° ± 0.8 in group A_{st} and 29.8° ± 0.4 in group B_{st} ($t = 3.1$; $p < 0.01$); 57.4° ± 0.4 in group A_{contr} and 32.6° ± 0.8 in group B_{contr} ($t = 2.8$; $p < 0.01$); with an average of lumbar lordosis in group A_{st} =38.7° ± 1.1 and B_{st}= 39.1° ± 0.8 ($t = 0.6$; $p > 0.05$); in group B_{contr} =40.9° ± 1.4 and B_{contr}= 38.8° ± 0.8

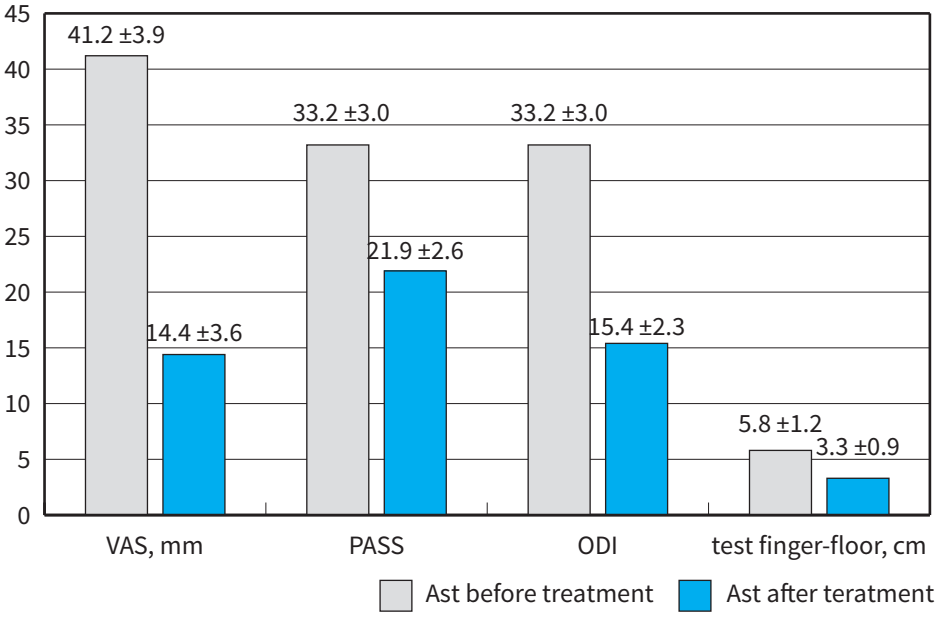

Figure 1. Some statistics in the study group (group Ast) with the classic Scheuermann's disease group before differentiated Kinesiotherapy program (white) and after treatment (black).

	Group Ast (n=25)	Group Acontr (n=25)
	VAS, mm	
Mean ± SD	41.2±3.9	40.4±2.8
	t=0.2 P>0.05	
	ODI, points	
Mean ± SD	33.2±3.0	32.6±3.0
	t=0.2 P>0.05	
	PASS, points	
Mean ± SD	33.2± 3.0	34.4±2.8
	t=0.3 P>0.05	
	Hip extension, degree	
Mean ± SD	8.0± 0.9	8.6±0.7
	t=0.8 P > 0.05	
	Hip flexion, degree	
Mean ± SD	103.5± 3.8	105.9±3.7
	t=0.7 P>0.05	
	Test "finger-floor", cm	
Mean ± SD	58.0± 1.2	5.294±0.938
	t=0.2 P > 0.05	
	EMG AmcV (impulse/sec) right	
Mean ± SD	74.9± 14.1	80.0±31.8
	t=0.7 P > 0.05	
	EMG AmcV (impulse/sec) left	
Mean ± SD	136.6± 11.4	137.9±23.5
	t=0.2 P > 0.05	
	EMG freq. (mkV) right	
Mean ± SD	76.3±18.8	54.6±23.4
	t=1.1 P>0.05	
	EMG freq. (mkV) left	
Mean ± SD	103.8±18.3	69.9±39.9
	t=1.1 P>0.05	

Table 1. Description on the study group (group A_{st}) and the control group (group A_{contr}) with classic Scheuermann's disease before treatment. VAS – visual analog scale; ODI – the Oswestry Disability Questionnaire, version 2.0; PASS - the Pain and Anxiety Symptoms Scale – 20; EMG - electromyography

	Group Bst (n=25)	Group Bcontr (n=25)
	VAS, mm	
Mean ± SD	49.3±2.9	48.4±4.0
	t=0.7 P>0.05	
	ODI, points	
Mean ± SD	37.9±3.2	39.1±3.1
	t=0.3 P>0.05	
	PASS, points	
Mean ± SD	39.7± 3.2	38.4±6.2
	t=0.3 P>0.05	
	Hip extension, degree	
Mean ± SD	4.7± 1.1	4.7±1.0
	t=0.2 P>0.05	
	Hip flexion, degree	
Mean ± SD	97.3± 2.8	102.0±4.3
	t=0.8 P>0.05	
	Test "finger-floor", cm	
Mean ± SD	166.0± 1.6	178.0±1.8
	t=0.8 P>0.05	
	EMG AmcV (impulse/sec.) right	
Mean ± SD	68.7± 11.4	71.1±13.3
	t=0.8 P > 0.05	
	EMG AmcV (impulse/sec.) left	
Mean ± SD	119.7± 4.7	117.6±22.8
	t=0.3 P > 0.05	
	EMG freq. (mkV) right	
Mean ± SD	65.5±11.9	63.2±23.4
	t=0.3 P>0.05	
	EMG freq. (mkV) left	
Mean ± SD	101.4±10.8	117.8±17.5
	t=1.1 P>0.05	

Table 2. Description on the study group (group Bst) and the control group (group Bcontr) with lumbar Scheuermann's before treatment. VAS – visual analog scale; ODI – the Oswestry Disability Questionnaire, version 2.0; PASS – the Pain and Anxiety Symptoms Scale – 20; EMG – electromyography

(t = 0.67; p> 0.05). Consequently, almost all of the patients noted the discrepancy values of the positional parameters of spinal-pelvic balance – thoracic kyphosis and lumbar lordosis. In groups A_{st} and A_{contrt}, the excess thoracic kyphosis were compensated by lumbar hyperlordosis, but thoracic deformation rather combined with lumbar hypolordosis. In groups B_{st} and B_{contr}, the normal thoracic kyphosis patients also recorded decrease in the lumbar lordosis.

During the superficial EMG of paravertebral muscles in a standing position between groups A (A_{st} and A_{contr}) and B (B_{st} and B_{contr}), no significant difference between the performance of the bioelectric activity of muscles was found (**Tables 1**, **2**). However, there was considerable asymmetric parameters of bioelectrical activity of the right and left paravertebral muscles in all groups: in groups A (A_{st} and A_{contr}) and groups B (B_{st} and B_{contr}), the difference between the indices of the amplitude was significant difference (p <0.001) and while the difference between the indices of frequency was not significant. The results may indicate a de-synchronization of lumbar paravertebral muscles stimulation.

Thus, in all patient groups we observed sagittal spinal-pelvic imbalance with uncompensated thoracic kyphosis (groups A_{st} and A_{contr}), and the flattening of the sagittal alignment of the type degenerative deformation "flatback" (groups B_{st} and B_{contr}). Upright posture in these different sagittal spinal-pelvic unbalance require compensat-

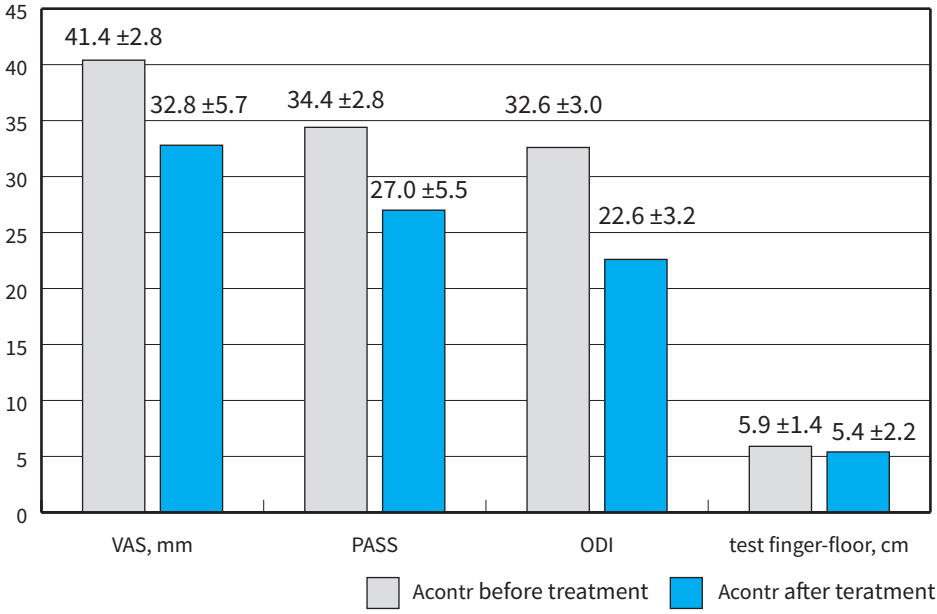

Figure 2. Some statistics in the control group (group A_{contr}) with the classic Scheuermann's disease before standart exercise program (white) and after treatment (black).

ing position in the lower limb joints and therefore different postural muscle group activity (**13, 15, 32**). Preserving projection common center of mass in the support area in patients with uncompensated thoracic hyperkyphosis accompanied hip hyperextension position and knee flexion setting with postural activity erector spinae, muscles of the hip anterior surface and leg muscles (**13**). Patients with hyperlordosis spinal deformity and low back pain demonstrated flextion posture of the hip and knee joints with postural activity erector spinae, muscles of the back of the hip, thigh and the leg (**11, 13**). Excessive postural work is related to biomechanical insufficiency of muscle groups and may be accompanied by vertebral pain.

Based on the findings the differentiated Kinesiotherapy programs were developed for group A_{st} and B_{st}. The program included exercises designed to postisometric relaxation of postural muscles with simultaneous isometric stabilization of their antagonists.

The results of monitoring studies conducted at the end of treatment, demonstrated the efficacy of the proposed program Kinesiotherapy for patients with Scheuermann's disease with different spine sagittal alignment. In groups Ast and Bst there was a significant decrease in pain intensity by VAS ($p < 0.001$), disability by ODI ($p < 0.01$ and $p < 0.05$, respectively), anxiety and worry associated with pain waiting on the PASS (<0.01) (**Fig. 1, 3**). In the control groups a statistically significant

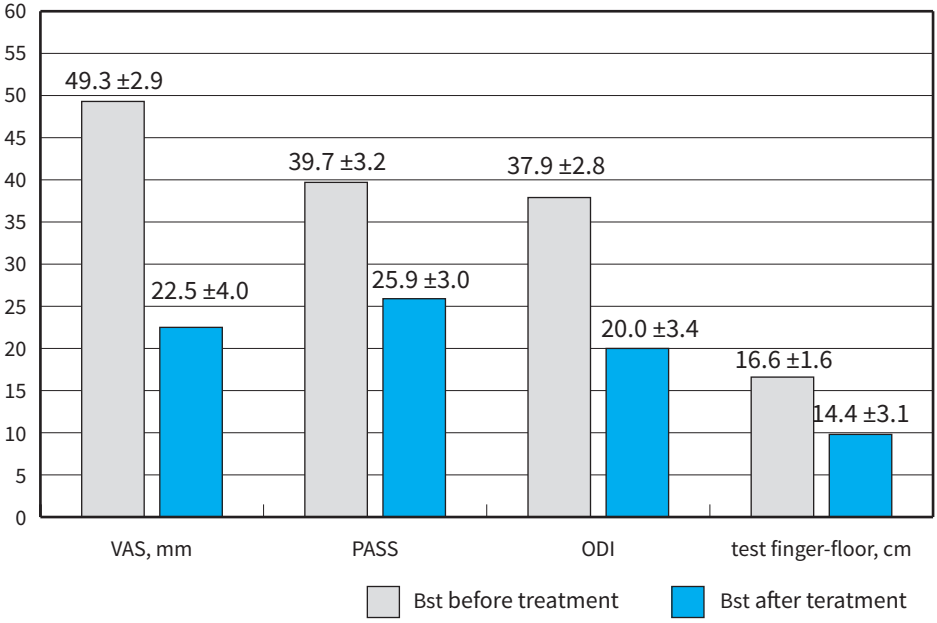

Figure 3. Some statistics in the study group (group B_{st}) with the lumbar Scheuermann's before differentiated Kinesiotherapy program (white) and after treatment (black).

	Group Ast (n=25)	Group Acontr (n=25)
	VAS, mm	
Mean ± SD	14.4±3.6	32.8± 5.7
	t=2.3 P > 0.01	
	ODI, points	
Mean ± SD	15.4± 2.4	22,6± 3,2
	t=1.8 P < 0.05	
	PASS, points	
Mean ± SD	21.9± 2.6	27.0± 5.6
	t=1.7 P < 0,05	
	Hip extension, degree	
Mean ± SD	9.1± 0.7	8.0± 0.9
	t=0.3 P > 0,05	
	Hip flexion, degree	
Mean ± SD	108.5± 3.7	98,0± 5,8
	t=0.3 P > 0,05	
	Test "finger-floor", cm	
Mean ± SD	33.0± 0.9	54.0±2,2
	t=0.1 P > 0,05	
	EMG AmcV (impulse/sec) right	
Mean ± SD	118.0 ± 31.8	113.4± 18.6
	t=0.8 P > 0.05	
	EMG AmcV (impulse/sec) left	
Mean ± SD	167.9± 23.5	112,0± 18,1
	t=1.3 P > 0.05	
	EMG freq. (mkV) right	
Mean ± SD	61.0±13.1	61.5±24.7
	t=0.1 p>0.05	
	EMG freq. (mkV) left	
Mean ± SD	92.3±16.7	84.8±25.9
	t=0.2 p>0.05	

Table 3. Description on the study group (group A_{st}) and the control group (group A_{contr}) with classic Scheuermann's disease after treatment. VAS – visual analog scale; ODI – the Oswestry Disability Questionnaire, version 2.0; PASS – the Pain and Anxiety Symptoms Scale – 20; EMG – electromyography

positive effect was observed only in the group Bcontr (**Table 3, 4, Fig. 2, 4**).

The spine mobility when bending anteriorly by the test "fingers-floor" increased in both study groups after designed software Kinesiotherapy, but in the group A_{st} these changes were not statistically significant. Also, there was an increase of movement of the hip joints in the sagittal plane: in the group A_{st} – flexion, in the group B_{st} – and flexion and extension. In both control groups, significant changes in these parameters have been identified.

See **Figures 1–4, Tables 3–5**.

These results suggest that the developed program kinesiotherapy is more effective in improving the muscles functional status as compared to the standard exercises program for the retraction of the extensor muscles of the torso and thigh and pectoralis muscles. The optimal combination of different modes (post isometric relaxation and isometric stabilization) in the exercise program kinesotherapy allowed to reduce the muscle imbalance as well to increase the flexibility of the spine and the hip joints. This, in turn, resulted in lower the intensity of pain and its associated disability and fear expectation of pain.

We also noticed the reduction in the EMG parameters asymmetry of the lumbar part erector spinae. In the group A_{st} the difference of parameters – the amplitude and frequency became statistically not significant. In groups B_{st} and

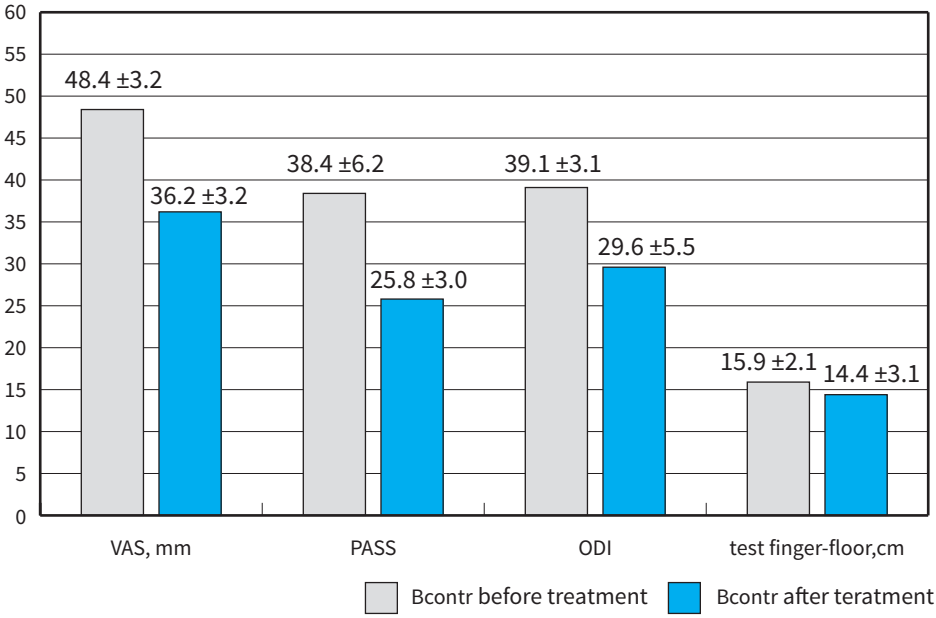

Figure 4. Some statistics in the control group (group B_{contr}) with the lumbar Scheuermann's before standart exercise program (white) and after treatment (black).

	Group Bst (n=25)	Group Bcontr (n=25)
	VAS, mm	
Mean ± SD	22.5±4.4	36.2± 3.2
	t=2.4 P<0.05	
	ODI, points	
Mean ± SD	20.0± 3.4	29.6± 5.5
	t=0.9 P > 0.05	
	PASS, points	
Mean ± SD	25.9± 3.2	25.8± 6.2
	t=0.8 P > 0.05	
	Hip extension, degree	
Mean ± SD	7.7± 1.0	4.0± 1.9
	t=0 .7 P > 0.05	
	Hip flexion, degree	
Mean ± SD	114.0± 4.3	96.0± 6.0
	t=0.8 P > 0.05	
	Test "finger-floor", cm	
Mean ± SD	98.0± 1.8	178.0± 1.9
	t=1.8 P < 0.05	
	EMG AmcV (impulse/sec) right	
Mean ± SD	82.1± 13.3	80.3± 16.0
	t=1.1 P>0.05	
	EMG AmcV (impulse/sec) left	
Mean ± SD	147.6±22.8	118.8±6.9
	t=1.4 P>0.05	
	EMG freq. (mkV) right	
Mean ± SD	68.6±13.3	65.4±24.3
	t=0.7 P>0.05	
	EMG freq. (mkV) left	
Mean ± SD	107.6±12.2	120.8±15.6
	t=0.8 P>0.05	

Table 4. Description on the study group (group B_{st}) and the control group (group B_{contr}) with lumbar Scheuermann's after treatment. VAS – visual analog scale; ODI – the Oswestry Disability Questionnaire, version 2.0; PASS – the Pain and Anxiety Symptoms Scale – 20; EMG – electromyography, VAS – visual analog scale; ODI – the Oswestry Disability Questionnaire, version 2.0; PASS – the Pain and Anxiety Symptoms Scale – 20; EMG – electromyography

	Ast		Acontr	
	Before treatment	After treatment	Before treatment	After treatment
VAS, mm	41.2±3.9	14.4±3.6***	40.4±2.8	32.8±5.7
PASS, points	33.2±3.0	21.9±2.6**	34.4±2.8	27.0±5.5
ODI, points	33.2±3.0	15.4±2.3**	32.6±3.0	22.6±3.2
test "finger-floor", mm	58.0±1.2	33.0±0.9	5.29±1.4	54.0±2.2

	Bst		Bcontr	
	Before treatment	After treatment	Before treatment	After treatment
VAS, mm	49.3±2,9	22.5±4.0***	48.4±4.0	36.2±3.2**
PASS, points	39.7±3,2	25.9±3.0**	38.4±6.2	25.8±3.0**
ODI, points	37.9±2,8	20.0±3.4*	39.1±3.1	29.6±5.5*
test "finger-floor", mm	166.0±1.6	98.0±1.8**	159.0±2.1	144.0±3.1

Table 5. Some statistics in groups of patients with classic Scheuermann's disease (the study group Ast and the control group Acontr) and with lumbar Scheuermann's (the study group Bst and the control group Bcontr) before and after treatment session. VAS – visual analog scale; ODI – the Oswestry Disability Questionnaire, version 2.0; PASS – the Pain and Anxiety Symptoms Scale – 20.
Note: * <0.05; ** <0.01; *** <0.001

B_{contr} statistically significant asymmetry of parameters of bioelectrical activity of the erector spinae lumbar part on the right and on the left is preserved to the end of treatment, although the degree of asymmetry of the amplitude reduction decreased, while the asymmetry of the frequency remained constant reduction. In the group A_{contr} significant changes in the bioelectrical activity parameters of the erector spinae lumbar part were observed. Therefore, the designed Kinesiotherapy program improves synchronization of paravertebral muscles stimulation and thus improves the motor control of vertical posture, especially in patients with spinal kyphosis.

DISCUSSION

Sagittal spinal-pelvic unbalance – non-compensated thoracic hyperkyphosis and flattening of the spine sagittal alignment provide suitable compensation positions in the lower limbs joints with excessive postural activity of paravertebral and periarticular muscules. The change of the configuration of the thoracic and lumbar spine, combined with a reduction in the height of the intervertebral space leads to a functional, and later to the organic relative change in length of the local and global stabilizers of the spine due to changes in the distance between the points of attachment. Changing the length of the muscles causes

a change in its tone: during the extension it is marked with delay, relaxation and lethargy, during the contraction we observe hyperactivity and muscle spasms (**10**). Also change the angles at which the muscles and tendons are attached to the vertebrae (e.g., the local stabilizer multifidus muscle), to the rib cage and to the pelvis (e.g., the global stabilizers rectus abdominis and iliocostalis thoracic). This situation causes a change in position of the instantaneous center of rotation change arms forces and torques, respectively, these muscles exertion in comparison with the norm. In this regard, the character of interaction between the flexors and extensors of spine and joints of the lower limbs while keeping the vertical posture is also changed. In particular, Choon-Sung L. et al. found the excessive activity of the postural muscles of the back of the thigh and early fatigue during the standing and walking (according to functional electromyography) with degenerative deformation «flat back» (**15**). This situation in turn can lead to disruption of motor control and occurrence of back pain. This position is to some extent confirmed by the results of the correlation analysis in the group A (A_{st} and A_{contr}). The degree of disability ODI correlates with the magnitude of thoracic kyphosis, global spine and lumbar mobility and hip flexion. In other words, the degree of disability in patients with the classic Scheuermann's disease is associated with the magnitude of the primary rigid spinal deformity and postural muscle tone – the thoracic and lumbar paravertebral muscles, and muscles – the extensor of the hip. Since we found a strong positive correlation between value of ODI, VAS and PASS, then back pain intensity and anxiety and worry associated with waiting for the pain also indirectly depend on the thoracic hyperkyphosis degree and postural tone of the extensor muscles.

Most of the results of the study – reduction of pain intensity on VAS, the degree of disability by ODI, the level of anxiety and worry on a PASS, increase the spine and hip mobility. It was predictable. An unexpected result was the impact of our Kinesiotherapy programs on motor control with significantly improved synchronization of activation of the erector spinae lumbar part in the upright posture. Achieving almost complete synchrony of stimulation in the right and left erector spinae lumbar part in patients of the group A_{st} suggests that bioelectric activity changes of the muscles in the classic Scheuermann's disease are more functional and are associated with the redistribution of postural work. Saving the asymmetry in the activation of right and left lumbar part of the erector spinae in the group B_{st}, although less pronounced, can be associated with degenerative changes in the lumbar vertebral segments and concomitant chronic low back pain.

Postural improvement in standing and sitting is the strategic aims of the exercise programs in the treatment of patients with Scheuermann's kyphosis. The improvement sagittal alignment of body segments is achieved through extension exercises for the thoracic spine (**16, 17, 24, 29, 33, 39**) and hip joints (**24, 25, 29, 33, 36, 39**) to mobilize the spine and reduce the hip joints contractures. Also strengthening of the spine extensor muscles (**24, 25, 29, 36**) and the abdominal muscles (**24, 25, 29, 33**) is recommended, and in some studies suggested improving muscle endurance of the thoracic spine (**39**). The last parameter, the antigravity muscles endurance, in upright posture, especially in the corrected posi-

tion, is more important than the strength of these muscles. Important treatment elements is self-control of correct posture (**22, 25, 29**), auto-elongation (**22**), passive and active redression of the kyphotic hump (**16, 17**) and patient learning element of ergonomic loads on a daily activities at school and at home (**22, 39**). The best result is achieved by exercise program in patients with flexible deformity and skeletally immature (**34**) although the latter circumstance, according to P.D.Pizzutillo (**25**), requires the use of a spinal orthosis.

There are no conclusive data on the positive impact of exercise program on thoracic deformation improvement. Physical therapy can sometimes produce a noticeable improvement in the symptoms, but nevertheless it will not produce any effect on the magnitude of the deformity (**31**).

The Scheuermann's kyphosis magnitude, which makes is possible to treat exercise program alone, ranging from 40° to 60° (**26, 39**). Some authors believe that adolescents with immature skeletons who present a slight increase in normal kyphosis, with values of up to 60° and no evidence of worsening of the deformity, will only require regular clinical and radiological follow-up until they reach skeletal maturity (**31**), while the others signifantly limit the use of exercise program alone and recommend them to patients with mild flexible non-progressing deformity (**34**).

The differences in usage of exercises program in Scheurmann's disease treatment can be associated with individual variability of the thoracic kyphosis magnitude. The Scoliosis Research Society has defined this range as being from 20° to 40° in the growing adolescent (**37**). According G.T. Fon et al. (**9**), the average thoracic kyphosis increases with age from 20° in childhood, to 25° in adolescents, to 40° in adults; the upper limit of physiological kyphosis is 45° (in a study of 316 healthy subjects with age ranging from 2 to 27 years). The magnitude of thoracic kyphosis as the spinal parameter of the spinal-pelvic balance is 45°±10 in adults (**32**).

The degree of thoracic hyperkyphosis in our patients (58.5° ± 0.8 in group A_{st} and 57.4° ± 0.4 in group A_{contr}) was the border between treatment with exercise program alone and a combination of physiotherapy and bracing. Nevertheless, we intentionally used the exercise program alone in their treatment since in their age (16–26 years, mean age 20,6 ± 0,3 years) the efficacy of orthosis is significantly reduced (**29, 36**). Also, brace wear is accompanied by motion restriction and trunk stiffness, which reduced capability of patients to perform common daily activities, regardless of the type of orthosis (**5, 14**), and it was little acceptable for our patients – those in rural areas. In addition bracing produces the emotional distress in patients with scoliosis and hyperkyphosis causing non-compliance high frequency [0%–74% (**15**); 20%–85% (**7**)].

This study a short course of Kinesiotherapy programs was conducted for the patients with Scheurmann's disease with different sagittal spinal contour. We associate the efficiency of the Kinesiotherapy program with applying a differential approach to prescribing the exercises according to the variation of sagittal spinal alignment as well as using the exercises in different modes (post-isometric relaxation and isometric stabilization) in one treatment session. By varying the temp, intensity and duration of exercise mode isometric stabilization both the muscle strength and endurance can be increased.

The designed differentiated Kinesiotherapy programs for patients with Scheuermann's disease in different spine sagittal alignment seems to be promising. The proposed Kinesiotherapy program provides simultaneous effect on the flexor and extensor muscle groups of the spine and lower limbs joints by therapeutic exercises that are performed in different modes (postisometric relaxation and isometric stabilization), which, in our opinion, normalizes the tone of different muscle groups, improves their coordinated interaction in the orthograde position, improves motor control and functionality of the spine.

It should be emphasized that the preservation of the exercise program results is possible only at their prolonged and persistent use. Given the fairly early development of rigid kyphosis, its relatively high resistance to correction and the absence of reliable data on the improvement of the thoracic deformation using exercise programs (**31, 34, 37**) as well as the gradual loss of hyperkyphosis correction after the completion of bracing (**23, 28**), the kinesiotherapy programs for patients with Scheuermann's disease should be a lifestyle. Their regular use will improve the postural component of the sagittal spino-pelvic imbalance and will be a factor in the prevention of back pain.

CONCLUSION

Developed kinesotherapy programs for patients with Scheuermann's disease provide for the differential impact on the flexor and extensor muscle groups of the trunk and the hip joints at the spine different sagittal contour. This helps to improve the muscles functional condition, as well to increase flexibility of the spine and the hip joints, and thereby significantly reduce the intensity of pain, level disability and fear and anxiety associated with the expectation of pain.

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SAGITTAL ALIGNMENT OF SPINAL-PELVIC BALANCE PARAMETERS IN ASYMPTOMATIC VOLUNTEERS AND PATIENTS WITH LUMBAR DEGENERATIVE DISC DISEASES

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ABSTRACT

Introduction. Variability of sagittal spinal-pelvic balance parameters results to a change of the types of standing. Material and methods. In the groups of asymptomatic volunteers (n=30 at the age of 20–30) and patients with lumbar degenerative disc diseases (n=42, at the age of 20–40) were investigated parameters of sagittal spinal-pelvic balance and the location of the lower limb joints relative to the line gravity. Results. In asymptomatic volunteers with all types of standing an optimal matching parameters of sagittal spinal-pelvic balance were noted. In patients a flattening of the lumbosacral sagittal contour compensated by an increase of the sagittal spinal list at the types of standing 1 and 2 (19.0% and 45.2%, respectively); one compensated by pelvis retroversion and hyperextension position in the hip joints at the types of standing 3 and 4 (23.9% and 11.9%, respectively). Discussion and Conclusion. Lumbar lordosis flattening – that is, flexing position of suprapelvic part of the body – and compensatory pelvic retroversion with the hip joints extension position create torque in the lumbosacral segment, which counteracts the persistent tension of stabilizing muscles of the lumbar spine. This mismatch of sagittal spinal-pelvic balance parameters creates a biomechanical conditions for the further progression of degenerative lumbar disc diseases.

Keywords: sagittal spinal-pelvic balance, asymptomatic volunteers, patients with lumbar degenerative disc diseases.

INTRODUCTION

The upright posture of a person is normally defined as the harmonious balancing of the body on the pelvis with minimum muscle force which means the correlation between spinal and pelvic parameters of sagittal spinal-pelvic balance (SSPB) (**2, 5, 9, 16**), the passage of the line gravity (LG) through lumbosacral intervertebral space (**8, 11, 16**) and the positioning of the hip joint in front, knee and ankle joints behind the line gravity respectively. The range of expected values of SSPB parameters (**2, 5, 9**) and the position of sacrum relative to the line gravity are quite strictly determined. However, in asymptomatic population there is a fairly big difference in both sagittal spinal-pelvic balance parameters and the amount of deflection from line gravity (LG) (**12**). Moreover, there is an alteration of the positional parameter values of SSPB of lumbar lordosis GLL, sacral slope SS (sacral end-plate inclination angle in the horizontal plane) and pelvic tilt PT (the position of the pelvis in the horizontal plane), relating to lumbar degenerative disc diseases (LDDD) (herniated lumbar intervertebral discs, spondylarthrosis, lumbar spinal stenosis). When the value of positional parameters of sagittal spinal-pelvic balance and particularly of lumbar lordosis differs from standard (is not ideal), the compensatory displacement of the links of kinematic chain of human body happens (**8, 15**) as well as the change in the position of the lower limb joints related to the line gravity and the change in types of standing (**7, 11**). However correlation between SSPB parameters alignment and the position of the lower limb joints relative to line gravity has not been studied well enough in both asymptomatic volunteers and patients with lumbar degenerative disc diseases.

MATERIAL AND METHODS

30 asymptomatic volunteers (at the age of 20–30 years old, middle-age is 22.4±2.6 years) and 42 patients with lumbar degenerative disc disease (herniated lumbar intervertebral discs, spondylarthrosis, lumbar spinal stenosis) (at the age of 20–40, middle-age is 33.4 years) had a complete physical examination.

Study inclusion criteria: volunteers without any spine or hip pain complaint as well as without any neurological disorders; patients without any neurological motor disorders nor cuts nor plegia of the lower limbs.

Study exclusion criteria for volunteers and patients were spine fractures, spine surgery in anamnesis, spondylolisthesis.

Biomechanical examination in the standing position on the force platform in a comfortable pose (**3, 14**) included the study of the position of some of the anthropometric markings (spinous process of C7, L1, L5 vertebrae, trochanter major, knee joint space, and lateral malleolus) in regard to the line gravity (LG) projection in sagittal plane. This method of determination the standing type of a person was patented in Ukraine (patent UA No. 71927 U).

The radiography of lumbar spine with the projection on the heads of the hip was taken in lateral view standing comfortably on force platform (**3, 14**). Spondylograms determined parameters of the sagittal spinal-pelvic balance (SSPB – (**Fig. 1**):

- *the sacral slope SS* is the angle between the sacral end-plate inclination and the horizontal plane; SS is the positional

pelvic parameter. The mean sacral slope value is 48 ° ± 8 (**2**);

- *the pelvic tilt PT* is the angle between the vertical plane and a line linking the center of the sacral end-plate and the center of the femoral heads; PT is the positional pelvic parameter. The mean pelvic tilt value is 12 ° ± 6 (**2**);
- *the pelvic incidence PI* (53 ° ± 11) is the angle between the perpendicular axis to the middle of the sacral end-plate inclination and the center of the femoral heads. PI is morphological pelvic parameter, or the pelvic position. The mean pelvic incidence value is 53 ° ± 11 (**2**);
- *the lumbar lordosis GLL* (61 ° ± 10) introduced by Cobb (1) have been in common use,
- *sagittal list SL* is the angle between the vertical axis passing through the center of the femoral head, and a line connecting the center of the femoral head to the center of the Th9 vertebral body; Th9 is considered here as the center of the body mass. Sl is the spinal parameter, and represents the position of the trunk upon the lower limbs. The mean sagittal list value is 11 ° ± 3 (**15**);
- *the sagittal vertical axis SVA* is the distance from the posterior-superior angle of the S1 to plummet. The mean SVA value is 0.5 cm ± 2.5 (**5**);
- *femoral line Lf* is the distance from the center of the hip heads to plummet. The mean Lf value is 3–3.5 cm (**4**).

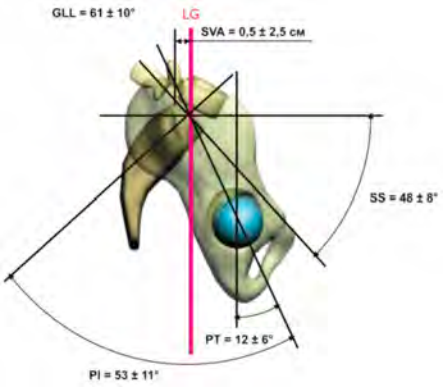


Figure 1. The spino-pelvic parameters (GLL – lumbar lordosis, SS – sacral slope, PI – pelvic incidence, PT – pelvic tilt, SVA –sagittal vertical axis) in normal with regard to the line gravity (LG) in the sagittal plane.

When statistical analyzing, the median was determined with a value of the standard deviation, t-test was evaluated by the method of Student. The level of significance was p <0.05. See **Figure 1**.

RESULTS

Biomechanical studies have demonstrated that in the human upright posture in the sagittal plane, there are 4 types of standing, which – in asymptomatic volunteers and patients with lumbar degenerative disc diseases – are not only revealed with a different frequency, but also have some differences in the values of the parameters of the sagittal spinal-pelvic balance and of the sacrum and hip heads deflection from the line of gravity (sagittal vertical axis SVA and femoral line Lf, respectively).

Biomechanically ideal (**7, 11**) type of standing (TS 1) with the anterior position of the hip, and posterior knee and ankle position relative to the line gravity was in 10 volunteers (33.3% of cases) (**Fig. 2 A**). This type of standing is the most ergonomic, as the joints of the lower limbs are fixed due to ligaments passive tension and isotonic contraction of periarticular muscles (**11**).

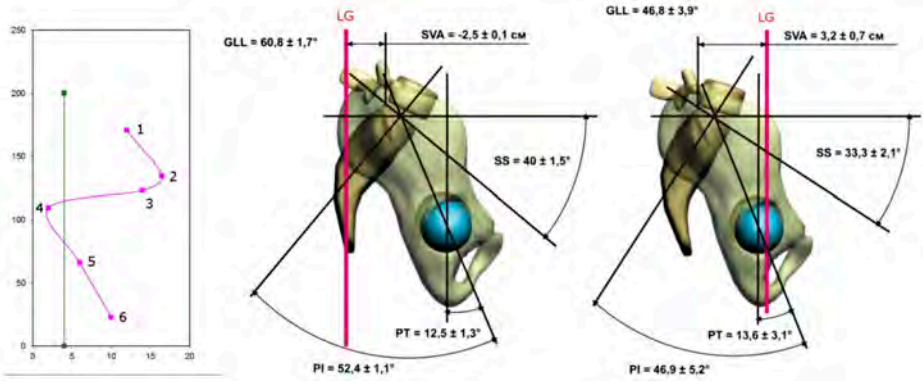


Figure 2. Positioning of some of the anthropometric markings (1 – C7 spinous process; 2 – L1 spinous process; 3 – L5 spinous process; 4 – trochanter major; 5 – knee joint space; 6 – lateral malleolus) (A) and the spino-pelvic parameters (GLL – lumbar lordosis, SS – sacral slope, PI – pelvic incidence, PT – pelvic tilt, SVA – sagittal vertical axis) in asymptomatic volunteers (B) and patients with lumbar degenerative disc diseases (C) with regard to the line gravity (LG) in the sagittal plane in biomechanically ideal type of standing TS 1.

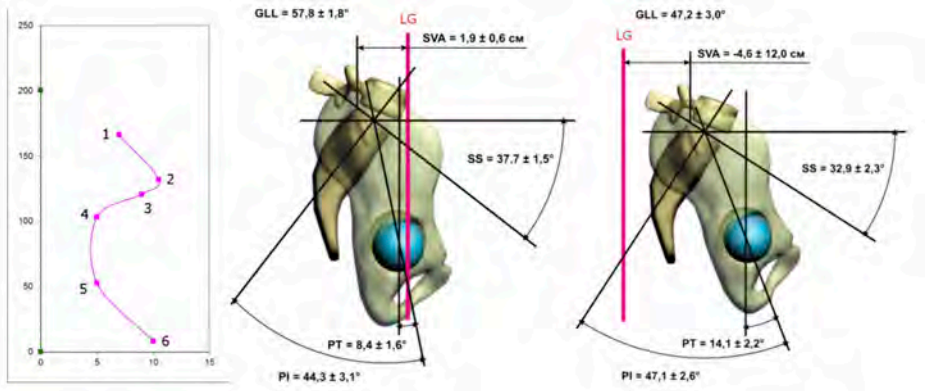
Mean values of sagittal balance parameters the lumbar lordosis GLL (60.8 ° ± 1.7), the sacral slope SS (40.0 ° ± 1.5), the pelvic incidence PI (52.4 ° ± 1.1) and the pelvic tilt PT (12.5 ° ± 1.3), and the position of the sacrum relative to the line gravity (SVA = –2.5 cm ± 0.1) were within the normal limits, while the mean values of spine sagittal list Sl were significantly less than normal (4.7 ° ± 0.9; t = 3.1; p <0.01) (**Table 1, Fig. 2 B**).

The same position of lower limb joints relative to the line gravity was also registered in 8 patients (19.0%) (type of standing TS 1pat) (Fig. 2 C). However, the vertical posture of the asymptomatic volunteers TS 1vol and of the patients with lumbar degenerative disc diseases TS 1pat had certain differences. The patients' pelvic parameters were also within the mark (PT = 13.6 ° ± 3.1), however, morphologically the pelvis (PI = 46.9 ° ± 5.2) and the sacrum (SS = 33.3 ° ± 2.1) were more upright, and the deviation of the sacral anteriorly from the line gravity increased (SVA = 3.2, cm ± 0.7), but not statistically significant. Only the value of a lumbar lordosis GLL in patients (46.8 ° ± 3.9; t = 3.3; p <0.01) was significantly lower compared with volunteers. Hip position relative to the line gravity in both the asymptomatic volunteers and the patients were within the mark (Lf = 2.0 cm ± 0.5 and 2.0 ± 0.7 cm, respectively), sagittal list of the spine was within the mark, too (Sl = 7 3 ° ± 1.9). See **Table 1, Figure 2**.

In people standing according to the most common type of standing in asymptomatic volunteers TS 2_{vol} (16 volunteers, 53.4%) and patients with lumbar degenerative disc diseases TS 2_{pat} (19 patients, 45.2%), lower limb joints were located posterior relative to the line gravity (**Fig. 3, A**). The volunteers with these standing

	GLL	SS	PI	PT	SI	SVA	Lf
TS 1_{vol} (n=10)	60.8°±1.7	40.0°±1.5	52.4°±1.1	12.5°±1.3	4.7°±0.9	–2.5 cm ± 0.1	2.0 cm ± 0.5
TS 1_{pat} (n=8)	46.8°±3.9	33.3°±2.1	46.9°±5.2	13.6°±3.1	7.3°±1.9	3.2 cm±0.7	2.0 cm±0.7
	t= 3.3; p<0.01	t= 1.8; p>0.05	t= 1.0; p>0.05	t= 0.35; p>0.05	t= 1.2; p>0.05	t= 3.3; p<0.01	t= 3.3; p<0.01
TS 2_{vol} (n=16)	57.8°±1.8	37.7°±1.5	44.4°±3.1	8.4°±1.8	5.4°±1.0	1.9 cm±0.6	0.2 cm±0.5
TS 2_{pat} (n=19)	47.2°±3.0	32.9°±2.3	47.1°±2.6	14.1°±2.2	6.4°±1.9	–4.6 cm ± 12.0	2.0 cm±0.7
	t= 3.1; p<0.01	t= 1.8; p>0.05	t= 0.7; p>0.05	t= 2.1; p<0.05	t= 0.46; p>0.05	t= 2.1; p<0.05	t= 2.1; p<0.05
TS 3_{vol} (n=3)	58.3°±5.5	41.3°±3.8	51.7°±3.8	10.7°±1.5	2.0°±0.6	–1.8 cm ± 1.9	1.6 cm±0.2
TS 3_{pat} (n=10)	54.0°±3.7	37.1°±2.5	54.0°±3.7	16.9°±1.9	4.8°±1.1	–1.0 cm ± 0.2	3.1 cm±0.1
TS 4_{vol} (n=1)	62°	47°	50°	10°	1°	3.1 cm±0.1	1.9 cm±0.5
TS 4_{pat} (n=5)	33.6.8°±5.2	28.8°±2.4	44.6°±1.3	15.8°±3.2	6.4°±2.6	–6.1 cm ± 0.8	1.0 cm±1.3

Table 1. Description of standing types parameters in asymptomatic volunteers and patients with lumbar degenerative disc diseases. TS – type of standing, GLL – lumbar lordosis, SS – sacral slope, PI – pelvic incidence, PT - pelvic tilt, Sl – spine sagittal list, SVA – sagittal vertical axis, Lf – femoral line.



A B C

Figure 3. Positioning of some of the anthropometric markings (1 – C7 spinous process; 2 – L1 spinous process; 3 – L5 spinous process; 4 – trochanter major; 5 – knee joint space; 6 – lateral malleolus) (A) and the spino-pelvic parameters (GLL – lumbar lordosis, SS – sacral slope, PI – pelvic incidence, PT – pelvic tilt, SVA – sagittal vertical axis) in asymptomatic volunteers (B) and patients with lumbar degenerative disc diseases (C) with regard to the line gravity (LG) in the sagittal plane in type of standing TS 2.

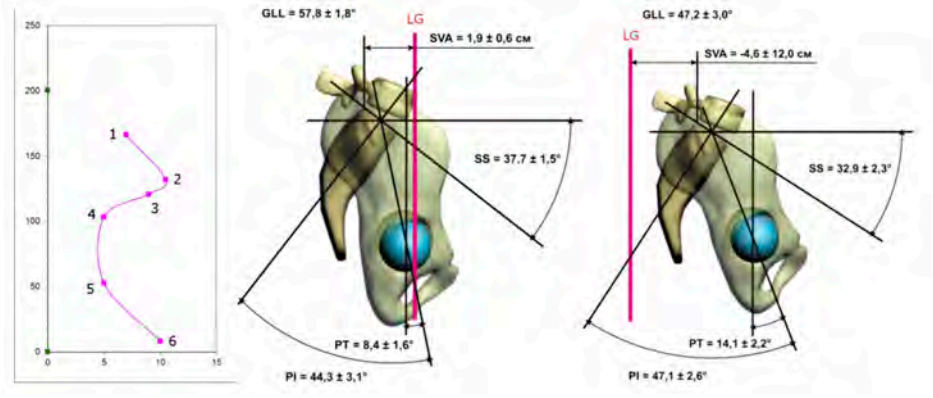


Figure 4. Positioning of some of the anthropometric markings (1 – C7 spinous process; 2 – L1 spinous process; 3 – L5 spinous process; 4 – trochanter major; 5 – knee joint space; 6 – lateral malleolus) (A) and the spino-pelvic parameters (GLL – lumbar lordosis, SS – sacral slope, PI – pelvic incidence, PT – pelvic tilt, SVA – sagittal vertical axis) in asymptomatic volunteers (B) and patients with lumbar degenerative disc diseases (C) with regard to the line gravity (LG) in the sagittal plane in type of standing TS 3.

type had the parameters of sagittal spinal-pelvic balance close to the lower limit of the normal (PI = 44.3 ° ± 3.1; PT = 8.4 ° ± 1.6; GLL = 57.8 ° ± 1.8; SS = 37.7 ° ± 1.5) and the decrease in the sagittal spine list (Sl = 5.4 ° ± 1.0). The position of sacrum relative to the line gravity was within the normal (SVA = 1.9 cm ± 0.6), whereas hip head centres nearly coincided with the line gravity (Lf = 0.2, cm ± 0.5) (**Figure 3, B**). In this case, the hip joints are stabilized in the most economical way – with the tonic contraction of periarticular muscles (**10**), which requires perfection of motor control mechanisms for the fine regulation of the sustainable balance of suprafemoral part of the body on the spherical heads of femur at the constant lability of the body posture.

Patients with lumbar degenerative disc diseases with TS 2pat and morphologically vertical pelvis (PI = 47.1 ° ± 2.6) tended to have the pelvis retroversion (PT = 14.1 ° ± 2.2) (**Fig. 3 C**). The values of the positional sagittal spinal-pelvic balance as well as of SVA parameters were less than normal (GLL = 47.2 ° ± 3.0; Sl = 6.4 ° ± 1.9; SS = 32.9 ° ± 2.3; t = 2.4 , p <0.05; SVA = –4.6 cm ± 12.0; t = 2.0; p <0.05). In groups of volunteers TS 2vol and patients TS 2_{pat} between parameters GLL (t = 3.1; p <0.01) and Lf (2.0 cm ± 0.7; t = 21; p <0.05) had significant difference, which shows that the reduction of the depth of lumbar lordosis was compensated by the increase in the pelvis horizontal tilt, which helped to keep biomechanically ideal position of the hip joint relative to the line gravity. See **Figure 3**.

Type of standing TS 3 was identified in three volunteers (TS 3_{vol}; 10% of cases) and in 10 patients (TS 3_{pat}; 23.9% of cases) (**Fig. 4 A**). In volunteers TS 3_{vol} was characterized by the anterior position of the hip

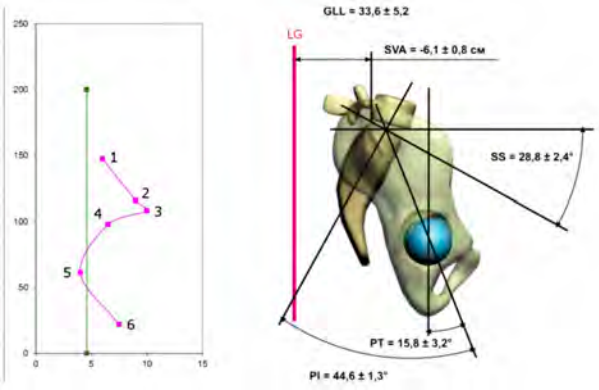


Figure 5. Positioning of some of the anthropometric markings (1 – C7 spinous process; 2 – L1 spinous process; 3 – L5 spinous process; 4 – trochanter major; 5 – knee joint space; 6 – lateral malleolus) (A) and the spino-pelvic parameters (GLL – lumbar lordosis, SS – sacral slope, PI – pelvic incidence, PT – pelvic tilt, SVA – sagittal vertical axis) in patients with lumbar degenerative disc diseases (B) with regard to the line gravity (LG) in the sagittal plane in type of standing TS 4_{pat}.

and the knee, and posterior position of the ankle relative to the line gravity. Almost all of the studied parameters of sagittal spinal-pelvic balance, as well as the value of SVA were within the normal (PI = 51.7 ° ± 3.8; PT = 10.7 ° ± 1.5; GLL = 58.3 ° ± 5.5; SS = 41.3 ° ± 3.8; SVA = –1.8 cm ± 1.9; Lf = 1.6, cm ± 0.2), although the value of the sagittal spinal list was the least in comparison with the other types of standing (Sl = 2.0° ± 0.6) (**Table 1, Fig. 4 C**). Because of the small size of this group these results cannot be used in statistical analyze, and therefore we can only talk about the tendency for the change in the studied parameters.

In group of patients TS 3_{pat}, normal morphological parameter (PI = 54.0 ° ± 3.7) and the relative pelvis retroversion (PT = 16.9 ° ± 1.9) had lumbar lordosis GLL (52.0 ° ± 3.8) and sacral slope SS (37.1 ° ± 2.5) values at the lower limit of the normal; their sacrum was located closer to the line of gravity (SVA = –1.0 cm ± 0.2), and the heads of the hips were further (Lf = 3.1 cm ± 0.1) compared with a small group of volunteers TS 3_{vol}. Such patients have morphologically horizontal pelvis with the tendency to retroversion and hyperextension in the hip joints which goes together with the relative decrease in the depth of the lumbar lordosis and sacral inclination. Sagittal spine list in comparison with volunteers in TS 3_{vol} was significantly less (Sl = 4.8 ° ± 1.1; t = 2.3; p <0.05) (**Table 1, Fig. 4, C**). See **Figure 4**.

Vertical posture with the posterior position of the hip and ankle joints and anterior position of the knee relative to the line gravity was only found in one volunteer (TS 4_{vol} – 3.3% of cases) and in 5 patients (TS 4_{pat} – 11.9% of cases) (**Figure 5, A**). Morphological pelvic parameter PI of the

TS 4_{pat} group of patients corresponded to vertical pelvis (PI = 44.6 ° ± 1.3) with relative retroversion (PT = 15.8 ° ± 3.2), GLL and SS parameters were significantly less than normal (33.6 ° ± 5.2; t = 3.7; p <0.001 28.8 ° ± 2.4; t = 3.1; p <0.01, respectively). The sagittal spine list was rather less (Sl = 6.4 ° ± 2.6). Sacrum deviation from the line gravity was the highest among all types of standing (SVA = – 6.1 cm ± 0.8; t = 2.6; p <0.05); heads of the hips were located posteriorly to the line gravity (Lf = –1.0 cm ± 1.3) (**Fig. 4, C**). The vertical position of such patients was characterized by a flattening of the lumbosacral sagittal contour (similar to degenerative deformation flat back) with an increase in the horizontal tilt of the pelvis and hyperextension in the hip joints. In patients when standingaccording TS 3_{pat} and especially TS 4_{pat} the alignment of the sagittal spinal-pelvic balance parameters and of the position of the lower limbs joints relative to the line gravity was biomechanically inappropriate. Lumbar lordosis flattening – that is, flexing position of suprapelvic part of the body – and compensatory pelvic retroversion with the hip joints extension position create torque in the lumbosacral segment, which counteracts the persistent tension of stabilizing muscles of the lumbar spine. Additional overexertion is created by myotonic forces related to pain syndromes. As a result, stress-strain state of the low-lumbar vertebral segments develops which can affect the process of remodelling and cause hyperplastic strains of articular processes, vertebral arches, dislocations of facet joints and vertebral bodies as well as progression of degenerative lumbar strain.

Any significant differences in the parameters of sagittal spinal-pelvic balance between the types of standing in patients with lumbar degenerative disc diseases were not found. See **Figure 5**.

DISCUSSION

The correlation between the parameters of sagittal spinal-pelvic balance is one of the conditions for biomechanically ideal ergonomic vertical posture. PI (pelvic incidence) morphological pelvic parameter values approximating to the lower limit within the normal results characterize vertical pelvis, which corresponds to the pelvis anteversion and lumbar lordosis GLL, sacral slope SS at the lower limit of the normal. Horizontal pelvis (PI at the upper limit) is combined with pelvis retroversion and high values of GLL and SS (**13**). In a simplified version the sagittal spinal-pelvic balance determines the correspondence of the spine sagittal list Sl and pelvic tilt PT (**15**).

In our study, PI, PT, GLL and SS parameters of sagittal balance corresponded each to other in volunteers of all the types of standing. Discrepancy between spine sagittal list Sl and pelvic tilt PT in volunteers but a more balanced ratio of these parameters in patients with lumbar degenerative disc diseases was unexpected, which can be considered as one of the compensatory mechanisms of the sagittal realignment of vertical posture parameters.

However, according to our study, correspondence between sagittal spinal-pelvic balance parameters is broken in a certain part of the patients with lumbar degenerative disc diseases (e.g, in patient groups of ST 3_{pat} and ST 4_{pat}); which leads to compensatory changes in the position of the lower limbs joints (especially in hips) relative to the line gravity and creates a biome-

chanical conditions for the progression of degenerative changes in the lumbar segments.

In our opinion, the changing in the sagittal alignment of the parameters of sagittal spinal-pelvic balance in patients with lumbar degenerative disc diseases is due to not only structural abnormalities in the lumbar segments and the development of degenerative deformation flat back, but also due to functional changes because of antalgic muscular hypertension and the development of functional segmental deformation of vertebral segments (segmental kyphosis, segmental hyperlordosis, segmental scoliosis or kyphoscoliosis) or functional hip joint contractures (flexion, flexion-lead). Such functional myogenic changes occur in patients with the pelvic crossed syndrome (6).

CONCLUSION

Optimal sagittal alignment of the body segments in biomechanically non-ideal postural parameters is achieved by changing the relative position of the positional parameters of sagittal spinal-pelvic balance by increasing the sagittal spinal list, the horizontal tilt of the pelvis and hyperextension position of the hip. The development of uncompensated sagittal spinal-pelvic imbalance is associated, in our opinion, with a combination of degenerative lumbar segmental deformation and myotonic syndromes related degenerative spinal disorders.

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KINESIOTHERAPY PROGRAM IN THE REHABILITATION OF PATIENTS WITH LUMBAR OSTEOCHONDROSIS AND SAGITTAL SPINAL-PELVIC IMBALANCE IN THE LONG-TERM FOLLOW-UP AFTER LUMBAR FUSION

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ABSTRACT

Introduction. Postoperatively, patients with lumbar osteochondrosis due to sagittal spinal-pelvic imbalance suffer from residual pain.

Material and methods. The efficacy of the selective kinesotherapy program was studied in randomized study group (with selective kinesiotherapy program) and control group (standard program of stabilizing exercises) of 15 patients with lumbar osteochondrosis after posterior lumbar fusion in the late postoperative period. The parameters of sagittal spinal-pelvic balance and indicators of endurance of flexors and extensors of body and hip using the isometric tests were defined. Patients interviewed on the visual analogue scale (VAS), on the Oswestry Disability Questionnaire, version 2.0 (ODI), on the Tampa Scale for Kinesiophobia (TSK), on the Pain and Anxiety Symptoms Scale (PASS) – 20.

Results. All patients defined the presence of sagittal spinal-pelvic imbalance with muscles imbalance. In the study group was significantly lower VAS and ODI, while decreasing TSK and PASS, as well as increasing muscle endurance was not statistically significant as compared with the control group.

Discussion and Conclusion. The short-term results of using the selective kinesotherapy program for patients with lumbar osteochondrosis with uncompensated sagittal spinal-pelvic imbalance and muscle imbalances in the late postoperative period after lumbar fusion have demonstrated its efficacy and applicability in specialized rehabilitation and orthopaedic centres.

Keywords: selective Kinesiotherapy program, lumbar fusion, sagittal spinal-pelvic balance

INTRODUCTION

In the recent decades we have seen steady growth of vertebral pathology, first of all of lumbar degenerative disc disease (**5**) and increasing surgical activity in the treatment of these patients (**3**).

Successfully performed surgery is just a stage in a program of medical and social rehabilitation of orthopaedic patients. The purpose of subsequent rehabilitation treatment, which provides elimination of static and kinematic disorder and optimization of muscle work of body and lower limbs, is functional recovery of the musculoskeletal system, (**25**), as well as the movement patterns improvement.

There are no standards of postoperative medical rehabilitation of patients with lumbar osteochondrosis. In postoperative period the degree of active management of a patient with the same surgical procedure varies considerably (**16**) which may affects the functional results, the degree of disability of patients and ultimately their social re-adaptation after surgical treatment.

The back lumbar fusion with transpedicular fixation is performed in patients with lumbar osteochondrosis with long and / or persistent pain syndrome and antalgic myotonic syndromes, the presence of degenerative lumbar deformity with the change of tone in the muscle groups of body and lower limbs. Postoperatively, the muscle imbalance can be exacerbated due to the additional insufficiency of paravertebral muscles damaged during the surgical approach, which is a factor potentiating recurrent low back pain. However, embodiments of the sagittal lumbar-pelvic alignment and cooperation of muscle groups of the lumbar-pelvic region in the postoperative period are not studied. In postoperative period, the principles of correction of muscle disorders in different variants of sagittal alignment are also required during further development.

MATERIAL AND METHODS

The study involved 30 patients with lumbar osteochondrosis (L4–L5, L5–S1 lumbar discs herniated with lumbar spinal stenosis) after spinal fusion L4–L5, L5–S1 segments with pedicle fixation. All in-patients were males aged 36-46 years (middle age – 39.2 ± 4.6 years) in the late postoperative period (from 1 year to 2 years on average – 1.2 ± 0.6 years). They were rehabilitated at the Sytenko Institute Vertebrology Clinic. Exclusion criterion was the presence of neurological motor disorders with paresis or plegia of the lower limbs.

Patients were randomized into two groups: group with selective Kinesiotherapy program (SKP) (n = 15) and the control group with the standard program of stabilizing exercises for the lumbar spine muscles (n = 15).

Clinical examination

Clinical examination studied orthopaedic status, defined indicators of strength and endurance of flexors and extensors of body and hip using the isometric tests. For evaluating lumbar flexor endurance Shirado's test was used: subjects were lying in a supine position and raise the lower extremities with 90° flexion of the hip and knee joints (**11**). For measuring lumbar extensor endurance

Sorensen-Biering's test was applied: subjects were lying in a prone position while holding the sternum off the floor, a small pillow was placed under the lower abdomen to decrease the lumbar lordosis (**11**). The Killy's test was used to assess muscle endurance in quadriceps; subjects were in a sitting position, hip and knee joints 90°-flexed, against a wall and without a chair. An finally, an endurance test for the hip extensors was indicated: subjects were lying on his belly on the table, the upper limbs were stabilizing the body, the lower limbs were on horizontal plane, out of the table (**1**). During all tests, the subjects were asked to maintain the original position for as long as possible.

The intensity of low back pain during daily activities in the past week was assessed by means of the 100-mm visual analogue scale (VAS) ratings (**6**). Disability due to back pain (ODI) during the past week was assessed by the Oswestry Disability Questionnaire, version 2.0; ODI scoring: 0% to 100% (**18**). The level kinesiophobia during the past week was assessed by the Tampa Scale for Kinesiophobia (TSK) with 17 item questionnaire, score is 0–68 (**15**). The level of worry and anxiety associated with the expectation of pain during the past week was assessed by the Pain and Anxiety Symptoms Scale (PASS) – 20 with 20 items, score is 0–100 (**15**).

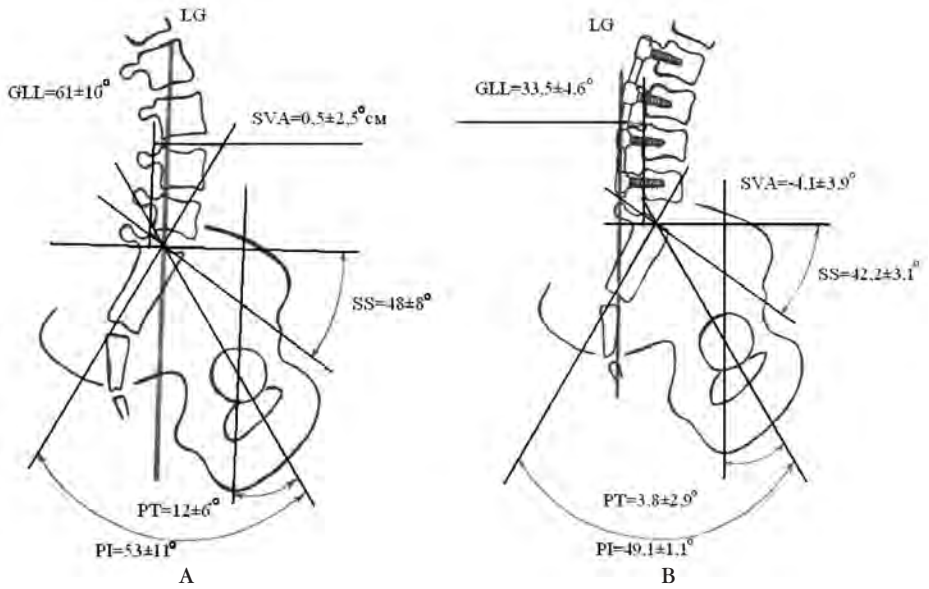

Figure 1. The spino-pelvic parameters (GLL –lumbar lordosis, SS – sacral slope, PI – pelvic incidence, PT – pelvic tilt, SVA – sagittal vertical axis). in normal (A) and in patients after spinal fusion in the late postoperative period (B) with regard to the line gravity (LG) in the sagittal plane

X-ray examination

X-ray of the lumbar spine with femoral heads was performed in lateral view in the upright position in the subject standing on the force plate in a comfortable position (**19**). On spondylograms the parameters of sagittal spinal-pelvic balance were determined (**Fig. 1**):

- *the sacral slope SS* is the angle between the sacral end-plate inclination and the horizontal plane; SS is the positional pelvic parameter. The mean sacral slope value is 48° ± 8 (7);
- *the pelvic tilt PT* is the angle between the vertical plane and a line linking the center of the sacral end-plate and the center of the femoral heads; PT is the positional pelvic parameter. The mean pelvic tilt value is 12° ± 6 (**7**);
- *the pelvic incidence PI* is the angle between the perpendicular axis to the middle of the sacral end-plate inclination and the center of the femoral heads. PI is morphological pelvic parameter, or the pelvic position. The mean pelvic incidence value is 53° ± 11 (**7**);
- *the lumbar lordosis GLL* (61° ± 10) introduced by Cobb (**4**) have been in common use,
- *the sagittal vertical axis SVA* is the distance from the posterior-superior angle of the S1 to plummet. The mean SVA value is 0.5 cm ± 2.5 (**13**);
- *femoral line Lf* is the distance from the center of the hip heads to plummet. The mean Lf value is 3–3.5 cm (**9**).

Physiotherapy programs

In the study group we used the program of selective kinesiotherapy for patients developed by us that was as follows. In the first phase a mild methods of manual therapy were applied – soft tissue mobilization (release-technicque) myotherapy (ischemic compression of trigger points), losing-technique (position muscle relaxation combined with pressure of trigger points), as well as selective postisometric relaxation (SPIR) of muscles lumbar-pelvic region. SPIR of muscles lumbar-pelvic region developed by us includes the use of two exercise programs, one of which provides postisometric relaxation of adaptively shortened muscles, and the other one includes an isometric stabilization of adaptively elongated muscles. Kinesoitherapy programs are executed sequentially one after the other with the repetition of each exercise 3–5 times for 3–4 sets throughout the day.

With a decrease in pain intensity SPIR exercises for adaptively shortened muscles gradually were replaced by stabilizing exercises in isometric mode.

In the control group we used the standard program of physiotherapy for stabilizing muscles of the lumbar spine with exercises in isometric stabilizing mode for the muscles of the lumbar spine and abdominal muscles. The standard program as well the program of selective kinesotherapy performed with the repetition of each exercise 3–5 times for 3–4 sets throughout the day.

Duration of therapy sessions for patients in both groups was 3 weeks.

Statistical analysis

When statistical analysing, the median was determined with a value of the standard deviation, t-test was evaluated by the method of Student. The level of significance was $p < 0.05$.

	Control group (n=15)	CKP group (n=15)
	Age (years)	
Mean ± SD	39.2±3.6	38.8±2.9
Median [min; max]	38.6 [36.0; 46.9]	38.2 [36.2; 46.2]
	t=0.26; p>0.05	
	Duration of follow-up after lumbar fusion	
Mean ± SD	1.4 ± 0.3	1.4 ± 0.4
Median [min; max]	1.6 [1.0; 2.0]	1.6 [1.0; 2.0]
	t=0; p>0.05	
	Test Shirado	
Mean ± SD	164.8 ± 480.3	166.8 ± 470.5
Median [min; max]	171 s [15 s; 645 s]	168 s [21 s; 639 s]
	t=0.31; p>0.05	
	Test Sorensen	
Mean ± SD	84.5 ± 42.3	88.7 ± 41.9
Median [min; max]	87 s [22 s; 128 s]	93 s [25 s; 132 s]
	t=0.22; p>0.05	
	Test Killy	
Mean ± SD	30.7± 62.2	31.1 ± 59.8
Median [min; max]	32 s [9 s; 93 s]	30 s [9 s; 91 s]
	t=0.17; p>0.05	
	Test hip extensors	
Mean ± SD	28.9± 59.8	30.6 ± 57.2
Median [min; max]	29 s [12 s; 89 s]	31 s [11 s; 88 s]
	t=0.17; p>0.05	
	VAS	
Mean ± SD	48.8 ± 10.5	50.9 ± 10.5
Median [min; max]	53.8 [38 mm; 60 mm]	54.4 [40 mm; 63 mm]
	t=0.22; p>0.05	
	ODI	
Mean ± SD	50.1 ± 4.0	48.9 ± 5.7
Median [min; max]	48.0 [39; 54.4]	49.4 [38.5; 55.5]
	t=0.22; p>0.05	

	Control group (n=15)	CKP group (n=15)
	TSK	
Mean ± SD	49.7 ± 5.2	51.3 ± 6.4
Median [min; max]	50.4 [44; 56]	50.2 [42; 58]
	t=0.22; p>0.05	
	PASS	
Mean ± SD	40.4 ± 8.8	42.3 ± 9.6
Median [min; max]	39.0 [39; 50]	41.8 [40; 53]
	t=0.22; p>0.05	
	GLL	
Mean ± SD	33.5 ± 4.6	32.6 ± 4.9
Median [min; max]	32.2° [18°; 39°]	30.0° [16°; 38°]
	t=0.17; p>0.05	
	SS	
Mean ± SD	42.2 ± 3.1	41.0 ± 4.7
Median [min; max]	44.1° [38°; 46°]	42.2° [34°; 46°]
	t=0.22; p>0.05	
	PI	
Mean ± SD	49.1 ± 1.1	48.4 ± 1.3
Median [min; max]	48° [46°; 51°]	47.5° [44°; 52°]
	t=0.26; p>0.05	
	PT	
Mean ± SD	3.8 ± 2.9	3.6 ± 1.8
Median [min; max]	3.6° [2°; 7°]	3.6° [2°; 6°]
	t=0.17; p>0.05	
	SVA	
Mean ± SD	–4.1 ± 3.9	–4.0 ± 3.4
Median [min; max]	–3.9 mm [–9 mm; 1 mm]	–3.8 mm [–9 mm; 0 mm]
	t=0.12; p>0.05	
	Lf	
Mean ± SD	–2.7 ± 1.9	–2.6 ± 1.6
Median [min; max]	–2.5 mm [–4 mm; 0 mm]	–2.5 [–4 mm; 0 mm]
	t=0; p>0.05	

Table 1. Description of the control group and the selective Kinesiotherapy program (CKP) group before treatment

	Control group (n=15)	CKP group (n=15)
	Test Shirado	
Mean ± SD	228.4 ± 489.2	247.2 ± 495.1
Median [min; max]	224.4 s [28 s; 720 s]	232.5 s [34 s; 745 s]
	t=1.2; p>0.05	
	Test Sorensen	
Mean ± SD	100.3 ± 63.3	117.1 ± 71.9
Median [min; max]	98.8 s [32 s; 164 s]	120.4 s [37 s; 189 s]
	t=0.79; p>0.05	
	Test Killy	
Mean ± SD	42.1± 72.2	48.4 ± 78.1
Median [min; max]	44.4 s [11 s; 115 s]	50.2 s [17 s; 127 s]
	t=0.67; p>0.05	
	Test hip extensors	
Mean ± SD	33.7± 58.8	36.6 ± 60.6
Median [min; max]	34.4 s [16 s; 94 s]	37.9 s [18 s; 98 s]
	t=0.67; p>0.05	
	VAS	
Mean ± SD	39.4 ± 7.5	21.4 ± 8.9
Median [min; max]	41.3 [27 mm; 47 mm]	23.8 [18 mm; 32 mm]
	t=0.22; p>0.05	
	ODI	
Mean ± SD	40.7 ± 5.1	25.7 ± 4.4
Median [min; max]	42.2 [24.5; 46.5]	27.0 [18.5; 30.5]
	t=2.8; p<0.01	
	TSK	
Mean ± SD	45.2 ± 6.1	31.9 ± 2.4
Median [min; max]	48.0 [36; 51]	34.2 [24; 35]
	t=2; p<0.05	
	PASS	
Mean ± SD	38.8 ± 9.1	29.6 ± 9.3
Median [min; max]	39.2 [32; 50]	30.2 [24; 40]
	t=2.2; p<0.05	

Table 2. Some statistics in the control group and the selective Kinesiotherapy program group after treatment.

Legend to tables 1 – 3. VAS – visual analogue scale, ODI – disability level by the Oswestry Disability Questionnaire, TSK – kineziphobia level by the Tampa Scale for Kinesiophobia, PASS – level of worry and anxiety associated with the expectation of pain by the Pain and Anxiety Symptoms Scale, GLL – lumbar lordosis, SS – sacral slope, PI – pelvic incidence, PT – pelvic tilt, SVA – sagittal vertical axis, Lf – femoral line.

All clinical studies were performed twice – at the initial examination before treatment and after treatment.

RESULTS

Patients in both groups at the initial examination were observed sufficiently expressed parameters of disability (**Table 1**). Isometric muscle tests detected a significant decrease in the flexor endurance ($p < 0.05$), and especially the spine extensors ($p < 0.001$) and flexors ($p < 0.05$) and hip extensors ($p < 0.05$) relative to the norm.

The results of X-ray examination of patients in both groups determined the presence of sagittal spinal-pelvic imbalance with a significant reduction in the depth of lumbar lordosis GLL relative to the norm ($p < 0.001$) and the magnitude of sacrum slope SS, which is approaching the upper limit of normal (**Fig. 1**). Besides, patients

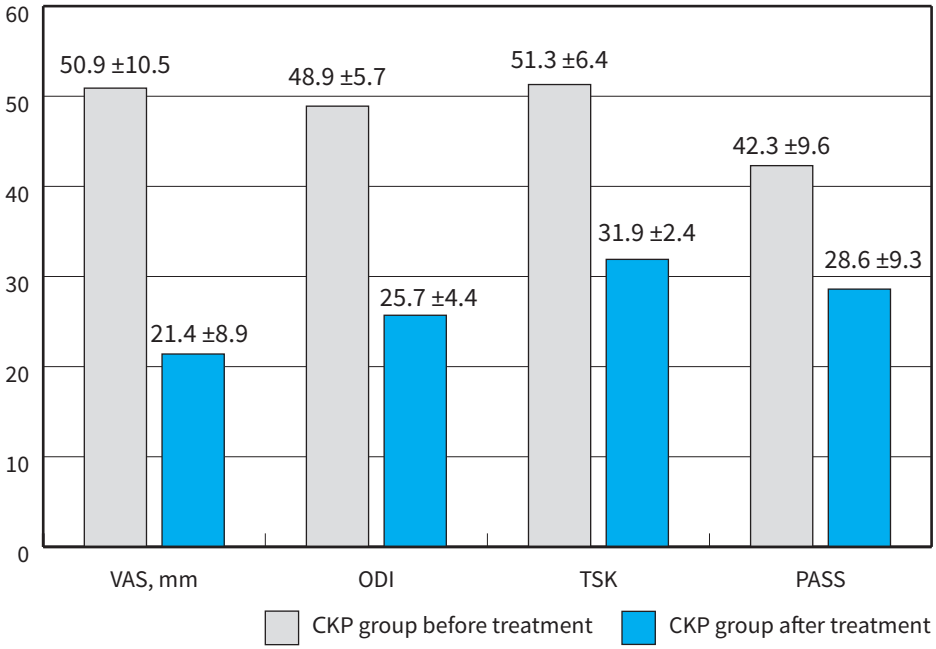

Figure 2. Some statistics in the selective Kinesiotherapy program group before treatment (white) and after treatment (black).

	CKP group before treatment (n=15)	CKP group after treatment (n=15)
	Test Shirado	
Mean ± SD	166.8 ± 470.5	247.2 ± 495.1
Median [min; max]	168 s [21 s; 639 s]	232.5 s [34 s; 745 s]
	t=1.2; p>0.05	
	Test Sorensen	
Mean ± SD	88.7 ± 41.9	117.1 ± 71.9
Median [min; max]	93 s [25 s; 132 s]	120.4 s [37 s; 189 s]
	t=0.79; p>0.05	
	Test Killy	
Mean ± SD	31.1 ± 59.8	48.4 ± 78.1
Median [min; max]	30 s [9 s; 91 s]	50.2 s [17 s; 127 s]
	t=0.67; p>0.05	
	Test hip extensors	
Mean ± SD	30.6 ± 57.2	36.6 ± 60.6
Median [min; max]	31 s [11 s; 88 s]	37.9 s [18 s; 98 s]
	t=0.67; p>0.05	
	VAS	
Mean ± SD	48.8 ± 10.5	21.4 ± 8.9
Median [min; max]	53.8 [38 mm; 60 mm]	23.8 [18 mm; 32 mm]
	t=0.22; p>0.05	
	ODI	
Mean ± SD	50.1 ± 4.0	25.7 ± 4.4
Median [min; max]	48.0 [39; 54.4]	27.0 [18.5; 30.5]
	t=2.8; p<0.01	
	TSK	
Mean ± SD	49.7 ± 5.2	31.9 ± 2.4
Median [min; max]	50.4 [44; 56]	34.2 [24; 35]
	t=2; p<0.05	
	PASS	
Mean ± SD	40.4 ± 8.8	29.6 ± 9.3
Median [min; max]	39.0 [39; 50]	30.2 [24; 40]
	t=2.2; p<0.05	

Table 3. Some statistics in the selective Kinesiotherapy program group before treatment and after treatment.

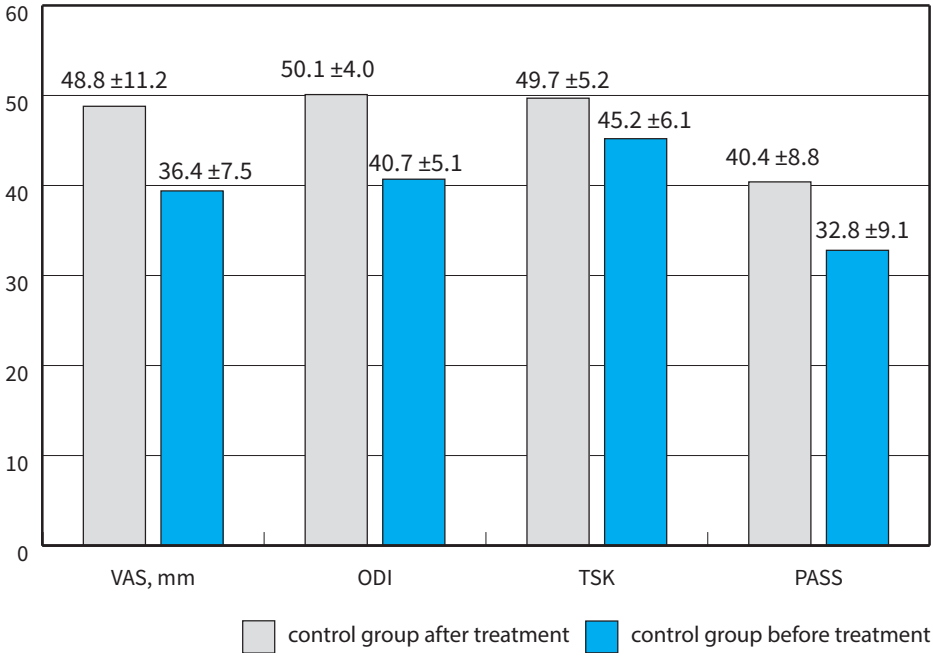

Figure 3. Some statistics in the control group before treatment (white) and after treatment (black).

in both groups had morphologically relational vertical pelvis, which is in anteversion. Relative to the gravity line and the sacrum and femoral heads were reflexed (**Table 1**). The vertical position of patients was characterized by the development of non-compensated spinal-pelvic imbalance and biomechanically inappropriate extensor set in the hip joints. Muscular imbalances occurred in adaptive shortening with hyperactivity of the thoracolumbar part of muscles erector spinae, psoas muscle, piriforme muscles and internal hip rotators and adaptive extension with inhibition of muscles of anterior abdominal wall, lumbosacral part of muscles erector spinae, iliac muscle and gluteus medius muscle. See **Figure 1, Table 1**.

Repeated clinical examination at the end of therapeutic session demonstrated the efficacy of the selective kinesiotherapy program developed by us for the patients with lumbar osteochondrosis with uncompensated sagittal spinal-pelvic imbalance in the late postoperative period after lumbar spinal fusion. There was a statistically significant improvement in all parameters in the study group with the selective kinesiotherapy program compared with the primary examination: the intensity of low back pain during daily activities (VAS) ($p < 0.001$), disability due to back pain (ODI) ($p < 0.001$), the level kinesiophobia (TSK) ($p < 0.01$), the level of worry and anxiety associated with the expectation of pain (PASS) ($p < 0.05$)

(**Tables 1, 2, Fig. 2**). Also there were significant differences in investigated parameters in the study group with the selective kinesiotherapy program and the control group with the standard stabilising program after treatment: VAS ($p < 0.05$), ODI ($p < 0.05$). Indicators of muscle endurance – flexor and extensor of muscles of lumbar spine and hips have also been improved with no statistically significant difference between the groups, but have not reached their normal values (**Table 2**). In the control group after treatment session pain intensity significantly decreased by VAS ($p < 0.01$), and disability degree by ODI ($p < 0.05$) (**Fig. 3**). See **Figures 2, 3, Table 2**.

DISCUSSION

Sagittal spinal-pelvic imbalance of patients with lumbar degenerative disc diseases (hernias of lumbar intervertebral discs, spinal segments instability, spondylarthrosis) is a result of the functional antalgic spinal deformities and degenerative structural deformation of the lumbar vertebral segments. Changing of sagittal lumbar-pelvic alignment is accompanied by adaptive changes in length, tone and contractility of the muscle groups along the line gravity. There is no spontaneous recovery of muscle tone in the compromised muscles of body and lower limbs after surgery. Moreover, spinal deformity and associated pelvis rotation, compensatory position in the joints of the lower limbs with the change of tone and character of the interaction of different muscle groups cause redistribution of loads to the relevant parts of the musculoskeletal system with change of intradiscal pressure, ligaments tension, joint capsules, tendons and fascia, deregulation of their tensor and mechanoreceptors (**2**) and activation of nociceptive receptors (**20**). Thus, preoperative pain may remain unchanged and new sources of pain may occur even in case of creating of the new optimal anatomical biomechanical conditions in the compromised lumbar segments during the operation. According to Nielsen et al., 62 % of the operated patients continue to suffer from low back pain (**16**). In studies of other authors there are even more disappointing results of surgical treatment of lumbar degenerative disc disease: from 60 to 86 % of patients exposed to relapse lumbodynia (**12**).

Therapeutic exercise program after decompressive-stabilizing and stabilizing operations with the use of metallic structures are presented in separate publications (**8, 16**). Thus physiotherapy generally applies from the 6^{th}-8^{th} week after the surgery, and includes general (aerobic endurance exercises) and special stabilizing exercises usually on outpatient basis or at home. Therapeutic exercises aimed at increasing of muscle strength and endurance of the lumbar spine and lower limbs, are standard, regardless of configuration of the lumbar lordosis and nature of myotonic syndrome (**8, 16, 17**).

Taking into account medical, psychological and social aspects of chronic neuropathic pain occurrence, such means of medical and social rehabilitation as education programs (back-school, back-cafe), cognitive and psychomotor therapy, ergonomics trainings, widespread mostly in Western literature, became a frequent practice (**14, 22-24**).

They are aimed at overcoming of kinesiophobia and depression by increased

motivation for social rehabilitation, training habits to biomechanically optimal postures and stresses. Combination of these programs is considered appropriate (**17, 21**), although the significant differences in the long-term results of treatment with the isolated use of each of the programs have not been identified (**24**). Noteworthy is the fact that the effectiveness of educational and cognitive therapy is comparable to the therapeutic effect of the exercises. This indicates a low selectivity and specificity of the existing kinesiotherapy programs which do not allow achieving optimal functioning of the musculoskeletal system and, therefore, do not provide the required co-activation level of muscle groups and adequate distribution of loads in the elements of the musculoskeletal system.

The criteria for the effectiveness of rehabilitation programs after surgical treatment of lumbar degenerative disc disease is mostly subjective: in the early postoperative period – self-assessment of the patient's functional status using the indicators of pain intensity on a visual analogue scale VAS, disability level by Oswestry or Rolland-Morris questionnaires, kinesiophobia level on a Tampa scale, the level of worry and anxiety associated with the expectation of pain on Pain and Anxiety Symptoms Scale (PASS), self-assessment of fear of pain by Fear of Pain Questionnaire (FPQ). In the late postoperative period self-assessment of rehabilitation results is added (for the lumbar spine) by Self-Efficacy for Rehabilitation Outcome Scale (SER) (back), as well as, in some studies – an objective assessment of the functional status of the patients in endurance level of flexor and extensor muscles of the lumbar spine and hips using isometric muscle tests and degree of spine mobility (**10**).

Application of selective kinesiotherapy programs for correction of muscular imbalance and improvement of sagittal lumbar-pelvic alignment of patients with lumbar osteochondrosis after surgery, seems to be promising not only in the postoperative period. Program of selective corrective kinesiotherapy may be one of the elements of preoperative preparation of such patients. In our opinion, the use of such programs will help to improve the functional outcome of surgical treatment of patients with spine degenerative diseases.

CONCLUSION

The short-term results of application of the program of selective kinesiotherapy developed by us for the patients having lumbar osteochondrosis with uncompensated sagittal spinal-pelvic imbalance and muscle imbalances in the late postoperative period after lumbar fusion have demonstrated its effectiveness and applicability in specialized rehabilitation and orthopaedic centres.

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EFFECTIVENESS OF THE COMPLEX TREATMENT OF IDIOPATHIC SCOLIOSIS IN CHILDREN. PAIR CONTROLLED INVESTIGATION

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ABSTRACT

A pair controlled investigation for effectiveness of complex conservative treatment of idiopathic scoliosis to be evaluated was performed in patients matched by sex and severity and pattern of the deformity. 38 patients of the therapeutic group and the same quantity of the control one were examined at the clinic of the center. During 6 weeks all the patients were conservatively treated with therapeutic program developed by specialists of our center including therapeutic exercises, apparatus physiotherapy with electric, magnetic and light therapy techniques and also procedures of functional bioregulation with video-computer auto training and electromyographic feed back and Chêneau brace. Patients of the therapeutic group had corrective exercises according to Schroth method in H. R. Weiss' modification additionally. Effectiveness of treatment evaluated with instrumental diagnostic techniques: computer optical topography, stabilometry and spirometry. Positive results of the study confirm that application of this complex conservative treatment (during 6 weeks) in children with scoliosis combined with Schroth-Weiss exercises allow to achieve obvious deformity correction and reduce symptoms of the disease.

Keywords: Idiopathic scoliosis, therapeutic exercises, conservative treatment, Schroth-Weiss therapeutic exercises.

INTRODUCTION

The main method of treatment of scoliosis is conservative. Therapeutic exercises should accompany all stages of the treatment of scoliosis. A brand new model of idiopathic scoliosis mechanogenesis was developed in our center under auspices of Prof. M. Dudin and Dr. D. Pinchuck. It explains pluri-casual nature of scoliosis with formation of three dimensional spine deformity [**3**]. There are evidence-based studies proving that exercise therapy in primary stages of scoliosis is quite effective. [**11, 8**]. Disease progression leads to severe rigid spine and chest deformities, respiratory failure [**3, 2**] and postural imbalance. Thus, complex approach including differential methods of therapeutic exercises which allow three dimensional correction of the deformity to be fulfilled and pathological symptoms to be minified should be used for achieving the better results in treatment of progressive types of scoliosis. For the treatment of children with scoliosis to be more effective Schroth-Weiss exercises were included in our clinic to the complex of conservative therapy. Efficiency of the method has been proved in the previous study on a small number of patients [**13**].

The aim of this investigation was to evaluate effectiveness of complex treatment of scoliosis in children combined with Schroth-Weiss exercises.

MATERIALS AND METHODS

A pair controlled investigation was performed in patients with scoliosis matched by sex and severity and pattern of the deformity. 38 patients of the therapeutic group and the same quantity of the control one were examined. All the patients were girls with idiopathic C-type scoliosis (type 4 according to King classification). Mean age in therapeutic and control group was 13.8 years (SD 1.4) and 14.2 (SD 1.2) correspondingly. Mean value of the Cobb angle was 35.5 (SD 6.4) in therapeutic group and 34.6 (SD 5.2) in the control one. The patients were treated for 6 weeks. They had daily complex therapy except weekends, which included:

1. Complex of special corrective exercises for back muscles strength endurance to be increased, with asymmetric weights and resistance. [**6, 7, 9**],
2. Therapeutic massage of the trunk [**5**],
3. Therapeutic swimming [**1**],
4. Apparatus physiotherapy (electrophoresis of medications on a spine, magnetic-impulse myostimulation, inductothermy of spine muscles, magnetic fields influence on a spine) [**4**],
5. Procedures of functional bioregulation with electromyographic feed back, performing in individual corrective poses. [**12**],
6. Chêneau braces [**14**].

The patients in both groups wore Chêneau braces during the second half a day and night (on average 17 hours per day). Cobb angle correction in the brace in both groups was averaged 40% (SD 2.1).

Patients of the therapeutic group had additionally everyday 60 minutes special corrective Schroth-Weiss exercises including (individually) [**16**]:

1. Exercises for sagittal profile correction ("physio-logic")

2. The program of three dimensional trunk correction ("3-D Exercises made easy")
3. The program to keep the corrected posture through the day ("3D-Activities of daily living – ADL")
4. Postural Schroth exercises with asymmetric diaphragmatic breathing Effectiveness of treatment evaluated with instrumental diagnostic techniques: computer optical topography (COT), stabilometry and spirometry. The following factors were evaluated with computer optical topography: lateral curvature of a spinal column in degrees, the angle of trunk rotation in degrees, the angle of the thoracic kyphosis in degrees. The factor of weight distribution was analyzed with stabilometry according to foothold coefficient. The factor of external respiration was evaluated with spirometry according to measurement of pulmonary vital capacity (in liters). The results of six-week treatment were compared to those before treatment. The data were statistically manipulated.

RESULTS

The values obtained by the optical topography stabilometry and spirometry in patients of the therapeutic and control groups before and after treatment are shown in **Table 1**. The difference of values of the estimated parameters is presented in **Table 2**.

Parameters	Before treatment	After treatment
Therapeutic group		
Lateral spine curvature (˚)	35 (SD4.7)	23 (SD4.1)
Angle of trunk rotation (˚)	12 (SD1.2)	7 (SD1.7)
Angle of thoracic kyphosis (˚)	21 (SD6.7)	21.1 (SD7.1)
Foothold coefficient (CR)	0.82 (D1.1)	0.96 (SD1.2)
Vital capacity (litres)	2.84 (SD1.2)	3.16 (SD1.4)
Control Group		
Lateral spine curvature (˚)	33 (SD5.6)	28 (SD6.1)
Angle of trunk rotation (˚)	12 (SD2.1)	10 (SD2.4)
Angle of thoracic kyphosis (˚)	22 (SD9.7)	19 (SD8.7)
Foothold coefficient	0.88 (SD1.2)	0.88 (SD1.3)
Vital capacity (litres)	2.87 (SD1.3)	2.89 (SD1.4)

Table 1. The lateral spine curvature (°), the angle of trunk rotation in degrees (°), the angle of the thoracic kyphosis (°), the foothold coefficient, vital capacity (litres) in patients of the therapeutic and control groups before and after treatment.

Our study revealed significant changing of the parameter of the lateral spine curvature in patients of the therapeutic group in comparison with patients of the control one (–12° Cobb). Foothold coefficient and vital capacity improved in the therapeutic group also. These parameters in the control group remained unchanged. The angle of trunk rotation in both groups, more significantly in the therapeutic group. The angle of thoracic kyphosis did not change significantly in the therapeutic group, and even decreased in the control one.

DISCUSSION

The main goal of the treatment of scoliosis is to prevent the further development of the deformation and to improve the respiratory function [**10**]. Flat back is a poor prognostic sign of the disease and seems to be the major problem in the treatment of patients with idiopathic scoliosis [**3, 15, 17**]. There is an evidence the use of different braces in such incorrect posture can lead to its progression, not to correction [**17**]. The optical topography was used to assess the effectiveness of physiotherapy on a three-plane deformation of the spinal column. In our study the angle of the spine lateral arc (–12 ° Cobb) and the trunk rotation angle on the top of vertebral arc (–5°) were significantly changed in the treatment group compared with the control group. The kyphotic angle in the treatment group remained unchanged, while in the control group it decreased even though the program of physiotherapy by Schroth-Weiss aims to strengthen thoracic kyphosis. Katharina Schroth program involves the treatment of kyphosis with special breathing exercises. In international practice the use of Schroth program gives good long-term results in flat back correction [**15**].

We've not got explanation why hypokyphosis can't be corrected by described above physiotherapy methods

Parameters	Mean difference of value
Therapeutic group	
Lateral spine curvature (˚)	–12 (SD2.1)
Angle of trunk rotation (˚)	–5 (SD3.1)
Angle of thoracic kyphosis (˚)	+0.1 (SD1.2)
Foothold coefficient	+0.14 (SD1.4)
Vital capacity (litres)	+0.32 (SD 1.1)
Control group	
Lateral spine curvature (˚)	–5 (SD2.4)
Angle of trunk rotation (˚)	–2 (SD2.3)
Angle of thoracic kyphosis (˚)	–3 (SD2.1)
Foothold coefficient	0
Vital capacity in (litres)	+0.02 (SD1.1)

Table 2. Difference of value between the lateral spine curvature (°), the angle of trunk rotation (˚), the angle of the thoracic kyphosis (°), the foothold coefficient, vital capacity (litres) in patients of the therapeutic and control groups after treatment.

in short term. It confirms the fact that the primary problem for scoliosis is the sagittal deformity and it is the most rigid and more difficult to correct than the strain in the other planes.

The use of Schroth-Weiss gymnastics can improve short-term results of complex conservative treatment of scoliosis and should be considered as a useful addition to a range of conservative treatment of scoliosis. The long-term controlled study is necessary to assess the long-term effects of the physiotherapy program.

CONCLUSIONS

Application of the 6 weeks complex conservative treatment in children with progressive forms of scoliosis combined with Schroth-Weiss therapeutic exercises gives opportunity to achieve obvious correction of deformation and reduction of the symptoms of the disease.

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GENERALIZED JOINTS HYPERMOBILITY A MARKER OF CHILDREN'S AND ADOLESCENTS' PATHOLOGY POSTURE

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SUMMARY

Introduction. Nowadays children's pathology posture has become an epidemic. One of the leading symptoms of "connective tissue dysplasia" (CTD) is a generalized joint hypermobility (JH), which is a condition characterized by an excessive mobility of the joints.

The aim of the study was to analyse the incidence of the children's posture pathology in Voronezh and identify its connection with generalized joint hypermobility depending on the age. Material and methods. To assess JH modified Beighton score has been used. The Beighton score was incorporated into the Brighton Criteria. Diagnosis JH can be established in 4/9 or more points. A total of 700 children have been examined. At computer-optical topography methods analogous to Cobb's X-ray diagnostic were employed.

Results. Generalized joint hypermobility as a basic characteristic of undifferentiated connective tissue dysplasia, according to the examination, has been identified in 187 out of 700 children making up 26.7% ($p \leq 0.05$). Pathology posture has been detected in 493 out of examined 700 children, accounting for 70.4% of cases.

Conclusion. A marker of children's pathology posture has been identified – a generalized joint hypermobility which should be assessed as the underlying risk for the static deformation of the skeleton with a tendency to early and rapid progression. Children with generalized JH are in need of regular pediatric, orthopedic and other relevant medical check-ups since early age and as well individual comprehensive treatment.

Keywords: Children, posture, joint hypermobility, scoliosis, kyphosis, connective tissue dysplasia.

INTRODUCTION

The locomotor system disorder has reached epidemic proportions and is a leader of children's and adolescents' pathologies with the incidence of 80–95% (**9**). In this series the so-called "acquired" disorders of the musculoskeletal system can be observed: impaired posture, scoliosis and abnormal kyphosis. Up to the present moment there is no unanimity on the prevalence rate of the posture pathology in the medical literature, since according to different authors spine pathology is detected in 6–65% of children (**10, 11, 12**). The term "connective tissue dysplasia" (CTD) is understood as a disorder of homeostasis at the tissue, organ and organism levels accompanied by a variety of morphological and functional disturbances of the visceral and locomotor systems with progressive chronic changes (**2, 7, 8, 13, 14, 15**).

An universal characteristic and one of the leading symptoms of connective tissue dysplasia is a generalized joint hypermobility (JH), which is a condition characterized by an excessive mobility of the joints (**2, 4, 5, 6, 13**). JH per se is not considered to be a pathological condition, yet it is a significant risk factor of the locomotor system non-specific response as well (**3**). Joint hypermobility is one of the most common deviations from the normal condition of the children's locomotor system. However, there is almost no information on its role in the development of the pathology posture in the present medical literature.

The aim of the research is to analyse the incidence of the children's posture pathology in Voronezh and identify its connection with generalized joint hypermobility depending on the age.

MATERIALS AND METHODS

The research was conducted in Children's polyclinic No 11, Voronezh, located in the Severny district with a child population of 30,310. A total of 700 children have been examined (boys : girls = 1:1). The children belong to certain age subgroups of 100 persons: 3, 5, 7, 10, 12, 15, 17 years old. A clinical examination by an orthopedist was carried out in pre-school institutions and schools. All children have had computer-optical topography of the spine (a computer-optical topography device produced by LLC "METOS" Novosibirsk, Russia). At computer-optical topography methods analogous to Cobb's X-ray diagnostic are employed. All children with JH have consulted a geneticist (undifferentiated connective tissue dysplasia – UCTD has been confirmed in 100% of cases). To assess JH modified Beighton score has been used (**1**). The Beighton score is an edited version of the Carter & Wilkinson scoring system which has been used for many years as an indicator of widespread hyper-mobility. The Beighton score was incorporated into the Brighton Criteria (**6**). Diagnosis JH can be established in 4/9 or more points. The Beighton score is measured by adding 1 point for each of the following:

- Placing flat hands on the floor with straight legs
- Left knee bending backward
- Right knee bending backward
- Left elbow bending backward
- Right elbow bending backward
- Left thumb touching the forearm
- Right thumb touching the forearm
- Left little finger bending backward past 90 degrees

- Right little finger bending backward past 90 degrees

RESULTS

Generalized joint hypermobility as a basic characteristic of undifferentiated connective tissue dysplasia, according to the examination, has been identified in 187 out of 700 children making up 26.7% ($p \leq 0.05$). Pathology posture has been detected in 493 out of examined 700 children, accounting for 70.4% of cases. Pathology posture (**diagram 1**) in children with hypermobility of the joints occurs 1.56 times more often than in children without it ($p \leq 0.05$).

Diagrams 2, 3 demonstrate that there is a decrease in children's functional disorders (posture disorders) with age. The children without JH symptoms have a tendency to posture normalization by the age of 15–17 (**diagram 3**). However, the children with generalized joint hypermobility (**diagram 2**) tend to have a significant growth of the structural pathology (scoliosis, kyphosis, kyphoscoliosis) with age, unlike those without JH characteristics. Incorrect posture with JH is observed 15% more often than without JH ($p \leq 0,05$). Abnormal kyphosis (Cobb's angle 44 º ± Sp 6.2º) typical of the children with hypermobility of the joints in the age groups over 10 years old has a considerably wider incidence than in children without HJ. The largest difference (3.6-fold) is observed in boys at the age of 17. Along with JH, girls' kyphoscolioses manifest themselves much earlier (at the age of 5) than those of children who do not have JH (12 years old). No significant difference is observed as far as

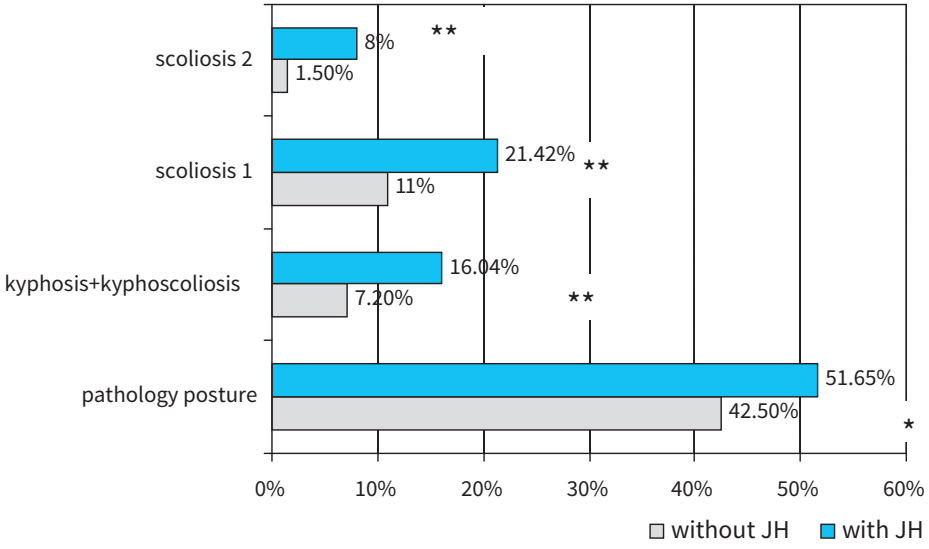

Diagram 1. Pathology posture in children with and without JH. A comparative analysis. (* Indicates that $p \leq 0,05$, ** means that $p \leq 0,0$)

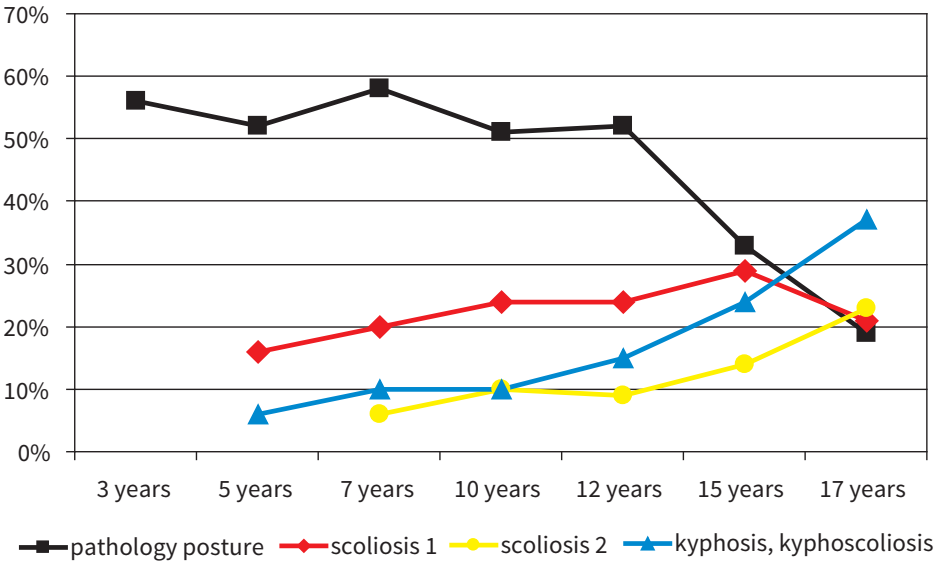

Diagram 2. Pathology posture in children with JH by age

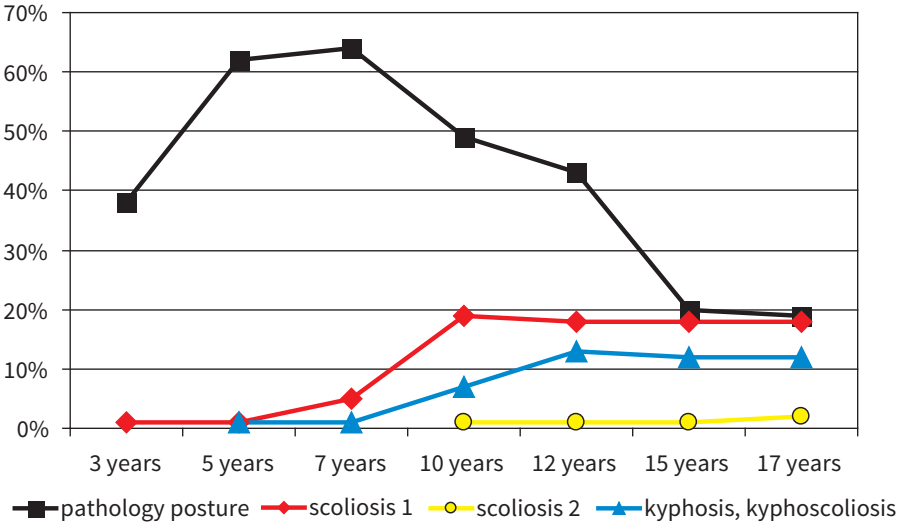

Diagram 3. Pathology posture in children without JH by age

the incidence of children with and without JH aged over 12 is concerned.

Scoliosis in children with JH manifests themselves much earlier (at the age of 5) than in children who do not have JH (7 years – boys, 12 years - girls). The incidence of scoliosis grade 1 (according to Chuklin's classification) in children having JH (Cobb's angle 8 º ± Sp2.4º) at the age of 7-12 years is 3 times higher with boys, and 2 times higher with girls than in children without JH. No significant difference in the incidence of children with and without JH aged over 12 years was observed. ($p \leq 0.05$). Scoliosis of grade 2 (according to Chuklin's classification, Cobb's angle 16 º ± Sp3.6 º) in children with hypermobility of joints was diagnosed already at the age of 7, without JH – at the age of 10 for boys and only 15 for girls.

So, children with joint hypermobility tend to have scoliosis of grade 1 twice more often than those without joint hypermobility; abnormal kyphosis and kyphoscoliosis – 2.5 times more often and scoliosis grade 2 – 5 times more often ($p \leq 0{,}01$).

CONCLUSIONS

1. Generalized joint hypermobility as the main characteristic of undifferentiated connective tissue dysplasia (UCTD) was diagnosed in 26.7% of the children.
2. Pathology posture was observed in 70.4% of the children. The children with generalized joint hypermobility tend to have it 1.56 times more often than those without JH symptoms (99% versus 66%).
3. Manifestation of the structural spinal pathologies in children with generalized joint hypermobility occurs at the age of 5–6, while those without signs of JH at this age are prone to minor functional disorders. The formation of the structural pathology begins only at the age of 12–15. Generalized joint hypermobility should be considered as the underlying risk of the formation of static deformations of the skeleton with a tendency to rapid progression.
4. Generalized joint hypermobility as the main UCTD characteristic is a marker of children's pathology posture.
5. Children with generalized joint hypermobility are in the risk group as far as the progression of posture pathologies is concerned. They are in need of regular pediatric, orthopedic and other relevant medical check-ups since early age.
6. The basic prevention measure of the structural pathology of the spinal column lies in teaching children and their parents a healthy lifestyle: regular exercise, work – rest ratio and a balanced diet.

Acknowledgements

The authors of the article are grateful to radiologist T. Vatrak, computer-optical topography doctor M. Derkacheva, director of Voronezh regional medicogenetic centre V. Fedotov, for the conducted research.

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OSTEOPATHIC TREATMENT OF CRANIO-VERTEBRAL DEFORMITIES IN NEONATES AFTER BIRTH INJURY

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ABSTRACT

Birth injuries of upper cervical spine and cranial base in newborn can lead to torticollis, scoliosis and brain dysfunction. Early X-ray exam soon after birth can reveal the details of natal injury and thus give a doctor the way for proper treatment. 40 children aged 1–3 months with traumatic birth injuries of the upper cervical spine were treated. Osteopathic treatment (craniosacral therapy) in the first group of 20 children lasted for 35 days. Medicine therapy (vasodilatators) in the second group of 20 children took 1.5 months. Comparison of osteopathic and medicine treatment in two groups of neonates shows high effectiveness of osteopathic correction of cervical disorders. Proper osteopathy in the first months of life can prevent scoliosis of the whole spine.

Keywords: birth injury, facet blocks, cervical fracture, osteopathic treatment

INTRODUCTION

Birth injury of newborn may cause deformities in his cranio-vertebral region. The cervical spine of a child is situated between his head and his shoulders, two largest parts of neonatal body. So, if child's head or shoulders move through the natal canal in the wrong way, child's neck is the most vulnerable place. Birth injury of the cervical spine damages most often the upper cervical vertebrae and their relations with cranial base. It leads to muscular-skeletal strain, which can be corrected by osteopathic treatment.

Cervical spine X-ray is rarely used to detect the orthopedic deformities reasons in cranio-vertebral region of the neonate.

When correction is delayed, the results are worsened. The urgent X-ray examination of the neonatal cervical spine can give clue for understanding of the anatomic disorders in the upper cervical spine. This may be the base for treatment planning. Osteopathy can make child healthy. The aim of investigation was to find out the kinds of upper cervical disorders in injured neonate through X-ray examination, and to compare the osteopathic and allopathic treatment.

MATERIAL AND METHODS

In our Medical Centre "Neonatus Sanus" we had treated 40 children aged 1-3 months with traumatic birth injuries of the upper cervical spine. They all were full-term, their weight was 3200–3500gr. Their Apgar score was not less than 7 points. The children were brought to our centre with diagnosis brain and/or spinal cord birth injury and torticollis. All patients were examined by neurologist, X-ray of the cervical spine and brain sonography was carried out. We used plain films in two projections, added with the functional probe of cervical spine flexion and extension in lateral view.

The patients were randomly divided into two groups, 20 children in each. The first group was treated by osteopathy, the second – by medicine. Osteopathic treatment in the first group of children lasted for 35 days (5 visits once a week). We used craniosacral therapy in order to recover cranial kinetics, improve liquor movement and to correct the vertebral position. Medicine therapy in the second group took 1.5 months, it included vasodilatators in order to correct the blood flow of the vertebral artery: in patients with cervical vertebra rotation the diameter of the vertebral artery on the opposite side was usually narrowed. 3 months later all patients from both groups were examined once more.

RESULTS AND DISCUSSION

While patient examination we found out that child head was tilted more often to the left (70%) and rotated to the opposite side; the movements of the cervical spine were restricted; asymmetric hypertonic sternocleidomastoideus muscle was left in 75%; pelvic rotation to the side, opposite to the head rotation (42%); pelvic rotation to the same side of head rotation (28%), no pelvic rotation (30%).

X-ray films demonstrated birth injuries of the cervical spine: functional facets blocks in C0–C1, C1–C2; fractures of occipital bone, atlas or axis, rotate subluxation of C1. Each type of birth injury had its specific signs. Functional facets blocks saved the proper forms of upper cervical vertebrae, but limited the movements. Functional facets block of C0–C1 caused lifting of the posterior arch of atlas towards the occipital bone, the movements in C0–C1 were absent; in cases of C1–C2 functional facets blocks the position of atlas was nearly similar, but the atlas was fixed at C1–C2 level, while movements in C0–C1 were free. The patients with torticollis had asymmetrical facet blocks: the injured joint has narrowed fissure between facets because joint cartilage in infant could be compressed with pain muscle contraction. The edges of facets were not displaced.

The fracture of occipital bone damaged the posterior intraoccipital synchondro-

sis: the space between occipital squama and occipital lateral part narrowed, the occipital squama was situated higher and anteriorly than the lateral parts of the same bone. This kind of natal fracture was often combined with facet block at C0–C1 level.

The atlas fractures damaged the anterior and posterior arches of the vertebra. One of two lateral masses had lateral displacement and was situated slightly lower and anterior to the corresponding facet of C2. The fissures of atlanto-axial and atlanto-occipital joints were strongly narrowed, the head was tilted. When the fracture damaged the part between posterior arch and lateral mass of atlas, where vertebral artery was situated, the clinical situation was serious: the movements of neonate head and neck while child care could cause transient ischemic attack in vertebral-basilar vascular region with loss of consciousness, such episodes could be mixed up with epilepsy.

The fracture of C2 usually damaged the cartilage between dens and vertebral body. The axis dens moved slightly anterior and could rotate.

Rotate subluxation of atlas was rare. Rotated atlas was moveless. No lateral displacement was found in these cases.

Ultrasound examinations of the brain usually demonstrated posthypoxic damages of deep white matter, slight ventricle dilatation, plexus cysts etc.

Osteopathic treatment in the first group of children lasted for 35 days (5 visits once a week). Medicine therapy in the second group took 1.5 months. Three month later all children were examined by neurologist. The muscle tonus was symmetric in 17 patients of the first group (85%), there was no torticollis and no pelvic rotation. In the second group asymmetric muscle tonus and torticollis resisted. Control neurosonography revealed regress of posthypoxic brain changes in the first group. Vertebra rotation was absent in 19 patients (95%) in the 1st group. 17 patients of the 2nd group (85%) after medicine therapy still had rotated vertebra. Thus, osteopathy treatment proved its high cure rate in children with birth injuries of upper cervical spine and cranial base.

X-ray exam of neonates with birth cervical injuries revealed functional facets blocks of C0-C1, C1-C2, natal fractures of occipital bone, atlas and axis, asymmetric muscle tonus etc. The results of early X-ray exam enabled the proper treatment

Displacement of upper cervical vertebra and occipital bone breaks the correct position in cranio-vertebral region and changes blood and liquor circulation. It can also lead to malfunction of diencephalic brain zone. Central nervous system disfunction leads to scoliosis (Dudin and Pinchuk 2009). Osteopathic treatment of cranio-vertebral deformities in newborn saves their whole spine from severe scoliotic disturbances.

Changes of position and movement of one spinal level immediately results in the secondary abnormalities of the other spinal levels. Long-lasted cervical muscle asymmetry causes postural muscle asymmetry, thus involve the whole spinal column.

The early osteopathic treatment of children with cervical birth injury is very effective. It prevents gravitation line displacement and kinematic chains derangements and thus improve postural balance in whole.

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TRANSCRANIAL MAGNETIC STIMULATION IN MECHANOTHERAPY EFFICACY EVALUATION

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INTRODUCTION

Mechanotherapy have gained well-established position in neurorehabilitation in recent years. Main effect of mechanotherapy are neuroplasticity activation. In animal models neuroplasticity may be evaluated by neurochemistry, patomorphology, deep-brain electrodes etc. Experimental data may not always be applied to humans, as experimental animals, even primates, have different anatomy and activity of the certain parts of motor pathways, e.g. in monkeys rubrospinal and reticulospinal pathways are much more developed, than in humans, and may affect obtained data significantly. Thus reliable and safe methods for neuroplasticity evaluation are needed, and in human main instrument for neuroplasticity evaluation are transcranial magnetic stimulation (TMS) [**2**]. TMS was used in mechanotherapy efficacy evaluation in several works [**3**].

Our goal was to evaluate efficacy of mechanotherapy by Locomat Basic apparatus in patients with brain lesions using TMS technique.

MATERIALS AND METHODS

5 patients (average age 34 years, range 31–49 years) were enrolled. All patients had established cerebral palsy, main neurological finding was lower diplegia. All patients underwent mechanotherapy on Locomat Basic apparatus. Each patient participated in 10 sessions of therapy. TMS was performed before the 1st session and 1 day after last session.

TMS was performed according to currently accepted standard procedures. We used circular coil 90 mm in diameter and Neiro-MS-D monophasic current pulse magnetic stimulator. Single-pulse TMS pro-

tocol was used. Coil was positioned over the optimal scalp site. Cortical motor areas, cervical and lumbar parts of the spine were stimulated to obtain motor evoked potentials (MEPs) and to calculate central motor conduction times (CMCTs). For the conduction studies target muscles were at rest. The onset of the MEP was determined by measuring the shortest latency of at least 5 single stimulation responses. For each site at least 5 MEPs were collected, averaged and analyzed. MEPs amplitude, duration, and onset latency were measured. The measurements were performed for the legs. Recording surface skin-mounted EMG electrodes (diameter 8 mm) were placed on both legs on m. Abductor Hallucis. Surface EMG signal was recorded using a Neiro-MVP apparatus.

Study was approved by the local ethical committee according to the Helsinki declaration. The purpose of the study was fully explained to the participants, written informed consent was obtained from all patients.

RESULTS

Clinical improvement (better ability to sustain posture, lesser spasticity and better walking abilities) were seen in all cases. There were no adverse reactions, complaints or side-effects. On first evaluation high MEP threshold (90–100%) was seen in all patients. In 2 patients MEP was elicited only after the facilitation (minimal target muscle contraction). In 4 of 5 patients MEP shape polyphasy, amplitude lowering and CMCT asymmetry more than 2 ms were seen. CMCT slowing was seen in 3 of 5 patients. On second evaluation all patients showed MEP threshold lowering to 40–55%. Polyphasic MEPs were still seen, but MEPs duration was lessened in 2 patients. In 2 patients mild amplitude raising was registered.

DISCUSSION

Shape and threshold of MEP were most often affected in cerebral palsy patients. MEP thresholds seems to reflect excitability of the cortical motor neurons [**1**]. Polyphasic MEPs represents demyelization process in corticospinal tract. CMCT slowing and severe asymmetry reflects more pronounced motor pathways involvement, and MEP amplitude lowering mostly happens due to axonal lesions [**4**]. As can be seen from the general tendency towards MEP threshold lowering and shape improvement in our patients, main neurophysiologic changes after the course of treatment were elevation of cortical motoneurons excitability and signs of remyelization. It can be suggested that mechanotherapy in our patients influenced neuroplasticity. Thus without real registered effect on anatomical lesions the adaptation towards their existence was established, which in its turn led to the clinical improvement.

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EXPERIMENTAL BASIS OF MAGNETIC FIELDS FOR CONTROL OF BONES' GROWTH PLATES FUNCTIONAL ACTIVITY

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ABSTRACT

Magnetotherapy is actively used for treatment of a range of health problems in orthopaedics and traumatology. The usage of magnetic fields helps to accelerate the consolidation of fractures, reduces pain syndrome, it is used in the treatment of false joints (pseudoarthroses), aseptic bone necroses, etc. The usage of magnetic fields for growth bone plates' functional activity control can be a very perspective one. Such effect can increase the effectiveness of the treatment of many orthopaedic diseases and consequences of injuries in children. It was carried out a pilot study of impulse magnetic field (1.5 Tl) influence on the growth bone plates of the rabbits (34 experimental animals). As a result was found out the inhibitory action of such fields on growth bone plates' functional activity. The similar results in mice were obtained under the application of the "weak" combined magnetic fields.

Keywords: magnetotherapy, magnetic field, growth bone plates, DNA synthesis.

INTRODUCTION

The etiology and pathogenesis of the whole range of diseases in paediatric orthopaedics is closely related to changes in the normal process of bone growth. Bone's growth can accelerate, slow down or infringe. These deviations can bear as systemic character and involve virtually the entire skeleton, so as occur locally.

In this case, the longitudinal growth of the skeleton is entirely determined by the functional activity of the germ zones, which are the ultimate executive "authori-

ties" which are performing step-by-step growth programs. One of the cartilage's growth zone features is its high metabolic activity that is comparable to exchange activity of glandular epithelium. The increased metabolism makes it sensitive to the effects of various endogenous and exogenous factors. It's considered to be prospective the usage of magnetic fields influence to control the functional activity of the germ zones.

MATERIAL AND METHODS

The experimental animals – mice (C57BL6) and rabbits breed Soviet Chinchilla. In total, the present work has been used 34 experimental animals. All animals were kept in the nursery of the Institute of Cytology RAS, under the same conditions. The object of the study were tibia and femur growth zones. Magnetic field generators: the apparatus for pulsed magnetic therapy "Amit-01" (Russia) and original device "Effect" (St. Petersburg, Russia). The first unit generates a magnetic field with induction level up to 1.5 T and a pulse duration of 110 microseconds, and the second one – with the amplitude of the alternating magnetic induction field 1.8 times higher than the static magnetic field and the induction frequency range of the alternating magnetic field - ranging from 15 to 100 Hz.

Methods

The **histological** method. Selected fragments of femoral, tibial bones were fixed in 10% formalin solution for 7 days, then washed with water for several days in water and 1N decalcified in acetate buffer at pH 4.5. After the appearance of signs of a softening of bone most of the epiphysis and diaphysis was removed with a scalpel, and continued until the disappearance of decalcified in decalcifying fluid response to calcium ions under the control of the reaction with 5% solution of sodium oxalate. Fragments of bones were studied in paraffin according to the standard scheme. Then they were oriented so as to be able to retrieve sections in the frontal plane. 20 micron thick sections were obtained on a microtome by "Reichert". These preparations were stained with hematoxylin-eosin and Mallory's method.

Morphometric method (germ zones measuring, calculation and evaluation of the ratio of proliferating and differentiated germ zones chondrocytes). Thickness of the growth plate was evaluated by ocular micrometer at 20×, 15× eyepiece and expressed in micrometers (microns). Counted the average number of chondrocytes in the growth plates areas of so-called coin columns, as well as measured by the absolute thickness of the growing zone. Along with this, the ratio determined by the zone of differentiated ("mature") and proliferating ("young") as a percentage of chondrocytes. Assessment of the differences was made by Student's test.

Autoradiography (assessment of DNA synthesis)**.** Activity of DNA synthesis was determined by autoradiography. 3H-thymidine production by Radium Institute, named by Khlopin RAS was used as a mark. It specific activity was ranged from 19 to 23 Ci (Curie)/ mol. After dilution in saline solution of 3H-thymidine was administered intravenously at a dose of 1 mk Curie/ gram weight of the rabbit

after 1 hour after the last impact by the magnetic field. Collection of material was taken off in one hour after the administration of 3H-thymidine. Liquid emulsion type "M" or type "P" (production of NGO "Fomos", Moscow) was applied to sections to registrate incorporating radioactive label. The D-19 was used for the manifestation of the developer. On hematoxylin and eosin-stained preparations index of labeled nuclei were counted using a 20× lens and a 15× eyepiece. On a standard rectangular area (ocular grid) of the epiphyseal plate was counted the total number of nuclei of chondrocytes and labeled nuclei among them. Areas of counting evenly distributed along the length of growing plate with the distance between them is 350 cm.

RESULTS

Morphometric data indicate that, under the influence of the pulse magnetic field occurs a significant/authentic/ reduction in the germ zones overall height, in the bones forming the knee joint. In the experimental animals as compared to the control group, there was registered a reduction of 24% on the hip side and 10,7% on the tibia side ($p < 0.05$). Besides, is noted a significant increase in the (specific gravity) proportion of differentiated chondrocytes by 19,4% on the tibia area ($p < 0.05$), in the femur – is observed a slight tendency to decrease in the zone by 8.5% ($p > 0.05$) . In other words, are observed two concurrent processes - the germ zones height reduction and increase in the differentiated chondrocytes portion.

Of particular note is that in a number of germ zones preparations//portions were observed degenerative changes. They were manifested as deformed "rouleaux" and cell-free areas formation and in proliferating chondrocytes resizing. These changes are accompanied by autoradiography results that indicates a suppression of DNA synthesis (the index of label nuclei decreased in germ zones of the femur by 32.5% and in the tibia by 40.3%) ($p < 0.05$).

In the experiment on mice was shown that at course influence of "weak" magnetic field tuned to the resonant frequency of Ca ions, takes place an acceleration of growth and weight gain of the animals. Under these conditions Ca-specific magnetic field enhances cell proliferation as evidenced by the inclusion of increasing levels of 3H-thymidine in poorly differentiated cells of the epiphyseal plates of long tubular bones. In the case of exposure of experimental animals in the "weak" magnetic field tuned to the resonant frequency of the ions K are marked the signs of growth deceleration.

CONCLUSION

There were obtained experimental data evidencing the change in the functional activity of bone growth plate areas in vivo under the influence of magnetic fields with specific parameters. As a result was found out the inhibitory action of such fields on growth bone plates' functional activity. The similar results in mice were obtained under the application of the "weak" combined magnetic fields.

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10 YEARS EXPERIENCE WITH TIBIO-FEMORAL ANGLE CORRECTION BY HEMI-EPIPHYSIODESIS

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Keywords: hemi/epiphysiodesis; eight-Plate guided Growth System; deformity correction; valgosity; varosity; tibiofemoral angle; anthropometry;

INTRODUCTION

The first surgical technique of open epiphysiodesis was described by Phemister in 1933 (**10**). Several techniques of epiphysiodesis have been evolved, enabling gradual correction of angular deformity and/or leg length equalisation. Many other procedures attempting to guide epiphyseal growth have been discussed and published (**2, 4, 6, 12**). Epiphyseal stapling described by Blount (**2**) has disadvantages and limitations because of staples. When rigid staples are affected by the powerful forces generated by growth of physis, the staples can migrate, break or extrude (**4**) and may take the risk of permanent damages of growth physis. The permanent epiphysiodesis using drilling of epiphysis that was introduced by Macnicol and Pattinson (**6**) must be carefully and punctually planned.

Ambulant Centre for Defects of Locomotor Apparatus in Prague use a modified Macnicol´s technique of epiphysiodesis (**6**) more than twenty years. We are presenting our last years results. The new surgical technique of temporary hemiepiphysiodesis have obtained the own place between the operation techniques in course of several last years. This surgical technique use guided growth by new device called the eight-Plate guided Growth System (Orthofix, McKinney, TX,

USA). We are gaining the first experience with this method.

METHODS AND PATIENTS

The timing of permanent drilling epiphysiodesis by modified Macnicol´s technique (**6**) is addicted to accurate determination of T-F angle. The measurement of **valgosity or varosity** of knee joints using tibiofemoral angle we perform by both anthropometric and special photographic methods (**5, 7, 8, 9**). In the first case the T-F angle is calculated from anthropometrical measured dimensions and values. The second method uses depicted anthropometric points on body and then the value of T-F angle is measured by goniometer at the photographs. For preliminary assessment of T-F angle is measured intermalleolar (valgosity) and intercondylar (varosity) distances, resp.

The indication and timing of permanent epiphysiodesis issue from accurate determination of T-F angle (**5, 7, 8, 9**) and from the **remaining growth** of long bones predicted according to Anderson, Green and Messner method (**1**) on basis of determination of patients **bone age** (Greulich Pyle and Tanner Whitehouse Method 3 /13/).

The partial permanent **epiphysiodesis** was carried out by boring of a medial or lateral part of a growth plate using an X-ray intensifier for its identification according to modified Macnicol´s technique (**6**).

At present, we also carry out the temporary hemi-epiphysiodesis by eight-Plate Guided Growth System (Orthofix, McKinney, TX, USA) and we gained the first experiences with this method.

In retrospective study was assessed a cohort of 34 patients (18 boys, 16 girls). The deformities around the knee joint region were solved by partial boring (permanent) epiphysiodesis. The right time of surgery was indicated on the basis of remaining long bones growth. The cohort includes children with deformities caused by idiopathic, metabolic, neuromuscular, genetic and developmental bone diseases.

The new introduced hemiepiphysiodesis by eight-Plate Guided Growth System is presented on concise case reports. The temporary hemi-epiphysiodesis was carried out in a cohort of 13 children due to angular deformities. The most common diagnosis in the small cohort was hypophosphatemic rickets.

RESULTS

Partial permanent medial or lateral hemiepiphysiodesis (deformity correction in a frontal plane) was done in a cohort of 34 patients (16 girls, 18 boys) aged 10.4 – 16.5 years. Total number of 39 hemiepiphysiodesis has been done.

In region of the knee joint (i.e. growth epiphysis of distal femur or proximal tibia) was carried 32 medial and 7 lateral hemiepiphysiodesis. Average age of surgery was 13.3 ± 1.34 years (12.63 ± 1.27 years in girl, 13.99 ± 1.07 years in boys).

In boys the average T-F angle was 15.2° ± 4.82° before surgery. The T-F angle was normalized to 5.4° ± 2.39°. The evaluation showed that intermalleolar distance was decreased by growth from 8.2 cm ± 2.96 cm to 1.6 cm ± 1.74 cm. Similar results were in girls. The average T-F angle before surgery was in range of hypervalgosity 11.2° ± 1.95°. Its value was decreased to physi-

ological range of valgosity 5.2° ± 2.08°. Intermalleolar distance measured in lying position was decrease from 7.9 cm ± 2.16 cm to 1.59 cm ± 1.64 cm. Hemi-epiphysiodesis normalized the axis of lower extremities in frontal plane, walking stereotype was improved and especially girls appreciated an aesthetic effect.

CONCLUSION

The temporary or permanent hemiepiphysiodesis are the method of choice for correction of the angular deformities in frontal plane on both the lower and upper extremities. Ambulant Centre for Locomotor Defects in Prague has achieved very good results with permanent epiphysiodesis (by modified Macnicol methods using drilling of growth physis). In cases when we are unable to perform reliable prediction of remaining bone growth (e.g. severe bone dysplasias) or where is biomechanically desirable resolve the deformity in early childhood is the epiphysiodesis using the Orthofix eight-Plate System (or Guided Growth Plate) the right method of choice.

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CHILDREN'S REHABILITATION CENTER OF ORTHOPAEDICS AND TRAUMATOLOGY „OGONYOK"

DUDIN M.G.

Prof. Dudin M.G., director of Children's Rehabilitation Center of Orthopaedics and Traumatology „Ogonyok"

Brief scientific CV of Prof. M.G. Dudin

1949 – was born.
1972 – graduated with honors LPMI (Leningrad Pediatric Medical Institute), Leningrad, Soviet Union.
1972–1974 – specialization (residency) in orthopedics and traumatology.
1974–1984 – work in public health practice.
1982 – PhD, «Idiopathic scoliosis with atypical abnormal rotation of the vertebral bodies."
1984–1986 – work as a specialist in the Lenin hospital, Holguin, Cuba.
1986–1996 – researcher at the Turner scientific and research institute for children's orthopedics, St. Petersburg, Russia.
1993 – DScM, «Hormonal aspects of the idiopathic scoliosis pathogenesis».
1996–present – Director of Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia.
1997 – Professor.
1999 – first award GICD. 14 PhD and 1 DScM dissertations were performed and defended under the guidance of DScM prof. Dudin. He published more than 200 scientific papers in medical journals in Russia and abroad, wrote 3 monographs (in 2009, 2011 and 2013), which presents the main results of his research activities.

HISTORY

Children's Rehabilitation Center of Orthopedics and Traumatology (CRCOT) "Ogonyok" was founded in February 12, 1958 for the treatment of children affected polio.

In the beginning of the 60s, when thanks to the doctors' efforts the epidemic of polio was defeated, the Center began to accept on treatment children with traditional children's orthopedic disorders (scoliosis, trauma, degenerative skeletal lesions) and patients undergoing surgery for congenital malformations of the skeleton.

In 70–80 years the main idea in the work of the Centre was a classic restorative treatment of all locomotor apparatus (LA) lesions, except for tuberculosis and oncology. As a result, medical staff of the Centre came to the conclusion that the earlier rehabilitation had been started, the better the result would have been obtained. This situation has led to the need for effective early diagnosis of LA diseases and injuries, so as identification of etiologic factors of these diseases. After all, in most cases, as international experience shows, we have little idea of etiology and pathogenesis of orthopedic diseases.

Therefore, in the early 90s due to the progress in medical science on the basis of available practical treatment technologies in the center was launched an investigation project with the aim to reveal the causes of the LA disorders in children. Therefore,

Children's Rehabilitation Center of Orthopaedics and Traumatology „Ogonyok", the main building

‚Department of physical therapy

in the Centre was formed special diagnostics complex. As a result, during the years 1995–2005 in the Center were deployed 12 such diagnostic units.

High qualification of medical staff, the possibility of obtaining information about the disease at the earliest stages of its development, objective information on biomechanics, physiology, functional status control systems have allowed experts open new pages on the etiology and pathogenesis of a number of LA diseases and injuries. As an example, can be mentioned the developed on the basis of the laws of chronobiology (biorhythmology) system of treating children with vertebra column injuries. In the same group of patients were identified and found therapeutic solutions for the diagnosis and cure of the heart traumatic contusion injury.

The use of the modern achievements in laser medicine helped to create a system of effective treatment of inflammatory lesions of the joints, child's chronic arthritis and rheumatoid proliferative arthritis.

A special place in the research work of the Center's team is AIS (adolescent idiopathic scoliosis). Under the guidance of Professors M. Dudin and D. Pinchuk was initiated and is being carried out at present the large-scale study of AIS with the approach of basic and applied biomedical specialties. As a result, for the first time in the world by the physicians of the Center were revealed the factors that triggered the development of vertebra column 3-D deformation. Subsequent AIS studies, based on the study of biomechanics, neurophysiology and neurochemistry in children with very early symptoms of the disease

Swimming pool

provided the basis for the development of AIS preventive measures.

The results of the staff's work in this sphere are presented in numerous publications, monographs. A number of methods of diagnosis and treatment are protected by patents of the Russian Federation. As recognition for outstanding achievements in innovation in pediatric orthopedics in 2009 the Center became A.N. Kosygin Prize Laureate.

The most important feature of the Center is a combination of diagnostic and therapeutic processes with a full training program due to the state program of the Russian Federation. In the Center were formed 5 clinical departments, where patients are divided according to the age groups. Since 2007 has been opened the department for teenagers. The staff of the Centre is amounts to more than 400 employees. Among them are professors, doctors and candidates of medical sciences, doctors, nurses and teachers of the highest qualification category. Every day in the hospital receive treatment 226 children and adolescents aged from 3 to 18 years old (1600 people per year) with a wide range (more than 40 disease entities) of orthopedic disorders, 70% of which is vertebral pathology. Along with the daily activities of the diagnostic and treatment the physicians of the Centre are engaged in research work. The main idea of the work is the early diagnosis of orthopedic and concomitant pathology, and its pathogenetic treatment. Such a comprehensive evidence-based approach in the sphere of diagnostics and treatment of children's orthopedic pathology explains the increased interest paid to the work of

the Centre by medical scientists not only in Russia, but also in foreign countries (USA, Canada, Finland, the Netherlands, Spain, Italy, South Korea, Poland and etc.). In particular, when handing to prof. M.G. Dudin the GICD first prize in 1998, the world-renowned Professor Jean Dubousset said that in matters of conservative treatment of idiopathic scoliosis CRCOT "Ogonyok" is working in the XXI century.

CLINICAL DEPARTMENTS

In St. Petersburg's SHI CRCOT "Ogonyok" there are 5 clinical departments for in-patient treatment of children with diseases and consequences of musculoskeletal system injuries.

Children are allocated according to their age, regardless their orthopedic pathologies.

- I clinical department – 45 beds for children aged 4 to 8 years
- II clinical department – 45 beds for children aged 9 to 11 years
- III clinical department – 55 beds for children aged 12 to 13 years
- IV clinical department – 55 beds for children aged 14 to 15 years
- V clinical department – 26 beds for children aged 16 to 17 years

All departments comply with sanitary norms and rules imposed on the device and placement of children's clinical departments of orthopedics. The apparatus and equipment of offices enable us to provide

Hydrotherapy room

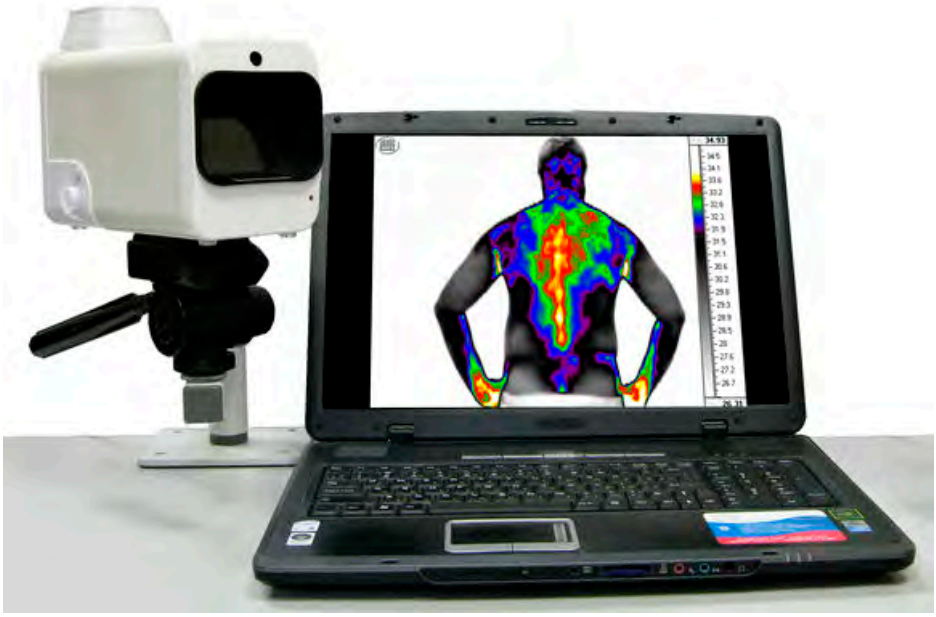
specialized care to patients with reduced mobility.

In the clinical departments works highly qualified doctors, orthopedic trauma surgeons and nurses. Child's care is provided by attentive and caring nurses. Children's activities are organized by experienced and qualified teachers.

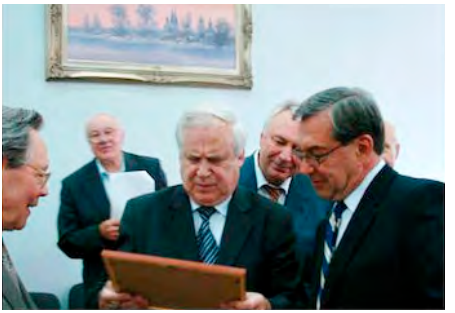
CLINICAL AND DIAGNOSTIC LABORATORY

Types of performed tests

1. General Clinical Research
   - Blood tests
   - Research of urine
   - Research of feces
2. Biochemical studies
   - Calcium in blood serum
   - Inorganic phosphorus in blood serum
   - Glucose in blood plasma
   - The activity of alkaline phosphatase in blood serum
   - The activity of serum alanine aminotransferase in blood serum
3. Determining the hormones' level
   - Calcitonin
   - Parathyroid hormone
   - Somatotropin (Growth hormone)
   - Cortisol
   - Adrenocorticotropic hormone



Thermograph IRTIS



Prof. Dudin M.G. receives A.N. Kosygin Prize

The laboratory participates in the Federal system of quality in clinical laboratory tests (FSQLT).

FUNCTIONAL DIAGNOSTICS AND BIOMECHANICS DEPARTMENT

The department was established in 1996. The studies conducted in the department, allow evaluating the function of organs and systems of the patient, to deter-

Staff at work

mine the degree of violation. The data obtained are used in the future to refine the diagnosis, determine the scope of remedial measures, assess the effectiveness of the treatment, control the course and predict the outcome of the disease.

In the Centre are used the standard methods of functional diagnostics and biomechanics, and the latest unique techniques, developed in conjunction with the staff of the leading St. Peterburg's research institutions (Research Institute of Experimental Medicine, Institute of Physiology named after Pavlov I.P., SRI of Evolutionary Physiology named after Setchenov I.M.).

Rubtsova O.F., acting director of Children's Rehabilitation Center of Orthopedics and Traumatology "Ogonyok" in 1958–1959.

Staff at work

An important approach is not the number of the techniques used, but their integrated use that gives opportunity to increase greatly the effectiveness of diagnostic measures.

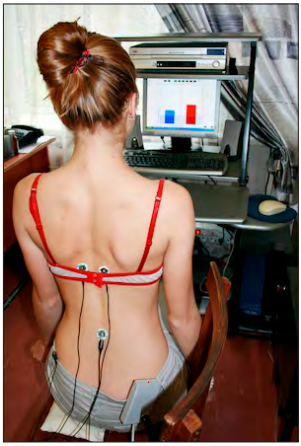
In the department are conducted the following studies:

1. Electromyography: surface and pacing – determination of speed of motor, sensory fibers of peripheral nerves, study of late responses (H-reflex and F-waves).
2. Electroencephalography with a visual assessment of the curves and «on-line» information processing according to the original program. Is performed complex processing of entries on standard programs using amplitude-frequency spectra, methods of coherence, correlation and mapping, which can significantly improve the efficiency of diagnosis, visual data's presentation.
3. Electrocardiography – a study of the electrical activity of the heart.
4. Computer Optical topography – the identification and quantification of spinal deformity documentation, evaluation of the dynamics of deformation.
5. Stabilography – evaluation of the support function of the foot, calculation of a number of biomechanical parameters to investigate the mechanism of regulation of posture and ensure the statokinetic sustainability.
6. Podography – step estimation parameter. In the process of walking is recorded the dynamics of change of pressure on various points of the foot.
7. Plantography - method of assessing the degree of flat feet with foot print.

Sinitsky Yu.F., director of Children's Rehabilitation Center of Orthopedics and Traumatology "Ogonyok" in 1974–1996.

Children's vegetable garden

Classes for nurses



Functional biofeedback procedure with feedback on electromyogram (FBU running EMG)

Kinesiotherapist Pugacheva N.V. carries out classes with scoliotic patients

Radiographic system Q-Rad-DS-3

8. Spirography – a method of graphic recording of the changes in lung volume during breathing.

In the department of functional diagnostics work highly skilled experts, among them – the doctor of medical sciences, professor.

MASSAGE AND PT DEPARTMENT

Therapeutic exercise (physical therapy – PT) – is a method of non-specific training therapy and rehabilitation by means of physical culture and sports (physical exercise, massage, nature factors).

PT – a mandatory part of an integrated treatment of children with musculoskeletal system diseases and injuries.

With the help of physical therapy are solved the following tasks of rehabilitation of patients with disorders of the musculoskeletal system:

- Improvement and recovery of patients' physical performance
- Improvement and restoring of the general metabolism level
- Restoration of patient's normal psycho-emotional tone
- Improvement of cardio-respiratory function, cardio-respiratory system
- Improvement and restoring qualities of balance and coordination
- Strengthening the muscles and restore physical activity
- Improving of blood and lymph circulation
- Development of adaptive compensatory mechanisms aimed at the restora-

tion of the physiological balance in the spine and musculoskeletal system
- Stimulation of the immune system and blood cellular immunity
- The prevention of pain syndrome
- The effect of tempering

Exercise therapy (remedial gymnastics):

1. Morning hygienic gymnastics
2. Therapeutic exercises
3. Hydrokinesiotherapy
4. Functional biofeedback procedure with feedback on electromyogram (FBU running EMG)
5. Training simulator exercises

- At the department work highly experienced professionals:
- Two physical therapy doctors;
- Ten instructors-trainers of physical therapy;
- Nine massage nurses.

In 2010 two members of the department (a doctor and instructor) have been trained in Germany by Dr. Weiss on the course «Best practice» and got the certificates.

DEPARTMENT OF PHYSICAL THERAPY

Modern methods and applications of physical factors in medicine can effectively influence the course of the musculoskeletal system diseases and the recovery period of the injured bone tissue. That's why we widely use physical factors in the complex pathogenetic treatment of children and adolescents with orthopedic disorders and traumas.

The department possesses 8 physiotherapy rooms with modern medical equipment that allows us provide effective child's health care not only due to the main musculoskeletal system diseases, but also in comorbidity of other organs and systems.

We have used both natural and preformed therapeutic physical factors. Applicable types of physical therapy:

- Galvanized and electrophoresis of drugs
- Pulse-amplitude therapy
- LWM-therapy, EHF-therapy, UHF-therapy, D'Arsanval therapy
- Inductothermy
- Magnet
- Ultraviolet radiation
- Fotochromotherapy
- Laser therapy
- Photodynamic laser therapy
- Mud and ozokerite therapy
- Whirlpool, mineral and medicinal baths
- pneumomassage
- Ultraphonophoresis of drugs
- Magnetic and electrical pulse stimulation
- Inhalations: vapor-air and ultrasonic
- Reflexotherapy

RADIOLOGY DEPARTMENT

Radiology – a branch of medicine that applies radiation to the study of the structure and function of human organs and systems for the prevention and detection of the diseases.

Department of Radiology of the Centre has the following types of studies: X-ray and ultrasound diagnostics, thermography.

Radiology department of St. Petersburg's SHI CRCOT "Ogonyok" is equipped with modern radiographic system Q-Rad-DS-3, which allows quickly and with low X-ray dose obtain high-quality roentgenogram with the following long term digital storage and get thermo film.

Intraoral X-ray unit ENDOS ACP enables sighting radiographs of the teeth, which is an indispensable diagnostic tool in providing dental care to our patients.

Ultrasound diagnostics is used also for injuries of the musculoskeletal system, especially in those cases where it is necessary to explore the "transparent" for x-rays structures.

Thermography (thermal imaging) –a method of visualizing and registration of infrared (IR) radiation from the surface of the human body which can help to detect abnormalities, based on deviations of the temperature distribution on the surface of the human's body. For over 60 years this method has been successfully applied in various fields of medicine, in particular – in traumatology and orthopedics, where with the help of thermal imaging is being diagnosed scoliosis, inflammatory diseases of different etiologies of major joints, osteomyelitis, meniscal injuries and other diseases.

DENTAL ROOM

On examination of the incoming children, including being on bed rest, is determined their dental status, revealed the occlusion pathology and issued a dental card.

Dental office is equipped with the latest equipment "Darta" (2010) which allow application of innovative technologies in dentistry. In the treatment of uncomplicated caries are used filling materials containing fluorine (glass-ionomers) and materials based on calcium hydroxide which have caries-static effect. During the restoration and reconstruction of the anatomical shape of the permanent teeth are used light-polarizated composites.

The treatment of complicated forms of caries is performed under anesthesia, after consultation with a physician pediatrician, considering allergic and somatic status of a child. Endodontic treatment and obturation of the canals of permanent teeth is carried out only after the X-ray examination with the completion of the formation of roots. In treatment are applied calcium preparations which possess anti-inflammatory action and stimulate apexification. To determine the length of the channels there is a device anekslocator i-Pex, for endodontic treatment – ultrasound handpiece Sonic-Air.

SCHOOL

The school exists on the bases of St. Petersburg's SHI CRCOT "Ogonyok" from 1967. At school according to the State educational standards are taught children of 1–11 classes. In all there are 15 classes: the first stage (1–4 classes), the second stage (5–9 classes) and the third stage (10–11 classes).

On average there are 17–19 pupils in a class. From the second class pupils study foreign languages: English and German.

The activities are organized by the school in three areas:

1. Educational activity;
2. Extracurricular work – "Knowledge and Creativity" – the project, subject – matter decades;
3. Ethics education.

PSYCHOLOGICAL SUPPORT

The main problem that a child admitted for a treatment meets in a medical facility is the process of his adaption to the new conditions. To solve this problem in the Centre under the guidance of highly qualified teachers-psychologists was developed and implemented a special system of psycho-pedagogical support. In the realization of this program has been involved the whole staff of the Centre and first of all school teachers.

The system of psychological and pedagogical support for children was developed due to:

- Medical institution specific character (separation children from family, the necessary combination of medical and educational processes, the regime of hospital stay, the terms of a new temporary group of children, etc.);
- The need to create a correct children's attitude toward the disease, which depends on many factors: the severity of the disease, limitation of movement, success of the treatment, age, temperament, maturity or immaturity of self-awareness, motivation sphere, sex, psychosocial development, family environment, parental perception of the disease.
- The efforts of the Center's entire team are aimed at creating the conditions that would help a child to cope with his problems, to reduce anxiety state and establish a positive emotionality.

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NADBYTEK SOLI ŠKODÍ DĚTEM I DOSPĚLÝM

JANDA JAN

Česká pediatrická společnost

Koncem listopadu 2013 proběhla v ČR podruhé masmediální akce pod shora uvedeným názvem, v anglické verzi **2nd Czech Salt Awareness Week 2013.** Následující text shrnuje podstatná data týkající se problematiky, která patří mimochodem mezi nejdůležitější úkoly navrhované a sledované WHO. To bylo i důvodem, že shora uvedená akce proběhla s podporou České kanceláře WHO, Ministerstva zdravotnictví a Státního zdravotního ústavu.

Ve vyspělých zemích je asi u 1/3 populace **zvýšený krevní tlak (hypertenze**), v ČR jsou poslední údaje ještě vyšší, např. u mužů je hypertenze přítomna asi u poloviny dospělých mužů a asi u 35 % dospělých žen. Nejčastější příčinou nemocnosti a úmrtí u dospělé populace jsou **choroby srdce a cév**, u nich **je hypertenze považována za jeden z nejvýznamnějších rizikových faktorů**.

Již dlouho je známý **vztah mezi zvýšeným příjmem soli a hypertenzí**. V historii lidstva byl příjem soli podstatně nižší než dnes (před více než 5 000 lety se pohyboval okolo 1g/osobu/den!). **Dnes se v ČR odhaduje příjem soli okolo 14–15 g soli/osobu a den**. Přitom Světová zdravotnická organizace **– WHO- doporučuje příjem okolo 5 g soli/den!**

A tak i u nás zbytečně vysoký příjem soli významně zvyšuje riziko komplikací hypertenze – především náhlých mozkových příhod **(mozková mrtvice),** méně, ale i tak významně, riziko srdečních koronárních příhod **(infarkt).** Rizikoví jsou především jedinci, u kterých je již významně krevní tlak (TK) zvýšen.

Počátky hypertenze je třeba hledat již v dětském věku, to je důvod, proč se dnes problematikou zabývají i pediatři! Studie provedené ve spolupráci mezi Zdravotně-sociální fakultou v Českých Budějovicích a Českou pediatrickou společností ukázaly, že zvláště u dorostenců obou pohlaví je často přítomen „vysoce normální" krevní tlak (dnes se používá rovněž názvu prehypertenze) nebo dokonce již jasná hypertenze. V obou případech je zvýšený TK často spojen s nadváhou nebo obezitou. Percentilové grafy pro hodnocení TK jsou součástí přílohy Zdravotního a očkovacího průkaze dítěte a mladistvého. Měřit krevní tlak u dětí a hlavně dorostu se doporučuje především v rodinách, kde je přítomna hypertenze u rodičů a prarodičů, event. sourozenců.

Studie provedené v ČR (Státní zdravotní ústav) prokázaly, že **u dospělých osob se konzumace soli dnes pohybuje okolo 14–15 g/den.** V Evropě je ještě vyšší spotřeba soli jen v Turecku (pokud bereme v úvahu, že část země je v Evropě), dále pak v Maďarsku, Chorvatsku a Makedonii. V řadě evropských zemí je ale spotřeba soli na osobu poloviční! Bohužel, v ČR i **u dětí**

denní příjem soli významně překračuje doporučené normy, platí to i u jedinců v prvních letech života. Naprostá většina dětské populace tedy dostává více soli, než je doporučeno. Zvýšená dodávka soli vyvolává pocit žízně a u dětí při dnešní oblibě různých nápojů typu „soft drinks" s vysokým obsahem cukru vede ke zvýšené kalorické dodávce a tím k nadváze až obezitě. **A obezita představuje vedle nadměrného příjmu soli další nezávislý rizikový faktor pro hypertenzi!**

Nejvíce soli přijímáme v potravinách, které kupujeme v obchodech (asi okolo 75 %, denní dodávky), možná překvapí, že značná část soli je např. obsažena v pečivu! Pouze menší dodávka je dána přídavkem soli při vaření a při dosolování jídel doma.

Příklady potravin se zvýšeným obsahem soli: šunka, uzeniny, polévky v prášku, čipsy, rohlíky a housky (zvláště posypané ještě navíc solí!), slané tyčinky, mandle, kukuřice, lupínky, řada sýrů (např. balkánský typ, niva, atd.). Také většina nabídek tzv. fast-foodů, které jsou tak oblíbené nejen u dospělých, ale i u dětí, nabízí produkty s vysokým obsahem soli. V poslední době se přece jen některé řetězce snaží dodávku soli redukovat (MacDonald údajně o 20 %). Řetězce také inzerují, že zákazník může požádat např. o nesolené hranolky, třeba pro dítě. Bylo by ale třeba to skutečně ověřovat, zprávy ze zahraničí uvádějí, že fast-foody uváděné množství živin a soli často neodpovídá skutečnosti.

Světová zdravotnická organizace (WHO) v poslední době intenzivně upozorňuje na problém vysoké konzumace soli ve vyspělých zemích. Žádá jednotlivé země, **aby na etiketách potravinářských výrobků byl standardně uváděn nejen obsah kalorií, podíl živin, ale i množství obsažené soli v gramech,** což podporuje samozřejmě i Evropská unie. Pokud je v označení uveden obsah sodíku v g nebo mg, je třeba jej násobit indexem cca 2,4, abychom se dostali ke gramům soli!

V řadě vyspělých zemí se **cílenými masmediálními kampaněmi podařilo snížit příjem soli a tím i riziko shora uvedených nemocí a jejich komplikací.** Mezi ty méně známé **komplikace provázející vysoký příjem soli patří i nádory žaludku, onemocnění ledvin a osteoporóza (řídnutí kostí).**

Naše pozvání k týdenní akci ***Nadbytek soli škodí dětem i dospělým*** pořádané Ministerstvem zdravotnictví a Českou kanceláří WHO poslední týden v listopadu 2013 přijal **profesor Graham McGregor (London),** který se problematikou hypertenze dlouhodobě zabývá. Organizuje kampaně upozorňující na zbytečně vysokou konzumaci soli ve Velké Británii (UK) i jinde ve světě: Consensus Action on Salt and Health (CASH) a World Action on Salt and Health (WASH). Cílenými kampaněmi podporovanými vládou se podařilo v UK snížit příjem soli na cca 8,1 g/osobu/den. Jeho přednáška v Lékařském domě měla název „**Blood Pressure and Salt: The Silent Killers – Time for Action"**.

Studie provedené v rámci Zdravotně sociální fakulty v Českých Budějovicích u dorostenců s vysoce normálním TK (**prehypertenzí**) ukázaly, že **lze i během krátké doby dietními opatřeními (tzv. DASH dieta) významně** TK **snížit.** Celosvětově se doporučuje tato dieta DASH **(**z anglického **Dietary Approach to Stop Hypertension = Dietními opatřeními zastavit hypertenzi).** Na internetu si můžete najít řadu odkazů, uvádíme jeden jako příklad:

http://www.tlukotsrdce.cz/vyziva-a-recepty/co-znamena-dieta-dash-aneb-jak-krotit-krevni-tlak-bez-pilulek.

Státní zdravotní ústav otevře brzy svou webovou stránku: **www.mene-solit.cz,** kde bude možno najít řadu dalších informací, včetně zpráv WHO, zkušeností s omezování konzumace soli ze zahraničí, atd.

SHRNUTÍ

Vysoký příjem soli v oblasti 14–15 g/osobu/den prokázaný v ČR nepochybně zvyšuje významně riziko hypertenze a tím i jejích komplikací, např. mozkové mrtvice a infarktu. Nejvyšší riziko je u jedinců, kteří již mají krevní tlak významně zvýšený.

Nadměrný příjem sodíku (natria), který tvoří 40 % složení kuchyňské soli, **je do určité míry vyvažován zvýšeným příjmem draslíku (kalia).** Draslík je obsažen především v zelenině a ovoci, tedy **diety typu DASH** zvyšují jeho dodávku a současně vedou k nižší kalorické dodávce, snižuje se tak i riziko obezity. **A obezita je dalším rizikovým faktorem hypertenze, stejně jako nedostatek pohybu, kouření a nadměrný konzum alkoholu.**

Zkušenosti ze zahraničí ukazují, že pokusy snížit v populaci vyspělých zemí příjem soli znamenají „běh na dlouhou trať". **Profesor Graham McGregor (London)** přednášel v Praze pro odborníky, ale účastnil se dne 26. 11. 2013 i tiskové konference, kterou vedl ministr MUDr. Martin Holcát, MBA. **McGregor ukázal, že kampaň cílená na laickou veřejnost a aktivní jednání s potravinářskými firmami za pomoci vlády a parlamentu ve Velké Británii vedly k významnému snížení konzumace soli.** Její spotřeba na osobu/den klesla z 9,5 to 8,1 g (pokles o 15 %), tedy na hodnoty skoro poloviční ve srovnání se současnou situací v ČR. Ve Velké Británii to znamená významné snížení rizika náhlých mozkových příhod (mrtvic) a koronárních příhod (infarktů).

Úkolem lékařů, odborníků na výživu, pracovníků ve veřejném stravování, rezortu ministerstva zdravotnictví, zemědělství, vlády a parlamentu ČR musí být v blízké budoucnosti především podpora snah o postupné snižování obsahu soli v komerčně dodávaných potravinách. To naší zemi doporučuje WHO a zkušenosti z Velké Británie ukazují, že lze snižovat obsah soli postupně. Naopak nárazové významné snížení soli v potravinách zvyšuje riziko, že populace zvyklá na vysoký příjem soli by takové potraviny jen těžko tolerovala, což by se samozřejmě výrobcům potravin vůbec nelíbilo.

Podstatné je i dlouhodobé informování laické veřejnosti, že sůl je sice životně důležitá, ale v přiměřeném množství a její současný konzum v ČR doporučené množství významně překračuje nejen u dospělých, ale i u dětí. Pediatři musí upozorňovat na to, že **pokud si dítě zvykne v útlém věku na zvýšený příjem soli, vzniká skutečně „závislost na slaném",** děti pak vyžadují vše, co je hodně slané, přesolené.

Přitom je třeba stále zdůrazňovat i **další rizikové faktory přispívající k hypertenzi** (která bohužel začíná již v době, kdy o jedince ještě pečují pediatři!) a řešit **vysoký výskyt nadváhy/obezity u dětí i dospělých, zvýšit pohybovou aktivitu a omezit kouření a nadměrnou konzumaci alkoholu**.

Na internetu mohou zájemci nalézt řadu sdělení o vztahu příjmu soli a TK.

Řada z nich zpochybňuje fakt, že zvýšený příjem soli vede k hypertenzi. K nedorozumění vede i fakt, že u některých jedinců skutečně zvýšený příjem soli ovlivňuje TK jen málo, také u zdravých TK klesá po omezení přívodu soli jen málo. Na druhé straně ale **řada studií prokazuje významný pokles krevního tlaku v případech, kdy tento je už zvýšený (hypertenze).**

A i zdánlivě malý pokles TK v rozsahu několika mmHg je již spojen s významným snížením rizika mrtvice a infarktu.

Metaanalytické studie ukázaly, že i kratší doba snížení příjmu soli o cca 4,5 g/den (u nás by to znamenalo konzum cca 10 g soli/osobu/den) může v budoucnu snížit riziko úmrtí na mrtvici o cca 14 % a riziko infarktu o cca 9 % u jedinců s již přítomnou hypertenzí, významně, i když méně, se snižuje i toto riziko u osob s normálním krevním tlakem. Sdělení publikované WHO v roce 2013 v renomovaném žurnálu BMJ konstatuje závěrem: **Je vysoce průkazné, že snížení příjmu sodíku (soli) snižuje krevní tlak a přitom nemá žádný nepříznivý vliv na hladiny krevních tuků, katecholaminů (ty naopak zvyšují krevní tlak) a ledvinných funkcí. Nižší příjem sodíku je spojen se snížením rizika náhlých mozkových příhod (mozková mrtvice) a fatálních koronárních příhod (infarkt).** Vzhledem k tomu, že v ČR je hypertenze přítomna téměř ve 45 % populace (u mužů skoro polovina populace, u žen „jen" asi 35 %), pak je logické, že téměř polovina populace může z omezení vysokého příjmu soli těžit.

A nakonec si je třeba položit následující otázky: desítky tisíc let ve vývoji lidské populace byl příjem soli nesmírně nízký, okolo 2 gramů/den. V této souvislosti je konzum těch 14–15 gramů soli/den v ČR údaj, který přece musí zarazit! V Evropě patří Češi v konzumaci soli mezi šampióny, i když nikoliv medailisty (viz výše). Přidáme-li k tomu fakt, že příliš mnoho soli vede k pocitu žízně, pak si uvědomte, co pijí Češi, zvláště muži (a kde jsme nepochybně na medailových pozicích, pokud už ne absolutními vítězi!) A děti pijí samozřejmě často přeslazené nápoje se zbytečnými kaloriemi, což vede k obezitě a ta zase k hypertenzi.

Naše pohádka Sůl nad zlato je pravdivá v tom, že bez soli by nebylo života, pro udržování životních procesů je nenahraditelná, ale přitom musí platit i zde – všeho s mírou! A tato míra je bohužel v České republice významně překračována a proto je logické, že nastal „time for action".

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Adresa autora:
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ZPRÁVA O ČINNOSTI ODBORNÉ SPOLEČNOSTI ORTOPEDICKO-PROTETICKÉ ČLS JEP V ROCE 2013

KRAWCZYK PETR

V roce 2013 se zástupci výboru Ortopedicko – protetické společnosti (OPS) ČLS JEP aktivně účastnili jednání pracovní skupiny MZČR pro přípravu kategorizace zdravotnických prostředků se snahou poukazovat na nedostatky a nesystémové změny v připravené právní normě tak, aby se chystané změny v úhradách zdravotnických prostředků, které plynou z připravované změny Zákona o zdravotnických prostředcích, co nejméně finančně dotkly pacientů.

Více než 2leté úsilí členů výboru OPS ČLS JEP prosadit postgraduální vzdělávání v oboru ortopedická protetika bylo úspěšné. Obor je zařazen mezi obory s nástavbovou atestací (novela vyhlášky č. 185/2009 Sb., o oborech specializačního vzdělávání lékařů, zubních lékařů a farmaceutů a oborech certifikovaných kurzů, ve znění vyhlášky č. 361/2010 Sb.). Nástavbová atestace je otevřena pro specialisty z oboru ortopedie, chirurgie, rehabilitace, neurologie a úrazové chirurgie. V současné době je připraven pro lékaře vzdělávací program zahrnující veškeré oblasti ortopedické protetiky.

Odborná vzdělávací činnost naší odborné společnosti je realizována od roku 2003 v úzké spolupráci se Společností pro pojivové tkáně ČLS JEP. Spolupracujeme na vydávání odborného recenzovaného časopisu Pohybové ústrojí – pokroky ve výzkumu, diagnostice a terapii a podílíme se na přípravě tradičních odborných symposií. V roce 2014 se bude konat již 19. Kubátův den v Praze a mezinárodní The 16th Prague-Lublin-Sydney-St. Petersburg Symposium v polském Lublinu (viz www.pojivo.cz).

V říjnu a listopadu 2013 proběhly volby nového výboru Ortopedicko – protetické společnosti ČLS JEP.

Do výboru OPS ČLS JEP byli zvoleni:

MUDr. Petr Krawczyk – předseda
MUDr. Jiří Vosátka – místopředseda
Doc. MUDr. Ivo Mařík, CSc. – vědecký sekretář
MUDr. Jiří Hrabák – pokladník
MUDr. Karel Čížek – člen výboru
MUDr. Václav Roubíček – člen výboru
MUDr. Ivan Hadraba ml. – člen výboru

Členové revizní komise OPS ČLS JEP:

MUDr. Aleš Mareček – předseda revizní komise
MUDr. Vlastimil Kousal – člen revizní komise
MUDr. Alena Maříková – členka revizní komise

Cílem výboru OPS ČLS JEP pro nadcházející období je aktivní odborné ovlivňování nových norem, které budou připravovány na MZ ČR. Neméně důležitým úkolem je postgraduální vzdělávání lékařů v ortopedické protetice tak, aby se preskripce zdravotnických prostředků odvíjela od racionálního zhodnocení zdravotního stavu pacienta se stanovením adekvátního funkčního požadavku na pomůcku.

Na spolupráci se za výbor OPS ČLS JEP těší

MUDr. Petr Krawczyk
e-mail: : petr.krawczyk@seznam.cz

INFORMACE O SPOLEČNOSTI PRO POJIVOVÉ TKÁNĚ ČLS J. E. PURKYNĚ (SPT)

Vážená paní kolegyně, vážený pane kolego,

dovolujeme si Vás informovat o možnosti stát se členem **Společnosti pro pojivové tkáně** *(SPT),* která v roce 2004 navázala na plodnou desetiletou činnost Společnosti pro výzkum a využití pojivových tkání vedenou panem prof. MUDr. M. Adamem, DrSc. Posláním *SPT* je podpora rozvoje výzkumu pojivových tkání, šíření nových poznatků týkajících se všestranných analýz tkání z obecného pohledu, moderních klinických přístupů k diagnostice a léčbě. Dalším posláním *SPT* je usnadnění styků mezi jednotlivými odborníky navázáním spolupráce s různými vědeckými, odbornými, výrobními a farmaceutickými společnostmi. Vědecké poznání a aplikace nejnovějších poznatků v klinické praxi nabyly v posledních letech nebývalého zrychlení, a to nejenom v zahraničí, ale i u nás. Tato skutečnost bezprostředně souvisí s kvalitativním rozvojem poznání i v nebiologických vědách a v moderních inženýrských přístupech. Stále více se prokazuje, že vše se vším souvisí – není náhodou, že nové poznatky a objevy vznikají na rozhraní oborů a různých vědních disciplin. Lidská společnost v posledních desetiletích dosáhla nové civilizační kvality – ve vědě a v jejich aplikacích zcela jistě, avšak v morálce a etice ne tak příliš. Biomedicína je v současné době rozsáhlou interdisciplinární vědou, která bez kooperace s jinými vědními obory by byla odsouzena ke stagnaci. Proto cílem *SPT* je nejenom integrovat odborníky v biomedicíně, ale i v technických sférách.
Prioritní snahou *SPT* je presentovat odborné veřejnosti a specialistům v klinické praxi nejnovější poznatky v oblasti pojivových tkání. *SPT* je i společenskou organizací klinických pracovníků, vědců, pedagogů, která si klade za cíl společensky sblížit nejenom pracovníky v aktivní službě, ale i kolegyně a kolegy v důchodovém věku a v neposlední řadě i studenty a mladé doktorandy z vysokých škol, universit a akademických ústavů.
SPT bude organizovat během každého roku alespoň dvě odborná a společenská setkání, kde vedle odborných přínosů bude kladen důraz také na společenské – přátelské diskuse všech vás, kteří nechtějí stagnovat, a kteří nechtějí přemýšlet o nových poznatcích izolovaně a osamoceně.
Pro uhrazení nejzákladnějších nákladů na korespondenci se členy společnosti, jejich informovanost a pořádání odborných kolokvií, symposií a společenských odborných setkání byl stanoven **roční členský příspěvek pro aktivní kolegyně a kolegy 200 Kč** a **pro studenty a důchodce 100 Kč.**
SPT vydává časopis *Pohybové ústrojí – pokroky ve výzkumu, diagnostice a terapii,* do kterého se i vy můžete aktivně zapojit odbornými články, vašimi zkušenostmi a slunečnou pohodou. **Předplatné časopisu** je **300 Kč ročně,** pro zahraniční odběratele **12 Euro.**
Milí kolegové, nestůjte (pro katastrofální nedostatek času) opodál a připojte se k české inteligenci – v oblasti pojivových tkání, ke které i Vy zcela jistě patříte. V naší krásné české zemi je třeba, aby prameny poznání byly stále živé a permanentně udržované. Poslání každého z nás není náhodné. Jsme velice zavázáni našim předkům, kteří rozvíjeli kvalitu odbornosti v naší zemi. Nepřipusťme útlum vědy u nás. Nenechme se zmanipulovat programovanou lhostejností, vyrůstající z neodbornosti, závisti a z patologického prosazování ekonomicko-mocenských zájmů.

Těšíme se na Vás a na Vaše zkušenosti – přijďte mezi nás!

Za výbor společnosti:
Doc. MUDr. Ivo Mařík, CSc. – předseda
Prof. Ing. Miroslav Petrtýl, DrSc. – místopředseda
Prof. MUDr. Josef Hyánek, DrSc. – místopředseda
Ing. Hana Hulejová – jednatel
Ing. Jana Zelenková – pokladník

PŘIHLÁŠKA

řádného člena

Společnosti pro pojivové tkáně ČLS JEP

Příjmení ..... **Jméno** .....

Titul(y) .....

Datum narození ..... **Rodné číslo** .....

Adresa pracoviště .....

..... **PSČ** ☐☐☐ ☐☐

Telefon ..... **Fax** .....

Adresa bydliště .....

..... **PSČ** ☐☐☐ ☐☐

Telefon ..... **Mobil** .....

E-mail .....

Přihlašuji se za řádného člena Společnosti pro pojivové tkáně ČLS JEP (odborná společnost 1200) a souhlasím s posláním a cíli České lékařské společnosti J. E. Purkyně.

Datum ..... **Podpis** .....

Stanovisko organizační složky:

Přijat dne ..... **Podpis** .....

Přihlášku do společnosti doručte na adresu:

Společnost pro pojivové tkáně ČLS JEP, Olšanská 7,
130 00 Praha 3, ČR, tel./fax: 222 582 214, e-mail: ambul_centrum@volny.cz

Informace uvedené na tomto formuláři jsou přísně důvěrné a nebudou poskytnuty žádné další osobě ani organizaci.

INFORMATION ABOUT SOCIETY FOR CONNECTIVE TISSUES CMA J. E. PURKYNĚ (SCT)

Dear Sir/Madam, dear Colleagues,

We have great pleasure to inform you about the possibility of joining the **Society for Connective Tissues** (SCT) that was established in 2004 in order to continue the ten-year fruitful activities of the Society for Research and Use of Connective Tissue headed by Professor M. Adam, MD, DSc. The activities of the SCT are aimed at supporting the research development in the field of connective tissues, the dissemination of knowledge related to the all-purpose analyses of the tissues in general, and the application of the up-to-date approaches to the diagnostics and clinical practice. Further, the SCT is determined to facilitate contacts between the respective specialists by means of collaboration with various research, professional, production and pharmaceutical companies.

In the last few years, the scientific knowledge and the application of the latest findings in the clinical practice have accelerated on an unprecedented scale, not only abroad, but also in this country. This fact is closely connected with the qualitative development of the knowledge in the non-biological sciences and in the up-to-date engineering approaches. The fact that all things are mutually connected is becoming more and more evident. It is fairly obvious that the new knowledge and discoveries arise on the dividing line between the different fields and disciplines of science. In the last few decades, the human society has reached the new qualities of civilization. This applies, in particular, for the disciplines of science and their applications; however, this statement can hardly be used with reference to the moral and ethical aspects of the human lives. At present, the biomedical science is a wide-ranging interdisciplinary science which, in case of lack of cooperation with other scientific disciplines, would be condemned to stagnation. That is the reason why the SCT is aimed at integrating the specialists both within the biomedical science and within the engineering fields.

The priority objective of the SCT is to present the professional public and specialists involved in the clinical practice with the latest knowledge in the field of connective tissues. The SCT is also a civic society whose aim is to bring people close together by joining members of the clinical staff, researchers and teachers including the retired ex-colleagues and, last but not least, the undergraduates and PhD students from universities and academic establishments.

The SCT is planning to organize at least two professional and social meetings each year. Beside the professional contribution of these meetings, emphasis will be laid on social activities – informal discussions of all those who do not want to stagnate and who do not want to acquire the new knowledge in solitary confinement.

The annual membership fee is 200 Czech crowns for full workers, and 100 Czech crowns for students and pensioners. This membership fee shall be used to cover the basic costs on correspondence with the members of the Society in order to inform them about organizing colloquiums, symposiums and social meetings.

The SCT is also engaged in publishing of the interdisciplinary journal entitled *Locomotor System – Advances in Research, Diagnostics and Therapy*. You are invited to contribute to the journal writing professional articles, exchanging experience or, simply sharing your opinions. **The annual subscription is 300 Czech crowns, for foreign subscribers 12 euros** (incl. shipping).

Dear Colleagues, do not stand aside (suffering from terrible lack of time) and join the professional people in the field of connective tissues to whom you undoubtedly belong. In this beautiful country, the sources of knowledge should be kept alive

and maintained permanently. Our role in this process is not accidental. We are much obliged to our ancestors who had developed the qualities of proficiency in this country. Do not allow the decline of science. Do not let the programmed indifference arising from lack of professionalism, enviousness, and pathological promotion of economic and power interests manipulate us.
We are looking forward to meeting you. We will be pleased if you join us and share your experience with us.

On behalf of the committee of the Society for connective tissues:

Associate Professor Ivo Mařík, MD, PhD – chairman
Professor Josef Hyánek, MD, DrSc – vice-chairman
Professor Miroslav Petrtýl, MSc, DrSc – research secretary
Hana Hulejová, MSc – secretary
Jana Zelenková, Eng. – treasurer

Společnost pro pojivové tkáně ČLS J.E. Purkyně
&
Odborná společnost ortopedicko-protetická ČLS J.E. Purkyně

Vás srdečně zvou na symposium

19. KUBÁTŮV PODOLOGICKÝ DEN
PORUCHY RŮSTU, MEZIOBOROVÝ POHLED

Symposium se koná 7. a **8. března 2014 v Lékařském domě v Praze 2, Sokolská 31.**

Přihlášky k aktivní účasti (včetně členěného abstrakta práce v elektronické podobě) zašlete do **8. února 2014** na adresu organizátora.

Kontaktní adresa organizátora:
Doc. MUDr. Ivo Mařík, CSc.
Ambulantní centrum pro vady pohybového aparátu s.r.o.
Olšanská 7, 130 00 Praha 3,
tel.: +420 222 582 214, e-mail: ambul_centrum@volny.cz

Registrační poplatek 300,– Kč bude uhrazen při registraci. Program a abstrakta přednášek uveřejněná v Supplementu časopisu „Pohybové ústrojí 1–2/2014“ budou uveřejněna v digitální formě na www.pojivo.cz

Society For Connective Tissues CMA J.E. Purkynje
&
Society for Prosthetics and Orthotics CMA J.E. Purkynje
&
Czech Society of Biomechanics
&
Czech Medical Association J.E. Purkynje
&
Medical University of Lublin
&
Vincent Pol University in Lublin
&
Children's Rehabilitation Center of Orthopaedics and Traumatology Ogonyok

invite you for

THE 16TH PRAGUE-LUBLIN-SYDNEY-ST. PETERSBURG SYMPOSIUM

DISORDERS OF GROWTH AND DEFECTS OF GROWTH EPIPHYSIS

The Symposium will be held on 21st–25th September 2014
in the Military University's Hospital, Lublin, Poland

Registration Form should contain: Name with titles, Address, Phone, E-mail, indicate active or passive participation. Abstract form with key words and structured text (try to provide objectives, methods, results and discussion).

Conference fee 10 Euros will be paid during registration.

Deadline for Abstract Submission: May 31, 2014.

Both Forms submit by E-mail to the Secretary of the Symposium:
Assoc. Prof. Ivo Marik, MD, PhD, e-mail: ambul_centrum@volny.cz
Assistant Professor Jacek Karski MD PhD, Medical University in Lublin, Lublin, Poland,
E-mail: jkarski@vp.pl

ŽIVOTNÍ JUBILEA
ANNIVERSARIES

Professor Michael Charles Bellemore, F.R.A.C.S. - sexagenarian

Michael Bellemore is a senior orthopaedic surgeon at The Children's Hospital at Westmead in Sydney, Australia. He studied Medicine at the University of New South Wales graduating in 1977. He trained to be an orthopaedic surgeon in Sydney 1980 – 1984. Part of this training was at The Children's Hospital where he was inspired to pursue a career in paediatric orthopaedic surgery. To achieve this goal he spent 2 years overseas undertaking further training. In 1985 he was a Clinical Fellow at The Hospital for Sick Children in Toronto, Canada. He was privileged to work with Professor Robert Salter developing expertise in the treatment of many paediatric musculo-skeletal disorders, especially developmental dysplasia of the hip. In 1986 he was a Clinical Fellow at the Hospital for Sick Children in Bristol, UK. Whilst in Bristol he learnt further techniques including hip ultrasonography which he introduced as a screening tool for babies when he returned to Sydney in 1987.

He has been a specialist orthopaedic surgeon on the staff of The Children's Hospital from 1987 till the present time. From 2003 till 2010 he was Head of the Department of Orthopaedic Surgery. He also works at Westmead Private Hospital and Strathfield Private Hospital.

Professor Michael Bellemore together with Professor Kazimierz Kozlowski established the first Prague-Sydney meetings in the Department of Orthopaedic Surgery in The Children's Hospital at Westmead in Sydney in years 1997 and 1999. In 2000 The 1st Prague-Sydney Symposium was held in Prague in the Department of Anthropology, The faculty of Science, Charles University in Prague in cooperation with Associate Professor Dr. Ivan Mazura, PhD. Honorary guest of The Symposium was Professor Kazimierz Kozlowski. In

2001 Michael Bellemore was adopted as a new member of the International Editorial Board of the journal "Locomotor system – advances in research, diagnostics and therapy". In the same year he took part in The 2nd Prague-Sydney Symposium in Prague National Museum, he presented outstanding lectures on his experience with leg lengthening and surgical treatment of osteogenesis imperfecta. Later he gave his outstanding lecture "Osteogenesis imperfecta: where are we at in 2007?" at the Scientific Conference in Prague Domus medica (12th October 2007) and he was awarded by the Diploma and the Medal of Honorary Membership of the Society for Connective Tissues Czech Medical Association J.E.Purkynje.

By the name of members of the Editorial Board of the journal "Locomotor System" and by the name of the Committee members of the Society for Connective Tissues Czech Medical Association J.E.Purkynje I sincerely wish Professor Michael Bellemore on the occasion of his 60th anniversary good health, personal fulfilment and further scientific success.

CURRICULUM VITAE

1. PERSONAL DETAILS

Name: Michael Charles Bellemore
Address: Suite 3, Children's Hospital Medical Centre
Hainsworth Street, Westmead NSW 2145, Australia
Contact: Telephone: +61 2 9893 7394
E-mail: mbellemore@michaelbellemore.com
www.michaelbellemore.com

2. QUALIFICATIONS

Undergraduate M.B., B.S. (Hons)
University of New South Wales 1977
Postgraduate Fellow Royal Australasian College of Surgeons 1985

3. ACADEMIC AWARDS

1970 – Commonwealth Scholarship, University of New South Wales
1985 – Zimmer Travelling Fellowship
1988 – Inaugural Research Fellowship, Australian Orthopaedic Association
1993 – Diploma in Management for Clinicians
2003 – Best Lecturer, Diploma of Child Health Course
2013 – Excellence in Teaching CHW Clinical School, University of Sydney.

Professor Michael Bellemore, F.R.A.C.S. and Professor Jaroslav Blahoš, M.D., D.Sc. – president of the Czech Medical Association J.E. Purkynje after the Scientific Conference in Prague Domus medica (12th October 2007).

4. POSITIONS

Fellowships

1985 – Clinical Fellow in Orthopaedic Surgery, The Royal Alexandra Hospital for Children, Sydney

1985–86 – Clinical Fellow in Orthopaedic Surgery, The Hospital for Sick Children, Toronto, Canada

1986–87 – Clinical Orthopaedic Fellow, The Royal Bristol Hospital for Sick Children, Bristol, England

University Appointments

1987 – Senior Clinical Lecturer, Sydney University
2011–12 – Senior Clinical Lecturer, University of Notre Dame, Sydney
2012 – Adjunct Clinical Associate Professor, University of Notre Dame, Sydney.

Hospital Appointments

1987–89 – Consultant Orthopaedic Surgeon, The Lewisham Institute of Sports Medicine
1987–94 – Senior Staff Specialist, Department of Orthopaedic Surgery, The Children's Hospital
1994 – Visiting Medical Officer Department of Orthopaedic Surgery, The Children's Hospital at Westmead
2003–10 – Head of the Department of Orthopaedic Surgery, The Children's Hospital at Westmead.
1990 – Visiting Medical Officer Department of Orthopaedic Surgery, Strathfield Private Hospital
2001 – Visiting Medical Officer Department of Orthopaedic Surgery Westmead Private Hospital

Some participants of the Scientific Conference in 2007 – from the left: Professor Eng. Miroslav Petrtýl, D.Sc., Professor Ctibor Povýšil,M.D., D.Sc., RNDr. Daniela Zemková, Ph.D., Professor Michael Bellemore F.R.A.C.S., Olga Maříková, M.D., Ph.D., Assoc Professor Ivo Mařík, M.D., Ph.D, Professor Eng. František Maršík, D.Sc., Professor Eng. Stanislav Otáhal, Ph.D.

5. PROFESSIONAL SOCIETIES

Royal Australasian College of Surgeons
Australian Orthopaedic Association
Canadian Society of Orthopaedic Technologists (Life Member)
Australian Society for Limb Lengthening and Reconstruction
Australian Society of Orthopaedic Surgeons
Australian Paediatric Orthopaedic Society – President 2011 – 2013
Society for Connective Tissues Czech Medical Association J.E.Purkynje, Czech Republic

6. TEACHING

University of Sydney – Graduate Medical Program, Senior Clinical Lecturer
University of Notre Dame, Australia – Graduate Medical Program, Adjunct Clinical Associate Professor
The Children's Hospital at Westmead – Graduate and Post-graduate medical programs, Diploma of Child Health Course
Australian Orthopaedic Association – Registrar Training Program, Lecturer and Clinical tutor
Australian Paediatric Orthopaedic Society – Convenor Annual Scientific Meeting 1999, 2012, ASM paper presentations
Invited Lecturer – Australian Orthopaedic Association COE Meeting, "Update in Paediatric Orthopaedics", Convenor: M C Bellemore, 1992 Sydney.

Prague-Sydney Orthopaedic Symposium
Ambulant Centre for children with Locomotor Defects, Prague, Czech Republic May 2001

Australian Orthopaedic Association COE Meeting
"Hips for All Ages", 2004 Sydney.

First Australian Ponseti Method Conference
Royal Children's Hospital , Brisbane, 16–17th October 2006

Paediatric Orthopaedic Seminar
Hamburg, Germany, 10th October 2007

Scientific Conference
Society for Connective Tissues, Prague, Czech Republic, 12th October 2007

Second Australasian Ponseti Method Conference
Conveners: M C Bellemore and P Gibbons, Darling Harbour Convention Centre, Sydney 15–16th February 2008

Third Australasian Ponseti Method Conference
Adelaide, 26–27th February 2010

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Professor Michael Bellemore with his son Jeremy Bellemore, a biomedical engineer, who was graduated from Medicine in 2012

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ŽIVOTNÍ JUBILEA
ANNIVERSARIES

Prof. JUDr. Ing. Viktor Porada, DrSc, dr. h. c. mult. – sedmdesátiletý

V srpnu roku 2013 oslavil významný kriminalista, pedagog, vědec, rektor Vysoké školy Karlovy Vary prof. JUDr. Ing. Viktor Porada, DrSc. Dr. h. c. významné životní výročí 70 let.

Prof. Viktor Porada se narodil 7. srpna 1943 v Popradu jako nejstarší z 6 dětí. V roce 1961 ukončil studium na Střední průmyslově škole elektrotechnické v Košicích. Poté začal studovat na Fakultě elektrotechnické ČVUT v Praze, v roce 1966 úspěšně ukončil vysokoškolské studium a získal titul inženýr. V roce 1968 vstoupil do služeb Federálního ministerstva vnitra, kde nejprve začal pracovat jako samostatný energetik a revizní technik. Po ukončení své sportovní kariéry v roce 1969 začal pracovat jako metodik sportu na

Tělovýchovném odboru FMV. V roce 1969 začat také studovat Trenérskou školu Fakulty tělesné výchovy a sportu UK v Praze, kterou úspěšně dokončil v roce 1972 ve specializaci sportovní gymnastika. Ve funkci metodika sportu vydržel do roku 1971, poté nastoupil do Kriminalistického ústavu v Praze jako samostatný expert v oboru kriminalistické elektrotechniky, kde pracoval do roku 1974. V roce 1974 nastoupil na Fakultu veřejné bezpečnosti Vysoké školy SNB v Praze. V letech 1974 až 1976 současně také učil na Právnické fakultě UK v Praze v kriminalisticko-právním směru studia. V té době studoval Fakultu veřejné bezpečnosti VŠ SNB, kterou úspěšně dokončil a navázal vědeckou aspiranturou, kterou úspěšně dokončil v roce 1978 a získal vědeckou hodnost kandidáta právních věd. Následně v roce 1980 získal na Právnické fakultě UK v Praze titul doktora práv. V roce 1981 se úspěšně habilitoval na docenta pro obor trestní právo. V tomto období se prof. Porada intenzivně věnoval vědecko-výzkumné a publikační činnosti hlavně v oblasti kriminalistických stop a kriminalistické identifikace. V roce 1976 založil nový směr vědeckého bádání týkající se nových zkoumání tzv. biomechanického obsahu trasologických stop.

Postupně se prof. Poradovi podařilo na základě spojení vědomosti a poznatků z matematiky, biomechaniky, kriminalistiky a práva, definovat tzv. biomechanický obsah trasologických stop, provést jeho kvantifikaci pro potřeby znaleckého zkoumání a využívání získaných informací v procesu odhalování, ale hlavně dokazování trestné činnosti podle stop s biomechanickým obsahem. Vznikl úplně nový obor znalecké činnosti nazývaný forenzní biomechanika.

Intenzivní vědecko-výzkumná činnost logicky vyústila do práce nad doktorskou dizertační prací „Teorie kriminalistických stop a identifikace“, kterou obhájil v roce 1985 a byla mu udělena vědecká hodnost doktora právních věd. V letech 1985 až 1990 se stal prof. Porada za svojí vědeckou činnost členem vědeckého kolegia mechaniky ČSAV, členem komise pro biomechaniku vědeckého kolegia pro mechaniku ČSAV a členem Československé (následně České) biomechanické společnosti a členem Národní skupiny Mezinárodní biomechanické společnosti při ČSAV. Následně byl jmenován za místopředsedu Rady pro organizaci vědeckých společností ČSAV. V roce 1987 mu byla udělena medaile „Za zásluhy o rozvoj mechaniky“ Československé společnosti pro mechaniku při ČSAV a v roce 1988 byl odměněný medailí „20 roků výzkumu umělého srdce“ Lékařskou fakultou UJEP v Brně. Prof. Porada byl zodpovědným řešitelem a koordinátorem státního plánu základního výzkumu ČSAV, zodpovědným řešitelem a spoluřešitelem rady vědecko-výzkumných úloh rezortního a institucionálního charakteru

V roce 1989 byl navržen za člena korespondenta ČSAV a na národní cenu ČSR za zásluhy o rozvoj vědy v oblasti kriminalistické biomechaniky. Dosažené výsledky výzkumné a vědecké práce prof. Porady byly zařazeny do publikace „Biomechanika“ pod redakcí akademika Jaroslava Valenty, vědecká monografie byla zaměřená na vybrané okruhy současné světové biomechanické pokroky. Vědecké pokroky a nové poznatky prof. Porady a současné jeho působení jako vedoucího katedry a prorektora pro vědu a výzkum vyústily v roce 1989 k jeho jmenování prezidentem republiky za profesora v oboru kriminalistika.

Ve vědecké orientaci ho výrazně ovlivnili prof. JUDr. Ján Pješčak, DrSc., zakladatel moderní kriminalistické vědy v ČSSR a prof. PhDr. Vladimír Karas, DrSc., vedoucí katedry anatomie, biomechaniky a antropometrie FTVS UK v Praze.

V roce 1990 se prof. Porada stal krátce vedoucím sekce kriminalistiky na Institutu pro výchovu a vzdělávání FMV. V roce 1992 se profesně přesunul na Slovensko a byl ministrem vnitra SR pověřený založit Akademii Policajného zboru v Bratislavě, akademie byla v roce 1992 úspěšně založena společně s Kriminalistickým a expertizným ústavem. Současně se stal vedoucím katedry kriminalistky a forenzních disciplín. Akademickým senátem byl jednomyslně zvolen za prvního rektora A PZ.

V roce 1994 se prof. Porada vrátil do Prahy a byl v konkurzním řízení přijat na Policejní akademii ČR v Praze, na katedru kriminalistiky, kde působil jako profesor kriminalistiky až do roku 2000. Poté byl pověřen řízením vědy a výzkumu a výrazně se podílel na tvorbě nového vědeckého zaměření PA ČR a tvorbě institucionálního výzkumného záměru. V letech 2002 až 2006 působil jako člen Akademického sněmu Akademie věd ČR a v letech 2007–2010 ve Sněmu Rady vysokých škol.

Začátkem roku 2006 byl přijat na Vysokou školu Karlovy Vary, kde se stal vedoucím Katedry trestního práva, kriminalistiky a forenzních disciplín, současně vykonával funkci ředitele Ústavu kriminalistiky a forenzních disciplín (2006–2008) a prorektora pro vědu a výzkum (2006–2010). V roce 2010 byl jmenován rektorem Vysoké školy Karlovy Vary, v této funkci je dodnes.

Jako akademický pracovník je velmi žádaný na jiných vysokých školám právního nebo bezpečnostního charakteru. Přednášel na Právnické fakultě UP v Olomouci (v letech 2007 až 2010 zde garantoval výuku kriminalistiky), dále na Vysoké škole bezpečnostného manažérstva v Košicích (garantoval předměty kriminalistika a všeobecné otázky bezpečnostní teorie a praxe). Prof. Porada působí jako profesor na Fakultě práva Panevropské vysoké škole v Bratislavě, na Ústavu veřejného práva, kde garantuje výuku kriminalistiky. Od roku 2013 je členem vědecké rady této vysoké školy.

Prof. Porada externě působí bud jako hostující profesor nebo ad hoc přednášející na – Ústavu soudního inženýrství a Fakultě špeciálneho inžinierstva Žilinskej univerzity v Žiline, Ústavu súdneho inžinierstva VUT v Brně, Vojenském ústavu soudního lékařství ÚVN v Praze, Právnické fakultě UPJŠ v Košicích, Akademii Royal Canadian Mounted Police v Kanadě, Středoevropské policejní akademii ve Vídni, Federální policejní akademii v Münsteru, Gimbornu a Policejní akademii Fürstenfeldrucku (SRN).

Prof. Poradovi byl udělen čestný titul „doktor honoris causa“ na dvou vysokých školách, v roce 2002 na Akademii Policajného zboru v Bratislavě a v roce 2009 na Vysoké škole bezpečnostného manažérstva v Košicích.

Vědecká práce prof. Porady je velmi široká, obsáhlá a podrobný souhrn všech vědeckých aktivit by vydal na jedno celé číslo tohoto časopisu. Vědecká práce se prolíná celým životem profesora Porady „jako červená nit“. Vědecké úspěchy jsou podloženy jednak jeho vrozeným talentem pro vědu, neutuchajícím zájmem a nesmírnou pracovitostí. Tak jako ve sportu, ani ve vědecké činnosti se nedosáhne úspěchu bez každodenní vytrvalé a cílevědomé práce. Dovolím si zmínit alespoň některé významné vědecké aktivity prof. Porady.

Celoživotně se prof. Porada věnuje rozvoji kriminalistické teorie a praxe, zaměřuje se na teoretické otázky kriminalistických stop a identifikace. Již v roce 1987 napsal vědeckou monografii Teorie kriminalistických stop a identifikace (doktorská dizertační práce), ve které položil základy moderního pojetí kriminalistických stop a teorie kriminalistické iden-

tifikace. Kriminalistické stopy analyzoval z nových perspektivních pohledů, např. definovat teorii stopového kontaktu z pohledu přenosu energie, definoval vznik kriminalistických stop jako důsledek teorie relace, objasnil entropii informace a její důsledky na kriminalistickou identifikaci atd. Je zakladatelem nové teorie identifikace systémů (systémové identifikace) a teorie digitálních stop. Nové, moderní a progresivní poznatky a teorie se nesetkaly u všech teoretiků kriminalistů s pozitivním přijetím. Často musel trpělivě obhajovat svá tvrzení a pouštět se do vědecké konfrontace poznatků. On vždy chápal takové „souboje" velmi pozitivně a vždy tvrdil, že jen konflikt různých pohledů na akademické platformě posunuje poznání kriminalistických problémů vpřed.

Prof. Porada založil nový pohled na trasologické stopy jako projev dynamického stereotypu, nejprve se věnoval výzkumu biomechanického obsahu trasologických stop bipedální lokomoce a v posledních 10 letech zcela logicky přesunul vědeckou aktivitu na identifikaci osoby podle dynamického stereotypu chůze. Výsledky jeho exaktního výzkumu vytváří jedinečný základ pro využití ve znalecké praxi. Velmi aktivně se věnuje rozvoji metodologie policejních věd, jeho dosažené výsledky jsou velmi příznivě přijímané nejen u nás, ale i v zahraničí.

V průběhu dosavadní vědecké práce byl zodpovědným řešitelem nebo spoluřešitelem mnoha vědeckých projektů a to jak rezortního, tak institucionálního charakteru, celkem úspěšně obhájil 12 výzkumných úloh.

Prof. Poradu patří k našim předním forenzním vědcům, významné špičce v oboru kriminalistika, forenzní biomechaniky, policejních věd a trestního práva. Je zakladatelem nových směrů výzkumu v kriminalistice a forenzní biomechanice. Publikačně je velmi aktivní, je autorem a spoluautorem kriminalisticky zaměřených publikací (57 monografií, 36 učebnic) a přibližně 550 dalších odborných článků v domácí i mezinárodní vědecké literatuře. Viktor Porada patří k významným průkopníků kriminalistické vědy, převážná část jeho vědecké produkce spadá do konce 90. let 20. století a začátku 21. století. Z nejvýznamnějších děl jen vybírám monografii „Teorie kriminalistických stop a identifikace", kterou vydala ČSAV v roce 1987, dále monografii „Silniční dopravní nehoda v teorii a praxi" (2000), "Biomechanics" (1985, 1993, 2004), či „Biomechanics aspects of general and forensic biomechanics" (2002, 2003, 2004) napsané spolu s Jaroslavem Valentou a Jiřím Strausem, Kriminalistická trasologie (2004) a Kriminalistická daktyloskopie (2005) ve spoluautorství s Jiřím Strausem.

Z nejvýznamnějších publikací posledních let mohu jmenovat např. „Kriminalistika" (2001), Kriminalistika (2007 – SR), vědecké monografie „Identifikace podle dynamického stereotypu chůze" (2008 – SR, 2010), vědecké monografie „Policejní vědy" (2011) a „Policejní vědy – úvod do teorie a metodologie" (2011 – SR) a „Kriminalistické stopy" (2013). Na některé z nich bylo zaznamenáno množství pozitivních ohlasů, např. z Mie University – Japonsko, Columbia University in the City of New York – USA, Akademie věd – Bulharsko, International Society of Biomechanics – Belgie, Katholike Universiteit Nijmagen – Norsko, Trent Polyttechnic Nottingham – V. Británe, Journal of Biomechanics – Belgie, Ergonomics and Clinical Biomechanics, Spinal Reserch Unit, University of Huddersfield – V. Británie, Orofacial Pain, University of Integrated Studies – USA, Human Factors and Ergonomuics Society, California – USA.

Výsledky výzkumu pravidelně prezentuje na špičkových konferencích ENFSI (European network of Forensic Science Institutes), 2003 Istanbul (Turecko), 2006 – Helsinky (Finsko), 2009 – Glagow (UK), 2012 Hagg (Holandsko).

Prof. Porada je uznávaným vědcem i v zahraničí, je pravidelným účastníkem pracovních setkání, stáží a seminářů zahraničních konferencí s tématikou kriminalistika a forenzní vědy a teorii a metodologii kriminalistické vědy a forenzní biomechaniky. Je šéfredaktorem periodika Karlovarská právní revue, členem redakčních rad časopisů Soudní inženýrství, Znalectvo (SR), Notitiae ex Academia Bratislavensi Iurisprudentiae (SR), Košická Bezpečnostní revue (SR). Je též členem České biomechanické asociace a Prezidentem Akademie forenzních věd v ČR, členem vědeckých akademických rad mnoha vysokých škol.

Pocta prof. Poradovi u příležitosti jeho životního výročí se uskutečnila (19. 9. 2013) mezinárodní vědecká konference na Fakultě práva Panevropské vysoké škole v Bratislavě, kde vystoupilo s příspěvkem mnoho významných kriminalistů, právníků, forenzních vědců. Z konference byla vydána vědecká monografie s názvem „Trestné právo, kriminalistika, bezpečnostné vedy a forenzné disciplíny v kontexte kontroly kriminality". V autorském kolektivu je 19 profesorů, 22 docentů, významných odborníků práva, kriminalistiky a forenzních věd z České a Slovenské republiky, Polska a Ukrajiny.

Na závěr bych velmi rád zmínil, myslím všeobecně známou skutečnost, že v dobách aktivního sportování v gymnastice se stal Viktor Porada modelem známé sochy maratonce v Košicích, sochu vytvořil národní umělec Arpád Račko.

Profesor Porada má do dnešních dnů rád sport, osobně mohu „prozradit" že rád posiluje a cvičí každý den, ještě před několika lety pravidelně běhal a systematicky sportoval. A právě sportovní vytrvalost mu dodává energii a sílu do překonávání dennodenních překážek.

Prof. Porada je svojí životní energií a širokým vědeckým záběrem inspirací pro mnoho kolegů. Profesoru Viktorovi Poradovi přejeme trvalé zdraví, entuziasmus jemu vlastní, nepřestávající, neutuchající energii a hodně spokojenosti v osobním životě.

Za redakční radu časopisu Pohybové ústrojí – pokroky ve výzkumu, diagnostice a terapii a Společnost pro pojivové tkáně ČLS JEP

Prof. Phdr. Jiří straus, DrSc.
a
doc. MUDr. Ivo Mařík, CSc.

TÉMATIKA PŘÍSPĚVKŮ

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Na titulní straně uveďte název článku, pod ním jméno autora, případně autorů, úřední název jejich pracoviště a konečně adresu prvního autora. U českých rukopisů uvádějte název článku a pracoviště také v angličtině. Na další straně uveďte stručný souhrn (do 150 slov), který má informovat o cílech, metodách, výsledcích a závěrech práce, doplněný překladem do angličtiny. Za ním připojte nejvýše šest klíčových slov v češtině resp. angličtině.

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ADRESA PRO ZASÍLÁNÍ PŘÍSPĚVKŮ

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SUBJECT MATTER OF CONTRIBUTIONS

The journal Locomotor System will publish the papers from the field of locomotor apparatus of man which are above all concerned with the function, physiological and pathological state of the skeletal and muscular system on all levels of knowledge, diagnostical methods, orthopaedic and traumatological problems, rehabilitation as well as the medical treatment and preventive care of skeletal diseases. The object of interest are interdisciplinary papers of paediatric orthopaedics and osteology, further object of interest are problems of biomechanics, pathobiomechanics and biorheology, biochemistry and genetics. The journal will accept the original papers of high professional level which were not published elsewhere with exception of those which appeared in an abbreviated form.

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Authors should supply illustrations and tables on separate sheets in the document. They should be numbered in the same order as is their desired location in the text. The figures should include the relevant details. Pictures should have resolution min. 300 dpi, drawings and graphs in bitmap representation 600 dpi. They should be saved as tif or jpg format, tables and graphs in Microsoft Excel or as vector graphics in formats *.eps or *.cdr. Figure legends should be provided for all illustrations on a separate page and grouped in numerical order of appearance.

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Manuscripts and contributions should be sent to the Editor-in-chief:

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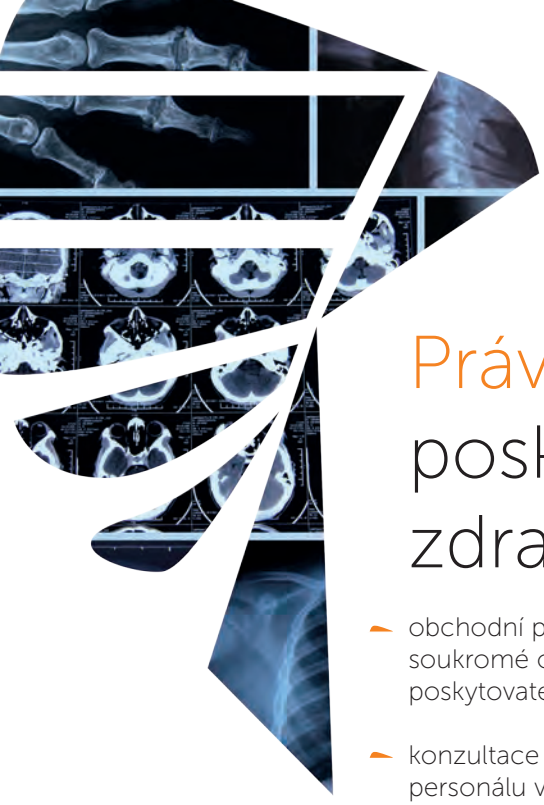

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Pohybové ústroji

Pokroky ve výzkumu, diagnostice a terapii

The 15th Prague-Lublin-Sydney Symposium

The operative and non-operative orthopaedics: the path of development orthopaedic anthropology. Biomechanics. Orthotics & prosthetics genetics of skeletal disorders. Osteology. Varia.

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SUNDAY, SEPTEMBER 15TH 2013

During the day arrival of participants, accommodation in hotels

SYMPOSIUM PROGRAMME

MONDAY, SEPTEMBER 16TH 2013

8.30–8.45 REGISTRATION OF PARTICIPANTS

08:45–09:00 Dudin M.
THE OPENING CEREMONY

SESSION I.A – **ADOLESCENT IDIOPATHIC SCOLIOSIS – AIS**

9.00–12.20 chairmen: ULRIKH E., MUSHKIN A.

TUESDAY, SEPTEMBER 17TH 2013

SESSION III.A – **INJURIES OF THE SPINE**

09.00–12.20 chairmen: GRASS R., MARIK I.

12:30–13:30 LUNCH

SESSION III.B – **INJURIES OF THE SPINE**

13.30–16.00 chairmen: KARSKI J., ALAMELDIN M.

16:00–16:30 COFFEE BREAK

SESSION III.C – **INJURIES OF THE SPINE**

16.30–17.50 chairmen: KARSKI J., ZWIPP H.

18:30-22:00 GALA DINNER

WEDNESDAY, SEPTEMBER 18TH 2013

DURING THE DAY: EXCURSION TO HERMITAGE CITY TOUR, EXCURSION TO WELLNESS & MEDICAL & SPA CENTER NEWTON

THURSDAY, SEPTEMBER 19TH 2013

SESSION IV.A – **GENETICS OF SKELETAL DISORDERS. ORTHOPAEDIC ANTHROPOLOGY. DIAGNOSTICS.**

09.00–12.20 chairmen: DUDIN M., KUKLIK M.

12:30–13:30 LUNCH

SESSION IV.B – **GENETICS OF SKELETAL DISORDERS. ORTHOPAEDIC ANTHROPOLOGY. DIAGNOSTICS.**

13.30–15.50 chairmen: ALAMELDIN M., PARIZKOVA J.

16:00–16:30 COFFEE BREAK

SESSION IV.C – **GENETICS OF SKELETAL DISORDERS. ORTHOPAEDIC ANTHROPOLOGY. DIAGNOSTICS.**

16.30–17.50 chairmen: KUKLIK M., MARIK I.

FRIDAY, SEPTEMBER 20TH 2013

SESSION V.A – **VARIA**

09.00–12.20 chairmen: MARIK I., KARSKI J.

12:30–13:30 LUNCH

SESSION V – **MASTER-CLASSES**

Time	**Activity**	**Lector**
13:30–14:30	Excursion to Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok"	Falinsky A.
14:30–15:30	Relief of pain in patients with polyarthritis, deforming arthrosis, spondyloarthrosis and degenerative diseases of the spine with "LANTOKS"	Krasavina D.
15:30–16:30	Functional diagnosis of feet. Methods of correction of feet disfunction	Kurchenko S.
16:30–17:30	The possibility of providing a multidisciplinary prosthetic and orthopaedic care in the science-industrial enterprise JSC "ORTO-S"	Baranovskaya I.
14:30–15:30	Corrective breathing exercises in the treatment of scoliosis	Pugacheva N.
14:30–15:30	Kinesotherapy on the suspension system "Ekzarta" in the treatment of juvenile kyphosis	Gayduk T.
17:30–18:00	The Closing Ceremony. Awarding of certificates	
18:30–22:00	Gala dinner (in the restaurant "Strelna")	

REVIEW ARTICLE

THE ETIOLOGY, PATHOGENESIS AND PROPHYLAXIS OF ADOLESCENT IDIOPATHIC SCOLIOSIS – AIS. THE CONSERVATIVE ORTHOPEDIST POINT OF VIEW

Dudin M., Pinchuk D., Pechersky V.
Children's Rehabilitation Center of Orthopaedics and Traumatology „Ogonyok", St. Petersburg, Russia
E-mail: ogonek@zdrav.spb.ru

Published as a review article in Locomotor System, vol. 20, 2013, No. 3+4

ABSTRACT

THE OPERATIVE TREATMENT OF AIS

Mikhaylovsky M, Mushkin A

Abstract was not sent.

CONTROVERSIAL TOPIC: CONSERVATIVE OR SURGICAL MANAGEMENT OF AIS

moderator: Ulrikh E

Abstract was not sent.

ABSTRACT

THE BRACE 2013: 9 ELECTIVE MECHANISMS OF ACTION. THREE LEVELS TO BE TREATED

Jacques Chêneau, MD. Spine Disorders Unit, Department of Pediatric Orthopedics, University of Medical Sciences, Poznan, Poland.
Chief, Professor Tomasz Kotwicki
Mohamed Haddam M.D. Tlemcen, Algeria
Zacharias Haddam O.T. Tlemcen, Algeria
Johanna Slup Physiotherapeut. London, GB
E-mail: cheneau.jacques@neuf.fr

Corset 1973

Un corset doit rectifier neuf types de déformations : 1. Les courbures latérales. 2. Les rotations. 3. La croissance, fortement perturbée par la scoliose. 4. La statique costale. 5. L'asymétrie des diamètres obliques du thorax. 6. Une ambivalence paradoxale des zones 7 et 19, sous le sein droit. 7. Le dos creux, souvent présent à l'origine, très souvent aggravé par les mauvais corsets. 8. La respiration, dont le corset doit gommer l'asymétrie, organique et fonctionnelle. 9. La cunéisation.

Le corset applique des forces orientées et localisées avec précision, que l'on analyse en les réduisant à des appuis en trois points, dont deux sont à un niveau donné et le troisième à un étage adjacent. Il y a deux grandes catégories de scolioses. Celles à quatre courbures admettent quatre étages d'appuis correcteurs des courbures latérales et les mêmes quatre étages de dérotations. Les scolioses à trois courbures ne comportent que trois étages d'action sur les déviations latérales, mais les mêmes quatre étages concernant les dérotations. Notons également que le thorax reçoit à très peu près les mêmes appuis, que la scoliose soit à trois ou à quatre courbures. Mais

au-dessous, aux niveaux, lombaire et pelvien, les deux catégories de scolioses reçoivent un traitement très différent.

Corset 1973

Nine correction mechanisms. Four levels to be treated.

A brace should rectify nine types of deformations: 1. Side bends. 2. Rotations. 3. Growth, strongly affected by scoliosis. 4. Static rib. 5. Asymmetry of the oblique diameters of thorax. 6. Paradoxical ambivalence of areas 7 and 19, under the right breast. 7. Hollow back, often already present in scoliosis before all treatment, very often aggravated by bad braces. 8. During breathing, the brace must eliminate asymmetry, organic and functional. 9. Wedge shaped vertebral bodies.

The brace applies specific and localized forces. They can be analyzed until they are reduced to a certain level of support at three points. Two points are at a given level and the third one is at an adjacent height. There are two main types of scoliosis. Scoliosis types with four curves admit four levels for correction of lateral curvatures and the same four levels for derotation. Scoliosis with three curves admits only three levels of action for correcting the lateral deviations, but the same four heights for derotation. Note also that the thorax receives very nearly the same support if scoliosis has three or four curves. But below, at the lumbar and pelvic levels, both types of scoliosis receive very different treatments.

Корсет 2013. девять механизмы коррекции. Четыре этажа, чтобы лечиться.

Корсет исправить девять типов деформаций: 1.Наклоны в стороны. 2. Вращений. 3. Рост, сильно зависит от сколиоза. 4. Ребра статическим. 5. Асимметрия косой диаметры грудной клетки. 6. Парадоксальная двойственность области 7 и 19, под правой грудью. 7.Полые спине, часто уже присутствуют в сколиоза видел все лечение, очень часто усугубляется плохим корсетов. 8. Дыхание, корсет должен стереть асимметрия, органические и функциональные. 9.Клиновидной. Скобка относится ориентированных и локали з ованные 0 сил. Они могут быть проанализированы, пока они не сводятся к определенной три точки опоры. Две опоры на заданном уровне и третий находится на соседней высоте. Существуют два основных типа сколиоза. Сколиоз типов с четырьмя кривыми признать четырех этажей для коррекции бокового искривления и те же четыре этажа для derotations. Сколиоз с тремя кривые имеют только три этажа действия для исправления боковых отклонений, но те же самые четыре высот derotations. Отметим также, что грудная клетка получает почти такой же поддержки, если сколиоз имеет три или четыре поворотах. Но ниже, поясничной и тазовой уровнях, оба типа сколиоза получают очень различных методов лечения.

ABSTRACT

FEASIBILITY OF AIS CORSET TREATMENT

Tesakov D

Abstract was not sent.

APPLICATION OF CHENEAU BRACE FOR CONSERVATIVE MANAGEMENT OF EARLY ONSET SCOLIOSIS

Chekryzhev D, Mezentsev A

Abstract was not sent.

ABSTRACT

FEASIBILITY STUDY FOR THE DIAGNOSIS OF CARDIO-RESPIRATORY SYSTEM IN CHILDREN WEARING RIGID BRACES

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Children's Rehabilitation Center of Orthopaedics and Traumatology Ogonyok
Closed Joint Stock Company «Orto-S»
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Scoliosis is one of the most common orthopedic disorders of childhood and adolescence (from 1 to 10%), accompanied by multiplanar spinal deformity and chest deformity with impaired movement and statics, with damage of organs and the body systems, especially the cardiovascular and respiratory systems (Pozdnikin Y.I., 2002; Ishal V.A, 1990; Kazmin A.I., 1981; Netchaev V.I., 1997).

The increasing spine deformation causes reduced lung ventilation, impaired activity of the cardiovascular system, which leads to insufficient supply of the growing organism, including the brain, with oxygen. Children with scoliosis make worse progress at school, get tired more quickly, and suffer from headaches and increased emotional lability (Smolina Y.G., 2002; Fishtchenko V.Y., 1982; Dudin M.G., 2009).

The results of the complex X-ray radiological study of respiratory system (X-ray pneumo-polygraphia) in children with scoliosis (Cobb angle 26–45 degrees) demonstrate distinct diffuse imbalance of capillary blood flow in the lungs (Lukina O.V., 2001). In addition, patients with the second stage of scoliosis demonstrated impaired regional ventilation of lungs.

Dynamics of changes obtained from research studies of heart shows the development of cardiac hypertrophy and dilatation of the right ventricular cavity, with the development of hypertension in the pulmonary circulation in patients with scoliosis. These problems significantly increase in patients with scoliosis 26 - 45 degrees (according to Cobb angle). Additionally, changes occur in the left ventricle, in the systolic and diastolic phases of the cardiac rhythm, in the ejection velocity of blood. The electrical axis of heart changes its position and moves in the direction of the vertical position. Patients with scoliosis 11–25 degrees are at risk of developing hypertension in the pulmonary circulation (Dudin M.G., 2009; Enaldieva R.V., 2006).

Rigid braces have been gaining more and more popularity in Russia in recent years (Skoblin A. A., 2005), the Cheneau brace being the most popular of them (Tesakov D.K., 2011; Tchekryhschev D.O., 2003; Cheneau J., 2009). However, this brace appears to be a second "hard case", after chest, for cardio-respiratory complex. Hence, there is every reason to monitor the state of this complex on the stages of the conservative treatment of idiopathic scoliosis.

We have developed a diagnostic algorithm for the examination of the cardiovascular and respiratory systems in children with idiopathic scoliosis both without brace treatment and with the Cheneau brace treatment. This algorithm is included in the protocol of examination of children with scoliosis who have a Cobb angle greater than 20–25 degrees.

ABSTRACT

HUMAN BIOMECHANICS

Skvortsov D

Abstract was not sent.

ABSTRACT

FUNCTIONAL ANATOMY AND BIOMECHANICS OF THE SPINE: REHABILITATION THERAPY PROPOSALS

Pedan Aleksej
Soblahvská 17/4
911 01 Trenčín, Slovac Republic
E-mail: alexejpedan@gmail.com

The author focused his forty years experience in biomechanics and the function anatomy of the spine which should be a leitmotiv in the selection of therapeutic movements and exercise in the patients with vertebral painful syndrome and disc compression syndrome. The author presents mobilization exercises targeting into the predominantly exposed damaged segments of the spine in the horizontal, gravitationally lightened position with enhancement of the sucking mechanisms from the synovial liquid.

It is a kind of the therapeutic gymnastic "pro domo" given for these patients instructed as an outpatient.

ABSTRACT

BIOMECHANICAL AETIOLOGY OF THE SO-CALLED IDIOPATHIC SCOLIOSIS. NEW CLASSIFICATION (1995–2007) KARSKI TOMASZ

Vincent Pol University in Lublin, Poland
E-mail: tmkarski@gmail.com

Key words: biomechanical aetiology of scoliosis. Role of" gait" and "standing at ease on the right leg.

Introduction

The article describes the biomechanical aetiology of the so-called idiopathic scoliosis (1995 – 2007), known as an adolescent idiopathic scoliosis (AIS). The first lecture dealing with the issue was delivered in Hungary in 1995. The first publication was made in Germany in 1996 (Orthopädische Praxis).

Biomechanical development of scoliosis. The scoliosis appears as the secondary deformity originating in the asymmetry of hips' movement while walking and while standing 'at ease' on the right leg. The research proves that the right leg is the preferred one over the years. Every type of scoliosis starts to develop at the time when the child starts to stand and walk.

Material. In the years between 1985 and 2012, 1950 children with scoliosis

were examined and 360 children constituted the control group. The children from the control group were presented by parents as ones with the problem of scoliosis but there were without any visible spine deformity.

Classification

There are three groups and four types of scoliosis:

- **"S"** double scoliosis with stiff spine (3D - I epg), connected with gait and standing 'at ease' on the right leg;
- **"C"** and **"S"** scoliosis with flexible spine (II/A - 1D & II/B - 2D epg), connected only with standing 'at ease' on the right leg in **"C"** II/A epg and with additionally of laxity of joints and / or harmful previous exercises in **"S"** II/B epg.
- **"I"** scoliosis (III epg – 2D), connected with gait.

The necessity of causal prophylaxis

The new classification clarifies the need for therapeutic approach to each etiopathological group of scoliosis and provides the possibility to introduce causative prophylaxis which is the theme of the next lecture.

Literature

www.ortopedia.karski.lublin.pl

ABSTRACT

NEW TESTS FOR SCREENING IN CAUSAL PROPHYLACTICS OF SCOLIOSIS. PRACTICAL PRESENTATION OF CLINICAL TESTS – EXAMINATION OF CHILDREN

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Key words: so-called idiopathic scoliosis. New rehabilitation exercises.

Introduction

New tests for scoliosis. In the diagnosis of so-called idiopathic scoliosis we should use widely known old tests such as Adams & Meyer test, symmetry or asymmetry of waist test, but also new tests like – the side bending test for scoliosis, a test checking the habit of standing 'at ease'– the right versus the left leg, Dunkan Elly – test, pelvis rotation test (a new test since 2006), the adduction of hips test (similar to Ober test) and many other tests presented below.

List of the new tests and clinical sings enabling an early discovery of scoliosis:

1. Test of adduction of both hips (in extension position of joints – like the Ober test). It also checks the flexion contracture of the hips and the external rotation contracture of the right hip.
2. Bending test for scoliosis – Adams/Meyer test. Flexion test performed with bent spine (and the whole of the body). If the shape is round it is good, if stiff and straight, it shows the beginning of scoliosis.

3. Side bending test for scoliosis (bending to the left and to the right leg during standing in abduction), also called Karski or Lublin test, it is a modified Adams/Meyer test – more sensible as Adams test.
4. Rotation movements of the body test (new test since 2006).
5. Permanent standing at ease test – checking the right versus the left leg. The length of time influences standing and in scoliosis children there is the right leg.
6. The symmetry or asymmetry of the waist test (an old test, but still very important).
7. Presence of an illnesses (e.g. rickets). Rickets increase oncoming of scoliosis.
8. Anatomical anomalies of the spine (spina biffida occulta, pectus infundibuliforme). If present, the proper development of the spine is endangered.
9. Body build type – asthenic and picnic (bad), athletic (good).
10. Willingness to participate in sports, if yes – good, if no – bad.

New rehabilitations exercises. Proper solution to the problem of scoliosis is an early prophylactics based on the new exercises depending on the biomechanical aetiology. The new rehabilitation exercises should remove the contracture in the pelvis, the hips and in the whole spine. The flexion - rotation exercises should be performed by very young children, already at 3 and 4. It is also important to change the standing, sitting and sleeping positions. The results of such treatment has proved beneficial in years 1985 – 2012.

Literature

www.ortopedia.karski.lublin.pl

ABSTRACT

INFORMATION ABOUT OLD METHODS OF THERAPY AND PRESENTATION OF "NEW EXERCISES" AND EXERCISES IN KARATE IN TREATMENT AND PROPHYLAXIS OF SCOLIOSIS. RESULTS. EXAMPLES

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Key words: so-called idiopathic scoliosis. New rehabilitation exercises.

Exercises in scoliosis in past time

Till 1995 – 2007 the aetiology of idiopathic scoliosis was no found and treatment by exercises was also not correct. All the strengthened exercises were only bad. The other name of such harmful exercises were: strengthened exercises, in prone position exercises, extension exercises, "muscle corset" making exercises.

New tests for scoliosis

The test for scoliosis are presented in other article on our Symposium. Here we would like to repeat some information. In the diagnosis of scoliosis we should use known old tests (Adams & Meyer test) but also new tests such as side bending test for scoliosis, checking of habit of standing (right versus left leg), Ely-Duncan test (other – Thom test, other – Staheli test), pelvis rotation test (new test – 2006),

"adduction of hips test – similar to Ober test" and others, presented in others article in detail.

New rehabilitations exercises – general information

Firstly, it must be stated that all extension exercises, all so-called strengthening exercises were and are wrong and harmful. All patients coming to our Department after such therapy were only with huge deformity, with bigger hump and stiffness of the spine. To explain these undesirable results of treatment the term "the natural history of scoliosis" was coined. The proper solution of the spinal problem, in my opinion, is an early prophylactics based on the biomechanical etiology of scoliosis. This therapy must be based on the new exercises which are beneficial for the treatment but especially for prophylaxis of scoliosis. They include all exercises removing contracture in the region of hips, of pelvis and in the spine such as flexion - rotation exercises practiced as early in life as the age of 3 or 4.

The results of the new therapy with the new exercises

The results statistically were presented on the material from years 1985 – 2005 (published in 2005 in "Pan Arab Orthop Journal" – T. Karski and in "Ortopedia. Traumatologia. Rehabilitacja", Poland – 2005 – Karski T. and team). The article published in 2005 described the material covered 434 randomly chosen case histories ("Pan Arab Orthop Journal") and the other article published in the same year covered the material of 629 randomly chosen case histories ("Ortopedia. Traumatologia. Rehabilitacja").

The following group of children and results were **in I epg "S" primary double scoliosis**, stiff spine and with rib gibbous following:

A) Normal axis of spine – 18% of children. In this group were children with incipient scoliosis and first stage of curvature according Cobb. These children were not primary treated by incorrect, wrong exercises outside our Department.

B) Decreasing of curves - 60% of children. In this group were children with I – st and II – nd stage of curvature according Cobb. These children were not primary treated by incorrect, wrong exercises outside our Department.

C) Stop with progression – 9% of children. In this group were children with I – st and II – nd stage of curvature according Cobb. These children were primary treated by incorrect, wrong exercises outside our Department, some month.

D) Progression – 13% of children. These children were primary treated by incorrect, wrong exercises outside our Department, some years.

The following group of children and **results were in II/A epg "C" scoliosis and II/B epg scoliosis,** with thoracic curve secondary, with flexible spine:

A) Normal axis – 39% of children. In this group were children with I – st and II – nd stage of curvature according Cobb. These children primary were not treated by incorrect, wrong exercises outside our Department.

B) Decreasing of curves – 32% of children. In this group were children with I – st and II – nd stage of curvature according Cobb.

These children primary were not treated by incorrect, wrong exercises outside our Department.

C) **Stop with progression** – 26% of children. In this group were children with I – st and II – nd stage of curvature according Cobb. These children primary were treated by incorrect, wrong exercises outside our Department, some month.

D) **Progression** – 3% of children. These children primary were treated by incorrect, wrong exercises outside our Department, some years.

Literature

By authors and in www.ortopedia.karski.lublin.pl

ABSTRACT

SYNDROME OF STANDING 'AT EASE' ON THE RIGHT LEG (2010) – AND ITS INFLUENCE ON HIPS, KNEE, SHANK, FOOT – AS WELL AS "CAUSAL INFLUENCE" FOR SECOND GROUP OF SCOLIOSIS ("C" II/A EPG AND "S" II/B EPG)

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Key words: standing on the right leg in aetiology of the so-called idiopathic scoliosis.

Introduction

Never in orthopaedic literature – in books or articles till now I could find the description of "manner of standing" of children or adults people. There are informations in many books about the gait, there are described the phases of walking, also the standing on one leg in some tests for example "Trendelenburg test" but never "standing at ease" when the load is going through one leg. In this "Habit or Syndrome of standing 'at ease' on the right leg" the decisive and crucial is "cumulative time of standing" on this one / right leg.

Examples of "standing at ease" on the right leg and its influence to shank, knee, hip and spine

1) **Shank** – the varus deformity in Blount disease in small children is symmetrically. In older children the "both sides varus deformity" is changed with the time in form "of one sided varus deformation". Mostly the right leg is more affected (examples in lecture). Here I want to give the explanation of causes of Blount disease. This deformity in not "genetically deformation", it is not "primary necrosis of medial - proximal part of growth plate of tibia" but in aetiology the deciding are: **a/** excessive varus of legs in some newborns, **b/** to early standing and walking already in age of 7 – 8 month, **c/** overweight, d/ rickets
2) **Knee** – in situation of valgus deformity – because of "permanent standing 'at ease' on the right leg the deformity in the right knee is bigger (examples in lecture). In knee the difference between left and right side can be smaller or none because mostly the ten-

sion of *tractus iliotibialis* in similar on both - left and right sides.

3) **Hip** – in 70% of patients with hip arthrosis the right joint in more affected. If in some patients the arthrosis is on both sides (bilateralis) – the first symptoms of illness are in right hip (examples in lecture). The exception are people with dysplasia of left hip (DDH), just from the early infants period of life.
4) **Spine** – In new classification of the so-called idiopathic scoliosis there are three etiopathological (epg) groups and four types **"S"** I-epg, **"C"** II/A-epg, **"S"** II/B-epg and **"I"** III-epg of development of spine deformity. Three types are connected with "Syndrome of standing 'at ease' on the right leg":
   - **A/ "S"** I epg scoliosis – connection with gait and standing 'at ease' on the right leg. Model of hips movement in this type of scoliosis: adduction in the right hip 0 degree or even abduction contracture 5 or 10 degree, and adduction in the left hip 35 – 50 degree. Characteristic of this type: both curves develop on the same time and very early in age of 2-3-4 years of life. First is rotation deformity and stiffness of spine (connection with gait). This spine deformity is with extensive progression. Some types are "lordoscoliosis". The children with this type of scoliosis has the habit of "standing 'et ease' only on the right leg.
   - **B1/ "C"** II/A epg scoliosis - connection only with permanent standing 'art ease' on the right leg. Model of hips movement in this type of scoliosis: adduction in the right hip 20 degree or 30 degree, and adduction in the left hip 35 – 50 degree. Characteristic of this type: one curve deformity in shape of – lumbar or thoraco – lumbar left convex curve, early beginning - in age of 2-3-4 years of life but full develop scoliosis is to recognize in age of 10 – 12 years. No stiffness of spine, no extensive progression
   - **B2/ "S"** II/B epg scoliosis also connection only with permanent standing 'art ease' on the right leg – but in this subtype there are additional influences: "general laxity of joints" and "harmful exercises" – based on old knowledge about scoliosis. Characteristic of this II/B type: two curve deformity. Lumbar or sacral – lumbar left convex curve as first, the thoracic right convex curve as secondary. Early beginning - in age of 2-3-4 years of life but full develop scoliosis is to recognize in age of 10 – 12 – 14 years. No stiffness of spine, no extensive progression. Some types are "kyphoscoliosis".
   - **C/** Here we would mention that the fours type of scoliosis is the deformity of spine without curves or very small and this type is connected only with "walking" and not with standing 'at ease' on right leg and therefore is not subject for this paper.

Literature

By authors and www.ortopedia.karski.lublin.pl

ABSTRACT

"BACK PAIN" – WHO SUFFERED. PHYSIOTHERAPY IN TREATMENT VERSUS SURGERY

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Key words: Back pain, Aetiology, Treatment

Introduction

In Out – Patient Orthopaedic Clinic and in Orthopaedic Department every fours women and every sixths men on the world suffered because of pain in spine and hips, especially because of "back pain" (information from material of WHO, in "Decade of Bones and Joints 2000 – 2010" – Lars Lidgren). Every year in world is spent many millions dollar or euro for treatment of these patients.

Causes of pain back

According to our observations there are three causes of such "pain insufficiency":

anterior tilt of pelvis and hyperlordosis lumbalis,

lumbar or thoraco – lumbar left convex scoliosis ("C" scoliosis in II/A epg and "S" scoliosis in II/B epg),

stiffness of spine (scoliosis in III epg).

According to our observation, not surgery but physiotherapy can help patients with "spine problem". The same opinion has presented many years ago Prof. K. F. Schlegel from Orthopaedic Department in Essen / Germany.

How to treat the spine pain

Possibility and effectiveness of physiotherapy in „pain syndrome" in movement apparatus (locomotors system) are widely known in many countries and we could this confirm. In the lecture are presented four cases shown effectiveness of such therapy.

Literature

www.ortopedia.karski.lublin.pl

ABSTRACT

TECHNICAL DEVELOPMENT OF BRACING IN PRAGUE AFTER 1990

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Key words: spine, brace, scoliosis, correction

Until 1992 there were made only some old types of spinal braces (Hessing, Milwaukee and Boston) at the state department in Prague.

At a new private Prague orthotic workshop production of Cheneau brace was created in 1993. The basic know-how was obtained at a workshop at specialized clinic in Bad Wildungen (Germany). In that time doctor Jacques Cheneau cooperated

with that workshop when he was developing the Cheneau brace – type I. Our models of Cheneau brace were influenced by technical and technological possibilities at the Prague workshop. From start of our production of the spinal braces we attained average very good corrections of spine scoliosis. We innovated technical solutions. Our inventions were quite modern at the moment. Since 1993 we have started to stick foam pads by thermo formation of plastics shell of brace. In 1995 our new type of "Dynamic Spinal Brace according to Cerny" was developed (patent cz-281800).

Since 1995 we have unlocked the pelvis part under the lumbar pelotas according to dynamic brace. Since 2000 we have used the model modifications of Cheneau brace (type I) for night bracing. In the same year the second dynamic spinal brace for sitting according to Kosteas was developed (patent cz-12158). We invented another modification of Cheneau brace (type I) for adjustment of axila's hight according to patent cz-296200. Since 2008 we have made two variant spinal brace according to Cerny with possibility to adjust daily and night position according to patent cz-296200 too. Since 2010 we have used pendentive and variable lumbar Pelotas in some cases. Since 2011 we have made 3-point modification of spinal brace by flexible lumbar curves It attained a bit bigger corrections of lumbar spine.

ABSTRACT

NUCLEAR MAGNETIC RESONANCE THERAPY. A SHORT ANALYSIS OF THE SCIENTIFIC STUDIES FOCUSED ON THE SPINE

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Key words: Nuclear Magnetic Resonance Therapy

Aims

Present the MBST®- NuclearMagneticResonanceTherapy that has been developed recently and point out today application in degenerative disorders of locomotor system.

Introduction

The MBST®- NuclearMagneticResonanceTherapy (NMRT) has been developed recently. The active principle is based on the same principles as nuclear magnetic resonance diagnostic systems (MRI). NMRT appliance generate a static magnetic field and a 3 dimensional radio frequency field, leading to the build-up of a nuclear resonance field at the site of the treated tissue. The frequency and intensity of the electromagnetic field in the MBST® is adjusted appropriately to induce resonant vibration of molecular structures within cartilage or bone tissue, thereby stimulating cell proliferation. The effective

mechanism has been derived directly from nuclear resonance thomography and is used in more than 300 centres Europe wide.

Princip of the method

A special permanent magnetic field causes the protons of hydrogen atoms (hydrogen nuclei) to algin their resonant axes along the field lines. A radio frequency (RF) field on the nuclear resonant frequency transfers energy to the protons which transfers the extra energy highly effectively into the surrounding tissue. This added energy is therapeutic as it supports the cell regeneration and cell division rate

To document therapeutic results it is best to use specially developed and validated questionnaires for the evaluation of no-specific low back pain, which are also available in a German version (Roland and Morris, Oswestry). They are the most frequently used questionnaires in pertinent literature. Such documented therapeutic results form an important foundation for the evaluation of rehabilitative improvements.

Results

We present two clinical studies:

1. **Study:** MBST®-NuclearMagneticResonanceTherapy improves rehabilitation outcome in patients with low back pain

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Methods

- Placebo controlled, double-blind, randomized mono-centric multiple data study.
- Duration: three months.
- Multi-disciplinary rehabilitation concept
- Standartized, inpatient physiotherapy programme including gymnastics in and out of the water, mechanotherapy, massages, parafango applications, and medicinal baths, excluding electrotherapeutic applications on the spine, as well as hydroelectric baths.

MBST® sequence

- Five treatments of one hour each, on five consecutive days.
- Double-blind randomization by coded chip cards: activation of the construction of the complex therapy fields (MBST®-group) or no activation (placebo group).
- Examinations: baseline, 1 week, as well as 3 months after the five treatments.

Results

- The Roland-Morris (RM) total score for low back pain for all patients during the three-week inpatient rehabilitation period.
- After three months: placebo patients had decreased again. MBST® patients showed a RM score that was significantly better than initial value.
- The Oswestry score after 3 months MBST® 70% none of them (!) any deterioration.
- Both results revealed good effect of the standardized rehabilitation program.

2. **Study:** One-year-suvrey with multicenter data of more than 4,500 patients

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Ludwig Boltzmann Cluster für Rheumatologie, Balneologie und Rehabilitation

Background and objectives

MBST® has been shown to stimulate repair processes of cartilage and to reduce pain signalling. It represents an alternative therapy for patients from osteoarthritis. To prove the clinical success of this new therapeutical method, validated measuring parameters are important that are convincing for pain and function in a one-year-follow-up.

Methods

During the course of its application over the last 10 years over 4.500 protocols of a one-year-follow-up have been collected to record the outcome of MBST® therapy. This report reflects the outcome MBST® therapy on patients with the following degenerative rheumatic diseases of MBST® therapy:

- OA of the knee (n = 2770), OA of the hipp (n = 673), OA of the ankle joint (n = 420), chronic low back pain (n = 655)
- Data were collected at baseline, 6-8 weeks and 6 and 12.

Results

Pain reduced significantly 6 weeks after MBST® treatment All four examined indications improved and stayed measurably reduced up to 6 and 12 months.

The improvements in all three forms of pain (pain on load, pain on motion, pain at rest) following MBST® treatment were around 21–50% on average.

Conclusions

The nuclear resonance field has a predefined cell frequency which is an amplitude modulated with a spin frequency. The purpose is to bring the highest possible actively directed energy transfer using the smallest possible field strength. MBST® NuclearMagneticResonanceTherapy can positively enhance therapeutic success in the rehabilitation of patients suffering from low back pain, without side effects.

Several larger multi-centric evaluations of some thousand treated patients evidenced continuous and highly significant improvements of the basic symptoms in the course of 6 months after treatment with MBST®-NuclearMagneticResonanceTherapy.

Last years a few small studies proved that the MBST®-NuclearMagneticResonanceTherapy is also effective for treatment of whole-body Osteoporosis.

Reference

KULLICH W, SCHWANN H, WALCHER J and MACHREICH K. The effect of MBST-Nuclear Resonance Therapy with a complex 3-dimensional electromagnetic nuclear resonance field on patients with low back pain. J. Back and Musculoskelet Rehab., 19, 2006, p. 79–87.

ABSTRACT

COMPREHENSIVE TREATMENT OF SPINAL TUBERCULOSIS

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Key words: tuberculous spondylodiscitis. anterior instrumentation. strut grafting , kyphosis

Background

Tuberculosis is once more widespread with an estimated world wide total of eight million new cases in 1990. Spinal tuberculosis accounts for about 2% of cases of tuberculosis Specific and effective chemotherapy is now the mainstay of treatment. There is considerable agreement in the literature on the indications for surgical treatment of tuberculous spondylodiscitis. An anterior approach usually is recommended for debridement and bone grafting.There are controversy concerning anterior instrumentation in the surgical management of spinal tuberculosis because of the risk of persistence and recurrence of infection.

Objective

To evaluate the results of one-stage interbody autografting and anterior plating in the surgical management of dorsolumbar spinal tuberculosis.

Indications

Definitive treatment of dorsolumber spinal tuberculosis using anterior debridement, autograft and anterior plating.

Methods

Over the last four years ,18 patients with dorsolumber spinal tuberculosis were treated using anterior debridement, autograft and anterior plating to evaluate the results of one-stage interbody autografting and anterior plating in the surgical management of dorsolumbar spinal tuberculosis. They were 10 men and 8 women, aged from 22 to 55 years (mean 36 years). The involved spines included thoracic spine (**11**), thoracic-lumbar spine (**1**), and lumbar spine (**6**). MRI showed evident collapse of the vertebrae because of tuberculous destruction and paravertebral abscess. Neurological deficits were found in 6 patients.One case was graded B, two cases were graded C, and three cases were graded D according to Frankel classification.

Technique

Before surgery, patients received standard anti-tuberculosis chemotherapy for 2 to 3 weeks. Retroperitoneal or extrapleural approach was chosen according to the tuberculosis lesion segment. Anterior radical depritment, iliac or rib autografting and anterior plating was used

Postoperative management

Anti-tuberculosis chemotherapy was continued for at least 9 months, and the patients were supported with thoracolumbosacral orthosis for 6 months after surgery. All patients were followed up for an average of 18 months.

On each assessment, data related to drug regimen and its side effects if any, abscess or sinus formation, improvement of back pain and tenderness were recorded.

Postoperative neurological assessment was reported and compared with the

preoperative state The activity of the disease was assisted by ESR at monthly intervals for the first 3 months, then once every 3 months during the first year, and every 6 months until the final follow up.

Anteroposterior and lateral radiographs of the spine were obtained each visit and studied for the angle of kyphosis and the progress of healing.

Results

All cases were healed without any recurrence of tuberculosis. Spinal fusion occurred at a mean of 4 months after surgery. All patients with neurological deficits, showed obvious improvement.No implant loosening or deep wound infection were noted. During the follow-up period, a mean of 16 degrees of kyphosis correction was achieved after surgery. There was a mild loss (2 degrees – 5 degrees) of kyphosis correction during follow-up period

Complications

- One superficial wound infection which responded to parenteral antibiotics
- Backing out of screws in 1 patient
- transient dysesthia in the distribution of the genitofemoral nerve in one patient
- Accidental opening of the peritoneum which was re- paired immediately.
- None of the patients had an iatrogenic neurological injury, vascular injury or loosing of the hardware other than in one patient with backing out of the screw. Non of the implants needed to be removed.

Conclusions

This study concluded that anterior plating with anterior autologous strut grafting following anterior radical debridement a safe and good treatment option with high correction rate, and high fusion rate in treatment of dosolumber spinal tuberculosis.

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ABSTRACT

CLASSIFICATION OF THE SPINE FRACTURES – HELPFUL TOOL FOR DECISION MAKING?

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Key words: spine injuries, vertebral fractures classification, depending between the classification and treatment of the spine fractures

Depending on the kind of injury and destroying force type, that work on the spine the specific type of fractures will be determined. The compression, flexion-distraction and rotation type of vertebral fractures will be distinguished. As there are many famous classifications of the vertebral fractures. It's very important to understand the mechanism of injury leads to vertebral fracture and to choose the right treatment. The common classification is AO-classification. Depending on fracture level (cervical, thoracic and lumbar spine) we use special classifications for example Anderson-Montesan, Anderson-D'Alonzo etc. The right describing of the fracture type makes the choose of treatment easier. In this presentation we want to show how important is correctly classify the spine fractures and consequently choose the right treatment.

ABSTRACT

FRACTURES OF DENS AXIS. TREATMENT ALGORITHME

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Dens axis fractures account for 9–18% of all cervical spine fractures. They are the most common cervical spine injuries in the elderly. Moreover, as the population ages, these fractures will become increasingly relevant to clinical practice. The right treatment of this condition is still the subject of controversy. Compare to the operative treatment the non union of the fracture and subjective symptoms are described double higher after conservative procedure. The treatment for patients with dens fracture should be based on fracture patter, patient age, neurological deficits and the patient's condition. Many factors have to be taken into account to find the right balance between fracture healing and treatment complications. In our presentation we want to explain our algorithm for the treatment the fractures of dens axis that we established in our department.

ABSTRACT

TREATMENT OF CERVICAL SPINE FRACTURES. INDICATION, TECHNIQUE PITFALLS AND COMPLICATIONS

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Abstract was not sent.

ABSTRACT

MINIMAL INVASIVE ANTERIOR (STAND ALONE) FIXATION FOR HIGH THORACIC FRACTURES

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Abstract was not sent.

PERSPECTIVE ORIGINAL PAPER

OSTEOPATHIC TREATMENT OF CRANIO-VERTEBRAL DEFORMITIES IN NEONATES AFTER BIRTH INJURY

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Published as a **prospective original paper** in Locomotor System, vol. 20, 2013, No. 3+4

ABSTRACT

THORACOLUMBAR FRACTURES

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Background

The treatment of unstable fractures and fracture-dislocations of the thoracic and lumbar spine has long been controversial. Many authors, such as Guttmann and Bedbrook, advised nonoperative treatment .Later reports, such as those by Levine and Edwards; Bohlman; Bradford et al.; McAfee, Bohlman, and , Dubousset, have emphasized the advantages of open reduction and rigid internal fixation with posterior instrumentation. Causes of thoracolumber fractures are Motor vehicle accidents (45%), Falls (20%), Sports (15%), Acts of violence (15%), and Miscellaneous activities (5%).

Objective

To present our experience in management of thoracolumber fractures.

Indications

The timing of surgery for spinal cord injuries is controversial., Most authors agree that in the presence of a progressive neurological deficit ,emergency decompression is indicated. Some authors advocate delaying surgery for several days to allow resolution of cord edema, Compression fractures rarely require surgery. Surgery is indicated if PLC is disrupted Relative indications for surgery include:

- single level lumbar VB height loss >50%
- single level thoracic VB height loss >30%
- combined multi-level height loss >50%

- relative segmental or combined kyphosis >30

Methods

Orthopedic surgery include:

- Anterior corpectomy. It is safe and most predictable form of decompression indirect decompression
- Relies on annulus to reduce retropulsed fragment through ligamentotaxis

Technique

- Posterior
- Indirect (distraction and ligamentotaxis)
- Direct (transpedicle or posterolateral)
- Anterior
- Following posterior decompression with Partial / complete corpectomy

Postoperative management

Postoperative Rehabilitation is a must.

Conclusions

The treatment of thoracolumbar burst fractures must be individualized. Canal compromise from retropulsed bone fragments is not in itself an absolute indication for surgical decompression.

ABSTRACT

ACTUAL TENDENCIES IN POSTERIOR APPROACH TO THORACOLUMBAR INJURIES: SHORT VS LONG INSTRUMENTATION, MINIMAL INVASIVE TECHNIQUE, PITFALLS AND MISTAKES

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Abstract was not sent.

ABSTRACT

PERCUTANEOUS DORSAL INSTRUMENTATION. TECHNIQUE, PITFALLS AND COMPLICATIONS

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ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

PHENOMENON OF CHILDRENS HEART DAMAGE WITH UNCOMPLICATED COMPRESSION SPINE FRACTURE

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Keywords: compression spine fracture, catatrauma, postcontusional myocardial syndrome

Introduction

Uncomplicated compression spine fracture is related to one of the most common injuries among children and adolescents. According to different authors the frequency of occurrence of this type of injury is up to 9.2% of all fractures [**1**]. For the last 10 years more than 4 thousand of patients with such kind of injury were treated in our hospital. Our experience in the treatment and monitoring of patients with uncomplicated compression spine fracture, accumulated through years, enabled us to identify the features of this injury [**2**]. We revealed the presence of abnormalities of the heart in 32% of cases. Such damages are well studied in adults [**3**], but the posttraumatic damages in children are not described.

Material and methods

The results of observation of 227 patients with uncomplicated compression spine fracture in age from 5 to 16 years were included in our research. The clinical and electrocardiographic analysis of the cardiovascular system was made at all children. Clinical assessment of the cardiovascular system included the determination of the heart beat and heart rate, measuring of a blood pressure, auscultation and percussion of the heart, conducting of the functional tests (test with physical activity, vagal tests). Electrocardiographic examination was performed in a 12-leads: 3 standard, 3 augmented unipolar of the limbs and 6 unipolar of the chest.

Results

We revealed the presence of abnormalities of the heart in 32% of cases at the first time in children and determine it as postcontusional myocardial syndrome. The consequent clinical and instrumental research after treatment of these patients revealed positive dynamics in 72% of cases.

Clinical example No 1. Patient S., 13 years old, diagnosis: uncomplicated compression spine fracture of the vertebral bodies L1, L3 (injury occurring after falling from a height of 2 meters). Clinical examination revealed a split of the first tone of the heart, muting of it on a top of the heart. Electrocardiographic examination detected intramural ischemia in walls, top and side wall of the left ventricle of the heart (negative T- waves in the chest leads). Electrocardiographic examination which was made 6 months before the trauma, did not detect any changes. After medication treatment (prepa r ations of potassium and magnesium, mildr o nat, vitamins of group B), electrocardi o graphic examination demonstrated a p o sitive dynamics of the recovery .

Clinical example No 2. Patient K., 12 years old, diagnosis: uncomplicated compression spine fracture of the vertebral bodies Th5-Th8 (injury occurring after falling from a height of 0,5 meters). Clinical examination revealed muting of the first tone on a top of the heart and at the point of Botkin. Electrocardiographic examination revealed local disturbances of intraventricular conduction in the anterior wall of the left ventricle of the heart, coronary intramural ischemia in the anterior-septal

region of the left ventricle (the change of the complex depolarization). After medication treatment (mildronat, vitamins of group B), electrocardiographic examination demonstrated a positive dynamics of the recovery.

Discussion

The patients had symptoms that could not be explained by the age characteristics of the heart, such as: sinus tachycardia, unmotivated emotional and physical stress, atrial and ventricular systole, sinus arrhythmia (from bradycardia to tachycardia), paradoxical Valsalva test. Electrocardiographic changes to our point of view deserve special attention. They are characterized by: a change of atrial complex PQ (P-wave splitting, „humped" form of the P wave, the length of more than 0.08-0.1 sec.), changes in the complex depolarization (QRS complex was digested in nursing leads and limb leads), change of the complex repolarization (ST interval prolongation and T wave inversion).

Such clinical symptoms, confirmed by electrocardiographic analysis and appropriate anamnesis, we named as postcontusional myocardial syndrome. The detected changes can be explained by two reasons: hydrodynamic shock and neurohumoral factor (postcontusional reaction from the spinal cord).

Medicamentous treatment regiment, including preparations of potassium, magnesium, vitamins of group B, mildronat was developed in order to correct the changes.

Conclusions

1. All children with suspected spinal injury should be carried out electrocardiographic examination.
2. Postcontusional myocardial syndrome has a precise clinical picture and characteristic electrocardiographic features.
3. Electrocardiographic features of postcontusional myocardial syndrome had a three kind of changes: coronary disorders, disorders of the rhythm and conduction and its combination.
4. It is necessary to carry out a complex treatment of heart damage in the early stages.
5. Patients with postcontusional myocardial syndrome should be under the supervision of a cardiologist for 2 years.

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ABSTRACT

SPINE-FRACTURES IN PATIENTS WITH SPONDYLITIS ANKYLOSANS. INDICATION, TECHNIQUE, PITFALLS AND COMPLICATIONS

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ABSTRACT

THORACOSCOPIC ASSISTED ADDITIONAL ANTERIOR FUSION INTHORACOLUMBAR FRACTURES: INDICATIONS, TECHNIQUE, PITFALLS AND COMPLICATIONS

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ABSTRACT

HAZARDS AND COMPLICATIONS IN DIAGNOSTIC AND THERAPY OF SPINE FRACTURES

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Abstract was not sent.

ABSTRACT

PERCUTANEOUS DORSAL STABILISATION WITH "VENUS-SYSTEM"

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PERSPECTIVE ORIGINAL PAPER

TRANSCRANIAL MAGNETIC STIMULATION IN MECHANOTHERAPY EFFICACY EVALUATION

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Published as a **Prospective original paper** in Locomotor System, vol. 20, 2013, No. 3+4

ABSTRACT

DIAGNOSIS AND TREATMENT OF GENETIC SKELETAL DISORDERS

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Key words: genetic bone disorders, clinical and anthropological, radiological and genetic diagnosis, classification, comprehensive treatment

Objectives

The aim of the paper is point out both recent possibilities of diagnostics and the comprehensive treatment of biomechanically severe problematics of Genetic Skeletal Disorders (originally called Constitutional and/or Intrinsic Disorders of Bone, Bone and/or Skeletal Dysplasia).

Introduction

The lecture summarizes longstanding experience of the authors with both diagnostics and the comprehensive treatment of Genetic Skeletal Disorders. There are distinguished: Primary Skeletal Dysplasias (SD) resulting from mutated genes that are expressed in chondro-osseous tissue and Secondary SD that are caused by abnormalities of extraosseous factors with secondary effects on skeletal system i.e. metabolic, enzymatic and hormonal disorders. Incidence is estimated 0.30 – 0.45 per 1000 live birth (**2**).

In the 1960's, accumulating evidence that genetic skeletal disorders were clinically and genetically heterogeneous prompted a group of international experts to prepare a document to reach an agreement on the nomenclature of what was then called "Constitutional (or Intrinsic) Disorders of Bone" [1970]. The "Nomenclature" was meant to bring together experts in radiology, clinical genetics and pediatrics to agree on the denomination and classification of skeletal disorders, syndromes and metabolic diseases that were being newly described. Revisions have been prepared in 1977, 1983, 1992, and 1997. Following the establishment of the International Skeletal Dysplasia Society (ISDS) in 1999, and to cope with the increasing complexity of information, revisions of the Nosology have been delegated to an expert group nominated ad hoc within the ISDS to ensure an adequate representation of clinical, radiological and molecular expertise - 2001 and 2006 revisions (**4**).

In the last 2010 revision (**5**), 456 conditions were included and placed in 40 groups defined by molecular, biochemical and/or radiographic criteria. Of these conditions, 316 were associated with mutations in one or more of 226 different genes, ranging from common, recurrent mutations to "private" found in single families or individuals. Thus, the Nosology is a hybrid between a list of clinically defined disorders, waiting for molecular clarification, and an annotated database documenting the phenotypic spectrum produced by mutations in a given gene.

Dysostoses are disorders affecting individual bones or group of bones. In contrast to the "dysplasias", that arise frequently from defects in structural proteins, metabolic processes or in growth plate regulation, the dysostoses often arise from embryonic morphogenic defects and are thus more closely related to multiple malformation syndromes. Since the first inclusion of dysostoses in the 2001 revision, the number of "dysostoses" included in the Nosology has grown significantly. The present revision includes an even larger number of dysostoses reflecting the advances made in identifying their molecular basis. The boundaries between skeletal dysplasias and dysostoses, metabolic and molecular disorders, and multiple congenital anomalies syndromes is

becoming progressively less sharp, and the diagnostic process requires knowledge that crosses between these subspecialty areas (**5**).

Orthotic and surgical treatment are based on biomechanical knowledge of growth of healthy and dysplastic skeleton, correction of long bones and spine deformities, shortening and/or lengthening of long bones and reconstruction of hand and foot malformations (**1**).

Patients and Methods and Results

The authors have own experience with revised Nomenclatures from 1983 (**2**).

At present, the authors introduced into clinical praxis the 8th version of Nosology and Classification of Genetic Skeletal Disorders: 2010 revision. In years 1994 – 2011 the authors diagnosed 112 nosologic units that are categorized into 36 groups. The cohort contains 619 probands (see Table 1 in **3**). For classification purposes the disorders are still identified by clinical features and radiographic appearance that are the basis for aspect of closely specialized molecular genetic examinations. For the majority of the above mentioned patients the team of Ambulant Centre ensures preventive and therapeutic care and comprehensive treatment from birth to unlimited period of time. Clinical, anthropological, genetic and radiological examination together with laboratory examination (including markers of bone metabolism) and also histological, histochemical, histomorphometry and electronmicroscopical investigation and dual energy densitometry were the basic prerequisite to specify diagnosis and monitor both course of bone disorders and effect of individual comprehensive treatment (paediatric, osteologic, orthotic-prosthetic, orthopaedic and surgical, etc.). The early right diagnosis is a prerequisite of the most suitable therapy. The lecture is documented by authentic photos and X-rays of diagnostic achievements and long term results of orthopaedic and orthotic treatment. Three new entities were diagnosed. These are:

1. Spondyloepiphysel dysplasia with metatarsal shortening (formerly Czech dysplasia),
2. Severe mesomelic dysplasia in two fetuses (associated with increased neck translucency and tetralogy of Fallot in one and cystic hygroma in the other) and
3. A new form or a variant of Spondylometaphyseal dysplasia type A4. From molecular genetic point of view there were analysed COL1A1 gene of 41 osteogenesis imperfecta (OI) patients using the methods Polymerase Chain Reaction and Sanger sequencing. Mutations were identified in 8 OI cases.

Some of authors have many years experience in intramedullary nailing (especially in osteogenesis imperfecta, hypophosphatemic rickets, etc.), bone lengthening (e.g. congenital limb defects, achondroplasia, etc.) and guided growth surgery (total epiphysiodesis and partial or hemiepiphysiodesis).

Discussion

- In last years, the number of Genetic Skeletal Disorders is growing up with the new scientific knowledge especially in area of molecular genetics and pathogenesis. Rapid advances have been made in identifying chromosomal locus and/or the molecular changes responsible for definition of conditions that help further understand the pathogenesis of individual disorders.

- The final shape of skeleton of SD patients is consequence of genetic defects, mechanical stimuli and functional adaptation of bones. Skeletal and joint deformities or malformations are considered as arthritic disposition and lead to biomechanical severe deformities of skeleton with premature osteoarthritis and osteoporosis and/or osteosclerosis. Disposition to osteoporosis and/or osteosclerosis is pathognomonic symptom for concrete SD.
- For classification purposes the disorders are still identified by clinical features and radiographic appearance that are the basis for aspect of closely specialized molecular genetic examinations. Organ manifestation of skeletal dysplasia does occur, and might in rare instances be of significant diagnostic value.
- The first aim of the Nosology is to provide a reference list, and only secondarily help in the diagnostic process. It must therefore coexist with other classifications that are based either on the clinical and radiographic approach to diagnosis, or the affected molecular systems and pathways. As more and more resources are published on the World Wide Web, cross linking between classifications and databases may facilitate their simultaneous use (**5**).
- The MIM catalogue contains many more entries, such as multiple malformation syndromes, that have some degree of skeletal involvement. Emphasis has been given to syndromes in which the skeletal component is prominent and/or essential to the diagnosis (5).
- Medicament therapy is suitable only exceptionally at some metabolic osteopathies.
- Symptomatic treatment of skeletal dysplastic deformities in childhood is early correction of both bone deformities (by physiotherapy, bracing, surgical procedures, etc.) and bone metabolism (e.g. calciotropic drugs) with the aim to achieve an individual ideal peak bone mass and optimal biomechanical properties of skeleton in adulthood.

Credo of authors are biomechanical aspects of surgical treatment. They are familiar so with treatment of bone metabolic disorders as with common and reconstructive orthopaedic surgical procedures in disabled children and adults (**1**).

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Skeletal Disorders – 2010 Revision&. Am J Med Genet A. 2011 May; 155A(5): 943–968.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

RICKETS AND HYPOPHOSPHATEMIC RICKETS: DIAGNOSIS AND THERAPY POSSIBILITIES

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Key words: Hypophosphatemic rickets, rickets and/or osteomalacia, Anthropometry, Vitamin D prophylaxis, Corrective osteotomy, Eight-Plate – Guided growth, Hemiepiphysiodesis

Objectives

The main aim of the paper is point out diagnosis, comprehensive treatment and problems of hypophosphatemic rickets (HyR). Secondly the authors point out both rickets and osteomalacia so-called vitamin D deficiency rickets (VDR) – pathogenetic congeneric disturbance of calcium homeostasis maintenance.

Introduction

Rickets is the term applied to impaired mineralization at the epiphyseal growth-plate, resulting in deformity and impaired linear growth of long bones. Rickets may be classified as vitamin D-related, secondary to low dietary calcium and those due to hypophosphatemia. These etiological factors may be inherited or acquired. The most commonly inherited form of rickets is X-linked hypophosphatemic rickets.

The lecture summarizes longstanding experience of the authors (**3**) with both diagnostics and comprehensive treatment of hypophosphatemic rickets (HyR) that results from mutated genes. Gene defect PHEX was localized at Xp2.2-p22.1 and causes bone metabolic disorder. HyR was classified into abnormal mineralization group (26th group) according to the Nosology and Classification of Genetic Skeletal Disorders – 2010 Revision (**5**). Inheritance is described as X-linked dominant, prevalence is estimated 1 : 20 000.

Major clinical findings: Short stature, bow leg and short lower limbs, waddling gait, protuberant abdomen, rachitic rosaries.

Laboratory findings: hypophosphatemia (dimished tubular resorption of inorganic phosphate), elevated serum alkaline phosphatase levels.

Major radiographic features: mild-moderate rachitic changes: apparently wide epiphyseal plates, flare metaphyses, bowing of long bones, tubular shape of long bones, coarse trabecular pattern, Looser zones and fractures in older age, mild osteopenia in childhood, generalized osteosclerosis in adulthood, premature epiphyseal closure and premature cranial synostosis.

Medicamentous treatment: combination of oral inorganic phosphate and 1,25$(OH)_2$ vitamin D. Side effects of this therapy are both secondary/tertiary hyperparathyroidism (due to too intake of phosphates) and hypercalcemia, hypercalciuria

with danger of nephrocalcinosis (due to excessive intake of $1,25(OH)_2$ vitamin D).

Comprehensive treatment is based on compensation of bone metabolism, surgical correction of leg deformities (in adulthood) from the biomechanical point of view and on knowledge of growth of healthy and dysplastic skeleton (in children). Orthotic corrective treatment is usually unsuccessful by our experience. The new perspective method of deformity correction in children is temporary hemiepiphysiodesis (so-called method of „guided growth"/1,2/).

The authors also point out the VDR risk group of immigrants like gipsies, Africans, Asians and their children living in Czech Republic or in neighbouring states and especially in the north of Europe that is a threat to disturbance of calcium homeostasis maintenance caused by deficiency of vitamin D and calcium in food at insufficiency of sun shine (**4**).

Patients and Methods

The group of patients with hypophosphatemic rickets consists of 33 patients born between 1940-2007 was examined and treated in Ambulant centre for Defects of Locomotor Apparatus in years 1994 – 2013.

Bone remodelling and its compensation during supplementation by $1,25(OH)_2$ vitamin D (Calcitriol), calcium, inorganic phosphate and other calciotropic drugs was monitored by biochemical markers of bone metabolism (ionized calcium, inorganic phosphorus, total alkaline phosphatase and its isoenzyme, osteocalcin, urine pyridinoline and deoxypyridinoline and/or beta-CTX).

Surgical treatment consists in corrective and/or multiple osteotomies. Suitable fixation of bone fragments was achieved by way of intramedullary nailing, external or plate fixation and/or by Blount staples. In children as perspective method we introduced permanent and/or temporary hemiepiphysiodesis.

The growth of children, their proportionality and treatment results was followed and assessed by repeated anthropometric examination.

Results

The cohort of 33 patients was assessed. At present, 11 females and 8 males of them achieved their final height: females 147.2 cm (126 – 162 cm, i.e. –3 SD) and males 154.2 cm (133 – 166.5 cm, i.e. –3,6 SD). Mean height (z-score) of our patients born in 1987 and later is –2.1 SD (–4.2 SD; –0.4 SD). Growth curves indicate slight improvement of body height due to medicament treatment. Patients are usually overweight and have characteristic disproportions: significantly shorter bowed legs, slightly shorter upper extremities, normal trunk and head circumference.

All patients with HyR are treated by Calcitriol ($1,25(OH)_2$ vitamin D) and inorganic phosphates with careful monitoring of biochemical markers of bone metabolism. Without regard to the treatment bone turnover was higher in all treated cases, serum level of phosphate was low, osteocalcin and bone isoenzyme of alkaline phosphatase were above reference levels.

X-ray survey and densitometric examination DEXA proved a mild osteopenia in childhood and generalized osteosclerosis in adulthood. We observed significantly delayed healing of osteotomies and precocious osteoarthritis of the hip and knee joints in adulthood.

The lecture is documented by short case reports (with authentic photos and X-rays) demonstrating diagnostic achievements, anthropometric assessment and long term results of medicament and surgical treatment.

Conclusions

The authors summarize their own experience with both acute vitamin D deficiency rickets (VDR) and especially hypophosphatemic rickets (HyR) from the point of diagnosis, anthropometric characteristics and comprehensive therapy. The early right diagnosis is a prerequisite of the most suitable therapy. The case reports demonstrate radio-clinical findings and treatment results of HyR and acute VDR.

Long term supplementation of children and adults with HyR by Calcitriol ($1,25(OH)_2$ vitamin D) and inorganic phosphate is often attended by side effects like secondary/ tertiary hyperparathyroidism, hypercalcemia, hypercalciuria and nephrocalcinosis.

Precocious osteoarthritis of the hip and knee joints and spondylarthritis in adulthood could be explained from biomechanical point of view as a consequence of generalized osteosclerosis. Very tough sclerotic subchondral bone disturbs joint cartilage during common daily activities.

When considering the costs and risks associated with osteotomies, guided growth in children presents us with an option of early (or late) intervention with obvious advantages (**1, 2**). In the light of recent studies of European and also Czech authors referring on seasonal hypovitaminosis D the authors recommend preventive administration of vitamin D (ergocalciferol or cholecalciferol) not only to infants but also to toddlers and children of preschool and school age and also to adults of advanced age alike to above mentioned immigrants (**4**).

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ABSTRACT

MUTATION AND PEDIGREE ANALYSIS AT SOME BONE AND TEETH DYSPLASIAS

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Introduction

we studied bone dysplasias, previously with autosomal dominant (AD) trait of inheritance as multiple cartilagineous exostoses (MCE) , cleidocranial dysplasia CD), hypochondroplasia (HCH), achondroplasia (ACH), pseudoachondroplasia (PSACH), osteogenesis imperfecta (OI), basal cell nevus syndroma (BCNS), dentinogenesis (DI) and amelogenesis imperfecta (AI).

Methods

The pedigree analysis was combinated with molecular genetics methods as direct or undirect gene analysis. We search the correlation between type of mutation ands phenotype (mutation position effect). We analysed 50 families with MCE, 15 families with CD, 5 families with hypochondroplasia, 50 with achondroplasia, 12 with PSACH, OI AD 40 families, 10 with BCNS, 15 with DI and 10 with AI.

Results

The most cases are recognized as new fresh mutations (60–70%). Multiple cartilagineous exostoses are represent in 25 from 50 cases as fresh mutation (50%). ACH have 4 from 5 cases (80%) as fresh mutation, hypochondroplasia one half cases (5/10) – 50%. CD – it is 7 from 10 cases (70%), PSACH 9/12 (75%). Osteogenesis imperfecta – autosomal dominant type of inheritance (OI) is represented in 19 from 40 cases as fresh mutation (48%). BCNS are 8 from 10 cases as fresh mutations, which represented 80%. Dentinogenesis imperfecta in 8/20 are as fresh mutation (40%) and amelogenesis imperfecta (AI) in the same percentage correlation as 4 from 10 cases are fresh new mutations.This is connection to the advanced paternal age. The mutation transmission through two, three and more generations was noted relatively rare. We found very large deletion 8q-, recognizable with help fluorescent in situ hybridization methods at MCE in family in two generations. It is the first familial case in the Czech Republic.

The mutations of metylentetrahydrofatreductase (MTHFR) on the predilectional site modified clinical picture many bone dysplasias, previously at OI, which have any another causative gene mutations. The mutations analysis of OI indicate most obvious mutation in glycine position collagen I alfa 1 position.

Discussion

At bone dysplasias (BD) with severe clinical picture are obviously present the fresh mutations. Moderate cases have more probability go through more generations. Additionally investigations for the related persons is more simple and no so difficult as for the first proband´s laboratory testing.

The knowledge of the type mutations have significance for next prenatal diagnoses with use chorion villi samples (CVS) or amniocenthesis (AMC) respectively.

Key words bone dysplasias, pedigree analysis, molecular mutation analysis, undirect gene analysis

PERSPECTIVE ORIGINAL PAPER

10 YEARS EXPERIENCE WITH TIBIO-FEMORAL ANGLE CORRECTION BY HEMI-EPIPHYSIODESIS

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Published as a prospective original paper in Locomotor System, vol. 20, 2013, No. 3+4

ABSTRACT

PARALYTIC DISLOCATION OF THE HIP. OPTIONS SURGERY: RECONSTRUCTION OR SUPPORT OSTEOTOMY

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Key words: Cerebral paresis children (CP). Hip dislocation. Treatment.

Introduction

The presentation is based on the material from Paediatric Orthopaedic and Rehabilitation Department from the years 1995–1999 and from the years 2005–2009 comparing the condition of the hips of CP children. The article bases particularly on the thesis written in the Orthopaedic of Orthopaedics by Dr S. A. (an assistant doctor from Libya – supervised by Prof. T. Karski). The research shows that hip dislocation in CP children with is not rare. The factors affecting the incidence of hip dislocation is presented in article. The authors presented also the clinical and radiological features, prevention and possible treatment methods.

The cause of CP

According to Prof. Harald Thom (Heidelberg, Rummersberg) there are 3 main causes of CP: prenatal, perinatal and post natal. The following are discussed in detail: abnormalities of the placenta, haemorrhage , hypertension, hypotension, anaemia, premature delivery, asphyxia during delivery and many other.

Material

The incidence of CP ranges from 0.6 to 5.9 patients per 1000 live births. In 400.000 newborn children in Poland there are 30.000 cases of premature newborn. Many of them are with CP. The patients in our Department suffered from various kinds of CP. Mostly there were slight cases like monoparesis, paraparesis, hemiparesis (60%), but also severe cases of tri- and tetraparesis (40%). Sometimes the paresis were connected with athetosis, chorea or cerebellum ataxia. The material for presentation is taken from the years 2005 – 2009 and includes 360 cases.

Causes of the dislocation

In severe cases of CP two complications, additional to CP, can occur:

a) fixed contracture of the knees, the feet, and
b) hip dislocation, very often with supercomplication of paretic scoliosis. According to the authors, the dislocation of the hip is caused by the wrong diagnosis, followed by bad or interrupted therapy. Some of orthopaedic surgeons in Poland claim that in CP cases, an accompanying hip dislocation can occur. Such diagnosis gives bases for a wrong therapy. Another wrong idea for the therapy would restrict it to the rehabilitation methods like Vojta, Bobath, Doman and other separate rehabilitation methods which all are wrong for such CP cases.

The treatment

The permanent abduction and flexion therapy of hips is necessary to prevent the dislocation of the hips. Proper and permanent clinical examination and X-ray examination, conducted at least once a year, is the condition to notice the hip dislocation on time. In the course of treatment, we use conservative or operative methods. In presentation provides examples of such therapy.

Conclusion

1) In every country there should be proper care for the pregnant women, which is particularly important.
2) CP children need proper diagnosis taken into consideration their of general situation and a regular monitoring of their hips.
3) The X-ray examination of the hips is especially important, and every doctor (orthopaedic surgeon, neurologist, paediatrician, general doctor, rehabilitation doctors and physiotherapist) should remember about it in their every day practice.
4) The best prevention treatment for the hip dislocation in CP children is a continuous abduction and flexion of the hips sustained for many years. Additionally the proper nursing and use of orthopaedic devices are of great importance.
5) In some cases the surgery is performed, that is the open reduction of the head, detorsion shortening osteotomy of the femur and the Dega or Salter osteotomy.

Literature

In authors and in www.ortopedia.karski.lublin.pl

ABSTRACT

PES PLANO-VALGUS STATICUS – TREATMENT WITH NICKY IMPLANT – PRELIMINARY REPORT

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Key words: valgus deformity of feet, surgery, Nicky implant

Purpose

The aim of our research is to examine the early results of flatfoot treatment using the Nicky implant

Material and Methods

Between years 2009 and 2012, 13 patients with flat-foot have been treated in the Paediatric Orthopaedic and Rehabilitation Department using Nicky implants. The group contained 1 girl, 13 boys, together 17 feet, age 7 to 17 years old, average 13.5 year old. Time of observation reaches from 3 to 18 months. The feet were static flatfoot usually connected with shortening of Achilles tendon due to contracture of Gastrocnemius muscle and Achilles tendon. The patients were mostly children with minimal brain dysfunction (MBD). The surgeries were performed in general anesthesia. The implant is a metal screw with plastic outside part (umbrella shape) which blocks the sinus tarsi.

Information about the implants and surgery

The Nicky implant consists of two parts: a plastic "dowel" decomposing element, "umbrella" shaped and a metal part serving as an expanding dowel screws. The skin incision is about 10mm long and allows us to introduce a metal guide wire and then to place the implant itself. After inserting the implant we turn the screw causing the expansion of the plastic, which prevents the implant from moving. After surgery we recommend short-term immobilization and we allow walking with crutches after around 2 weeks. Patients were evaluated retrospectively. We used podoscopic and plantographic examinations, photographic documentation to observe foot evaluation before, and 14 days after the surgery, then during the control examination in Outpatients Clinic.

Results

The observation period was from 3 to 18 months. In all patients, there was observed increasing of longitudinal arch of the foot. The patients report improvement of walking comfort, reduction or even disappearance of pain connected with overloading. Additionally we observed a good cosmetic result.

Conclusion

The introduction of the NICKY implant into the sinus tarsi in static valgus flat-foot is an effective method of treatment. Early observations confirm this recommendation in this group of patients.

ABSTRACT

"SYNDROME OF CONTRACTURES AND DEFORMITIES" IN NEWBORNS AND INFANTS ACCORDING MAU– AND ITS INFLUENCE FOR SECONDARY DEFORMITIES OF MOVEMENT APPARATUS IN BABIES, YOUTH AND ADULTS

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Key words: Syndrome of contractures according Mau. Influence on movement apparatus.

Introduction

In orthopedic literature mostly author speak about deformity in children and problem of pain in adults in context of weakness of muscles. They think – all problem are connected with "not enough strong muscles". No, the problem of deformity in children is connected with asymmetry of movement, even contractures and through influence by asymmetry steering of body growth.

Clinical signs of „syndrome of contractures"

The „syndrome of contractures" has been described primarily and in detail by Prof. Hans Mau – Tübingen / Germany – as *Siebener [Kontrakturen] Syndrom*" (syndrome of seven contractures) [**1, 2**]. This syndrome has been also described by: Hensinger [**3**], Howorth [**4**], Green & Griffin [**5**], Vizkelety [**6**], Komprda [**7**], Karski [**8, 9, 10, 11, 12, 13**], Tarczyńska, Karski & Karska [**14**]. In 1932 Prof. W. Dega / Poland described the "syndrome of contractures" as "ultra positioning" of the fetus [**18, 19**]. The causes of the „syndrome of contractures" can be related with fetus itself having a heavier, longer body; or with maternal conditions: small belly during pregnancy, lack of amniotic fluids, pelvic bone type: "androidal" or "platypeloidal"– which are not condusive to proper fetus growth [**14, 15**]. Prof. Mau emphasized influences of the CNS on development of the "syndrome of contractures".

Mostly we observe the "syndrome of contractures" as a result of left sided fetus position. This position of the fetus is connected with the "*first* fetus position" during pregnancy – 80% – 90% (Described by gynecologist - Oleszczuk) [**16, 17**].

In the "syndrome of contractures" according to Mau there are:

1. scull deformity */plagiocephaly/* - flattening mostly of left forehead and *os temporalis*, left cheek atrophy, eyes - nose and ears asymmetry / deformations;
2. *torticollis muscularis (wry neck)* / shortening of sterno-cleido-mastoideus muscle/ – usually left-sided, related with plagiocephaly or / and traumatic delivery or with congenital "*tumor neonatorum" (fibrous tumor);*
3. *scoliosis infantilis* (infantile scoliosis) – other than idiopathic scoliosis. Usually recedes spontaneously in 80% of cases [**20, 21, 22**] or even in100% (Mau) [**1, 2**];
4. contracture (shortening) of adductor muscles of the left hip. Untreated contracture can lead to development of hip dysplasia, which primarily can be observed in 10% of newborns [**10**]. The remaining 90% of dysplasias are cases of secondary deformity resulting from the contracture and are classified as "developmental hip dysplasia" (DDH – Klisič) ;
5. contracture (shortening) of abductor muscles and soft tissues of the right hip (Karski) [**9, 10, 11, 12**], described as *Haltungsschwäche* ("weak posture") by Mau. This contracture may cause oblique positioning of pelvic bone observed at radiography of hip joints in

babies. With time, asymmetry in movement causes asymmetry during gait and loading; and with time asymmetry of growth and development of the spine – consequently scoliosis (Karski 1995-2006) [**22, 24**]);

6. pelvic bone asymmetry – the oblique pelvis positioning visible during X-ray examination for hip joint screening – [see above points 4 & 5];
7. Foot deformities – such as: *pes equino-varus, pes equino-valgus, pes calcaneo-valgus.*

In Lublin we also include in the "syndrome of contractures and deformities in newborn and babies" excessive shank deformity (*crura vara*) which can lead with time to Blount disease. The development of this deformity and the causes are described in German in "Orthopädische Praxis" [Karski et al.]

Syndrome of contractures and its influence in youth and adults – list: arthrosis of the hip (mostly left – left hip dysplasia is more often), Blount disease, wry neck (torticollis), feet deformities, aetiology and problem of so-called idiopathic scoliosis.

Literature

By authors or www.ortopedia.karski.lublin.pl

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

NEUROPEPTIDES AND MOVEMENT DISORDERS. ENDOGENIC NEUROPEPTIDES IN EARLY STAGES OF SCOLIOSIS

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Keywords: vasopressin, oxytocin, incorrect posture, scoliosis

The level of vasopressin and oxytocin in blood serum of patients with right and left-sided scoliosis was detected. Specificity of neurohumoral indexes in postural fault was determined as type-dependant.

Introduction

It was revealed that unilateral lesion of different parts of central motor system activates neuro-chemical peptide-nature factors in central nervous system (**10, 11**). After subdural administration to a recipient animal this factors evokes elements of locomotor failure (identical in nature and side) which also are in progress in donor animal after brain injury (**9**). Initial factors activation arises in hipotalamus-hypophisis system regardless to injured part of the brain. Arginine[8]- vasopressine is one of the right-sided factors but oxytocine leads to

left-sided tonus alteration (**8, 11**). It perhaps is one of the mechanisms of postural asymmetry formation in scoliosis.

Objective

Objective of this research definition of level of the neuropeptids regulating asymmetry of a pose (oxytocin and vasopressine) at children with scolioses (0–15° according to Cobb) and postural fault.

Methods

27 children (7 boys and 20 girls) from 4 to 11 years old were examined in the State Institution of Health Service Saint Petersburg Rehabilitative Centre of Pediatric Trauma and Orthopaedics «Ogonyok» (Saint-Petersburg, Russia). At all patients the fence of a blue blood which carried out in the morning day on an empty stomach in the vacuum test tubes containing protease inhibitor – aprotinin has been carried out. Blood serum (BS) was obtained by centrifugation and was stored at –70°C up to the analysis conduction. Oxytocine and arginine- vasopressin levels were determined by IFA using commercial kits (Peninsula Laboratories, LLC No S-1355, No S-1357). The analyses were performed in according with instruction manual. In data processing the Student's test was used.

Results

All patients have been distributed on 4 groups (on clinical and instrumental examination): 1 group – 9 children with the flat back, the 2nd group – 5 children with 2-planes postural fault, the 3rd group – 5 children with right-side scoliosis, the 4th group – 8 children with left-side scoliosis. In children with right and left-side scoliosis the differences were revealed only in the level of oxytocin (Table). In children with 2-planes postural fault the level of both peptides was higher than in cases with flat back" type . This can indicate the process activity intensification in scoliosis.

Discussion

Appearance and progression of idiopathic scoliosis (IS) are considered as the result of inequality of the spinal column and spinal cord longitudinal growth. In consequence of this, normal afferent input from spinal cord elements to the highest parts of the central nervous system is altered by hyperextension of spinal cord structures (**3**). In this case, the factor of postural asymmetry is produced directly in

Diagnosis	The level of vasopressin, ng/ml Average ±mistake in average// Error of an average	The level oxytocin, ng/ml Average±mistake in average// Error of an average
1. Incorrect posture (flat back)	0.057±0.010**	1.77±0.15*
2. 2-planes posture violation	0.117±0.006	2.27±0.20
3. Right-side scoliosis	0.047±0.009	1.08±0.33#
4. Left-side scoliosis	0.045±0.009	1.90±0.11

Table. Indicators of neuropeptides in children with spinal deformity.
Comments//commentary: *–p≤0.05, **-p≤ 0.015 between 1 and 2 group, #–p≤0.01 between 3 and 4 group.

the structures of the central nervous system, deprived of the normal flow of afferent impulses (**5**). Method of biotesting allowed to reveal neurohormonal disorders in different stages of the deformity progression and types of scoliosis (**1, 2, 3, 4, 6, 7**).

Conclusions

We have revealed a certain level of the neuropeptids accompanying the right-and left postural fault at scoliosis. It was also found out that neurohumoral abnormalities depend on the type of spine deformation or the stage of IS progression.

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Table. Indicators of neuropeptides in children with spinal deformity

ABSTRACT

THE FEATURES OF BODY BALANCE DISTURBANCE IN CHILDREN AND ADOLESCENTS WITH IDIOPATHIC SCOLIOSIS

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Key words: scoliosis, body imbalans, stabilometry, «diasled», center of pressure

Introduction

The scoliotic spinal deformity is accompanied by three-dimensional space body imbalance. Assessment of the imbalance degree is necessary for prediction of the disease clinical course and correction and evaluation of the treatment efficacy identification.

Objective

We have studied the body features imbalance in 188 patients with scoliosis. Age of the patients tested was from 8 to 16 years old.

Methods

All children and adolescents under study (examination) had a unilateral arc of the spinal deformity in the frontal (coronal) plane. The values of these arcs were in the range of 10° to 30° (the second stage of severity according to classification by V.D. Chaklin, refer to the citation). The tops of the arcs were at Th7–L2 level. Pelvis obliquity (distortion) in the frontal plane in the studied patients was not observed. With right-sided arc deformation were examined 112 patients, with left-sided 76 patients. The survey was conducted on the stabilometric platform and with the help of hardware-software complex "Diasled." The patient at the time of the survey was in the main position. We determined the amount of the total pressure center displacement on the bearing area, the direction of the displacement, center of pressure displacement under the feet and the degree of asymmetry of body weight pressure on the feet.

Also in all patients were additionally determined: the value of the vertebral axis front deviation, the nature of changes in the physiological curves in the sagittal plane and the rotation displacement of the pelvis and shoulder girdle. During the survey were used the analyses of vertebral column X-ray examination and the body's dorsal surface optical topography data (findings). The level (extent) of these disorders was compared to the data obtained by stabilometry.

Results

Displacement of the center of the body depends on the extent, level and side scoliosis spine.

In all patients the center of pressure in the frontal plane was displaced toward the curve direction of the vertebral column scoliotic deformation.

Discussion

The degree of displacement of the center of pressure was greater in patients with lower arc deformation position. The degree of asymmetry of the pressure on the feet in patients with unilateral arc did not exceed 25%. Under the conditions of asymmetry pressure increase on the feet for more than 25% of the body weight - the patient loses the balance. Compensatory mechanisms arise to maintain the body balance e.i. the torso twisting in a horizontal plane and the formation of compensatory

arcs. In the sagittal plane the center of pressure under the feet in 83% of patients was displaced posteriorly, in 17% of patients anteriorly. The center of pressure was displaced anteriorly in the patients with higher levels of deformation (middle and upper chest arcs).

Conclusion

Based on test results it can be said that the displacement of the center of the support body is in the direction of the spinal deformity.

ABSTRACT

NEW OPPORTUNITIES OF ULTRASONOGRAPHY IN CHILDREN WITH MUSCULOSKELETAL DISORDERS

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Introduction

Ultrasonic method of the research has been used successfully in pediatric traumatology and orthopaedics over 20 years. This method helps to visualize bone and cartilage structure, soft tissues and it is used mainly for the examination of limb joints, cervical and lumbar spine. Our experience of orthopaedic patients treatment shows that ultrasonography is usefull for the examination of iliopsoas muscle in children with scoliosis, as well as the examination of long bones growth zones in patients with different size of lower limbs.

Materials and Methods

Ultrasound device ALOKA SSD-1100 (high-frequency linear ultrasound sensor with a scanning frequency of 7.5 MHz, sector transducer with a frequency of 5 MHz) was used. Ultrasound examination of iliopsoas muscles in 47 children with scoliosis of different severity was carried out. Growth zones of the lower limbs bones with different lengths in 28 patients were examined, too.

Results

It was noticed that the thoracolumbar scoliotic curve is followed by a reliable narrowing and compaction of the iliopsoas muscle on the convex side. The dimensions (height) of lower limbs growth zones varied from 1 to 3 mm depending on the age. The growth zones of the shorter limb were characterized by size reducing and structure changes.

ABSTRACT

DIAGNOSIS OF SPINAL PATHOLOGY IN CHILDREN THROUGH MOBILE PROSTHETIC LABORATORIES IN RUSSIA AND POLAND IN THE FRAMEWORK OF INTERNATIONAL COOPERATION

Gurinovich Y, Yefimov A

Abstract was not sent.

ABSTRACT

ASSESSMENT OF THE QUALITY OF THE REHABILITATION MEASURES USING THE ICF-BASED HEALTH INFORMATION SYSTEM

Strelnikov A, Yefimov A

Abstract was not sent.

ORIGINAL PAPER

SAGITTAL ALIGNMENT OF SPINAL-PELVIC BALANCE PARAMETERS IN ASYMPTOMATIC VOLUNTEERS AND PATIENTS WITH LUMBAR DEGENERATIVE DISC DISEASES

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Published as an **Original paper** in Locomotor System, vol. 20, 2013, No. 3+4

ORIGINAL PAPER

KINESOTHERAPY PROGRAM IN THE REHABILITATION OF PATIENTS WITH LUMBAR OSTEOCHONDROSIS AND SAGITTAL SPINAL-PELVIC IMBALANCE IN THE LONG-TERM FOLLOW-UP AFTER LUMBAR FUSION

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Published as an **Original paper** in Locomotor System, vol. 20, 2013, No. 3+4

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

EXPERIENCE OF PRACTICAL APPLICATION OF SUPERPOSTURE INTERACTIVE SYSTEMS FOR SPINAL SAGITTAL BALANCE DISORDER TREATMENT

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We have developed and practically applied interactive systems for correction of sagittal disorders of spine. Functioning of the offered systems is based on biological feedback principle. The essence of the systems' operation is based on registration of spinal position by dedicated sensors installed over the required part of the spine, processing of data acquired and their comparing to predetermined ones. In case of deviation of the registered parameters from admissible ones, various output signals are generated (vibration, sound, electric stimulation) until the faulty spinal position has been corrected. The device is real-time operating. It evaluates the required curve of the spine and can be programmed under many parameters. The systems are used in integrated treatment of patients with Scheuermann's disease and sagittal disorders of posture. Their efficiency is demonstratively proven.

Key words: kyphosis, posture, biological feedback, interactive system

Introduction

Spine posture disorders are the most widespread musculoskeletal disorders in children and adolescents. Number of children with faulty posture ranges up to 70%.

Faulty posture is one of the sources for spinal pain and results in generation or development of neurological disorders, significant faults in statics, and launches considerable functional and cosmetological issues, causes spinal sagittal balance disorders. Adaptive mechanisms aimed to compensate faulty position of spine result in development of early degenerative changes in spine, both in abutting and remote segments.

Spinal sagittal balance fault results in formation of early degenerative changes in all structures of spinal column. Visual appearance of a person deteriorates. Disadvantageous conditions for thoracic and abdominal cavity organs arise.

Material and methods

In order to evaluate the system's efficiency, its clinical approbation has been carried out in treatment of patients with Scheuermann's disease. 90 patients were being under observation (80 boys, 10 girls) aged 14 to 16. They were subdivided in three groups:

- Basic group: SUPERPOSTURE interactive system was used in integrated treatment
- Controls: treatment was carried out without biological feedback systems applied
- Additional controls: treatment involved biological feedback stationary system of Ambliokor.

All children were present with stationary course of integrated treatment at St. Petersburg State Health-care Budgetary Institution of Restorative Center for Children's Orthopedics and Traumatology "Ogonek". The stationary (Abliokor) and portable (SUPERPOSTURE) units were in use for 3 weeks, 45 minutes every day. The patients were subject to computerized optical topography, physical examination and radiography (if necessary). The original portable interactive system of SUPERPOSTURE working on BF principle [**1–3**] was installed over clothing at kyphotic section of spine and fixed with simple elastic attachment system (similar to suspenders or belt).

After the sensor has been attached, the patient sets up the correct position of the body in the device's memory using system control unit. If the patient's body takes a faulty position for a time period exceeding the admissible value the device generates an alarm signal that forces the patient to take a correct position.

- The essential advantages of SUPERPOSTURE system, as compared to other applied structures, are as follows:
- The interactive system, as distinct from all passive systems (braces) forms a patient's independent habit of keeping the right posture.
- Local isolated control of spine position at required level is maintained.
- User's movability is not constrained.
- Autonomous operation of the device (maintained by a built-in accumulator) may comprise 3 to 4 days with daily usage.

- A game-like kind of application increases children's motivation towards treatment.
- Selection of various alarm modes for a patient (sonic, vibrating, no alarm) provides additional comfort for application in casual practice.
- The device allows one to monitor the patient's status and stores the training results record in its built-in electronic memory. The posture correcting exercise device has budgeted cost.

One of the essential advantageous features of our system is an option of sagittal disorders' selective correction, i.e. if a thoracic spine has kyphosis, the correction will be applied to thoracic spine; if a lumbar spine has kyphosis (or lordosis) the lumbar section is resolved. This approach towards treatment allows recreation of physiological ratios between parts of a spine thus restoring general sagittal balance of spine.

Results

The general group presented with 50% improvement; 40% of patients showed stabilization of their state; 10% lacked positive dynamics.

Additional control group showed 54% improvement; 33% showed stabilization of state; 13% lacked positive dynamics.

The control group showed the worst results. There was 34% improvement, 33% stabilization, and 33% of patients lacked positive dynamics.

Thus, BF method application in Scheuermann's disease treatment significantly increases integrated treatment efficiency.

Efficiency of BF method using stationary systems (Ambliokor) is comparable to that using portable interactive system (SUPERPOSTURE).

Discussion

Our experience in applying device since 2010 has shown high efficiency of training using the interactive system of SUPERPOSTURE in patients with posture disorder in sagittal plane. Correct posture stereotype starts forming in 7 to 10 days subsequent to the first application of the device.

Efficiency of portable interactive system of SUPERPOSTURE is highly competitive with expensive stationary systems of biological feedback. Also the system may be used indoors by patients themselves.

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ORIGINAL PAPER

GENERALIZED JOINTS HYPERMOBILITY – A MARKER OF CHILDREN'S AND ADOLESCENTS' PATHOLOGY POSTURE

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Published as an **Original paper** in Locomotor System, vol. 20, 2013, No. 3+4

ABSTRACT

THE EFFECT OF OBESITY ON MUSCULOSKELETAL DEVELOPMENT AND PHYSICAL CAPACITY DURING GROWTH

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Key words: Obesity – children – physical fitness – musculoskeletal problems

Changing life style and enhanced sedentarism which has at present been manifested by increasing prevalence of obesity interferes with normal growth and development of somatic and functional characteristics in all age categories. During last decades the inadequate loading of the organism by excess fat deposits results in the reduction of physical fitness level due to worsening of the efficiency of the cardiorespiratory system (aerobic and anaerobic capacity), motor development, skill, endurance, etc. : this was revealed also in school children and adolescents all round the world, especially in the industrially developed countries, but also in the transition ones. More recent studies showed similar negative changes already in Czech preschool children. Along with that, inadequate loading of the areas of growth activities of the epiphyses by excess fat results also in aberrant mechanics of movements. Increased stress on bone, connective etc. tissues cause musculoskeletal problems and accidents, also due to reduced adaptation to movement activities. Most often flatfoot, scolioses, pains of the back, shoulder, hip and knee joints, genua vara and valga, deteriorated body posture, muscle flabbiness etc. have been appearing already in obese children and adolescents. This situation also contributes further – as circulus vitiosus - to reduced physical activity and exercise, and thus to permanently worsening undesirable status of the growing organism. As shown in most cases of obesity started early in life, excess fat deposition results not only in present, but also delayed deterioration of health (early arthritis, accidents – easier fractures, back and joint pains, and also in cardiovascular diseases, metabolic syndrom- especially diabetes, psychological problems, etc.).

ABSTRACT

EVIDENCE BASED INTERMITTENT PNEUMATIC MASSAGE SYSTEM (EBIPMS): A METHOD

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Introduction

The rehabilitation method using the EBIPMS is a computer based massage, using pressure cuffs with the uniform compression of muscle tissue during massage ther-

apy of the arms and the legs. Interactively informs on screen the massage effect in form of the muscles relaxation degree.

Purpose of the research

Purpose of the research using the EBIPMS-method is to activate important signaling molecule nitric oxide (NO), which penetrates into and activates muscle causing relaxation of smooth muscle cells (Nobel Prize 1988, Ortop. Resarch Sciety, 1997, San Francisco). On this way NO induces synthesis of cyclic GMP, by activation of enzyme guanylyl cycles (GC) leading to relaxation of myosin (muscle protein) and relaxation of the muscle in physiological way.

Group of patients, treatment and research using EBIPMS-method:

a. The treatment of postoperative swelling of the hands and arms, during 3 days at the Department of Hand Surgery, reducing swelling in a physiological manner.
b. The treatment of postoperative swelling legs after coronary bypass during 4 days at the Department of Heart Surgery, with good results.
c. The treatment of S-scoliosis, after 2 month massage of legs and arms the pain has stopped.
d. The treatment of postoperative paralyzed patient in both legs during 5 years, after 3 weeks of massage return sensibility I both big toes and after 2 month patient can get up and go.
e. The treatment of Carpal Syndrome, after 7 days massage of arm syndrome has been finished.
f. The treatment of 5 year old boy with Congenital Muscle Dystrophy, after 3 months massage of legs, the boy started crawling on the floor. The video available.

Conclusion

The EBIPMS-method offers an important contribution to healthcare, giving new opportunities of healing to patients suffering from acute painful conditions where conventional treatment is unsuccessful.

PERSPECTIVE ORIGINAL PAPER

EXPERIMENTAL BASIS OF MAGNETIC FIELDS FOR CONTROL OF BONES' GROWTH PLATES FUNCTIONAL ACTIVITY

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Published as a **Prospective original paper** in Locomotor System, vol. 20, 2013, No. 3+4

ABSTRACT

MAGNETOTHERAPY ROLE AND PLACE IN THE TREATMENT OF ORTHOPEDIC DISEASES IN CHILDREN

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Key words: Magnetic therapy, bone tissue growth, scoliosis, leg length irregularity

At the present stage the magnetic fields application in the practical medicine (including pediatric orthopedics) bears an empirical character. Such approach significantly reduces the efficiency of this physical factor. After analysing the native and foreign literature, we found out that recent magneto-biology advances often don't find practical application in medicine. Meanwhile, on the bases of well-known and proven biological effects of magnetic fields is possible to develop modern and efficient pathogenetic treatment methods.

As a point of magnetic therapy application in the child's orthopaedic diseases treatment, we selected the area of bones' growth zones. It should be noted that earlier were not applied any attempts to control the functional activity of the growth zones by means of magnetic fields. This direction is considered to be a very perspective one and can improve both the efficiency of many orthopaedic diseases treatment areas and the consequences of injury in children. Such a position is logical and justified. It is well known that the emergence and development of many orthopaedic diseases are closely associated with impaired functioning of the bones growth zones. As an example can be mentioned the following most common orthopaedic "problems": idiopathic scoliosis, limbs' different length, femoral head juvenile epiphyseolysis and a big number of inherited diseases concerned with impaired growth disorders.

Studies of the effects of magnetic fields on the bone growth zones and development of private methods of magnetic therapy have been held in St. Petersburg's GDH CRCOT "Ogonek" since 1998. In experimental studies in animals, conducted together with the Institute of Cytology of RAS (Russian Academy of Sciences), it was established that a "strong" pulse magnetic field (1.5 T) in a preset//determined mode can have a suppressive effect on proliferative processes in bone growth zones (plates).

Further experimental work with the theoretical support of the Institute of Theoretical and Experimental Biophysics of RAS has been focused on the combination of "weak" magnetic fields//weak combined magnetic fields. As the object of the research is bone growth zone. It was shown that by using weak fields it is also possible to control the functional activity of growth zones. It should be noted that the usage of weak magnetic fields is as effective as strong ones and thus//in that way is more "physiologic."

The data obtained in the course of the experimental work formed the basis of the original methods of conservative treatment of children with idiopathic scoliosis (RF patent No 2275943) and different-sized limbs in children (RF patent No 2212258). At the present moment, the experience of these techniques application in the comprehensive medical treatment of diseases of the locomotor system in children amounts 15 years. It is noted, that the selective and deliberate application of magnetic fields to control the functional activity of bones' growth zones is//is considered to be a very effective therapeutic factor.

ABSTRACT

STUDY OF PHOTODYNAMIC IMPACT ON GROWTH PLATES OF LONG TUBULAR BONES IN GROWING ANIMALS

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Keywords: Photoditazin®, Chlorine E6, laser, chondrocytes, photosensitizer, growth.

Introduction

The method of photodynamic impact (PDI) is based on the combination of laser irradiation (LI) and substances called photosensitizers (PS). Photosensitizers are Chlorine E6 derivatives and can accumulate selectively in intensively proliferating tissues and have selective sensitivity to certain light wavelengths of the optical range (**9**). The absorption of light quanta of PS molecules in the presence of oxygen leads to a photochemical reaction, resulting in a triplet molecular oxygen O_2 ($X3\Sigma g$) transformation into a singlet O_2 ($a1\Delta g$), as well as a large amount of highly active radicals arising. Singlet oxygen and radicals cause to necrosis and apoptosis of target cells.

PDI is able to supress tissues proliferating. It is used in treatment of cancer (**10**), as well as many other diseases, including juvenile arthritis and degenerative diseases in children and adolescents (**1, 3, 4, 8, 13, 14**). We have the evidence of mark antibacterial and virostatic activity of PDI (**2, 6, 7, 11**).

As shown earlier [**15**] in the study of histological preparations the photodynamic effect on the epiphyseal plates of bones (which are tissues with high proliferative activity) causes the epiphyseal plates decreasing and reducing of the chondrocytes total number in them. This research is devoted to the studying of this aspect at a macroscopic level by measuring the dynamics of growth of long bones of growing animals. It was realized in the experimental laboratory of The Russian Scientific Research Institute of Traumatology and Orthopedics named after R.R. Vreden. The aim of this research is to prove that PDI with a transcutaneous administration of Chlorine E6 derivatives to the area of the germ zones inhibits the growth of long bones in growing animals.

Material and methods

80 white mongrel nonlinear rats (40 of each sex) aged from 4 to 8 months were divided into two groups: control and experimental. The control animals (5 males and 5 females) were not exposed to and observed in age from 4 to 8.5 months. Animals of experimental group (35 males and 35 females) were exposed to single PDI procedure by laser therapy device Atkus-2 (Russia) with such parameters: wavelength 662 nm, power 1 W, dose 75 J/cm^2, exposition 1 min. 20 sec., distance 5 cm. PS gel penetrator 0.5% "Photoditazine®" (N-dimetylglucamate of Chlorine E6) dose of 0.7 mg/kg was administered transcutaneously 15 minutes before laser exposure on the region of the germ zones of both hind limbs (the knee joint).

PDI on experimental animals was carried out at different ages, with 10 animals (5 male and 5 female) in each age group: at the age of 4 months, 4.5 months, 5 months, 5.5 months, 6 months, 7 months

and 8 months. Before the experiment and until the age of 8.5 months with an interval of 2 weeks all animals were measured weight, the body length and the length of the thighs and shanks (on radiographs at standard conditions with the radiographic system Quantum Q-Rad-DS-3).

The measurements of animals were carried out in state of sedation caused by subcutaneous injection of 2% solution Xylazine dose of 0.2 mg. On reaching the age of 8.5 months, animals of the control and experimental groups were derived from the experiment by an overdose of Xylazine. Extracted material (hindquarters) was fixed with a solution of Methanediol.

The results were compared with similar measurements of animals of the same age who were not exposed.

Results

Comparison of the results convinced that the animals of the experimental group showed a slowdown in the hips and legs for 1.5 months after photodynamic impact, followed reclaimed normal growth.

Conclusion

Thus PDI with a transcutaneous administration of Chlorine E6 derivatives to the area of the germ zones inhibits the growth of long bones in growing animals.

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ORIGINAL PAPER

EFFECTIVENESS OF THE COMPLEX TREATMENT OF IDIOPATHIC SCOLIOSIS IN CHILDREN. PAIR CONTROLLED INVESTIGATION

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Published as an **Original paper** in Locomotor System, vol. 20, 2013, No. 3+4

ABSTRACT

REGULATION OF MOTOR SYSTEM OF HUMAN THE INDIVIDUAL GUIDE ALLOCATION OF PRESSURE ON THE BODY WITH CONTROL BY BIOMECHANICAL TESTS IN ORTHOPEDICS, MANUAL MUSCLE-SKELETAL MEDICINE, ORTHODONTISTS, PEDIATRY

Krivo Yu

Abstract was not sent.

Abstracts that were not presented and not included in Programme due to the author/speaker health state.

ABSTRACT

REFLEXOTHERAPY OF HERNIATED DISC

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Keywords: reflexology, acupuncture, back pain.

Introduction

One of the most common forms of degenerative spine is based on degeneration of the intervertebral disc with subsequent involvement in the process of

adjacent vertebral bodies, intervertebral joints and ligaments. Every second person in a lifetime experiences typical back pain. In 95% of cases it is discogenic pain. If the disease was found not long ago mostly in patients aged 25–45 years, there are cases of degenerative disc disease in early age (13–18 years) in recent years. The common form of the disease is herniated disc which is accompanied by severe pain. The treatment is usually aimed to pain relief by physical therapy, kinesotherapy, manual therapy. Up to 10–15% of these patients are sent to surgery, often unfounded, that without a full and comprehensive conservative treatment is becoming one of the main causes of disability. One of the methods of conservative treatment is reflexology. The objective of this study was to investigate the feasibility of reflexotherapy in conservative treatment of herniated disc.

Material and methods

We treated 29 patients of different ages. The diagnosis "herniated discs" was verified according to X-ray examination and MRI. All the patients had 2–5 herniated discs sized 2–8 mm. The hernias were located mostly in the lumbar spine, rarely in the cervical and thoracic spine. All the patients received following treatment. First of all the dominant energy and dominant meridian diagnostics was carried out. Then the harmonization of energy by acupuncture and moxibustion (the burning of cone-shaped or cylinder preparations of mugwort near the skin on an acupuncture point) was carried out according to the classic laws of submission and antisubjugation. In a day impact on the broad spectrum points (2 points for each procedure) was carried out: He Gu (GI 4), Zu San Li (E 36), Yang Ling Quan (VB 34), Yin Ling Quan (RP 9), San Yin Jiao (RP 6), Qu Chi (GI 11), Wai Guan (TR 5), Nei Guan (MC 6), Bai Hui (VG 20). All procedures were accompanied with moxibustion by mugwort cylinders. The total duration of treatment was 15 procedures.

Results

Pain syndrome was controlled after 4–5 procedures. At the control MRI (performed after 6 months) in all cases the small hernias (2–4 mm) disappeared and large hernias decreased from 5–8 mm to 2–3 mm.

Clinical examples

Patient A., 62 years old.

Complaints: severe pain in the lumbosacral and cervical spine, difficult walking (the inability to straighten up and walk straight).

Diagnosis: discogenic sciatica.

MRI: herniated discs C5–C6 4 mm, L3–L4 – 8 mm, L5–S1–5 mm.

Reflexological diagnosis (according to "6 Ki theory"): the constitution of combined Cold, excess of Dryness in the Large intestine channel (GI), lack of Heat in Gall bladder (VB) and Liver (F) channels.

Treatment: sedation of excess energy and stimulation of insufficient energy by needles. Warming up of energy points through the needle (by 2 points per session) and the areas corresponding to the disc herniation (pecking method) by sagebrush cigars. The first treatment course – 15 procedures in a day. After 2 months the second course was carried out (12 procedures according the same one scheme).

Dynamics: the pain was controlled after 3 treatment sessions.

Control MRI (after 6 months): in the L5–S1 herniation is not defined, in the L3–L4 herniated disc 3 mm, in the C5–C6 – disc protrusion without herniation.

Patient B., 21 years old.

Complaints: pain in the cervical and thoracic spine, severe headaches for 3 years.

Diagnosis: cephalgia, thoracalgia.

Previous treatment: drug therapy, physical therapy with a temporary effect and subsequent exacerbations.

MRI: herniated discs C4–C5 4 mm, C6–C7 – 3 mm, T6–T7 – 5 mm.

Reflexological diagnosis (according to "6 Ki theory"): the constitution of combined Cold, excess of Heat in the Small intestine channel (IG), the lack of Dryness in the Small intestine channel (IG).

Treatment: sedation of excess energy and stimulation of insufficient energy by needles. Also energy points and corresponding zones of herniae were warmed by sagebrush cigars. The first treatment course – 15 procedures in a day. After 2 months the second course was carried out (15 procedures according the same one scheme).

Dynamics: the pain was controlled only during the second treatment course.

Control MRI (after 3 months): C4–C5 disc protrusion without herniation, herniated C6–C7 is not defined, herniated T6–T7 was reduced to 2 mm.

Patient C., 43 years old.

Complaints: severe pain in the right shoulder joint, the restriction of the right upper extremity.

Radiograph of the right shoulder joint: pathology is not detected.

MRI: a herniated disc C5–C6 5 mm.

Diagnosis: osteochondrosis of the cervical spine, scapulohumeral periarthritis.

Reflexological diagnosis (according to "6 Ki theory"): the constitution of combined Cold, excess of Heat in the Small intestine channel (IG).

Treatment: 15 sessions of acupuncture with warming of energy points and the areas corresponding to the pathological focus by sagebrush cigars.

Dynamics: pain syndrome was arrested after 7 treatment sessions. After 15 treatment sessions the right upper extremity function was restored. After 2 months the second course was carried out (15 procedures according the same one scheme).

Control MRI: the size of hernia reduced to 3 mm.

Conclusion

Acupuncture combined with moxibustion is economical and effective method of herniated discs treatment.

ABSTRACT

MRI IN THE EARLY DIAGNOSTICS OF ADOLESCENT DYSPLASTIC HIP OSTEOARTHROSIS

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Objective

The use of x-rays at an early stage of development of dysplastic coxarthrosis in adoles-

cents is not sufficiently informative. The purpose of this study was to research diagnostic methods that would detect signs of arthrosis in adolescents at early stage of the disease.

Material and Methods

We examined hip joints of 44 adolescents with a presumptive diagnosis "coxarthrosis". The MRI scanner with capacity 0.3 to 3 T was used. MRI studies were performed in 3 projections: coronal, sagittal and transversal in T1 (echo time – 400, repetition time - 40) and T2 (time echo – 1200, repetition time - 60) modes with the sequence of partial saturation. 5 slices were made at intervals of 5 mm.

Results

We identified three types of changes in the MRI of the hip joints. Type 1 with high signal intensity in T1 mode and intermediate signal in T2 mode corresponds to the yellow marrow dystrophic changes (52% of patients). Type 2 with high intensity in T1–T2 modes corresponds to a significant venous hyperemia in the affected area (23% of patients). The third type with low signal intensity corresponds to the replacement of diseased bone and cartilage tissue by fibrous tissue (22% of teenagers). The MRI studies were confirmed by thermographic, biophotometric (laser), radioisotope and biomechanical studies of hip joints in these patients.

Conclusion

MRI of hip joints in adolescents can identify signs of osteoarthrosis in the very early stages of the disease, objectively records the area and depth of the lesion of the cartilage covering the joint surfaces and bone substance, observes nature of the pathological process in the hip, monitors the adequacy and efficiency of the treatment. Early detection of signs of dysplastic coxarthrosis enable timely start of appropriate treatment and, therefore, suspend the progression of disease, especially in adolescents, causing possible to achieve a significant reduction in the level of disability in the population.

ABSTRACT

OUR VISION OF AETIOPATHOGENESIS OF DYSPLASTIC COXARTHROSIS IN ADOLESCENTS

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In recent publications many authors attribute the occurrence of dysplastic coxarthrosis with genetically determined disorder of the hip joint bone structures organization, which increases with the development of the organism. Recent data suggest that the basis of dysplastic changes leading to hip arthrosis is a mutation of the gene synthesizing collagen type-2, constituting 95% of articular cartilage. It was noted that the underdevelopment of the hip joint can have a hereditary origin, and to be determined by exogenous factors in the form of various teratogenic effects on embryogenesis: embryo trauma, inadequate nutrition, infections, chemical poisoning, radioactive impact, etc.

We suppose the pathogenesis of dysplastic coxarthrosis as follows. The primary external factors (the endocrine dysfunction in mother during pregnancy, the effect of environmental factors, etc.) cause a change in the reading of genetic information. It leads

to metabolic changes in the body of the fetus, which manifest themselves in the course of its development by disorders of dysplastic hip joint tissue structures. After delivery, the load on a joint leads to new metabolic changes in the tissues of the joint, and the body in general. It leads to progression of degenerative processes and development of dysplastic coxarthrosis.

Myelodysplasia may be one of the causes of hip dysplasia and the hip arthrosis in adolescents. According to our observations this condition is accompanied by deviations from normal development in all parts of the spine, including ligament-muscular and osteo-articular apparatus, the elements of the nervous and circulatory systems.

We examined 210 adolescents with a preliminary diagnosis "dysplastic coxarthrosis." These patients underwent X-ray examination of the hip joints and the lumbar-sacral spine. Signs of arthrosis in the background of dysplastic changes in the hip joints, which were expressed in violation of anatomical and spatial relations of the femoral and acetabular components of the joint were found in 136 patients (65%). The X-ray of the lumbosacral spine in 194 patients (92.4%) showed indirect evidence of myelodysplasia: segmentation of the sacrum, cleft bow first sacral vertebra, painful (often bilateral) sacralization of L5 vertebrae, the longitudinal hypoplasia of the fifth lumbar vertebra, hypoplasia of the sacrum, the skew standing body of the fifth lumbar vertebra and the sacrum. Thus in 136 patients (65%) dysplastic scoliosis of varying severity was identified. Signs of hip dysplasia were detected on radiographs in 94 patients (45%). However, the salient features of dysplastic changes were identified on radiographs of the lumbosacral spine in these patients.

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