Pohybové ústroji

Pokroky ve výzkumu, diagnostice a terapii

The 19th Prague-Lublin-Sydney-St Petersburg Symposium

Interdisciplinary approach to growing skeleton

13th – 16th September 2017
Prague | Czech Republic

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

ročník 24 / 2017 číslo 2 Suppl.

EMBASE / Excerpta Medica | Bibliographia medica Čechoslovaca

ISSN 2336-4777

Systém výživy kloubů dle výzkumu prof. MUDr. Milana ADAMA, DrSc.

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POHYBOVÉ ÚSTROJÍ

ročník 24, 2017, číslo 2

Pohybové ústrojí. Pokroky ve výzkumu, diagnostice a terapii.

ISSN 2336-4777 (od roku 2013 pouze on-line verze)
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Excerpováno v Excerpta Medica a Bibliographia medica Čechoslovaca.
Návrh a grafická úprava obálky 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, Society for Prosthetics and Orthotics, Czech Medical Association of J. E. Purkyně, Prague, Czech Republic and Ambulant Centre for Defects of Locomotor Apparatus Prague, Czech Republic

Call for papers

Support this journal by sending in your best and most interesting papers. The issue of the journal is published during whole year after proof acception of the revieweres. In occasion of the symposia (twice a year) is published the supplement.

Submitted papers: Locomotor System will review for publication manuscripts engaged in diagnostics and interdisciplinary treatment of genetic and metabolic skeletal disorders, limb anomalies, secondary osteoporosis, osteo/spondyloarthritis and another disorders that negatively influence development and quality of locomotor appartus during human life. Both papers on progress in research of connective tissue diagnostics, medical and surgical therapy of multiple congenital abnormalities of skeleton mainly in the fields of paediatric orthopaedic surgery and plastic surgery, orthotics and prosthetics treatment, and papers dealing with biomechanics, clinical anthropology and paleopathology are appreaciated.

The journal has an interdisciplinary character which gives possibilities for complex approach to the problematics of locomotor system. The journal belongs to clinical, preclinical and theoretical medical branches which connect various up-to-date results and discoveries concerned with locomotor system. You can find the volumes of Locomotor System journal at http://www.pojivo.cz/cz/pohybove-ustroji/ since 1997 (free of charge). Since 2013 only electronic edition of the journal is available. That is why we recommend to all subscribers and those interested apply at http://www.pojivo.cz/en/newsletter, enter personal data, titles and e-mail address where the journal will be mailed.

Abstracts of presented papers are excerpted in EMBASE/Excerpta Medica (from the year 1994) and in the Bibliographia medica Čechoslovaca (from the year 2010). We prefer the manuscripts to be prepared according to Uniform Requirements for Manuscripts Submitted to Biomedical Journals (Vancouver Declaration, Brit med J 1988; 296, p. 401-405).



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

invite you to

THE 19TH PRAGUE-LUBLIN-SYDNEY-ST. PETERSBURG SYMPOSIUM

main topic

INTERDISCIPLINARY APPROACH TO GROWING SKELETON

under the auspices of
honorary president of the Czech Medical Association J.E. Purkynje
Professor Jaroslav Blahoš, MD, DSc.

&

director of Charles University Hospital Hradec Králové
Professor Vladimir Palička, MD, PhD, Dr.h.c.

&

dean of The Faculty of Health Care Studies, West Bohemia University
Assoc. Professor Dr. Ilona Mauritzová, PhD

The Symposium will be held in the Czech Police Museum & the Medical House
Sokolská 31, 120 26 Prague 2, Czech Republic
September 13–16, 2017

SYMPOSIUM FINAL PROGRAMME

WEDNESDAY, SEPTEMBER 13, 2017

Arrival of participants to Prague

19.30 GALA DINNER WITH FOREIGN GUESTS
Restaurant "Historie" (Londýnská 52, Praha 2 – near Metro station I.P. Pavlova
http://www.restaurace-historie.cz/en/)

THURSDAY, SEPTEMBER 14, 2017

8.00–9.00 REGISTRATION OF PARTICIPANTS
in the Czech Police Museum (Ke Karlovu 1, Praha 2, www.muzeumpolicie.cz)

9.00 OPENING OF THE SYMPOSIUM

Ivo Marik & Tomasz Karski & Mikhail Dudin (or Aleksey Arsenev)

WELCOME SPEECHES

Professor Ivo Marik, MD, PhD

President of the Society for Connective Tissues, Czech Medical Association J.E. Purkynje

Professor Mikhail Dudin, MD, DSc.

Honorary member of the Society for Connective Tissues, Czech Medical Association J.E. Purkynje

Professor Tomasz Karski, MD, PhD

Honorary member of the Society for Connective Tissues, Czech Medical Association J.E. Purkynje

GREETINGS

Assoc. Professor Dr. Ilona Mauritzová, PhD

Dean of The Faculty of Health Care Studies, West Bohemia University

Professor Josef Hyanek, MD, DSc.

Honorary president of the Society for Connective Tissues, Czech Medical Association J.E. Purkynje

9.30–12.00 **SESSION I**

BIOMECHANICS – VARIA

Chairmen: PETRTYL MIROSLAV, CULIK JAN, MARSIK FRANTISEK

Petrtyl Miroslav[1], Volf Jaromír[2], Povysil Ctibor[3] (Prague, Czech Republic)
The subtle electrical energy in bone tissue (30 min.)
[1] Department of Mechanics, Laboratory of Biomechanics and Biomaterial Engineering, Czech Technical University, FCE, Prague, Czech Republic
[2] Department of Electrical Engineering and Automation, The Faculty of Engineering, Czech University of Life Sciences Prague
[3] Institute of Pathology, 1st Faculty of Medicine, Charles University, Prague, Czech Republic

Marsik Frantisek[1, 2, 3] (Prague, Czech Republic)
The irreversibility of natural processes and their consequences for the evolution of biological systems. Entropy and its biological interpretation (30 min.)
[1] Institute of Thermomechanics of the Czech Academy of Sciences, Prague, Czech Republic
[2] University of West Bohemia, New Technologies - Research Centre, Pilsen, Czech Republic
[3] Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic

Tesar Karel[1, 2], Sucharda Zbynek [3], Zaloudková Margit [3], Balik Karel[3] (Prague, Czech Republic)
Biodegradable magnesium wires for bone support application (20 min.)
[1] Department of Materials, Faculty of Nuclear Sciences and Physical Engineering, Czech Republic
[2] Department of Dielectrics, Institute of Physics of the Czech Academy of Sciences, Czech Republic
[3] Department of Composites and Carbon Materials, Institute of Rock Structure and Mechanics of the Czech Academy of Sciences, Prague, Czech Republic

Braun Martin, Ryglova Sarka, Supova Monika, Zaloudkova Margit, Krizková Martina, Sucharda Zbynek, Suchy Tomas (Prague, Czech Republic)
Chemical analysis of collagen and non-collagen components of composite biomaterials for implantology (20 min.)
Department of Composites and Carbon Materials, Institute of Rock Structure and Mechanics, Academy of Science, Prague, Czech Republic

Culik Jan (Prague, Czech Republic)
Gait model (20 min.)
Czech Technical University, Division of Informatics of Faculty of Biomedical engineering, Kladno, Czech Republic

Krawczyk Petr[1], Marik Ivo[2, 4], Jakub Jozef[1], Sykora Ales[1], Zemkova Daniela[2], Petrasova Sarka[2], Marik Jan[2], Uchytil Jaroslav[3], Jandacka Daniel[3] (Prague & Ostrava, Czech Republic)
Influence of the weight of the transtibial prosthesis on postural stability and locomotion (20 min.)
[1] *PROTEOR CZ l.l.c., Ostrava, Czech Republic*
[2] *Ambulant Centre for Defects of Locomotor Apparatus l.l.c., Prague, Czech Republic*
[3] *Diagnostic Centre of Human Movement PdF, Ostrava University, Czech Republic*
[4] *Faculty of Medical Studies, West Bohemia University, Pilsen, Czech Republic*

12.00 LUNCH

13.00–16.30 **SESSION II**

Invited lecture of the President of the Society for Metabolic Bone Diseases (SMOS), Czech Medical Association J.E. Purkynje

PROFESSOR VLADIMIR PALICKA, MD, PHD, DR.H.C.

Introduction: OLGA HUDAKOVA, MD, PHD

Palicka Vladimir (Hradec Kralove, Czech Republic)
Clinical Osteology in the Czech Republic (organization and development) (30 min.)
Charles University and University Hospital Hradec Králové, Czech Republic

Moderator: PROFESSOR JOSEF HYANEK, MD, DSC.

(Honorary president of the Society for Connective Tissues, Czech Medical Association J.E. Purkynje)

OSTEOLOGY, BONE METABOLISM

Chairmen: PALICKA VLADIMIR, LYRITIS GEORGE, HYANEK JOSEF, MARIK IVO

PROFESSOR GEORGE LYRITIS, MD, PHD, DR.H.C.

Introduction: OLGA HUDAKOVA, MD, PHD

Lyritis George (Emeritus Professor of Orthopedics, President of Hellenic Osteoporosis Foundation Honorary member of the Society for Connective Tissues, Czech Medical Association J.E. Purkynje)
(Athens, Greece)
ELECOST: A Greek educational tool for the diagnosis and management of osteoporosis in Greece (30 min.)
Faculty of Medicine, National and Kapodistrian University of Athens, Greece

Rizou Stavroula (Athens, Greece)
Are Women Overtreated for Osteoporosis? (30 min.)
Hellenic Osteoporosis Foundation, Kifissia, Greece

Nikolaou Dimitrios[1], Rizou Stavroula[2] (Athens, Greece)
A novel approach for fracture risk and risk of falling aggregation (30 min.)
[1] Medical School, National and Kapodistrian University of Athens, Greece
[2] Hellenic Osteoporosis Foundation, Kifissia, Greece

Lambrou George I.[1, 2, 3, 4] (Athens, Greece)
Microgravity and bone metabolism. Issues of *orbis novum* colonalization (30 min.)
[1] National and Kapodistrian University of Athens, Medical School
[2] Graduate Program "Metabolic Bones Diseases", National and Kapodistrian University of Athens,
[3] Medical School, Goudi, Athens, Greece
[4] First Department of Pediatrics, University of Athens, Choremeio Research Laboratory, National and Kapodistrian University of Athens, Greece

15.30 COFFEE BREAK

Bayer Milan[1, 2], Jirotkova Jana[3] (Prague, Czech Republic)
Osteogenesis imperfecta – treatment with bisphosphonate from newborn period (30 min.)
[1] Department of Children and Adolescents, Third Faculty of Medicine, Charles University, Prague, Czech Republic
[2] Department of Pediatrics, Thomayer Hospital of Prague, Czech Republic
[3] Department of Pediatrics, Hospital of Ceske Budejovice, Czech Republic

Vyskocil Vaclav[1], Blahos Jaroslav[2] (Pilsen & Prague, Czech Republic)
Alendronate therapy for osteogenesis imperfecta in children: ten-year follow-up (30 min.)
[1] Department of Orthopaedic Surgery, Charles University Hospital, Pilsen,
[2] 1st Medical Faculty Prague, Charles University, Central Military Hospital, Prague, Czech Republic

17.30 GUIDED VISIT OF THE EXHIBITION MAN-MADE MAN-TECHNOLOGY AND MEDICINE, NATIONAL TECHNICAL MUSEUM PRAGUE
(Kostelní 42, 170 78 Prague 7, www.ntm.cz/en/en-muzeum)

20.00 DINNER
Note: transfer to the National Technical Museum and to dinner is secured by bus

FRIDAY, SEPTEMBER 15, 2017

8.00–9.00 REGISTRATION OF PARTICIPANTS
in the Medical House, Prague (Sokolská 490/31, 120 00 Praha 2,
www.cls.cz/koncepce-vyuziti-ld)

9.00–13.00 **SESSION III:**

SPINE DISORDERS I: PATHOGENESIS, DIAGNOSIS AND TREATMENT

Chairmen: KARSKI TOMASZ, ARSENEV ALEKSEY VALENTINOVICH, REPKO MARTIN

Karski Tomasz[1], Karski Jacek[2] (Lublin, Poland)
Twenty two years of knowledge about aetiology of the so-called idiopathic scoliosis (adolescent idiopathic scoliosis – AIS). Rules of casual prophylactics and new treatment. Examples (20 min.)
[1] Vincent Pol University in Lublin, Poland
[2] Pediatric Orthopedic and Rehabilitation Department of Medical University in Lublin, Poland

Pallova Iveta (Prague, Czech Republic)
Characteristic features of idiopathic scoliosis (20 min.)
Center of Rehabilitation, Pediatrics and Acupuncture, Prague, Czech Republic

Arsenev Aleksey Valentinovich, Dudin M.G. (St. Petersburg, Russia)
"Targets" for pathogenetic treatment of patients with adolescent idiopathic scoliosis (20 min.)
Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia

Repko Martin, Filipovic Milan (Brno, Czech Republic)
Surgical Treatment Strategy of Early Onset Scoliosis (20 min.)
Orthopaedic department, Faculty Hospital of Masaryk´s University, Brno, Czech Republic

Piet J.M. van Loon[1], Ruud HGP van Erve[1], Eric BTM Thunnissen[2], Lodewijk W. van Rhijn[3], Andre J Grotenhuis[4] (Deventer, Amsterdam, Maastricht & Nijmegen, Netherlands)
Sedentary lifestyle and discongruent neuro-osseous growth relations (M. Roth) as external and internal etiologic factors of spinal deformity and skeletal malalignement. Modern youth and their short cord (20 min.)
[1] Orthopedic surgeon, Care to Move, Centre for Orthopedics, Deventer, Netherlands
[2] Pathologist, epidemiologist VUMC, Free University, Amsterdam, Netherlands
[3] Professor of orthopedic surgery, Maastricht UMC, Maastricht, Netherlands
[4] Professor of neurosurgery, RadboudMC, University of Nijmegen, Netherlands

11.00 COFFEE BREAK

SPINE DISORDERS II – PATHOGENESIS, DIAGNOSIS AND TREATMENT – VARIA

Chairmen: KOLESNICHENKO VERA, CERNY PAVEL, KARSKI JACEK

Cerny Pavel[1, 2, 3], Stolinski Lukasz[4, 5, 6], Czaprowski Darius [7, 8], Marik Ivo[1, 9], Muranova J.[3], Kotwicki T.[4] (Prague, Pilsen, Czech Republic – Poznan Olsztyn, Poland)
Method of measuring axial pelvis rotation – a pilot study (20 min.)
[1] Faculty of Health Care Studies, University of West Bohemia, Pilsen, Republic
[2] Faculty of Physical Education and Sport, Charles University, Prague, Republic
[3] ORTOTIKA, l.l.c., the complex of the Faculty Hospital at Motol, Prague, Republic
[4] Department of Spine Disorders and Pediatric Orthopedics, University of Medical Sciences, Poznan, Poland
[5] Rehasport Clinic, Poznan, Poland.
[6] Rehasport Clinic Licensed Rehabilitation Center, Skierniewice, Poland
[7] Department of Physiotherapy, Józef Rusiecki University College, Olsztyn, Poland
[8] Center of Body Posture, Olsztyn, Poland
[9] Ambulant Centre for Defects of Locomotor Apparatus l.l.c., Prague, Czech Republic

Vasilevich SergeyViktorovich[3], Arsenev Aleksey Valentinovich[1], Dudin Mikhail Georgiyevic[1], Baloshin Yuriy Aleksandrovich[3], Kipke M.V.[2], Sorokin A.A.[2] Sukhov T.M.[B], Sukhova M.A.[C] (St. Petersburg, Russia)

The potential of modern mobile technology for the diagnosis of anthropometric parameters of a human (20 min.)

[1] Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok"
[2] FSBEI HE Baltic State Technical University "Voenmeh" Named after D.F. Ustinov
[3] "Smart-Orto" Ltd, St. Petersburg, Russia

Kolesnichenko Vera[1], Gresko Igor[2] (Kharkov & Lviv Ukraine)

Motor control dysfunction particularly in patients with chronic low back pain and a variety of myotonic reactions (20 min.)

[1] SI "Sytenko Institute of Spine and Joint Pathology
National Academy of Medical Sciences of Ukraine", Kharkov, Ukraine
[2] Lviv National Medical University named after Danila Galitsky, Ukraine

Karski Tomasz[1], Kędzierski Zbigniew[2], Karski Jacek [3], Domagała Marian[4], Slowinska Beata[2], Kowalska Magdalena[2], Boryga Bartosz[2] (Lublin, Poland) (30 min.)

Physiotherapy of spine, hips, knees, feet, shoulders – correct, incorrect, mistakes, wrong conceptions. Examples.

[1] Vincent Pol University in Lublin, Poland
[2] Military Hospital in Lublin, Poland
[3] Medical University in Lublin,Poland
[4] Medical Centre in Laszczów, Poland

13.00 LUNCH

14.00–18.30 **SESSION IV**

DISORDERS OF GROWING SKELETON – ORTHOPAEDIC ANTHROPOLOGY – PATHOBIOMECHANICS – VARIA

Chairmen: ZEMKOVÁ DANIELA, KARSKI TOMASZ, KRAWCZYK PETR

Zemkova Daniela[3, 1], Marik Ivo[1, 2, 4], Petrasova Sarka[1], Hudakova Olga[1] (Prague & Pilsen, Czech Republic)

Skeletal disorders with lower and higher bone density (30 min.)

[1] Ambulant Centre for Defects of Locomotor Apparatus l.l.c.; Prague; Czech Republic
[2] Faculty of Health Care Studies, West Bohemia University; Pilsen, Czech Republic
[3] Dept. of Paediatrics; University Hospital Motol; Prague; Czech Republic
[4] Orthopaedic and Traumatology Department, Hospital Pribram, Czech Republic

Hruskova Lucie[1], Marik Ivo[2, 4], Mazurova Stela[1], Honzik Tomas[1], Martasek Pavel[1, 3], Mazura Ivan[1]
(Prague & Pilsen, Czech Republic)
Recessive forms of osteogenesis imperfecta (20 min.)
[1] Department of Pediatrics and Adolescent Medicine, First Faculty of Medicine, Charles University and General University Hospital in Prague, Czech Republic;
[2] Ambulant Centre for Defects of Locomotor Apparatus 1.1.c., Prague, Czech Republic;
[3] Institute of Molecular Genetics of the ASCR, v. v. i, Division BIOCEV, Vestec, Czech Republic
[4] Faculty of Health Care Studies, West Bohemia University; Pilsen, Czech Republic

Marik Ivo[1, 2, 4], Zemkova Daniela[1, 3], Myslivec Radek[4, 1], Marikova Alena[1], Cerny Pavel[5, 2], Krawczyk Petr[6]
(Prague & Pilsen, Czech Republic)
Functional adaptation of bones. Explanation of skeletal deformities in skeletal genetic disorders (30 min.)
[1] Ambulant Centre for Defects of Locomotor Apparatus I.l.c.; Prague; Czech Republic
[2] Faculty of Health Care Studies, West Bohemia University; Pilsen, Czech Republic
[3] Dept. of Paediatrics; University Hospital Motol; Prague; Czech Republic
[4] Orthopaedic and Traumatology Department, Hospital Pribram, Czech Republic
[5] Ortotica I.l.c., Prague, Czech Republic
[6] PROTEOR CZ I.l.c., Ostrava, Czech Republic

Funda Jiri (Pribram, Czech Republic)
Leg length discrepancy following total hip arthroplasty (20 min.)
Department of Trauma and Orthopaedic Surgery, Hospital Pribram, Czech Republic

Kwiatkowski Michal, Popko Janusz (Bialystok, Poland)
Surgical treatment of flexible flatfoot in children. Early follow up study (20 min.)
Department of Pediatric Orthopaedics and Traumatology, Medical University of Bialystok, Bialystok, Poland

Karski Jacek[1], Okonski Marek[1], Jakubowski Pawel[1], Karska Klaudia[2], Kandzierski Grzegorz[1]
Indications for surgical treatment in Perthes disease. The effectiveness of different methods (20 min.)
[1] Paediatric Orthopaedic and Rehabilitation Department of Medical University in Lublin, Poland
[2] Department of Interventional Radiology and Neuroradiology of Medical University in Lublin, Poland

16.30 COFFEE BREAK

Chairmen: ZWIPP HANS, PARIZKOVA JANA, SMRCKA VACLAV

PROFESSOR HANS ZWIPP, MD, PHD, DR.H.C.

Introduction: OLGA HUDAKOVA, MD, PHD

Zwipp Hans (Dresden, Germany)

Fractures of the Foot and its Relevance of Foot Development in Children (30 min.)

Orthopedic and Traumatology Department of the University in Dresden, Germany

Nemec Ivo[1], Smrcka Vaclav[2], Mihaljevic M.[3], Mazanek J.[4], Pokorny J.[5] (Prague, Czech Republic)

Effect of inferior alveolar nerve transection on the inorganic component of the mandible – experimental model (20 min.)

[1] *Department of Otorhinolaryngology and Maxillofacial Surgery 3rd Faculty of Medicine of Charles University in Prague & the Military University Hospital Prague, Czech Republic.*

[2] *Institute for History of Medicine and Foreign Languages & Department of Plastic Surgery, 1st Faculty of Medicine, Charles University in Prague, Bulovka Hospital, Czech Republic*

[3] *Institute of Geochemistry, Mineralogy and Mineral Resources, Faculty of Science, Charles University in Prague, Czech Republic*

[4] *Department of Stomatology, 1st Faculty of Medicine, Charles University in Prague and General University Hospital in Prague, Czech Republic*

[5] *Institute of Physiology, 1st Faculty of Medicine, Charles University in Prague, Czech Republic*

Zarković Dragana[1], Sorfova Monika[1] , Groleger-Srsen Katja[2], Cikajlo Imre[3]
(Prague, Ljubljana & Soca, Czech Republic & Slovenia)

Can we improve selective voluntary motor control in cerebral palsied children? (20 min.)

[1] *Charles University in Prague, Faculty of Physical Education and Sport, Department of Anatomy and Biomechanics, Prague, Czech Republic, University of Ljubljana, Faculty of Medicine, Slovenia*

[2] *University Rehabilitation Institute of Republic Slovenia - Soca, Children's rehabilitation department, Ljubljana, Slovenia*

[3] *University Rehabilitation Institute of Republic Slovenia - Soca, Laboratory of clinical kinesiology, Ljubljana, Slovenia*

Ryba Lukas[1], Koudela Karel[2], Marik Ivo[1, 3], Rybova Stepanka[1], Staskova Sarka[1], Vlckova Iva[1] (Pilsen & Prague, Czech Republic)

Physiotherapy treatment in patient with femoroacetabular impingement – systematic review (20 min.)

[1] *Faculty of Health Care Studies, West Bohemia University; Pilsen, Czech Republic*

[2] *Faculty of Medicine, Charles University, Pilsen, Czech Republic*

[3] *Ambulant Centre for Defects of Locomotor Apparatus; Prague; Czech Republic*

Parizkova Jana, Sedlak Petr, Musalek M., Dvorakova H. (Prague, Czech Republic)
Long term changes of physical activity, motor abilities and problems, and body composition in children and adolescents (20 min.)
Obesity Management Centre, Institute of Endocrinology, Prague, Czech Republic

20.00 DINNER – RAUT
Restaurant Historie (Londýnská 52, Praha 2 – near Metro station I.P. Pavlova, http://www.restaurace-historie.cz/

SATURDAY, SEPTEMBER 16, 2017

8.00–9.00 REGISTRATION OF PARTICIPANTS
in the Medical House, Prague (Sokolská 490/31, 120 00 Praha 2)

9.00–12.00 **SESSION V: LECTURES & POSTERS**

DISORDERS OF GROWING SKELETON – ORTHOTICS AND PROSTHETICS – BIOMECHANICS – VARIA

Chairmen: POVYSIL CTIBOR, ZEMKOVA DANIELA, KUKLIK MILOSLAV

Povysil Ctibor[1], Marik Ivo[2, 3], Zemkova Daniela[2, 4], Krepelova Anna[5], Kuklik Miloslav[4], Kozlowski Kazimierz[6] (Prague & Sydney, Czech Republic, Australia)
Diastrophic dysplasia (20 min.)
[1] Institute of Pathology, 1st Faculty of Medicine, Charles University, Prague, Czech Republic
[2] Ambulant Centre for Defects of Locomotor Apparatus; Prague; Czech Republic
[3] Faculty of Health Care Studies, West Bohemia University; Pilsen, Czech Republic
[4] Dept. of Paediatrics; University Hospital Motol; Prague; Czech Republic
[4] Genetic Dept.; Czech Republic, Prague 3; Czech Republic
[5] Dept. of molecular genetics, Institute of biology and medical genetics, University Hospital Motol; Prague; Czech Republic
[6] New Children Hospital, Westmead, Sydney, Australia

Smrcka Vaclav (Prague, Czech Republic)
Challenges of biomolecular paleopathology (20 min.)
Institute for History of Medicine and Foreign Languages, Prague, Czech Republic

Chairmen: PIET J.M. VAN LOON, KRAWCZYK PETR, MARIK IVO, ARSENEV ALEKSEY

Piet J.M. van Loon[1], Ruud HGP van Erve[1], Andre J Grotenhuis[2], Eric BTM Thunnissen[3]
(Deventer, Nijmegen & Amsterdam, Netherlands)
Thoracolumbar lordotic intervention (TLI) in spinal deformities. Effective mechanical growth modulation by muscular forces induced by bracing (30 min.)
[1] Orthopedic surgeon, Care to Move, Centre for Orthopedics, Deventer, Netherlands
[2] Professor of neurosurgery, RadboudMC, University of Nijmegen, Netherlands
[3] Pathologist, epidemiologist VUMC, Free University, Amsterdam, Netherlands

Snytr Jan (Zruc-Senec, Czech Republic)
Practical Use of Sensomotoric Insoles for Neurologic Patien (30 min.)
Ottobock CZ l.l.c., Zruc-Senec, Czech Republic

11.00 COFFEE BREAK

Chairmen: POVYSIL CTIBOR, FEJFAROVA VLADIMIRA, MARIK IVO

Bem Robert, Fejfarova Vladimira (Prague, Czech Republic)
Charcot foot – the neglected complication of diabetes (20 min.)
Diabetes Centre, Institute for Clinical and Experimental Medicine, Prague, Czech Republic

Fejfarova Vladimira (Prague, Czech Republic)
Conservative treatment of Charcot foot (20 min.)
Diabetes Centre, Institute for Clinical and Experimental Medicine, Prague, Czech Republic

Navratil Kamil (Prague, Czech Republic)
Surgical management of Charcot foot (20 min.)
Transplantation Surgery Department, Institute for Clinical and Experimental Medicine, Prague, Czech Republic

E- POSTERS

Presenter: ARSENEV ALEKSEY VALENTINOVICH, CERNY PAVEL

Rybka Dina Olegovna, Dudin Mikhail Georgiyevich, Sharova L.E. (St. Petersburg, Russia)
Capabilities of ultrasound diagnostics of paravertebral muscules in healthy children. Preliminary report (5 min.)
Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia

Nikitina A. A., Dudin Mikhail Georgiyevich (St. Petersburg, Russia)
Parameters of electromyogram of paravertebral muscles of healthy children from 6 to 12 years old (5 min.)
Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia

Bazanova M.V., Dudin Mikhail Georgiyevich, Koloskova L.E. (St. Petersburg, Russia)
Vitamin D 3 and VDR gene role in AIS pathogenesis within infant population. (Preliminary report) (5 min.)
Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia

Dudin Mikhail Georgiyevich, Bober S., Maximova N., Gaiduk T., Bogdanova N. (St. Petersburg, Russia)
Selective biofeedback training of the m. transversospinalis method for AIS (5 min.)
Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia

Zaltsman P.L. (St. Petersburg, Russia)
Treatment of pain syndrome of vertebrogenic genesis in children and adolescents using differentiated methods of acupuncture (5 min.)
Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia

Pavel Cerny[1, 2], Petr Kawczyk[2, 3], Ivo Marik[1, 4] (Pilsen & Prague & Ostrava, Czech Republic)
Segment modifications of corrective spinal orthoses (5 min.)
[1] Faculty of Health Studies, University of West Bohemia, Pilsen, Czech Republic
[2] Faculty of Physical Education and Sport, Charles University, Prague, Czech Republic
[3] PROTEOR CZ l.l.c., Ostrava, Czech Republic
[4] Ambulant Centre for Defects of Locomotor Apparatus l.l.c., Prague, Czech Republic

Ivo Marik & Petr Krawczyk, Tomasz Karski & Arsenev Aleksey Valentinovich
Closing of the Symposium
Certificates
Planning of the 20th Prague-Lublin-Sydney-St. Petersburg Symposium

13.30 LUNCH

16.00 VLTAVA RIVER SIGHTSEEING CRUISE (http://www.prague-boats.cz/)

19.00 GALA DINNER – RESTAURANT APETIT

GOOD BYE!

NOTES FOR ALL PARTICIPANTS

Lectures and text slides will be presented in English.
Time of the individual lecture includes time for discussion.
A list of lectures/posters and chairmen of sessions can be changed!

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Hotel accommodation is paid individually.

Abstracts of lectures will be published in the Supplement 2 of the journal Locomotor System 24/2017 (electronic version, ISSN 2336-4777, http://www.pojivo.cz/cz/pohybove-ustroji/.)
Participants will receive the Programme & Certificate of Attendance & Symposium materials.

More recent information about the Symposium will be available on the websites:
www.pojivo.cz & www.pls-symposium.com

Do not hesitate address your questions to International Organizers of the Symposium:

Prof. Ivo Marik, MD, PhD & Petr Krawczyk, MD
e-mail: ambul_centrum@volny.cz & krawczyk@proteorcz.cz

Prof. Tomasz Karski, MD, PhD & Jacek Karski, MD, PhD
e-mail: tmkarski@gmail.com & jkarski@vp.pl

Prof. Mikhail Dudin, MD, PhD & Assist. Prof. Aleksey Shashko, MD
E-mail: ogonek@zdrav.spb.ru & shravan@mail.ru

Notes: an information about the Czech Police Museum is at
http://www.prague.eu/en/object/places/544/czech-police-museum-muzeum-policie-cr

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Speech of welcome to

The 19th Prague-Lublin-Sydney-St. Petersburg Symposium – Interdisciplinary approach to growing skeleton

Dear Ladies and Gentlemen, my dear colleagues!

I cordially welcome you all at this traditional international symposium which establishment will be mentioned by my friend Professor Tomasz Karski who is an honorary member of the Society for Connective Tissues, Czech Medical Association J.E.Purkynje. It is my great honour to welcome among us Associate Professor Dr. Ilona Mauritzova, PhD, the dean of The Faculty of Health Care Studies, West Bohemia University and invited speaker Professor Vladimir Palicka, MD, PhD., Dr.h.c., the director of Charles University Hospital Hradec Králové and president of the Czech Society for Metabolic Bone Diseases. Professor Jaroslav Blahos, MD, DSc., honorary president of the Czech Medical Association (CMA) J.E. Purkynje (JEP) was unable to join us because of his health problems. He sends his regards to all participants and he wishes success to the Symposium. It is my pleasure to welcome Professor Milan Bayer, PhD who is one of the founders of the Czech Society for Metabolic Bone Diseases and chief editor of the medici journal Osteological Bulletin. I cordially welcome all colleagues and especially these who participate in the Symposium for the first time. I am very pleased that this year the programme of the Symposium attracted colleagues from Belarus, Greece, Germany, the Netherlands, Poland, Russia and Ukraine and I hope for a future close not only scientific cooperation.

My great thanks belong to all International organizers – these are Professor Tomasz Karski, his son Assistant Professor Jacek Karski, MD, PhD from Lublin, further Prof. Mikhail Dudin, MD, DSc. and Assistant Professor Aleksey Shashko, MD from St. Petersburg. My warm thanks belong mainly to my close college Petr Krawczyk, MD(Ostrava, Czech Republic), president of the Orthotic and Prosthetic Society CMA JEP and last but not least to members of the Committee of the Society for Connective Tissues CMA JEP who prepared for you interesting social program.

The organizers are grateful for the support of The Symposium especially to the General Partner "ottobock." and the Partner "Orling s.r.o."

I believe that scientific lectures will amplified our knowledge which will become a profit for our disabled patients.I wish you to enjoy new scientific information, your stay in Prague and I wish you to make new friendships which will help us to arrange international and interdisciplinary scientific research.

At the end of my speech I would like to remember you well known Professors: Jacques Cheneau, Georg Neff, Kazimierz Kozlowski and Michael Bellemore. They sincerely wish a great success to The19th Prague-Lublin-Sydney-St Petersburg Symposium.

Now, let me a short reminiscence of a few moments that we spent with most of you in Zwierzyniec (District Zamość, Poland) in September 2016. Look at photos.

Professor Ivo Marik, MD, PhD, FABI

Faculty of Health Care Studies, West Bohemia University, Pilsen, CZ
Chief of the Centre for Patients with Locomotor Defects, Prague, CZ
President of the Society for Connective Tissue, CMA J.E.Purkynje
Scientific secretary of the Society for Prosthetics and Orthotics,CMA J. E. Purkynje
Chief-Editor of the journal Locomotor System – advances in research, diagnostics and therapy
Prague, Czech Republic
E-mail: ambul_centrum@volny.cz

Hello, Golden Prague! Dobrý Den!
Ladies and gentlemen!

One more year flies by and we meet again at The 19th Symposium! It is quite special to us, because exactly four years ago, you, dear friends and colleagues, welcomed specialists from Saint-Petersburg Children's Rehabilitation Centre of Orthopedics and Traumatology "Ogonyok" into the kind and friendly family of yours!

Since that memorable year, 2013, the ideology of the Symposium has taken the leading role in planning and realization of all the scientific-practical work of our Centre.

Jan Evangelista Purkynje, a great Czech encyclopaedist, who was born 230 years ago, and was the founder of present day science about tissues of a living organism, the man, after who was named not only a number of anatomic structures, but also a crater on the Moon, always stood for cooperation of people, organizations, and nations in the fields of science and culture.

With good reason, I think, that Prague-Lublin-Sydney-Saint-Petersburg Symposium, which cultivates the interdisciplinary cooperation in solving problems connected to locomotor system, is a well-deserved follower of the ideas of the great Czech. And thus, we are proud that we are able to make our humble contribution.

From all my heart, I wish the Symposium, which will undoubtedly give us all new knowledge and ideas, to work successfully

Sincerely yours

Professor Mikhail Dudin

Director of Children's Rehabilitation Centre of Orthopedics
and Traumatology "Ogonyok" St. Petersburg, Russia
E-mail: ogonek@zdrav.spb.ru

Dear Friends, Dear Colleagues,

it is my very big privilege to be together with our Friends – Professors, Doctors of various specializations, Physiotherapists, Orthopaedic-Prosthetics &Technicians in the 19th Symposium in Prague.

I would like to remember you, that majority of Symposia went on here, in Prague in Czech Republic, one time in Kroměříž, Czech Republic (The 17th Symposium, 2015). The first meeting of the interested specialists in genetic skeletal disorders took place in 1999 year in Sydney a next year in Prague due to close cooperation with Associate Professor Kazimierz Kozlowski M.R.A.C.R. and Associate Professor Michael Bellemore F.R.A.C.S. from Sydney (both from Children's Hospital Medical Centre in Westmead Australia). These meetings were retrospectively called" The 1st and the 2nd Prague-Sydney Symposium". In 2006 the symposium was re-called to The Prague-Lublin-Sydney Symposium because of close cooperation with Lublin orthopaedic paediatric surgeons.

In 2011, The 13th Symposium Prague-Sydney-Lublin & Biomechanical workshop was taken place in Rhodos (Greece), next year in Sarbinowo (Poland).

In 2013, The 15th Symposium was held in St. Petersburg (Russia) in "Ogonyok" Rehabilitation Centre and the designation of the symposium was again extended.

In 2014, The 16th Prague-Lublin-Sydney-St. Petersburg Symposium took place in Military Hospital in Lublin (Poland).

The 18th Symposium took place in Guest House „Zacisze" in Zwierzyniec (Poland) in 2016.

The 19th Symposium Prague-Lublin-Sydney-St. Petersburg gathers us in beautiful Prague. I would like to repeat, that these all scientific meetings were and are possible only owing to Professor Ivo Marik, thanks to his hard work, good organization, good cooperation with the other friends from Czech Republic and with colleagues from abroad.

Dear Ivo, many thanks to you and yours co-organizers!

I am sure, that The 19th Symposium will be, like foregoing, in friendly atmosphere, with successful organization and it will bring us recent interdisciplinary knowledge and new good ideas for treatment of sick and disabled patients

Prof. Tomasz Karski MD PhD

Former head of the Paediatric Orthopaedic and Rehabilitation Department
of Medical University in Lublin (1995–2009)

Actually: Professor Lecturer in Vincent Pol University in Lublin

tmkarski@gmail.com
t.karski@neostrada.pl
www.ortopedia.karski.lublin.pl


RESTAURACJA


8th Prague–Lublin–Sydney–St
sbu


Prof. Mikhail Georgiyevich Dudin, MD, DSc
Prof. Tomasz Karski, MD, PhD
Prof. Ivo Mařík, MD, PhD

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

THE SUBTLE ELECTRICAL ENERGY IN BONE TISSUE: PRINCIPLES OF MECHANOELECTRICAL STRENGTHENING OF BONE

Petrtyl Miroslav[1], Volf Jaromír[2], Povysil Ctibor[3]

[1] Department of Mechanics, Laboratory of Biomechanics and Biomaterial Engineering, Czech Technical University, FCE, Prague, Czech Republic

[2] Department of Electrical Engineering and Automation, The Faculty of Engineering, Czech University of Life Sciences Prague

3 Institute of Pathology, 1st Faculty of Medicine, Charles University, Prague, Czech Republic

Email: petrtylmir@seznam.cz

Keywords: bone, nanostructural domains, electric current, mechanoelectric strengthening

Hydroxyapatite nanocrystals (HAPs) in natural form and tropocollagen molecules (TCMs) are domains of nanostructural bone components. Basic nanostructural module consists of a pair of domains: HAP + TCM. *Haverty et al*. (in 2005) proposed for HAP*two polar symmetries*: *a monoclinic* $P2_1$ *and hexagonal* $P6_3$ which do not posses any centre symmetry. Presented work is focused on the effect of induced strains in TKMs and on the *mechanochemical and electrical strengthening* of nanostructural domains. When on the HAP is applied a principal strain having the principal direction parallel/identical with the *electrical axis*, the electrical charges are initiated and located on the opposed surfaces of hydroxyapatite crystals. Mineralisation by the HAP *plateaus* is considered in the gap zones and on the surfaces of some TKMs. The second fundamental nanostructural domain - TCM is considered as a dielectric *bioelectric material* exhibits the polar uniaxial orientation of molecular dipoles in its nanostructure and the quasipermanent space charge. Loading of these TCMs (by a tension/compression) in the direction of longitudinal axis initiate the voltage and electrical currents. The *collagen molecular fibrils behave as shear piezoelectric materials*. Covalent ties in 1st and 2nd structural level ensure the mechanical stability of bone tissue. Mechanochemical covalent ties among adjacent TCMs provide the transversal stability of TCMs and their complexity. The stability in the lateral direction is provided by the *electrical strengthening* as the consequence of electric current. The electric current creates around TCMs electromagnetic force lines, which *attract neighbour* TCMs. The electric current in the TCMs initiates not only the strong contraction of helical nanostructure of tropocollagen molecules but also *contributes to the reduction of extreme tensile strains in helical tropocollagen fibres*. **The hydraulic strengthening in bone depends on fully hydrated nanostructure (by bound water) and on the extracellular fluid containing non-collagenous proteins, proteoglycans, glycosaminoglycans and other components.** *Modulus of bone elasticity* **is variable one and** *depends directly on the electrical current* **in the measured nanocompartment of bone. Elastic/viscoelastic properties of the bone nanostructural systems are** *variable* **during the load cycles and** *fully adaptable* **to physiological biomechanical loads.**

References

1. HAVERTY D., TOFAIL S.A.M., STANTON K.T., MCMONAGLE J.B. *Structure and stability of hydroxyapatite: Density functional calculation and Rietveld analysis*. Phys. Rev. B **71**, 94103 (2005).
2. TOFAIL S.A.M., HAVERTY D., STANTON K.T., MCMONAGLE J.B. *Structural order and dielectric behaviour of hydroxyapatite.* Ferroelectrics **319**, 117-123 (2005).

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

THE IRREVERSIBILITY OF NATURAL PROCESSES AND THEIR CONSEQUENCES FOR THE EVOLUTION OF BIOLOGICAL SYSTEMS. ENTROPY AND ITS BIOLOGICAL INTERPRETATION

Marsik Frantisek[1,2,3] */Prague, Czech Republic/*

[1] *Institute of Thermomechanics of the Czech Academy of Sciences, Prague, Czech Republic*

[2] *University of West Bohemia, New Technologies - Research Centre, Pilsen, Czech Republic*

[3] *Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic*

Email: marsik@it.cas.cz

Keywords: entropy, biological systems, thermodynamic conditions of stability

Thermodynamics of open systems offers a new concept for description of real material objects including the living systems. The II. Law of Thermodynamics can be interpreted as an evolution law of all material systems, which are in interaction with their surroundings. The most important quantity is the entropy, which is defined by the balance law of entropy. The production of the entropy gives information about the processes into the systems. The convexity of the entropy informs us about the stability of the system states. Under the appropriate outer conditions the fluctuations can to drive the systems to an instability. The consequence is the creation or decay of new dissipative structures. When the new dissipative structure appears the system is going further from the thermodynamic equilibrium to the new stable state. However, if the dissipative structure disappears the systems tends to the thermodynamic equilibrium, which from the biological point of view equals to death.

In open (biological) systems, entropy can be sustained at values far from its maximum. The biological system that has reached the maximum of entropy (thermodynamic equilibrium) is dead (it does not interact with the environment and does not transform any form of energy). As can be seen from formula II. Law of Thermodynamics the entropy can be interpreted by two independent ways:

i) Time irreversibility of processes: A system non-interacting with surroundings is unable itself to reach an original state.

ii) The most probability of state: A system occupies the most probable state with respect to the specific conditions.

In either of these statements, entropy is not explicitly mentioned, but each one describes one of the main consequences of this law. The behavior of all real systems is implicitly described by entropy, and therefore the concept of entropy is often used to characterize the behavior of some non-material systems outside thermodynamics (outside physics). In general, entropy can be defined as a macroscopic quantity characterizing the collective properties of matter and a degree of randomness in the evolution of the system.

We will show the applications of thermodynamics laws for open living systems. Especially the thermodynamic condition of stability that can be interpreted by the words: A system that has ceased to grow (quantitatively and qualitatively) loses its stability and begins to die.

As examples we apply this concept to predict the evolution of specific systems:

- population growth – energy limits of their growth
- ecological systems - the dynamics of their growth with the consideration of migration
- properties of the human organism in conditions of basal metabolism

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

BIODEGRADABLE MAGNESIUM WIRES FOR BONE SUPPORT APPLICATION

Tesar Karel[1,2], Sucharda Zbynek [3], Zaloudková Margit [3], Balik Karel[3]

[1] *Department of Materials, Faculty of Nuclear Sciences and Physical Engineering, Czech Republic*

[2] *Department of Dielectrics, Institute of Physics of the Czech Academy of Sciences, Czech Republic*

[3] *Department of Composites and Carbon Materials, Institute of Rock Structure and Mechanics of the Czech Academy of Sciences, Prague, Czech Republic*

* Corresponding author, K. Tesař*, email: tesarkar@fzu.cz, tel.: +420 721 869 628

Keywords: biodegradable material, medical implant, magnesium, direct extrusion, bone support, hydroxyapatite

In this work a biodegradable pure magnesium wire with a diameter of 250 μm was prepared via direct extrusion at 300°C with the extreme reduction ratio of 576. It was found that the maximum true tensile stress achievable by our processing technique is 228 MPa, with a ductility reaching up to 13 %. The proposed single step direct extrusion can lead to notably higher ductility and bending plasticity when considering very thin Mg wires, while matching the strength of drawn wires. Degradation processes of these wires in the Minimum Essential Medium – Alpha Modification

(αMEM) solution with the addition of fetal bovine serum and antibiotics were characterized by scanning electron microscopy (SEM) and related techniques. Results show nucleation of various forms of hydroxyapatite (HA) on the surface of the wires as a corrosion product. HA nucleation phenomena and morphologies are discussed in respect to the purity of the used Mg. In-vitro tests were employed to determine the cytotoxicity of the Mg in its respective purity. Due to the insufficient corrosion resistance for in-vivo applications, a biodegradable polymer of favorable mechanical properties has to be found to delay the onset of Mg corrosion processes. First results of this approach for the tailoring of the onset of corrosion in human body environment are shown. Resulting wires show promising mechanical properties and could be potentially used for biodegradable applications.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

CHEMICAL ANALYSIS OF COLLAGEN AND NON-COLLAGEN COMPONENTS OF COMPOSITE BIOMATERIALS FOR IMPLANTOLOGY

Braun Martin, Ryglova Sarka, Supova Monika, Zaloudkova Margit, Krizková Martina, Sucharda Zbynek, Suchy Tomas
Department of Composites and Carbon Materials, Institute of Rock Structure and Mechanics
Academy of Sciences of the Czech Republic
Email: braun@irsm.cas.cz

Keywords: composite biomaterials, collagen, analysis, bone implants, scaffolds

In current tissue engineering and regenerative medicine are very useful advanced composite biomaterials that are ideally not only biocompatible, but also bioactive and biodegradable. Their biological and mechanical properties are designed to mimick the natural tissue as much as possible. In implantology they are frequently used in form of nanoscaffolds serving as a carrier for cell growth.

For bone implants and fillings these scaffolds are often prepared from biomaterials consisting of bone minerals (calcium phosphate or bioapatite) and a collagen-based organic component, because collagen belongs to the most important scleroprotein in human and animal kingdom (represents approximately 30% of all the proteins in the body).

However, there are some specific obstacles associated with using of collagen as a carrier matrix as well. Besides the fact that the isolation of collagen in its pure, native form is relatively demanding task involving a series of laboratory steps, the main disadvantage of this material is considerable natural variability of the source, animal material used for processing as well as its limited stability and tendency to degradation as a result of chemical and physical interactions.

To check the quality of the individual batches of prepared biomaterials and to achieve the optimal parameters, sensitive quantitative analytical methods should be applied. By combining methods

based on different principles, good chemical characterization can be obtained and the extent of eventual degradation can be verified. Moreover, selected chromatographic and spectroscopic methods are also able to identify some minor components of non-collagen origin (e.g. glycosaminoglycans, lipids, etc.) varying in the organic component of the biomaterial depending on the particular isolation procedure used and subsequent collagen processing.

In this contribution, the most important measurable characteristics of collagen and its fragments and an overview of the appropriate methods that can be used to determine them are summarized. These include, in particular, liquid chromatography (HPLC), enabling for example the determination of glycosaminoglycans, amino acids characteristic for collagen and some other components of the biodegradable composite matrix, infrared spectrometry (FTIR) capable of detecting differences in the content of key functional groups and electromigration separation methods such as polyacrylamide gel electrophoresis (SDS-PAGE), which can identify the molecular weights of the individual components of a mixture of substances or an isoelectric focusing technique (IEF) by which the characteristic values of the pI of the present proteins can be determined.

These results can be then used to optimization of the processing of biomaterials, monitoring of the influence of chemical and physical interactions on the integrity and uniformity of biological materials forming a part of advanced, biocomposites that can be potentially applied in implantology.

Acknowledgment

The work was financially supported by the Technology Agency of the Czech Republic (TACR project No. TA04010330) and the Institute of Rock structure and Mechanics, Academy of Sciences of the Czech Republic, v.v.i. (Institutional projects Nos. 481, 482, 842).

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

GAIT MODEL

Culik Jan
Czech Technical University, Division of Informatics of Faculty of Biomedical engineering, Kladno, Czech Republic
Email: culik.j@upcmail.cz

Keywords: walk simulation, simulation, different lower limb length, upstairs going simulation, osteoarthritis

The article searches the movement of the legs of walking patient. The model patient's gait was assembled on the computer. The purpose of the model is to observe the effect of varying stairs slope, walk velocity and the effect of leg lengths on the forces and moments in the lower limb joints.

It is determined pelvis tilt and moment exerted between the pelvis and spine. The results will be used for research spinal disorders. Furthermore, the article studies the walking up and down stairs [1] [2] [3] [4], [5], [7]. They are searched calculation methods for joint position during shifting of the weight from the back foot to the front and when lower limb swings on to the next stair. The precise model on the computer was assembled in the system CDCSIS [6]. Movement takes place when moving one step in three phases - carrying weight on patient front leg, swinging the rear lower limbs to the next step and grip feet on the stairs. The simulation program determines the positions of parts of the lower extremities at all time points. The calculated values are used to animate the movement of the patient by stairs with variable slope of stairs. Inertial forces and inertial torques is determined for the foot parts. The forces and moments at lower limb joints are determined from equilibrium conditions. The calculation is done for different height of the steps or slope. The walk on the level is modelled for zero step height. The calculation is performed for a specified length of the legs and thus it is respected the influence pathologic shortening some lower limb parts. The different walk velocities are respected. The simulation experiments were proved very big moments in the knee joint of the supported lower limb. The torque is carried by a pair of forces - pressure in the joint and drawn tension in the muscles, causing pain in the knees of patients suffering from osteoarthritis. The problem is solved as a planar in the plane of the hip, knee and ankle. Inclination of the pelvis and torque between the pelvis and the spine is searched in the frontal plane.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

INFLUENCE OF THE WEIGHT OF THE TRANSTIBIAL PROSTHESIS ON POSTURAL STABILITY AND LOCOMOTION. PRELIMINARY RESULTS

Krawczyk Petr[1], Marik Ivo[2], Jakub Jozef[1], Sykora Ales[1], Zemkova Daniela[2], Petrasova Sarka[2] Marik Jan[2], Uchytil Jaroslav[3], Jandacka Daniel[3]

PROTEOR CZ l.l.c., Ostrava, Czech Republic

[1] *Ambulant Centre for Defects of Locomotor Apparatus l.l.c., Prague, Czech Republic*

[2] *Diagnostic Centre of Human Movement PdF, Ostrava University, Czech Republic*

[3] Faculty of Medical Studies, West Bohemia University, Pilsen, Czech Republic

Email: petr.krawczyk@seznam.cz

Keywords: weight prosthesis, amputation, kinematic analysis, anthropometry, densitometry, oxygen consumption

Introduction

Deciding on the type of prosthesis indication is based on the empirical experience of the attending doctors, physiotherapists and prosthetic technicians based on a local assessment of the extent of disability, type of performance on a limb amputation, stump shape, condition muscles, skin cover,

any possible pain or tenderness of preserved limb. During the specification of the appropriate type of prosthesis doctor must indicate age, physical fitness, mental level of the patient and the possibility of other diseases that can negatively influence the prostheses. From biomechanical aspects, the neglected factor is determining the exact - optimum length of the prosthesis and in particular its weight. For patients with lower extremity amputations is optimal biomechanics of walking critical for the length and weight of the prosthesis. The authors present the preliminary results of kinematic measurements in patients with transtibial amputation who were considered to have a prosthesis in the original weight of the amputee segment of the limb.

Patients and Methodology

At present, the group of tested probands contains 13 patients (12 males and 1 female) with transtibial amputation. Average age of patients is 53.8 years (28 to 70). In 10 cases, the cause of amputation was of trauma, in 2 cases a tumor. In one patient, the amputation was a consequence of diabetes mellitus complication. The average lifetime of the patient's prosthesis was 16.8 years. Individual patients underwent detailed anthropometric measurements, based on which mass calculations of the amputee segment of the limb were performed. A total of 3 calculations were performed using Zaciorski, Osterkamp and Mozumdar methods. The results of the calculations were compared with Hologic's full-body densitometry, which was critical for determining the weight of the amputee part of the limb. The subjective perception of the patient's load when using the "heavier prosthesis" was evaluated using the Borg's RPE (Rating of Perceived Exercise) scale. Kinetic and kinematic analysis was performed in a biomechanical laboratory with 3 Kistler power platforms and Qualisys Oqus, Sweden with 9 cameras. The group of probands included patients with transtibial amputation with approximately the same length of the stump. The condition was also the absence of other comorbidities, deformity of the skeleton, and contracture of the lower limb joints. All probands had the same type of suspension of the prosthesis on the stump. Three weeks before the examination in the biomechanical laboratory, each investigated patients took a prosthetic foot replacement so that all probands were fitted with the same equipment with identical biomechanical parameters. The structure of the prosthesis - bench, static, dynamic alignment -was checked, depending on the used footwear when measuring all probands. Up to now 13 patients from the total 20 probands were examined.

Description of experiment and investigation

1. An identical type of footwear - adjustment was applied to investigated amputees
2. Marking of distinguishing points by reflective marks
3. Marking of the centre of gravity of the leg and foot segment on the patient's body - determination of the later placement of the weights on the prosthesis
4. Attach the limb cluster away from the localization of the later applied weights on the prosthesis
5. Instrument Calibration – System Calibrated without Patient
6. Calibration Static Measurement – Patient Tagged with Reflective Marks
7. Examination of the patient's walking speed

8. Block of examination of patient walking with prosthesis without weights
- 5 x examination of the healthy lower limb + 5 x examination of the amputated lower limb
- walking speed must be kept within a predetermined range

9. Check the location of reflective signs and clusters
10. Adding weight to the prosthesis in the weight of the segment
- Weight m_{z2} is calculated as $m_{z2} = m_s - m_p$
- Fixation of added weight centered on the center of gravity of the segment

11. Cluster control and location of reflective markers
12. Block of examination of the patient's walking with the insertion of the prosthesis into the total weight of the leg
- 5 examinations of the healthy lower limb + 5 examination of the amputated lower limb
- The walking speed must be kept within a predetermined range

13. Cluster control and location of reflective markers
14. Completing the questionnaire assessing the subjective perceptions of proband (the Borgova RPE scale).

m_{z2} - mass of the weight,
m_s - weight of the amputated part of the leg was obtained from the whole body densitometry - DEXA,
m_p - weight of the prosthesis

Preliminary Results

The authors present continuous results of kinetic and kinematic analysis of walking as in patients with their lighter type of prosthesis as in the same patients with the prosthesis loaded to the original weight of theirlegs.

Evaluation of time-spatial characteristics

On the unaffected limb in walking with added weight and without added weight on the prosthesis the differences are only small with a very significant effect. On the affected limb, a significantly longer step length was observed using weights and a longer duration of the standing phase with a mean effect of significance when using the weight. Longer standing on the affected limb when using weights may result in better stability on the affected limb.

Evaluation of power parameters

Trends in force parameter curves show differences in reaction forces across all three planes. A more thorough analysis of the forces will be the subject of further investigation after reckoning the planned number of probands.

Evaluation of angular parameters

Curve trends of angular parameters of ankles, knees and hips indicate differences In walking, using weights and weights, both on the affected and the unaffected lower extremity.

Subjective assessment by the patient

Questionnaire evaluation, Borg RPE scale: 70% of patients evaluated walking with a heavier prosthesis as a medium load, 30% as a lightweight load. All patients perceived walking with heavier prosthesis as more stable.

Evaluation of energy outflow

Patients were also tested for oxygen consumption at constant walking speeds with the original lighter prosthesis and the prosthesis loaded to the original weight of the limb. Oxygen consumption is slightly higher when walking with weights. Measurement of a control group of healthy individuals with identical anthropometric parameters is performed, comparing their energy output at walking at the same rate.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

VLIV HMOTNOSTI TT PROTÉZ DOLNÍ KONČETINY NA POSTURÁLNÍ STABILITU A LOKOMOCI. PŘEDBĚŽNÉ VÝSLEDKY

INFLUENCE OF THE WEIGHT OF THE TRANSTIBIAL PROSTHESIS ON POSTURAL STABILITY AND LOCOMOTION. PRELIMINARY RESULTS

Krawczyk Petr[1], Mařík Ivo[2] , Jakub Jozef[1] , Sýkora Aleš[1] , Zemková Daniela[2], Petrášová Šárka[2], Mařík Jan[2], Uchytil Jaroslav[3] , Jandačka Daniel[3] , Bužga Marek[4]

[1] PROTEOR CZ s.r.o. - nestátní zdravotnické zařízení, Ostrava

[2] Ambulantní centrum pro vady pohybového aparátu s.r.o., Praha

[3] Centrum diagnostiky lidského pohybu PdF, Ostravská univerzita

[4] Ústav fyziologie a patofyziologie, Lékařská fakulta Ostrava

Email: petr.krawczyk@seznam.cz

Klíčová slova: hmotnost protézy, amputace, kinematická analýza, antropometrie, denzitometrie, spotřeba kyslíku

Rozhodování o indikaci typu protézy vychází z empirických zkušeností indikujících lékařů, protetických techniků a fyzioterapeutů na základě lokálního posouzení rozsahu postižení, typu amputační-

ho výkonu na končetině, tvaru pahýlu, stavu svalstva, kožní krytu a případné citlivosti či bolestivosti zachovalé části končetiny. Při specifikaci vhodného typu protézy musí indikující lékař brát v úvahu věk, tělesnou zdatnost, duševní úroveň pacienta a koincidenci dalších onemocnění, které mohou použití protetické pomůcky negativně ovlivňovat. Z biomechanického aspektu opomíjeným faktorem je určení přesné – optimální délky protézy a zvláště její hmotnosti. U pacientů s amputací dolní končetiny je pro optimální biomechaniku chůze rozhodující délka protézy a hmotnost protézy. Autoři předkládají předběžné výsledky kinetických a kinematických měření u pacientů s transtibiální amputací, u nichž se předpokládá, že mají protézu v původní hmotnosti segmentu amputované končetiny.

Patienti a metodika

Prezentovaný soubor doposud vyšetřených probandů obsahuje 13 pacientů s transtibiální amputací. Ve zkoumaném souboru je 1 žena. Průměrný věk pacientů v souboru je 53,8 let (od 28 do 70 let). V 10 případech bylo příčinou amputace trauma, ve 2 případech byla amputace zapříčiněna tumorem. U jednoho pacienta byla důvodem amputace komplikace při diabetes mellitus. Průměrná doba používání protézy pacientem byla 16,8 let.

Jednotliví pacienti podstoupili podrobné antropometrické měření, na základě kterého byly provedeny výpočty hmotnosti amputovaného segmentu končetiny. Byly provedeny celkem 3 výpočty pomocí metod Zaciorského, Osterkampa a Mozumdara. Výsledky výpočtů byly porovnány s celotělovou denzitometrií Hologic, která byla rozhodující pro stanovení hmotnosti amputované části končetiny.

Subjektivní vnímání zátěže pacienta při používání "těžší protézy" bylo vyhodnoceno pomocí Borgovy RPE (Rating of Perceived Exertion) škály.

Kinetická a kinematická analýza byla prováděna v biomechanické laboratoři disponující 3 silovými plošinami Kistler a Systémem Qualisys Oqus, Sweden s 9 kamerami.

Do skupiny probandů byli zařazeni pacienti s transtibiální amputací s přibližně stejnou délkou bércového pahýlu. Podmínkou byla rovněž nepřítomnost dalších komorbidit, deformit skeletu a omezení hybností v kloubech dolní končetiny.

Všichni probandi měli identický typ ulpívání protézy na pahýlu. Každému z měřených pacientů byla **3 týdny před vyšetřením v biomechanické laboratoři** upravena protéza – výměna protetického chodidla, tak aby všichni probandi měli naprosto stejné vybavení s identickými biomechanickými parametry. Byla kontrolována stavba protézy – bench, static, dynamic alignment v závislosti na použité obuvi při měření, kterou měli všichni probandi stejnou. Postupně bylo vyšetřeno 13 pacientů z celkově plánovaných 20 probandů.

Popis experimentu

1. Pacientům byl aplikován identický typ obuvi – seřízení protézy
2. Označení význačných bodů reflexními značkami
3. Označení těžiště segmentu bérce a chodidla na těle pacienta – určení pozdějšího umístění závaží na protéze
4. Připevnění klastru na končetinu mimo lokalizaci později aplikovaného závaží na protézu
5. Kalibrace přístroje – systém kalibrován bez pacienta
6. Kalibrační statické měření – s pacientem označeným reflexními značkami (pouze stoj probanda)
7. Vyšetření rychlosti běžné chůze pacienta
8. Blok vyšetření chůze pacienta s protézou bez závaží
- 5 x vyšetření zdravé dolní končetiny + 5 x vyšetření amputované dolní končetiny
- Nutno dodržet rychlost chůze v předem určeném rozsahu
9. Kontrola umístění reflexních značek a klastrů
10. Dovážení protézy do hmotnosti bérce druhostranné končetiny
- Hmotnost závaží m_{z2} se vypočte $m_{z2} = m_s - m_p$
- Připevnění závaží na protézu se středem do těžiště segmentu
11. Kontrola klastru a umístění reflexních značek
12. Blok vyšetření chůze pacienta s dovážením protézy do celkové hmotnosti bérce
- 5 vyšetření zdravé dolní končetiny + 5 vyšetření amputované dolní končetiny
- Nutno dodržet rychlost chůze v předem určeném rozsahu
13. Kontrola klastru a umístění reflexních značek
14. Vyplnění dotazníku hodnotící subjektivní vjemy probanda - Borgova RPE škála

m_{z2} – hmotnost závaží,
m_s – hmotnost amputované části bérce, kterou získáme z vyšetření pomoci celotělové denzitometrie - DEXA,
m_p – hmotnost protézy

Předběžné výsledky

Autoři předkládají průběžné výsledky měření kinetické a kinematické analýzy chůze u pacientů s původním lehčím typem protézy a s protézou zatíženou do původní hmotnosti končetiny.

Hodnocení časo-prostorových charakteristik

Na končetině nepostižené při chůzi se závažím a bez závaží jsou rozdíly pouze s malým věcně významným efektem. Na postižené končetině byla pozorována významně větší délka kroku při použití závaží (ES = 1,13 – velký efekt), a delší doba trvání stojné fáze se střední efektem významnosti při použití závaží (ES = 0,63). Delší doba trvání stojné fáze na postižené končetině při použití závaží, může znamenat lepší stabilitu na postižené končetině.

Vyhodnocení silových parametrů

Trendy křivek silových parametrů ukazují na rozdíly reakčních sil ve všech třech rovinách. Důkladnější analýza sil bude předmětem dalšího zkoumání po doměření plánovaného počtu probandů.

Vyhodnocení úhlových parametrů

Trendy křivek úhlových parametrů kotníků, kolene a kyčle naznačují rozdíly v provedení chůze s použitím závaží a bez závaží a to jak na postižené, tak nepostižené končetině.

Subjektivní hodnocení pacientem

Vyhodnocení dotazníku, Borgovy RPE škály: 70 % pacientů hodnotilo chůzi s těžší protézou jako středně velkou zátěž, ve 30 % jako lehkou zátěž. Všichni pacienti vnímali chůzi s těžší protézou jako stabilnější.

Hodnocení energetického výdeje

U pacientů byla rovněž vyšetřována spotřeba kyslíku při konstantní rychlosti chůze s původní lehčí protézou a s protézou zatíženou do původní hmotnosti končetiny. Spotřeba kyslíku je mírně vyšší při chůzi se závažím. Probíhá měření kontrolní skupiny zdravých jedinců s identickými antropometrickými parametry s porovnáním jejich energetického výdeje při chůzi stejnou rychlostí.

INVITED LECTURE

CLINICAL OSTEOLOGY IN THE CZECH REPUBLIC (ORGANIZATION AND DEVELOPMENT)

Palicka Vladimir
Charles University and University Hospital Hradec Králové, Czech Republic
Email: palicka@lfhk.cuni.cz

ABSTRACT OF REVIEW PAPER

ELECOST: A GREEK EDUCATIONAL TOOL FOR THE DIAGNOSIS AND MANAGEMENT OF OSTEOPOROSIS IN GREECE

Lyritis George (Emeritus Professor of Orthopedics, President of Hellenic Osteoporosis Foundation)
Faculty of Medicine, National and Kapodistrian University of Athens, Greece
Email: glyritis@heliost.gr
Tel: +30 6999 30 7070

Keywords: Osteoporosis, assessment tool, diagnosis

Osteoporosis is a chronic disease with a significant economic burden mainly through the complications of fractures. The proper management of osteoporosis and its associated fractures is essential for maintaining the quality of life for patients. The decision to determine who receive treatment requires clinical evaluation of individual's fracture risk profile. The physicians should choose the most suitable treatment for patient based on medical history.

So as to confront this very common disease we have to develop a mutual and effective strategy. The ELECOST, a web-based platform, is under the auspices of Hellenic Osteoporosis Foundation. It is an educational tool for the management of osteoporosis and it aims to develop a Panhellenic electronic network of osteoporosis clinics with a shared diagnostic and therapeutic protocol. This platform is not only a way of keeping electronic records of osteoporotic patients but it is also a useful and efficient tool for the management of osteoporotic patients. It evaluates and assesses an abundance of clinical risk factors for fracture, thus providing accurate information to clinicians in order to facilitate them in deciding the appropriate therapeutic approach towards each patient. The ELECOST abides with the diagnostic and therapeutic protocols as well as the guidelines for treatment of osteoporosis in Greece as issued by the National Organization for Medicines. Until now, ELECOST has approximately 500 users (clinicians) and 12.000 patients' medical records.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

ARE WOMEN OVERTREATED FOR OSTEOPOROSIS?

Rizou Stavroula
Hellenic Osteoporosis Foundation, Kifissia, Greece
Address: Agias Varvaras 5, Kifissia, Greece
Email: st.rizou@heliost.gr
Tel: +30 6947495443

Keywords: Osteoporosis, Postmenopausal women, over-diagnosis

Objective

An estimation of fracture risk is important in determining which patients to treat. FRAX allows clinicians to distinguish patients who are at high fracture risk from those who are not and thereby to offer treatment to those most likely to benefit from one. The purpose of this study was to evaluate the initiation of antiosteoporotic treatment retrospectively based on Greek version of FRAX score.

Material and Methods

This was a cross-sectional retrospective study. The sample of the study is composed by 1000 post-menopausal women aged 45 or above who have had a consultation for osteoporosis evaluation. Patients were selected by doctors knowledgeable about osteoporosis randomly on a sequence of consultations, from five participating centres in Greece. Based on the protocol, we recorded all the parameters in order to calculate FRAX retrospectively at the time of the anti-osteoporotic treatment initiation. We assessed FRAX score before the initiation of any antiosteoporotic treatment so as to evaluate the percentage of patients that received or not treatment because of the doctors' overestimation or underestimation of actual fracture risk.

Results

The mean age of the study sample was 58.5 (S.D 8.79). 50.7 % of the participating women were osteoporotic and the rest was osteopenic based on WHO criteria. In our study, 97.9 % of the women who participated had already initiated treatment for osteoporosis and particularly after their first time that had seek consultation for osteoporosis. 47.7 % of patient should have initiated treatment based on the US adapted therapeutic intervention thresholds (probability for major osteoporotic fracture ≥20 or hip fracture ≥3) since Greek are not existent at the time.

Conclusion

There are indications that women who seek consultation for osteoporosis are over-diagnosed and as a result over-treated. Potentially those who actually need treatment but do not seek consultation are under-treated. We have to underline that FRAX does not replace good clinical judgment by the health care practitioner. All treatment decisions require clinical judgment and consideration of individual patient factors, including risk factors not captured in the FRAX model. Decisions to treat must be made on a case- by-case basis.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

A NOVEL APPROACH FOR FRACTURE RISK AND RISK OF FALLING AGGREGATION

Nikolaou Dimitrios [1], Rizou Stavroula [2]

[1] Physiotherapist, MSc, Medical School, National and Kapodistrian University of Athens, Greece
Email: dimitrisn91@gmail.com
Tel: +30 694 474 17 02

[2] Biologist, MSc, Hellenic Osteoporosis Foundation, Greece
Address: Agias Varvaras 5, Kifissia, Greece
Email: st.rizou@heliost.gr
Tel: +30 6947495443

Keywords: fall, fracture risk, elderly, assessment tool

Objective(s)

To point out the necessity of fracture risk and risk of falling aggregation for osteoporotic patients, and to set up an algorithm for that purpose. It is a cross sectional study depicting a novelistic approach in assessing osteoporotic patients.

Background

The occurrence and the number of falls in elder individuals are major concerns of everyday clinical practice. Falls in elderly may lead to adverse events such as injury, disability, hospitalization, morbidity and even mortality. Several studies indicate that fracture risk is clearly associated with an increased risk of falling. A number of *tools* are available in order to assess patients' fracture risk and risk of falling as well. What is seen is that patients with high risk of falling have a decent balance score, according to the "Berg Balance Scale" and other screening tools such as "Timed-Up-And-Go" examination, "Sit-To-Stand" test and evaluation of grip strength via vigorimeter. On the other hand, patients who have a decreased risk of fracture have worse scoring when it comes to balance. A point is reached where the aggregation of fracture risk and risk of falling is necessary for a comprehensive assessment of those patients

Methods

Data were collected from the medical records of 100 osteoporotic women regarding the number of falls and fractures. Furthermore, both the risk of falling and fracture were recorded. The main screening tools used for the patients' evaluation were: the electronic registration system entitled "ELECOST", the "Berg Balance Scale", the "TUG" test, the "STS" test and the assessment of grip strength via Vigorimeter.

Results

A significant number of patients, even though at the first consultation were defined with a low fracture risk score but great instability, experienced the associated adverse outcomes, the years to follow. On the other hand, patients with quite high fracture risk but good stability had a more stable health status through years.

Conclusion

The aggregation of fracture risk and risk of falling rather than assessing each parameter individual will lead us into a far-from-comprehensive evaluation of the patient balance status. With the recommended combination it seems that patient with higher fracture risk but with low risk of falling are

in favour of a safer lifestyle when those with low risk of fracture but high risk of falling have higher odds of adverse outcomes. An algorithm should be developed in order to depict risk for fracture, influenced by the risk or the numbers of falling.

ABSTRACT OF REVIEW PAPER

MICROGRAVITY AND BONE METABOLISM. ISSUES OF ORBIS NOVUM COLONALIZATION

Lambrou George I. [1,2,3,4]

[1] National and Kapodistrian University of Athens, Medical School

[2] Graduate Program "Metabolic Bones Diseases", National and Kapodistrian University of Athens

[3] Medical School, Goudi, Athens, Greece

[4] First Department of Pediatrics, University of Athens, Choremeio Research Laboratory, National and Kapodistrian University of Athens, Greece

dr. George I. Lambrou, PhD Special Laboratory Teaching Staff

Email: glamprou@med.uoa.gr

Tel: +30 695 191 36 88

Keywords: space flights, microgravity, musculoskeletal, terra nova

The role of gravity in the developing musculoskeletal system is undisputable, yet there is still much to be elucidated. The exact mechanisms are not yet clear, that is how exactly gravity signals to cells in order for them to retain their shape, size and function. Since the first space flight the vision was to succeed a long-term space flight to colonialize other planets, at least of our solar system. Yet, first experience on that matter showed that gravitational forces and subsequently their absence lead to significant complications concerning human well-being in space. Several problems emerged and some of them of grave nature, such as osteoporosis and muscle atrophy. This issue has been an area of intensive research in recent years. The more technology develops allowing and facilitating a long-distance space trip the more research on the role of gravity on living organisms intensifies.

The present work reviews the up-to-date knowledge on the issue of gravity's role on the musculoskeletal system and how this could affect the vision of conquering future worlds.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

OSTEOGENESIS IMPERFECTA – TREATMENT WITH BISPHOSPHONATE FROM NEWBORN PERIOD

Bayer Milan[1,2], Jirotkova Jana[3]

[1] Department of Children and Adolescents, Third Faculty of Medicine, Charles University, Prague, Czech Republic
[2] Department of Pediatrics, Thomayer Hospital of Prague, Czech Republic
[3] Department of Pediatrics, Hospital of Ceske Budejovice, Czech Republic
Email: milan.bayer7@gmail.com

Keywords: osteogenesis imperfecta; intravenous pamidronate; newborn

Osteogenesis imperfecta (OI) presents the group of clinically heterogenous heritable connective tissue disorder with increased bone fragility. Intravenous bisphosphonate therapy is the most widely used medical approach at present time. This treatment results in increase of bone mineral density and diminished number of vertebral or long-bone fractures. We would like to demonstrate five OI children (one female, four males) fractured either *in utero* or in their first month of life. Targeted genetic testing identified causative mutation in all of them, three in COL1A2 and two in COL1A1 gene. Children were clinically defined as OI type IV (patient 1), OI type I (patient 2), and OI type III (patients 3, 4, 5) according Silence classification. Children were treated with bisphosphonate from newborn or early infant period (the mean age of treatment initiation was 6.6 weeks). We used cyclic intravenous pamidronate with appropriate calcium intake and vitamin D3 supplementation. Treatment for 30.6 months on the average brought about decreased rate of fractures and improved mobility of patients. Lumbar spine areal bone mineral density showed a rapid increase. Moderate side effects were observed only during the first pamidronate infusion. All children are short for age (-3.48 ±1.78 SD). Patient 1 is able to walk short distances with aids, patients 2, 3, 4 are able to walk short distances independently. Patient 5 is too young to walk but in mobility corresponds to corrected age. All children have normal mental development/status. Early pharmacotherapy, rehabilitation, and correction surgery could significantly improve quality of life in children with manifestation of multiple OI fractures immediately after birth. Treatment with intravenous pamidronate seems to be safe and efficient.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

ALENDRONATE THERAPY FOR OSTEOGENESIS IMPERFECTA IN CHILDREN: TEN-YEAR FOLLOW-UP

Vyskocil Vaclav[1], Blahos Jaroslav[2]
[1] Department of Orthopaedic Surgery, Charles University Hospital, Pilsen,
[2] 1st Medical Faculty Prague, Charles University, Central Military Hospital, Prague, Czech Republic
Email: Vaclav.Vyskocil@vyskocilv.cz

Keywords: osteogenesis imperfecta; alendronate therapy; children

Aims

Osteogenesis imperfecta (OI) is a rare crippling disorder leading to fractures and bone deformities and also low BMD. Bisphosphonate therapy in contrast to other treatment modalities increases (BMD) and reduces fracture rates. Our group already published the results from 3 year follow-up of children with OI.We had already proved a significant increase in BMD, reduction of bone turnover markers (osteocalcin, Ctx, PICP) during these 3 years.

Methods

Parental and patients' consent was obtained prior to this treatment.We have been monitoring 30 children with OI for 4 years. During the first 3 years alendronate was administered orally: children aged 4–10 years received 5 mg/day, children above 10 years of age were given 10 mg/day. Calcium and vitamin D intake was maintained as adequate according to the recommended daily allowance in all patients by means of supplementation. During the fourth year of therapy we randomised our group into 2 branches: 1st branch in 15 children alendronate administration was continued and in 2nd branch (15 children) alendronate was discontinued. At the end of 4th year of follow up we assessed bone turnover markers and bone densitometry in all children.

Results

During the first 3 years of treatment we observed only one fracture in both groups. During the 4th year only one fracture in alendronate continuing group was observed. Discontinuation of alendronate therapy for 1 year did not lead to significant increase in the fracture rate. The fracture rate stayed low as in the group with alendronate treatment. In our presentation we will also discuss BMD and bone turnover marker changes during the fourth year of follow up in consequence of previous 3 years data. Considering the length of the treatment, we defined children age not by biological age. We regarded all the patients whose X-rays did not show the growth plate closure as children.

Conclusions

Alendronate therapy seems to be an effective tool to reduce the fracture rate in OI children. There is still onequestion left- if the treatment should be continuous or intermittent. Between 7th and 10th year, the type of illness, physical activity and weight of the patients had greater influence than the alendronate treatment itself or drug holiday. The treated group did not show a greater suppression of markers, or occurrence of some side effects such as atypical fractures or osteonecrosis of the jaw, but we noticed the uveitis. It was impossible to state if there was a significant increase in BMD or significant reduction of fractures between the treated and untreated groups.

ABSTRACT OF REVIEW ARTICLE

TWENTYTWO YEARS OF KNOWLEDGE ABOUT AETIOLOGY OF THE SO-CALLED IDIOPATHIC SCOLIOSIS (ADOLESCENT IDIOPATHIC SCOLIOSIS – AIS). RULES OF CASUAL PROPHYLACTICS AND NEW TREATMENT. EXAMPLES

Karski Tomasz[1], Karski Jacek [2]

[1] Vincent Pol University in Lublin, Poland

[2] Pediatric Orthopedic and Rehabilitation Department of Medical University in Lublin, Poland

Email: t.karski@neostrada.pl tmkarski@gmail.com

Keywords: adolescent idiopathic scoliosis (AIS), biomechanical aetiology, new classification, causal prophylaxis

Introduction

The biomechanical aetiology of the so-called idiopathic scoliosis [adolescent idiopathic scoliosis (AIS)] is described in years 1995 – 2007 (T. Karski) and presented since 1995 in many Congresses and Symposia in Poland and abroad. First lecture about this subject was presented during Orthopaedic Congress in Hungary (T. Karski, Szeged, 1995). First publication was in Germany in 1996 – in Orthopädische Praxis.

Material

In 2016 the whole material gathered 2250 cases. Patients were 2 to 60 years old. Control group 360 persons.

Explanation of biomechanical aetiology of scoliosis in points.

This biomechanical factors / causes are: **A/** Asymmetry of hips movements – smaller adduction in straight position of right hip joints as one of symptoms of "Syndrome of Contracture" according to Prof. Hans Mau**, B/** Permanent standing 'at ease' on the right leg and influence appearing during gait.

There are three groups and four types of scoliosis connected with special "model of movements of hips" (2006). Every type of scoliosis start to develop in 2 - 3 year of life of children.

New classification – three groups and four types - as important information for physiotherapy – for causal prophylaxis and for therapy.

(1) "S" I etiopathological (epg) scoliosis Double curves. Gibbous of the right side. Influenced by the "gait" and the permanent "standing at ease on the right leg". Stiff spine. 3D. Progression.

(2A) "C" II/A epg scoliosis. Influenced by the permanent "standing at ease on the right leg". One curve. Flexible spine. 1D. No or slight progression.

(2B) "S" II/B epg scoliosis. Influenced by the permanent "standing at ease on the right leg", plus - laxity of joints or/and incorrect exercises in previous treatment. Flexible spine. 2D or mix. Moderate progression.

(3) "I" III epg scoliosis. Influenced by the "gait" only. Stiff spine. No curves or small. No progression. No included till now to scoliosis.

Physiotherapy

All previous extensions, its mean "muscles strengthening exercises" were incorrect / harmful and caused only bigger curves, bigger rib hump and made the spine more stiff. All stretching exercises for spine and hips are proper for treatment and for prophylaxis. The prophylactic exercises should be introduced in small children in age 3 – 5 y. Very important in therapy are: karate, taekwondo, aikido and remembering about standing 'at ease' only on the left leg..

Discussion and Conclusions

1. The aetiology of the so-called idiopathic scoliosis is strict biomechanical.
2. There are three groups and four types of scoliosis.
3. In therapy and in causal prophylaxis are important the new conception / the stretching exercises introduced very early, when by the new tests, we find the first symptoms of scoliosis.

Literature

www.ortopedia.karski.lublin.pl

ABSTRACT OF REVIEW ARTICLE

CHARACTERISTIC FEATURES OF IDIOPATHIC SCOLIOSIS

Pallová Iveta
Center of Rehabilitation, Pediatrics and Acupuncture, Prague, Czech Republic
Email: Iveta.Pallova@seznam.cz

Keywords: idiopathic scoliosis, diagnostic tests, prevention, therapy

Objectives

Idiopathic scoliosis is a three-dimensional deformity of the spine. Scoliosis includes a complex of changes which may occurs at different scales in all systems of the human body.

The aim of the presentation is to show characteristic features and diagnostic tests applied in idiopathic scoliosis. The emphasis is placed on early catching of the first initial asymmetric manifestations, even when there are no symptoms on the spine or when scoliosis is not fixed yet. There are presented also features and manifestation in already developed scoliosis and options of its treatment.

Discussion

Scoliosis represents a change of shape and function not only in the case of spine. A number of therapeutic approaches is based on different assumptions. However, it is always important to think about interconnecting of the whole body system and selecting a suitable type of treatment for the particular patient.

Sometimes a philosophical question may arise whether the real goal is a more straight spine or a more balanced person.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

"TARGETS" FOR PATHOGENETIC TREATMENT OF PATIENTS WITH ADOLESCENT IDIOPATHIC SCOLIOSIS

Arsenev Aleksey Valentinovich, Dudin M.G.
Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia
E-mail: stivamat@rambler.ru

Abstract

One of the main problems of modern orthopedics is to increase the efficiency of conservative treatment of AIS. Development and introduction of methods of process control of bone growth allow the treatment of complex three-plane deformation of the spinal column with respect etiopathogenetic principles. The most important task is to define the goal – to activate or to inhibit the growth of the spine in patients with scoliosis.

Keywords: scoliosis, AIS, pathogenetic treatment, growth management.

Introduction

Today tactics of conservative treatment of AIS has not have common accepted principles and is based on the "three pillars" (medical gymnastics, physiotherapy and treatment by corset). However, the analysis of literature sources, devoted to the peculiarities of scoliotic deformation, shows that this approach does not reduce the treatment of patients to surgical care. Moreover, improvement of the surgical technology leads to expansion of the indications for surgical treatment [3]. Meanwhile, patient satisfaction with results of the surgery does not always match his expectations. Obviously, conservative treatment of idiopathic scoliosis requires a radical revision [1, 2]. We decided to look at this problem from the standpoint of pathophysiology and biomechanics of AIS [4]. This helped to determine the principles of "treatment without scalpel". In turn, adherence to these principles provides a significant increase in the effectiveness of conservative treatment.

Material and methods

The material for this work was the results of observation of more than 1000 patients with AIS aged 10 to 15 years for the last 20 years. All the children received inpatient treatment in conditions of SPb SBHI rehabilitation center of pediatric orthopedics and traumatology " Ogonyok ". Some of these children had received multiple courses of treatment in our clinic. Treatment consisted of pathogenic and background therapy. The first we attributed the effect on normalization of the hormonal profile, selective effect on the growing zone of the vertebra. To maintain control over the position of the vertebral column between the courses were widely used treatment by corset on the principles developed by J. Chenault. The background treatment included massage, swimming and gymnastics. To assess the effectiveness of treatment was used a wide range of objective diagnostics: clinical method, x-rays, the method of computer optical topography, the method of visualization and documenting posture "Smart-Ortho", ELISA hormones – controls growth of bone tissue, functional and biomechanical diagnostics.

Results

In the result of long experience and long observation of individual patients, there was a realization that the implementation of an individual approach to conservative treatment, should highlight the pathogenic "targets" for therapeutic action. As the most indisputable fact in the theory and practice of scoliosis is the relationship of occurrence and development process of a child's growth. Number one target we have identified the growing zone of the vertebral body. The impact on this target was carried out from several positions. The first correction osteotropic hormonal profile in favour of increased cortisol. The second is the influence of intense magnetic field (about 1.5-2 Tesla), resulting in local degradation of the germ zones. Third position – exposure to low-intensity magnetic field that causes a temporary inhibition of the activity of the germ zones. Target number two, the deformation of the vertebral column as a whole, the control of which was assigned to the hard corset chenault. We have found that one of the effects of these corsets is their opposition to the law of Gotera-Folkmana. Therefore, in the last five years, the corset type Chenault was appointed to patients with deformations from 10–15 degrees Cobb. Target number three – the muscles of the

torso in general and paravertebral muscles in particular. The impact they have carried out a wide range of treatments from classic medical gymnastics, massage and swimming to the application of the methods of biofeedback on EMG.

Discussion

The scheme of complex treatment of patients with AIS with regular inpatient treatment (3-4 courses per year) allows 99% of the case not only to stop progression but also to achieve significant regression of the three-plane deformation of the spinal column. The system of complex conservative treatment is of great social importance.

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ABSTRACT

SURGICAL TREATMENT STRATEGY OF EARLY ONSET SCOLIOSIS

Filipovic Milan, Repko Martin
Orthopaedic department, Faculty Hospital of Masaryk´s University Brno
Email: Repko.Martin@fnbrno.cz, ortop@fnbrno.cz

Keywords: early onset scoliosis, surgical treatment

The purpose of our contribution is to compare our patients with EOS treated by single growing rod and guided spine growth systems. The golden treatement standard in iuvenile scoliotic curves was procedure involving single growing rod using subfascial implantation with simultaneous distraction (Harrington or Ascani instrumentation) and repetitive distractions at every 6 month. Orthosis had been used until the age of definitive posterolateral fusion. This method we used since 1981 and had many advangtages as well as high rate of complications. Since 2011 we have been using guided spine growth system. The evaluation of x-ray films with measurement of changes in Cobb angle of 166 patients treated with growing rods in comparison with our first 30 patients treated by guided spine growth were the main methods. We evaluated also advantages as well as disadvantages of this methods and we refered to number and character of their specifical complications. The average degree of deformity in our both groups was 72 dg. (45-150) preoperatively with an average correction percentage of 47% in growing rods group respectively 60% in guided growth group. The main advantages of single rod growing system are: good correction of deformity with simple instrumen-

tation (price), short time of surgery and minimal blood losses. On the other hand there were main disadvantages like repeated surgeries, lordotisation and setting of distracted segment, truncal brace during the whole time of treatment and high percentage of complications like dislocation of upper hook, broken of distraction rods and deep infect (52%). The main advantages of guided growing systems are: better correction of deformity and postop. bracing is not required. But op. time of surgery and blood losses are higher.

EXTENDED ABSTRACT OF REVIEW ARTICLE

SEDENTARY LIFESTYLE AND DISCONGRUENT NEURO-OSSEOUS GROWTH RELATIONS (M.ROTH) AS EXTERNAL AND INTERNAL ETIOLOGIC FACTORS OF SPINAL DEFORMITY AND SKELETAL MALALIGNEMENT. MODERN YOUTH AND THEIR SHORT CORD.

Piet J.M. van Loon[1]; Ruud HGP van Erve[1]; Eric BTM Thunnissen[2], Lodewijk W.van Rhijn[3] , Andre J Grotenhuis[4]

[1] Orthopedic surgeon, Care to Move, Centre for Orthopedics, Deventer, Netherlands

[2] Pathologist, epidemiologist VUMC, Free University, Amsterdam, Netherlands

[3] Professor of orthopedic surgery, Maastricht UMC, Maastricht, Netherlands

[4] Professor of neurosurgery, RadboudMC, University of Nijmegen, Netherlands

Email: pvanloon@caretomove.nl

Keywords: neuro-osseous growth; spinal deformity; posture; tension; thoracolumbar spine; scoliosis

Introduction

Science on skeletal and spinal deformities is apparently on a crossroad. [1 2,3] Degenerative diseases of bone and joints but also of the CNS are an immense socio-economic burden. As growth is based on muscular forces overcoming gravity and moulding the immature bony tissues under regulation of the CNS, spinal deformations are a deviation of the natural **arrangement of forces** during growth. Environmental factors are known to be influential in morphogenesis. Man creates its own environmental factors like "offering" a sedentary lifestyle to his offspring. Their structural growing body has to follow in phenotypical alterations as is stated in the "Form follows function" axiom, also giving base to Wolff's Law and the Volkmann-Hueter principle. If malalignment is the prevailing result of growth as it looks nowadays, degeneration, pain and malfunction will be the fate in adulthood. Principles and practices of orthopedic prevention disappeared in many societies. A plea for restoration has to be made.

Goal

We go back in time to the era before the adverb "idiopathic" became popular in Anglo-Saxon Medicine. Not only scoliosis but all problems of unnatural postural development of child's bodies

got a drawback out of this. Most biomechanical models in bracing got here a scientific background. Was older knowledge forgotten? [4]

Morphogenesis is more dependent on the way the CNS arranges and controls it by muscular action during growth, than that genetic patterns do. In living structures, all processes like regulation of equilibrium in posture and movement go along Newton's and extended laws of Hooke on **conservation of energy, momentum and angular momentum** during growth. [56]. Form follows function (phylogenetic and ontogenetic) also in the spine. With its musculature it acts as primary engine in locomotion in vertebrates. If the spine is well aligned and flexible, locomotion will be safe and durable in adulthood. The change in biomechanical function of the spine in bipedalism is that the coupling mechanism at the thoracolumbar joint now couples a pendulum (the legs) with a reversed pendulum (shoulder-arms). But still by the use of torsional forces, men are amblers, not gallopers.[7]

Method

A search in scattered literature (textbooks) in the pre-PubMed era shows a clear gap in the evolution in science on deformities (by social disturbances) in the period 1914-1945. Only around 1970 a new start was made in the Anglosaxon orthopedic world.

"Lost" historic knowledge of spinal deformities

Andry described in 1741 guidance and correction of growing spines using the moulding capability of muscular forces with exercises and extending corsets (for "weak" girls that sit all day).[5] Focus on extension and avoidance of wrong sitting became a mainstay in Orthopedics out of his work and influenced the medical and educational systems for centuries .[11]

In **1792 Van Gesscher** postulated two concepts in "Observations on Deformations of the Spine" (Dutch): The optimalization of the balancing forces in men needs a certain optimal curvature to keep the weight of the head and the shoulders above the hips. The second concept was on the **role of sitting** in relation with postmortem changes around the discs at the thoracolumbar spine. Girls with "a weak constitution" knitting or reading while sitting develop scoliosis more easily because of the loss of protective lordosis and improper development of discs.[9] His extending corrective (by lordosis) corset was used for more than 150 years in Europe before plaster of Paris became popular [10]

In **1907 L. Wüllstein** described animal experiments in young dogs to show how forced flexion produces all characteristics of kyphotic deformities at sacrifice.[11] In **1912 Murk Jansen** brought in: "The Physiologic Scoliosis and its causes "(Dutch)[12] a review of all available knowledge till then and with own research found the origin of rotational forces in men. Postmortem studies (with Robert Jones) revealed anatomic asymmetry in the left and right crurae diafragmaticae responsible for asymmetric rotational forces in ventilation as clue for the predominant leftsided lumbar lateral curves. In vivo tests show increased thoracolumbar kyphosis if siblings are put too much and too soon in sitting positions leading to assessable contracture of this part. The thoracic spine is forced by this to rotate counterclock as the spine grows. In experiments in rabbits lower intrathoracic pressure was shown

in the right pleural cavity. Common alertness by parents and teachers was underwritten. Some of this still survive in non- Anglo-Saxon countries .[13,] In progressed scoliosis Sayre's method of corrective plastering in suspension and Calot's sagittal corrections in prone position under anesthesia and plaster shelves with lordosis in bed became popular.[15] In the "Volkmann Hueter principle" a start in knowledge was made why the resilience of the deformable structures in the spine, e.g. the discs, the apophyses and the cartilage in joints help deforming the spine (Conservation Laws). The genes deliver the individual resilience of cells and the complete structures that are builded of them and the non physiologic forces in prolonged sitting positions gives overloads and shearforces. So the goal of orthopedic prevention was in avoiding all overload and shearloading of the ventral structures of the spine and advocate less sitting and training of active erect sitting positions.

Cobb's warning not to forget the clinical aspects of scoliosis by measuring radiographs was ignored almost completely. The opening of the "black box" of how regulation of growth is performed by the growing body itself had to wait for Milan Roth and his astonishing observations and research. He brought knowledgeon growth in a comprehensive explanation: how it is organized and regulated by the oldest organ of animal life: the central nervous system in vertebrates in his concept of the "Nervous Skeleton" and researched this intriguing way of growth in a nondisputable way.[8] Milan Roth developed between 1960 and 1985 his concepts on neurovertebral and neuro-osseous growth relations and the tension driven incongruence of growth. Roth provided new biological knowledge on how dyscongruencies can affect the skeleton as well as the CNS (Syringomyelie; Arnold Chiari). In animal experiments, mechanical modeling and radiological studies in scoliosis he stressed the role growth by stretching of "the nervous skeleton" has in the (ab-) normal formation of the spine. A "short cord" can indeed cause scoliosis.[16.17,18,19] Recent studies with MRI in idiopathic scoliosis support this[20]. The bulk of spinal malalignement in the sagittal plane has to wait for the last two decades in gaining interest of the orthopedic scientific world, partly by the increased incidence of sagittal imbalance problems in sitting lifes.

Personal observations

In 2008 own study demonstrates that forceful restoration of thoracolumbar lordosis (and extension!) can correct double major scoliotic curves .[21] A consequent ever present thoracolumbar kyphotic curve was found, recently reproduced .[22]. With the TLI (Thoracolumbar Lordotic Intervention) brace technique we brought very promising results. It rest on the older techniques in exercises and plaster corsets in suspension and lordosis, and proves the too small focus on only the apical zone in the thoracic curve by Dickson and followers[23]. It is the total assessment of the locomotor system, which gives the clues. Out of personal observations the variable presence of neuromuscular tightness or tension, also present in the progressive scoliosis and kyphosis was found as representants of deforming and protective forces and can be assessed by any physician and teacher.[24,25.] In a recent study in 250 schoolchildren (14-17yrs) we found in over 60% evidence of concomitant neuromusculair thightness (Finger Floor test, Straight leg raising test) and serious spinal deformities as seen in the sagittal profile in Adam's bending test.

Conclusions

Combining older and neglected knowledge on proper growth and revitalizing clinical examination depicts spinal growth as result of a combination of neuro-osseous growth regulation in a very complex but still understandable spinal system, where external factors causes muscular reaction in order to obey all Mechanical Laws. Lifestyle factors as passive sitting positions were known of great influence in deformations and need renewed attention by physicians, parents and education workers.

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ABSTRACT OF PERSPECTIVE REVIEW ARTICLE

LONG TERM CHANGES OF PHYSICAL ACTIVITY, MOTOR ABILITIES AND PROBLEMS, AND BODY COMPOSITION IN CHILDREN AND ADOLESCENTS

Parizkova Jana, Sedlak Petr, Musalek M, Dvorakova H
Obesity Management Centre, Institute of Endocrinology, Prague Czech Republic
E-mail: jparizkova@endo.cz

Keywords: secular changes – physical activity – fitness – body composition – - obesity - motor abilities – orthopedic – metabolic problems

Physical activity and exercise in daily regime of children and adolescents have been reducing since several decades, and have resulted in a number of morphological, functional and clínical changes along with decreasing physical fitness. Energy dysbalance – absolutely and/or relatively increased energy intake due to reduced energy output resulting from hypokinesia has been considered as one of the main causes of global prevalence of obesity since early age. Adiposity has been increasing, and body composition concerning also muscle and skeletal tissues have been modified, often without marked changes of body mass index (BMI). These undesirable modifications were more recently revealed already in preschool age – e.g. relatively greatest accumulation of fat on the trunk, which is considered as a marker of increased possibility for the development of metabolic syndrome even during growth. Unchanged extremity circumferences along with increased skinfolds indicate also reduced muscle development, especially on lower extremities. Simultaneously with that, reduced ability to carry on usual physical activity and exercise programs, deteriorated motor performance, and faster achievement of fatigue have been shown. Also body posture has worsened, most often with flat feet, and orthopaedic problems including joint pains etc. have

increased. Enhanced clumsiness along with the deterioration of motor abilities has been resulting in more frequent accidents and fractures, accompanying often obesity (both apparent and/or latent, i.e. without marked changes of BMI) along with metabolic problems and comorbidities. More detailed examination of children´s development - morphological and functional are at present needed for more efficient and timely diagnosis, aimed not only to the treatment, but also prevention of this still increasing status during growth

ABSTRACT OF PERSPECTIVE ORIGINAL ARTICLE

METHOD OF MEASURING AXIAL PELVIS ROTATION – A PILOT STUDY

Cerny Pavel [1, 2, 3], Stolinski Lukasz [4, 5,6], Czaprowski Darius [7, 8], Marik Ivo [1, 9], Muranova J.[3], Kotwicki T.[4]

[1] Faculty of Health Care Studies, University of West Bohemia, Pilsen, Republic

[2] Faculty of Physical Education and Sport, Charles University, Prague, Republic

[3] ORTOTIKA, I.l.c., the complex of the Faculty Hospital at Motol, Prague, Republic

[4] Department of Spine Disorders and Pediatric Orthopedics, University of Medical Sciences, Poznan, Poland

[5] Rehasport Clinic, Poznan, Poland.

[6] Rehasport Clinic Licensed Rehabilitation Center, Skierniewice, Poland

[7] Department of Physiotherapy, Józef Rusiecki University College, Olsztyn, Poland

[8] Center of Body Posture, Olsztyn, Poland

[9] Ambulant Centre for Defects of Locomotor Apparatus I.l.c., Prague, Czech Republic

Email: pavel@ortotika.cz

Keywords: pelvis, rotation, measurement, body contour, posture, photograph

Introduction

Clinical examination, together with antero-posterior (AP) and lateral spine X-rays are standard examination of scoliosis. Rotation of the spinal column is usually identified by measuring axial rotation angles of individual vertebrae from AP X-ray. The position of the pelvis significantly influences the local or regional readings obtained from measuring the axial rotation of vertebrae from AP X-rays, particularly in the lumbar section.

Objectives

The aim of the study was to develop a method to identify the axial rotation of the pelvis from PA photograph.

Methods

A purely graphic principle which does not require the use of any other aids was developed and used to measure axial pelvic rotation form the patient photograph. The method uses the contour of the width of the patient's hips and the position of the proximal part of gluteal crease. The digital scans were processed using a freely available software "SCODIAC".

Results and discussion

The method of measuring pelvic rotation using the widths of projections of pelvic blades was successfully used to identify pelvic rotation from a photograph. In the first stage examination of the photographs comprised 13 persons (5 males, 8 females), aged 11-58 years. The relevant readings were measured in a physiological posture of the pelvis for the pelvic rotations ranging from 0° to 30°; SD = 2,7 (4,1).

The method of reading the photographs requires a visible contour of the patient's hips, including the proximal part of the gluteal crease. Using the presented method it is easy to identify the axial pelvic rotation. Examination of the axial position of the pelvic appears to be effective particularly when examination of the same patient over successive time segments is performed.

The method will be gradually checked on more representative group of individuals.

Conclusion and significance

The study presents the possibility of measuring axial pelvic rotation using photographs. The models, measurements and description show that this is relevant, simple and relatively accurate method, which can also be applied in combination with other commonly used methods in clinical practice in patients who exhibit axial pelvic posture variability over time.

ABSTRACT OF PERSPECTIVE ORIGINAL ARTICLE

THE POTENTIAL OF MODERN MOBILE TECHNOLOGY FOR THE DIAGNOSIS OF ANTHROPOMETRIC PARAMETERS OF A HUMAN

Vasilevich Sergey Viktorovich[3], Arsenev Aleksey Valentinovich[1], Dudin Mikhail Georgiyevic[1], Baloshin Yuriy Aleksandrovich[3], Kipke M.V.[2], Sorokin A.A.[2] Sukhov T.M.[b], Sukhova M.A.[c]

[1] Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok",

[2] FSBEI HE Baltic State Technical University "Voenmeh" Named after D.F. Ustinov

[3] Ltd "Smart-Orto", St. Petersburg, Russia

E-mail: stivamat@rambler.ru

Abstract

For effective work with patients with different deformations of the spine and torso, doctor must have the necessary methods of objective diagnosis. Today in practice implemented high-tech methods of the radiotherapy, biomechanical and functional methods of examination. However, some of them are very financial costly and some can only be used in a hospital environment. One of the promising areas of development is the development of methods for medical diagnostics on the base of portable consumer computing devices. Known methods of functional and laboratory diagnostics, operating on the base of tablet computers and even smartphones. We have studied the potential of modern mobile technology for the visualization and documentation of anthropometric parameters of the human. Diagnostics based on such principles is needed for observation of patients with impaired posture, deformities of the spine. Promising its use in aesthetic and sports medicine.

Keywords: posture, scoliosis, kyphosis, diagnosis, mobile equipment.

Introduction

Evidence-based medicine involves an objective assessment of the patient's condition in real time and changes of the significant symptoms in the dynamics. With regard to the diagnosis of the human's state of locomotor system this principle is documentation of the qualitatively - quantitative characteristics of a number of anthropometric parameters. With this approach, it is possible reliable determination of the dynamics of the disease, evaluation of treatment results and make more accurate forecasting. In 2016 we have developed a cross-platform software that allows for the analysis of the surface of the human body with the measurement of the main anthropometric parameters for digital image obtained using everyday mobile technology (the principle of "always at hand") [1]. Method is called "Smart ortho". The main difference from existing analogues is the easy, absolute harmlessness for the patient and unprecedented access to diagnostics for practical applications [2,3]. In the process of clinical trials were revealed the diagnostic potential of the method. Determined perspectives of practical application of the "Smart-Ortho".

Material and methods

The material for this work was the results of observation of 304 patients with orthopedic diseases 4 to 16 years with deformities of the vertebral column, incorrect posture, joint contractures, deformities of the limbs and feet. The main method of diagnosis was applied technology "Smart-Ortho". Diagnostics were performed by a tablet with preinstalled original software. The survey was carried out in the normal medical office environment. Digital photographs of the patient was done in the standard planes: frontal and sagittal, as well as when performing test Adams (back and front).

Image processing was carried out by a computer program "Smart-Ortho 2D Pro", allowing a quantitative form demonstrate symptoms of posture disorders. The diagnostic results were compared with conventional "standard" methods of examination: anthropometry with the use of the metric devices, x-ray, MRI and computer optical topography. Performed comparative analysis and determination of the accuracy of the obtained measurements.

Results

The results of diagnostics of "Smart ortho" program presented as a series of images on which the operator performs setting of reference points. The program measures the parameters in relative and absolute terms. Paired anatomical landmarks are subjected to comparative analysis. The method allows to capture and document as a one-time state of the musculoskeletal system of the patient and changes its dynamics. The diagnostic results are displayed as a series of images and the measured parameters (length, width, angular characteristics, area) in relative and absolute terms. Paired anatomical landmarks available for comparative analysis. The software allows you to save information and to assess the dynamics of clinical manifestations. Comparative analysis of measurement results obtained by the new method with the reference methods showed that the error of measurement of linear dimensions ±1 mm, angular ± 1 degree. An integral part of the software developed is the possibility of implementation of telemedicine technologies. Already at this stage can be carried out at the level of patient – doctor and doctor - doctor.

Discussion

Practical application of the method "Smart-Ortho" showed that the measured anthropometric parameters of the patient by digital photo (length, width, angular characteristics, area) can be captured and documented to assess a lump sum the state of the musculoskeletal system and change its dynamics. This method may be used for initial diagnosis in mass screening. In the process of treatment or monitoring of a patient with deformity of the spinal column, the method is able to objectively evaluate qualitative and quantitative changes of symptoms. The technology of remote control increases the availability of diagnostic services. The method has the potential for the development of telemedicine technology and online medicine.

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ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

MOTOR CONTROL DYSFUNCTION PARTICULARLY IN PATIENTS WITH CHRONIC LOW BACK PAIN AND A VARIETY OF MYOTONIC REACTIONS

Kolesnichenko Vera[1], Gresko Igor[2]

[1] SI "Sytenko Institute of Spine and Joint Pathology National Academy of Medical Sciences of Ukraine", Kharkov, Ukraine

Email: veakol@rambler.ru

[2] Lviv National Medical University named after Danila Galitsky, Ukraine

Email: gresko.i.v@gmail.com

Keywords: muscle control dysfunction, chronic low back pain, asymmetric tension of the paravertebral muscles.

Objective

To study motor control dysfunction in patients with chronic low back pain with symmetrical and asymmetric muscle tension.

Methods

Retrospective analysis of the case histories of 50 patients with chronic low back pain, that were observed in the SI "Sytenko Institute of Spine and Joint Pathology NAMS" vertebrology clinic, was performed. We evaluated the intensity of low back pain during daily activities in the past week by visual analogue scale (VAS); disability due to back pain (ODI) during the past week by the Oswestry Disability Questionnaire, version 2.0; the level kinesiophobia during the past week by the Tampa Scale for Kinesiophobia (TSK); the overall mobility of the spine using the test "fingers -floor"; the mobility of the lumbar spine in flexion by method Schober; indicators of endurance of lumbar flexors and extensors using the isometric tests, movement control tests of the low back.

Results and discussion

A retrospective assessment of 50 case histories of patients with chronic lumbar pain showed the presence of symmetrical paravertebral muscle tension in 20 (40.0%) patients (group A), asymmetric tension with antalgic scoliosis in 30 (60.0%) patients (group B) . There was no significant difference between groups A and B in the following indicators: the average duration of the history, the number of the low back pain relapses per year, the duration of the last relapse, VAS, ODI, endurance of the lumbar muscles. In group B, less mobility of the spine was noted according to the results of the test Schober' ($p < 0.001$) and the test "fingers - floor" ($p < 0.001$); more frequent errors in the performance the set of motor control tests were observed ($p < 0.05$), a higher level of kinesiophobia was recorded on the TSK ($p < 0.05$).

Conclusion

The results of a retrospective analysis of the case histories of 50 patients with chronic low back pain showed that the paravertebral muscles asymmetric tension significantly increased motor control dysfunction.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

PHYSIOTHERAPY OF SPINE, HIPS, KNEES, FEET, SHOULDERS – CORRECT, INCORRECT, MISTAKES, WRONG CONCEPTIONS. EXAMPLES.

Karski Tomasz[1], Kędzierski Zbigniew[2], Karski Jacek [3], Domagała Marian[4], Slowinska Beata[2], Kowalska Magdalena[2] , Boryga Bartosz[2]

[1] Vincent Pol University in Lublin, Poland

[2] Military Hospital in Lublin, Poland

[3] Medical University in Lublin,Poland

[4] Medical Centre in Laszczów, Poland

Email: t.karski@neostrada.pl tmkarski@gmail.com

Key words: Physiotherapy in locomotor system diseases and deformation.

Introduction

Authors present the various methods using in the therapy by Polish physiotherapists in deformations of movement apparatus in children and youths, and in pain syndromes of joints in adults. The presented material – there are patients treated, before contact with us – in others towns, in others rehabilitations centres and by various physiotherapists and orthopaedic surgeons – very often by improper methods. The lecture shown many of examples of these incorrect methods.

Material

The cases from the years 2009 – 2016 of all authors in their Out-Patients Clinics. The cohort of patients 1345 cases in age from some month to 90 years.

Spine

Mostly there were patients with scoliosis and before coming to us – all treated by improper exercises.

Hips

Children were very often treated without abduction of hips and by improper exercises. Adults with arthrosis were treated by strengthening exercises.

Knees

The patients with gonarthrosis and arthrosis patello- femoral were treated by improper exercises.

Feet

Children with valgus deformity were treated by old method of therapy. Adults with halluces valgi – mostly were sent to surgery.

Shoulder

Very often "the pain syndromes" of shoulders or frozen shoulders were treated in wrong methods of therapy.

Others examples of improper therapy will be presented in pictures.

Discussion and conclusions

The improper method of therapy were used because of insufficient education of physiotherapist and orthopaedic surgeons or because of "over education" of these specialist. The lecture present also proper method of therapy.

Literature

www.ortopedia.karski.lublin.pl

EXTENDED ABSTRACT OF PERSPECTIVE REVIEW PAPER

SKELETAL DISORDERS WITH LOWER AND HIGHER BONE DENSITY

Zemková Daniela[3, 1], Marik Ivo[1,2,4], Petrasova Sarka[1], Hudakova Olga[1]

[1] Ambulant Centre forDefectsofLocomotorApparatusl.l.c.; Prague; Czech Republic

[2] FacultyofHealth Care Studies, West Bohemia University; Pilsen, Czech Republic

[3] Dept. ofPaediatrics; University Hospital Motol; Prague; Czech Republic

[4] Orthopaedic and Traumatology Department, Hospital Pribram, Czech Republic

Email: dezem@email.cz

Keywords: osteoid, bone mineralization, bone resorption, osteogenesis imperfecta, rickets, sclerosing dysplasias

Understanding of the processes running on the growth plate allows us to elucidate a large part of both primary and secondary growth disorders and skeletal deformities and helps us to search for the appropriate treatment. This review is focused on processes following the apoptosis of hypertrophic chondrocytes, calcified cartilage resorption and vascular invasion. Cartilage is replaced by bone laid down by osteoblasts. This process has two steps: 1. Osteoid formation and 2. Mineralization.

Osteoid is the unmineralized, organic portion of the bone matrix composed of fibres and ground substance. The predominant fiber-type is collagen type I (together with collagen V and XII). The ground substance is mostly made up of chondroitin sulfate and osteocalcin (Golub, Boesze-Battaglia 2007). Collagen fibres serve as a scaffold for the hydroxyapatite crystals. Mutations in *COL1A1 and COL1A2* genes (or rarely mutations in other genes e.g. *CRTAP, P3H1* which alter the amount or structure of collagen molecules, type I) cause osteogenesis imperfecta (brittle bone disease) (Rush 2016). Transcription factors RUNX2 and Osterix and Wnt/ beta-catenin pathway play the most important role on osteoblast differentiation and proliferation. Genome-wide association studies revealed a number of genetic variants of *OSX* gene associated with bone mineral density and osteoporosis. Homozygous single nucleotide deletion (1052delA) mutation in *OSX* gene was found in an Egyptian child who had been clinically diagnosed with osteogenesis imperfecta. (Sinha, Zhou 2013) Changes in wnt signalling cause juvenile osteoporosis (*LRP5* gen). On the other hand, mutations enhancing wnt signaling cause sclerosing dysplasias (e.g. *LRP5, SOST*, endosteal hyperostosis, craniodiaphyseal dysplasia, *WTX* – osteopatia striata) (Perdu, Van Hul 2013).

Bone mineralization is the process of laying down minerals on matrix of the bone. The mineral content of bone is mostly hydroxyapatite [Ca10(PO4)6(OH)2]. Osteoblasts mineralize bone matrix by promoting hydroxyapatite crystal formation and growth in the interior of membrane-limited matrix vesicles (MVs) and by propagating the crystals onto the collagenous extracellular matrix (Hessle et al. 2002). The regulation of physiological mineralization is mediated at molecular, cellular and tissue levels and involves coordination between stimulatory and inhibitory factors. Local mineralization promoters are synthesized by osteoblasts, the most important is tissue-nonspecific alkaline phosphatase (TNAP) and phosphatase orphan 1 (PHOSPHO1). The local inhibitors are produced by osteoblasts and osteocytes and include inorganic pyrophosphate (PPi) and organic non-collagenous proteins or peptides of the extracellular matrix, such as osteopontin (Sapir-Koren, Livshits 2011). The Pi/PPi ratio is crucial in local regulation of mineralization and phosphate homeostasis (Thouverey et al.2009). Systemic calcium and phosphate homeostasis are regulated by the PTH – $1,25(OH)_2D_3$ axis. Additionally, locally synthesized fibroblast growth factor 23 (FGF23) regulates systemic phosphate levels by creating intestine-bone–kidney–parathyroid feedback loops (Sapir-Koren, Livshits 2011). Disorders of mineralization manifest themselves as a rickets. Nutritional rickets with vitamin D deficiency is rare in developed countries but remains a major health problem in many developing countries. Mutations in genes regulating the process of mineralization or causing disruption in the pathway of either vitamin D or phosphate metabolism cause various types of hereditary rickets (Plotkin 2017): Vitamin D–dependent rickets (type I), **defected receptor rickets (type II vitamin D–dependent rickets)**, X-linked hypophosphatemic rickets and autosomal recessive hypophos-

phatemic rickets /mutations in *PHEX* and *DMP1 genes influencing FGF-23/ (Levine et al.2009)*. FGF-23 has been implicated in the renal phosphate wasting in tumor-induced rickets and osteomalacia. Mineralization defects due to dysfunctions in tubular phosphate reabsorption are present in patients with renal diseases (Fanconi syndrome, end-stage renal disease). Mutations in the *ALPL* gene lead to hypophosphatasia - the production of an abnormal version of tissue-nonspecific alkaline phosphatase that cannot participate effectively in the mineralization process. Clinical severity widely varies, ranging from death in utero to pathologic fractures firstly presenting in adulthood only (Plotkin 2017). Uncontrolled or pathological mineralization, due to an unbalance between pro- and anti-mineralization factors, can occur during aging, degenerative joint diseases, or genetic and various metabolic disorders (Thouverey et al. 2009), e.g. hyperostosis in craniometaphyseal dysplasia /mutation *ANK* influencing PPi/ (Reichenberger et al. 2001).

Initially, woven bone is laid down (Hernandez et al.2004, Singh,). It is weaker, with a smaller number of randomly oriented collagen fibers, but forms quickly. Later it is resorbed and gets replaced by lamellar bone. Then bone resorption is a constituent part of skeletal development. The bone is resorbed by osteoclasts - derived from precursors from myeloid lineage of hematopoietic cells (related to macrophages). In healthy individual the processes of bone resorption and bone formation are precisely counterbalanced and coupled. Unbalance between bone formation and resorption leads on one hand to osteoporosis, on the other hand to osteopetrosis – the most common form of sclerosing dysplasia. It is caused by the inability of osteoclasts to resorb bone due to defects in the osteoclastogenesis or the acidification of the extracellular compartment. Pyknodysostosis is caused by mutation in gene for Cathepsin K catabolizing organic bone matrix (Perdu, Van Hul 2013).

Summary

The process of bone formation and modelling has 3 important phases: osteoid formation, mineralization and bone resorption. Owing to this arrangement the skeleton can fulfil body support and can adapt to changing mechanical demands while at the same time playing a key role as the body reservoir and regulator for maintaining calcium and phosphate homeostasis. In healthy individual these processes are well balanced. Unbalance leads on one hand to lower bone density (osteoporosis, rickets) and on the other hand to sclerosing dysplasias.

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ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

RECESSIVE FORMS OF OSTEOGENESIS IMPERFECTA

Hrušková L[1], Mařík I[2], Mazurová S[1], Honzík T[1], Martásek P[1,3], Mazura I[1]

[1] Department of Pediatrics and Adolescent Medicine, First Faculty of Medicine, Charles University and General University Hospital in Prague, Czech Republic;

[2] Ambulant Centre for Defects of Locomotor Apparatus 1.1.c., Prague, Czech Republic;

[3] Institute of Molecular Genetics of the ASCR, v. v. i, Division BIOCEV, Vestec, Czech Republic

[4] Faculty of Health Care Studies, West Bohemia University; Pilsen, Czech Republic

Contact author: Lucie Hrušková, Email: black.luca@seznam.cz

Key words: osteogenesis imperfecta, autosomal recessive, CRTAP, P3H1, sequencing

Osteogenesis imperfecta (OI) is a genetic disorder characterised by fragile bones and high presence of fractures. Spectrum of clinical signs varies based on severity of presented OI type. Currently, fourteen clinical (11 genetic) different OI forms are described. OI is usually inherited in autosomal dominant pattern with genetic origin in mutations of collagen type I genes (COL1A1, COL1A2). Mutations resulting in decreased production of structurally correct collagen type I lead to OI type I, the mildest form of OI. Production of structurally defective protein is typical for more severe OI types II, III and

IV. Autosomal recessive forms of OI result from defects of other genes participating bone formation or post-translational processing of procollagen type I. These genes include IFITM5, SERPINF1, CRTAP, P3H1, PPIB, SERpINH1, FKBP10, SP7, BMP1 and TMEM38B.

This study is focused on the analysis of coding sequences of CRTAP and P3H1 genes which encode (in conjunction with PPIB gene) collagen prolyl-3-hydroxylase complex. This complex is responsible for posttranslational 3-hydroxylation of proline 986. In this study we analyse four Czech patients diagnosed with OI type III. Unaffected collagen type I production was previously confirmed by analysis of COL1A1 and COL1A2 genes.

DNA samples were extracted from the leucocytes of peripheral blood and analysed using polymerase chain reaction and Sanger sequencing methods. Obtained data were compared to the wild-type sequences as submitted to Ensembl accession no. ENST00000320954.10 and no. ENST00000236040.8. Obtained data were compared with the Ensembl database.

Analysis of CRTAP and P3H1 gene is completed in three of four studied patients. There are identified no DNA changes resulting in OI phenotype in these cases. Single nucleotide polymorphisms of CRTAP gene, rs1135127 and rs1135128, were observed in two patients. In P3H1 gene were described following SNPs: rs11581921, rs3738498 and rs3738499. Polymorphism rs11581921 is described as benign missense variant, previously identified in a case of sudden cardiac death (United States).

Patients with unaffected CRTAP and P3H1 synthesis will be included in a subsequent study focused on PPIB and further on other genes (IFITM5, SERPINF1, SERPINH1 and other) involved in genetic origin of autosomal recessive OI forms. Analysis of these genes will be supplemented by other patients diagnosed with one of severe OI forms and with confirmed unaffected collagen type I synthesis. This analysis will be performed using next generation sequencing (NGS) method followed by Sanger sequencing of candidate genes. Aim of this study is mapping heterogeneity of genetic origin in cohort of Czech individuals with autosomal recessive OI.

Acknowledgment

This study was supported by the grants ProgresQ26/LF1 UK, UNCE 204011 and SVV-2015-260158 from the Charles University in Prague.

PERSPECTIVE ORIGINAL PAPER

FUNCTIONAL ADAPTATION OF BONES. EXPLANATION OF SKELETAL DEFORMITIES IN SKELETAL GENETIC DISORDERS

Marik Ivo [1,2,4], Zemkova Daniela [1,3], Myslivec Radek [4,1], Marikova Alena [1], Cerny Pavel[5,2], Krawczyk Petr[6]

[1] Ambulant Centre for Defects of Locomotor Apparatus l.l.c.; Prague; Czech Republic

[2] Faculty of Health Care Studies, West Bohemia University; Pilsen, Czech Republic

[3] Dept. of Paediatrics; University Hospital Motol; Prague; Czech Republic
[4] Orthopaedic and Traumatology Department, Hospital Pribram, Czech Republic
[5] Ortotica l.l.c., Prague, Czech Republic
[6] PROTEOR CZ l.l.c., Ostrava, Czech Republic
E-mail: ambul_centrum@volny.cz

Key words: deformities of skeleton, functional adaptation of bones, bone modelling and remodelling, lateral drift, remodelling at skeletal genetic disorders

Functional adaptation of bones is a process where influence of function leads to optimal development of bone shapes and structure of skeleton. Genetically anchored programmes for development of expedient shapes and structures during ontogenesis assert primary oneself in embryonal period without influence of special mechanic forces, muscle activity and impact of gravity of Earth. Genetic mechanism accruing during evolution creates only basic shapes.

Mechanisms of functional adaptation, i.e. a way haw tissues respond to external epigenetic impacts, are also hereditary anchored. Both genetic and epigenetic processes head towards the same goal. The muscle movement has morphogenetic function as early as foetal period.

Muscles take the specific forming function only postnatally. It means that genetic influence asserts oneself even in postnatal period when typical symptomatology of bone dysplasias (osteochondrodysplasias) develops.

Galileo (1564–1642) figured out certain natural relations of bone shape and structure building. Galileo was Tuscan astronomer, physicist and philosopher who scientifically connected mathematics with natural sciences. Later many anatomists and morphologists observed that the bone has been not only growing but also changing its shape and structure during whole life.

There were very important universal opinions in 2nd half of the 19th century:

- 1862 Hüter – development and growth are dominated by mechanical factors
- 1869 von Volkmann showed that changes of bone shape go on under influence of mechanical forces, gravitation, pulling of muscles and he explained the change of bone shape by apposition, resorption and also deformation.
- 1866 Culmann, mathematics, calculated course of the main force trajectories in the trabecular structure of proximal end of femur (similarly like the course of main tensile directions in framework of crane). Julius Wolff, the German anatomist and surgeon, accepted this "trajectory" theory and generalized it for whole skeleton as natural process. In 1892 Wolf described this process: *"by consequence of changes of functional requirements comes up in bone by mathematic laws to conversion of internal architecture and only just so to secondary changes of external shape of bone".* "Trajectory" theory is valid only for isotropic and homogenous material. For this material is valid

that both main directions of stress (tension) are perpendicular each to other. But the skeleton is assumed to be un-isotropic material!

- Wolff´s transformation law and remodelling has been verified in the experimental way and defined with more precision up to 70th years 20th century when 3 fundamental mechanisms (laws) of functional adaptation of connective tissues were explained - mainly growth of long bones, apposition and resorption.
- 1st mechanism of functional adaptation of bones depends on intensity of changing - cycling straining (internal stress in bone), velocity of alteration of deformation, number of cycles, etc. - strictly speaking on activity of osteoblasts (osteocytes) and osteoclasts that are influenced – activated by supraliminal deformation. In range of remodelling equilibrium (1500 – 2500 micro-strains) the bone does not respond to stress. Supraliminal values of changing - cycling straining cause apposition, subliminal bone resorption.
- 2nd mechanism of bone adaptation is caused by periosteum. The push of periosteum (and also endosteum) against the bone surface causes the resorption of bone tissue, whereas its take up is a cause of apposition. The convex surface of the long bone (diaphysis) inclines to resorption and the concave one to apposition.
- 3rd mechanism is a regulation of long bone growth by epiphyseal plate (so-called physis) and is possible only in growing period. According to Hüter and Volkmann law physis creates a new bone tissue into axial pressure direction (central line). Increase of stress causes restriction of growth, on the other hand unloading of physis accelerates growth. In situation of oblique loading, the epiphyseal plate regulates the growth of long bone into the direction of the pressure resultant (central line).

Big merits on understanding of bone physiology belong to Harold Frost, Lanyon et al., Jiri Heřt and a lot of no named anatomists, histologists, morphologists, orthopaedic surgeons, biomechanics, etc.

According to H. Frost, the *modelling* is a planar apposition and/or resorption process which changes the shape of bone. On the other hand, the *remodelling* of skeleton runs variously intensively for whole life in Hoffship´s lacunae (so-called basic multicellular units) on surface of bone trabeculae, subperiostally, on cortico-endostal surface and Haversian system of osteons.

In 1995 Sobotka and Mařík (Pohybové ústrojí 2, 1995, č. 1, s. 15 – 24) described clinical and X-ray investigation of long bones of some bone dysplasias and their macroscopical observation at surgical treatment of bone deformities by means of the fundamental laws of remodelling. The complex loading of bones involves compression, tension, bending, shear and torsion. They explained the phenomena of narrowing, vanishing and displacement of medullary canal of the long bones of children with different types of osteogenesis imperfecta, as well as the causes of disturbed functional adaptation of bones at some other bone dysplasias where the decrease in the resistance to deformation is often compensated by apposition of bone tissue on the external bone surface (e.g. in children with different forms of rickets). This increases the resistance of long bones to torsion and bending (Sobotka, Mařík 1994). Every divergence from the physiological composition of bone tissue is manifested by a disturbance of the resistance against mechanical effects. An excessive amount of the mineral components involves considerably hardness but also fragility of bones of children with

sclerosing bone dysplasias (e.g. osteopetrosis) and some people at advanced age. Such bones can carry considerable static loads but they frequently fail by impact. On the other hand, the lack of mineral components in the bone tissue leads to osteomalacia and typical subsequent deformities since it causes the escalated softness and insufficient strength of the skeleton even at rest (Sobotka 1994). The observed biomechanical impulses for bone remodelling can be explained on the basis of the deformation changes of bones. The investigation of these phenomena in cases of genetic skeletal disorders (investigation of X-rays, per-operative observation, results of orthotic and surgical treatment) has led the authors (Sobotka and Mařík 1995) to the formulation of the *deformational-rheological theory of bone remodelling*. There exist instantaneous elastic deformation changes arising immediately with changes of loading and furthermore the time-dependent viscoelastic deformation changes occurring at constant load or after unloading. According to this theory, the remodelling of bone tissue depends on its time-varying straining represented by extensions and shortenings. Because of the viscoelastic properties of bones (bone tissue contains collagen fibres, proteoglycans and fluids in skeleton), the strains vary not only at varying loading but the strain changes continue and fade as elastic after-effects at constant loads and after unloading – in rest, in sleep. The intensity of remodelling then depends on the amount, changes and duration of straining. By this theory we can explain and understand efficiency of orthotic treatment in the night regime or effectiveness of physiotherapy on remodelling of locomotion system.

Material and Methods

During 25 years a group of more than 600 children suffering with genetic skeletal disorders (GSD, bone dysplasias) has been investigated from the point of the fundamental laws of bone remodelling described above. We use X-ray documentation of children, per-operative observation and evaluate the results of orthotic and surgical treatment. Last years we also evaluate bone density at some bone dysplasias by densitometric examination (DEXA) with use of children software.

Results

The most frequent deformities of long bones are demonstrated on photos and X-rays of children with GSD – these are:

1. incomplete correction of long bone curvature by so-called lateral drift (e.g. rickets, genetic rickets, hypophosphatasia, hyperfosphatasia, osteogenesis imperfecta, fibrous dysplasia, enchondromatosis etc.).
2. abnormal (pathologic) changes of cross-sectional areas of long bones by apposition of new bone tissue at the external circumference (subperiosteal apposition) and resorption at the internal circumference causing tubular shape of long bones (e.g. rickets, genetic rickets especially hypophosphatemic rickets, severe types of osteogenesis imperfecta).
3. narrowing, displacement and vanishing of medullary canal of patients with osteogenesis imperfecta that enable compensation – lateral drift - of lower quality to resist loading and deformation. This phenomenon and so-called shepherd´s crook and sabre-like deformities were observed in severe types of osteogenesis imperfecta.

4. abnormal modelling of metaphysis and diaphysis (sclerosing bone dysplasias, multiple exostoses, enchondromatosis, pachydermoperiostosis, etc.)
5. genetically predetermined oblique growth of epiphyseal plate (e.g. epi-metaphyseal dysplasia)
6. growth retardation localized on medial and/or lateral part of epiphyseal plate (e.g. morbus Blount)
7. varosity of shanks due to overgrowth of fibula (achondroplasia, hypochondroplasia, pseudoachondroplasia, epi-metaphyseal dysplasia, etc.)
8. anteromedial angulation of tibia at fibular hemimelia, type 2 due to fibular fibrocartilage (anlage).

Discussion

The described fundamental laws of bone remodelling secure healthy organism an ability to adapt shape and solidness of skeleton to varying living condition.

In patients with bone dysplasias, the modelling and remodelling, bone resorption and apposition (it means function of osteoblasts, osteocysts and osteoclasts) are in some way abnormal - attenuated.

Abnormal shape and above described deformities of skeleton in individuals with bone dysplasias are results of modelling and remodelling of genetic predetermined pathologic bone tissue (that contains abnormal collagen chains, proteoglycans, etc.) with abnormal material properties.

Conclusion

At various genetic skeletal disorders (bone dysplasias), the functional adaptation of bones is affected in different levels, from the normal course to the pathological one. The remodelling is genetically predetermined. In these cases we observe various deformities of the skeleton.

Orthotic treatment which is based on the three point balanced principle takes advantage of the three fundamental mechanisms (laws) of functional adaptation of connective tissues.

We have many years ongoing experience with treatment of spine deformities by bracing and knee and shank deformities that can be corrected by orthoses with bending pre-stressing and/or by surgical method - so-called guided growth. Both methods of orthotic and surgical treatment use Hüter-Volkmann law (the 3rd mechanism of functional adaptation of bones) which involves growth of long bones.

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ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

LEG LENGTH DISCREPANCY FOLLOWING TOTAL HIP ARTHROPLASTY

Funda Jiri
Department of Trauma and Orthopaedic Surgery, Hospital Příbram, Czech Republic
Email: j.funda@quick.cz

Key words: leg length discrepancy, total hip arthroplasty, operative technique total hip arthroplasty

Introduction

The goal of total hip arthroplasty is relieving of pain, restoration of normal function and stability of the hip and achievement of equal leg length. Leg length discrepancy (LLD) following hip arthroplasty is unfortunately not just rare complication, cousing many clinical symptoms such as limp, pain around the hip, knee and spine. Many methods were described in literature to avoid LLD, but none of them solved the problem completely.

Materials and Methods

In the year 2016 altogether136 total hip arthroplasties were performed at our department, 73 cemented, 57 uncemented and 6 hybrid endoprothesis, all as primoimplantations. Revision operations and operations because of femoral neck fractures were excluded. Combination of preoperative planning of femoral neck osteotomy and intraoperative decisions was used. Leg length discrepancy (LLD) was measured before and after surgery, using 2 defined points (anterior superior iliac spine and lateral malleolus) and correcting pelvis obliquity using wooden blocks of known thickness (indirect measurement). Retrospective review of clinical records was used.

Results

Absolute average prolongation 22 mm, relative average prolongation (LLD) 8 mm, incidence of LLD 23 % (31 hips) shows, that praeoperative planning in combination with intraoperative measurement based only on palpation of bony landmarks brings significantly worse results as compared with techniques using precise intraoperative measurement published in literature. However non clinicaly important case of LLD demanding revision surgery or special therapy appeared.

Discussion

To avoid leg length discrepancy (LLD) following THA, different methods were described in literature. Praeoperative templating and planning, various intraoperative techniques helping making right decisions and selections of appropriate implants and finally computer assisted surgery techniques are used to minimise the risk of LLD. The best results are reported using combination of praeoperative planning and appropriate intraoperative techniques.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

SURGICAL TREATMENT OF FLEXIBLE FLATFOOT IN CHILDREN. EARLY FOLLOW UP STUDY

Kwiatkowski Michal, Popko Janusz
Department of Pediatric Orthopaedics and Traumatology, Medical University of Biaystok, Biaystok, Poland
Email: michalkwiatkowski@bialan.pl

Key words: arthroereisis; subtalat joint; pediatric flatfoot

Introduction

The optimal treatment methods of flatfoot have been sought for many years. Currently, the method of choice for dynamic disorders is support and stabilization of the displaced talus with the use of a titanium implant inserted into the sinus tarsi and extension of the gastrocnemius muscle fascia.

Purpose and character

The aim of our study was to evaluate the treatment results of a homogeneous group of patients operated due to flexible flatfoot.

Patients

The study included 62 patients treated for flexible flatfoot in 2013-2016 (21 girls, 41 boys). All the children used the stabilization of the talus with the titanium implant inserted into the sinus tarsi. Additionally, in 39 cases fascia of the gastrocnemius muscle had to be extended with the use of the Vulpius method. The average follow-up period was 1.9 years. The average age of patients in the time of surgery was 12.7 years.

Methods

Patients were examined clinically, performed a retrospective analysis of medical records and radiological images, pre- and post-operative. Evaluated the effectiveness of treatments using the AOFAS ANKLE-HINDFOOT scale in the form of a questionnaire, in which the maximum score to gain was 100 points.

Results

In the clinical study in the third month after the treatment there was observed an improvement in the appearance and function of the foot at 92% of patients.

On the pre- and postoperative X-ray images, angles rates of foot improved by an average of 10 points, at 75.6% of patients, this result was within limits of the physiological norm.

At 92% of patients, outcome in the applied scale improved by an average of 18,2 points, two children showed no difference, in two cases occurred deterioration of the initial state by 13 points.

All patients who underwent the procedure of lengthening the gastrocnemius muscle fascia with the use of Vulpius method in the applied scale achieved improvement by 21,6 points.

Conclusions

1. The correction of flexible flatfoot in children with the use of titanium implant inserted into the sinus tarsi improves cosmetics of feet, their self-esteem and reduces pain.

2. A properly qualified patient and the right size of the implant guarantees success.

3. The extension of the gastrocnemius muscle fascia in some cases is a necessary treatment and significantly improves the mobility of the foot and the final result.

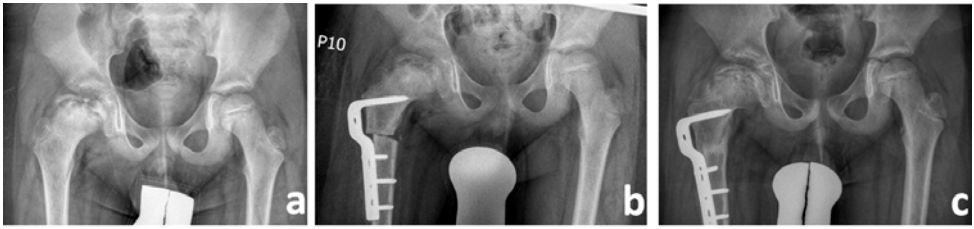

Fig. 1 SM, 10 year old boy. X-rays: pre op. (a), post op. (b), last (c)


Fig. 2 BA, 7 year old boy. X-rays: pre op. (a), post op. (b), last (c)

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

INDICATIONS FOR SURGICAL TREATMENT IN PERTHES DISEASE. THE EFFECTIVENESS OF DIFFERENT METHODS

Karski Jacek[1], Okoński Marek[1], Jakubowski Paweł[1], Karska Klaudia[2], Kandzierski Grzegorz[1]

[1] Paediatric Orthopaedic and Rehabilitation Department of Medical University in Lublin

[2] Department of Interventional Radiology and Neuroradiology of Medical University in Lublin

Email: jkarski@vp.pl

Keywords: Legg-Calve-Perthes disease, avascular necrosis of femoral head, hip osteotomy

Introduction

The aim of this study is to present our observations in the cases of surgical treatment of Legg-Calve-Perthes disease.

Legg-Calve-Perthesdisease can cause a deformation of the femoral head. In younger children the outcome is usually good, in age group over 7-10 years the risk of coxa magna et plana increases. This can lead to limping, pain, osteoarthritis.

In the majority of cases conservative – non-invasive approach is efficient to achieve a positive outcome of treatment.

However, in some patients, the surgery seems substantial to achieve proper congruence of the hip joint, as well as better prognosis for the future.

Material and Methods

In our Department there were 125 children treated for the Legg-Calve-Perthes disease. There were 26 girls and 99 boys, aged 4-10, at first admission.

Among this group indications for the surgical treatment were found in 20 patients.

We have performed open adductor tenotomy in 6 children (average 10 years), varisation osteotomy of the femur in other 8 children (average 8,5 years), 6 children had performed double osteotomy of the hip (average 9,5 years).

Results and Discussion

Results of either varisation (**Fig. 1**) or double osteotomy (**Fig. 2**) were satisfactory and there was no further need for another operation. The type of surgery was decided upon specific indications in each case.

Surgical treatment improves the healing process of the femoral head. Rehabilitation was performed in all patients, both pre- and post-operative treatment.

Radiographic images performed 2-3 months after the surgeries proved remodelling of the femoral head.

Open adductor tenotomy is necessary only in few cases when rehabilitation is unsatisfactory in range of movement improvement.

Conclusions

Surgical approach can be a very valuable and effective method of treatment in selected cases of Legg-Calve-Perthes disease.

The different type of surgery should be considered in each patient, according to physical examination and radiographic features.

Surgery accelerates the healing process, shortens overall time of treatment and helps to reduce the time of decreased activity in affected children.

Operative treatment is very valuable and effective method in selected cases of LCP disease. Surgical treatment reduces development of deformities, premature osteoarthritis and disability.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

FRACTURES OF THE FOOT AND ITS RELEVANCE OF FOOT DEVELOPMENT IN CHILDREN

Zwipp Hans
Orthopedic and Traumatology Department of the University in Dresden, Germany
Email: hans.zwipp@uniklinikum-dresden.de

Keywords: foot fractures, foot development, foot remodelling, children

Foot fractures in children are most often remodelled despite malalignement and joint destruction especially in fractures which occur the more distal located in the foot and in cases the younger the child is. Fractures through the epiphysis even in younger children, joint destruction in elder children (>12 ys) may cause malunion and posttraumatic arthritis, but in contrast to this a complex foot trauma especially in cases combined with an additional foot compartment syndrom or with significant tendon and/or skin damage will show in every case the same sequelae like in adults independent from childrens age.

Neglecting the very common and harmless toe fractures the analysis of an own previous study [1] of 128 foot and ankle fractures in children (<15 ys) shows that the most common fracture level out of six levels concerns with 69 ankle fractures (53.9 %) the ankle joint. The second frequent involved level equals the metatarsals (28.1 %).Excluding in the same study the frequent ankle fractures which are prone in some cases to malunions the analysis of a total of 59 foot fractures shows clearly that metatarsal fractures dominate in 61 % the distribution of all foot fractures. Of these the fifth metatarsal bone is most often (40.7 %) fractured, followed by the first in 18.6. %. Talus (10.2 %), calcaneus (13.6 %), navicular and cuboid (8.5%) as well as the cuneiforms (6.8 %) are much more less fractured.

Observations

The development in a growing foot is mainly dependent **1st**: of an anatomic reconstruction in a severely destructed joint fracture like the talus to avoid consequently following painful arthritis, **2nd** of an early (within 6 h) and correctly performed decompression of an acute compartment syndrom of the foot like in complex calcaneal fractures to avoid significant postraumatic toe deformity grade 1a,1b [2]. **3rd**: Most relevant for normal foot growing after foot fracture and additional significant burning of the skin seems to be the early correction of skin scars surrounding the foot.

Conclusions: There seems to be a high potential for remodelling in toe and metatarsal fractures as well as in calcaneal fractures up to an age of 12 years at the time of injury. Care has to be taken for avascular necrosis even in simple Hawkins fractures of the talus [3]. Not any tolerance concerning foot development is seen **1st**: if an additional acute foot compartment syndrome occurs like in calcaneus fractures , Chopart`s or Lisfranc`s fracture dislocations which is overlooked or insufficiently treated, **2nd**: if dislocated tendons are not treated by open reduction or **3rd**: if an adaequate skin coverage after fracture with a combined 3rd° burn injury is not performed.

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ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

EFFECT OF INFERIOR ALVEOLAR NERVE TRANSECTION ON THE INORGANIC COMPONENT OF THE MANDIBLE – EXPERIMENTAL MODEL.

Nemec Ivo[1], Smrcka Vaclav[2], Mihaljevič M.[3], Mazánek Jiří +[4], Pokorný J.[5]

[1] Department of Otorhinolaryngology and Maxillofacial Surgery 3rd Faculty of Medicine of Charles University in Prague & the Military University Hospital Prague, Czech Republic.

[2] Institute for History of Medicine and Foreign Languages & Department of Plastic Surgery, 1st Faculty of Medicine, Charles University in Prague, Bulovka Hospital, Czech Republic

[3] Institute of Geochemistry, Mineralogy and Mineral Resources, Faculty of Science, Charles University in Prague, Czech Republic

[4] Department of Stomatology, 1st Faculty of Medicine, Charles University in Prague and General University Hospital in Prague, Czech Republic

[5] Institute of Physiology, 1st Faculty of Medicine, Charles University in Prague, Czech Republic

E-mail: nemecivo@centrum.cz

Keywords: alveolar nerve lesions, chemical elements, bone, teeth, rat mandible

Introduction

Lesions of the inferior alveolar nerve may occur due to various causes (a trauma, pathological process, resection of the mandible, iatrogenic injuries). The purpose of the study was to test the hypothesis of an effect of transection this nerve on the contents and distribution of chemical elements in the bone and teeth of the rat mandible and to map the distribution of elements in intact bone and teeth. Furthermore, another purpose was to verify application of this model in subsequent research of elements.

Methods

We used 26 adult males of Wistar laboratory rats for the study. The animals were divided in three groups: the control group (intact); the sham group (the nerve was approached but not transected); and the experimental group (transaction of the nerve). After killing of the animals we extracted the molars and removed incisor crowns. The mandibular bone was divided in 4 parts. Inductively coupled plasma mass spectrometry was used to determine the elements.

Results

The contents of 43 elements were determined in total: Na, Mg, Al, K, Ca, Sc, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Rb, Sr, Y, Mo, Cd, Sn, Sb, Cs, Ba, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Tl, Pb, Bi and U.

Transection of the inferior alveolar nerve resulted in altered contents of the following elements: Na, Mg, K, Ca, Fe, Co, Rb, Sr, Mn, Ba, Zn, Cs, Mo, Ni and Sc.

In the control group, statistically significant differences for the bone and molars were found in the contents of the following elements: Na, Mg, K, Fe, Sr and Mn. For the following elements, statistically significant differences were found only in the bone: Ca, Co, Rb, Ba, Zn, Cs, Mo, Ni and Sc.

No substantial statistically significant differences between the compared samples were found for Cu. For other elements, their contents were below the detection limit for all or most of the samples.

Conclusion

As indicated by the study, transection of the inferior alveolar nerve has an effect on the contents and distribution of some elements in the bone and teeth of the laboratory rat mandible. Distribution of the contents of some elements in the bone and teeth of the intact mandible is clearly inhomogeneous. Based on the study, we believe that laboratory rat is a suitable model for further research of elements.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

CAN WE IMPROVE SELECTIVE VOLUNTARY MOTOR CONTROL IN CEREBRAL PALSIED CHILDREN?

Zarković Dragana[1], Sorfova Monika[1] , Groleger-Srsen Katja[2], Cikajlo Imre[3]

[1] Charles University in Prague, Faculty of Physical Education and Sport, Department of Anatomy and Biomechanics, Prague, Czech republic bUniversity of Ljubljana, Faculty of Medicine,

[2] University Rehabilitation Institute of Republic Slovenia - Soča, Children's rehabilitation department, Ljubljana, Slovenia

[3] University Rehabilitation Institute of Republic Slovenia - Soča, Laboratory of clinical kinesiology, Ljubljana, Slovenia

Email: dragana.z@seznam.cz

Keywords: cerebral palsy, selective voluntary motor control, selective control assessment of the lower extremity, clinical gait analysis, Lokomat

Objectives

Robotic-assisted gait training is coming to the fore of the neurorehabilitation field and represents a supportive frame in the neurorehabilitation process in cerebral palsied (CP) children. We aimed to investigate the effect of the robotic-assisted gait training device Lokomat on the selective voluntary motor control (SVMC) in CP children.

Methods

12 children with spastic diparesis/diplegia underwent a 4-week gait training program with Lokomat. Selective Control Assessment of the Lower Extremity (SCALE), assessment of spasticity, passive range of motion (ROM) of the lower limbs and clinical gait analysis (CGA) were used to compare SVMC pre-post-treatment and during a 3-month follow-up.

Results

SCALE showed significant improvement of the SVMC in the hip, knee, ankle joint due to the increased passive ROM and decreased spasticity. These results were maintained during 3-month follow-up. CGA analysis did not show statistically significant difference pre- and post-treatment ($p = 0.05$).

Discussion

The locomotor skills acquired through Lokomat may partially transfer to overground walking in CP children. Results suggest that SVMC in CP children can be improved through affecting musculoskeletal system by repetitive movements performed during Lokomat therapy. This improvement can be observed in posturally non-demanding positions for CP children. In dynamic situations and vertical positions, CP children are not able to maintain balance and SVMC is impossible to perform due to pathological reflexes.

Acknowledgment

The outcome of the research was supported by a grant 'Project FTVS SVV 2017-2019-260346' from Charles University in Prague. This study was written within the Programme of the institutional support for science at Charles University Progress, No. Q41 Biological aspects of the investigation of human movement.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

PHYSIOTHERAPY TREATMENT IN PATIENT WITH FEMOROACETABULAR IMPINGEMENT - SYSTEMATIC REVIEW

Lukas Ryba[1], Karel Koudela[2], Ivo Marik[1,3], Stepanka Rybova[1], Sarka Staskova[1], Iva Vlckova[1]
[1] Faculty of Health Care Studies, West Bohemia University; Pilsen, Czech Republic
[2] Faculty of Medicine, Charles University, Pilsen, Czech Republic
[3] Ambulant Centre for Defects of Locomotor Apparatus; Prague; Czech Republic
E-mail: rybal@kfe.zcu.cz

Key Words: femoroacetabular impingement, physiotherapy, PRISMA,

Introduction

Femoroacetabular impingement (FAI) is proposed as a possible biomechanical etiology of early, idiopathic hip osteoarthritis (OA). [1] First use of the hip impingement concept is dated since at least 1936 by Smith-Petersen. [2] Treatment of femoroacetabular impingement (FAI), discussions in more details and increase of publications risen due a new hip arthroscopic approach from early 2000s. In recent years, the number of patients being treated for FAI has risen in many countries as well as in Czech Republic. The definition of FAI is still in debate, some consensus gives The 2016 Warwick Agreement on FAI syndrome where most of participants agreed with definition that "FAI syndrome is a motion-related clinical disorder of the hip with a triad of symptoms, clinical signs and imaging findings, represent's symptomatic premature contact between the proximal femur and the acetabulum". [3] Till this moment were generally accepted morphologies consist of cam- there is an abnormal femoral headneck offset, [1,4] pincer- acetabular retroversion is the principle abnormality causing an anterosuperior overhang of the acetabular edge, [1] leading to conflict with the femoral neck upon flexion and internal rotation[5,6,7] or both in one in a mixed-type impingement [4,8]. So FAI is recognised as an anatomical discrepancy between the proximal femur and the acetabulum, which may increase the risk of intraarticular hip pathology, including OA, labral tears [8, 9] and contribute to the development of groin pain. [5] FAI syndrome can be treated by conservative care, rehabilitation or surgery [3]. Conservative care may involve education, watchful waiting, lifestyle change and activity modification[3]. Physiotherapy-led rehabilitation aims to improve hip stability, neuromuscular control, strength, range of motion and movement patterns[3]. Surgery, either open or arthroscopic, aims to improve the hip morphology and repair damaged tissue.[3] The common goal of treatment is to decrease the mechanical contact between the acetabular edge and the femoral neck. [10, 11] Moreover, surgical treatment of FAI should recreate normal anatomic structure in an attempt to halt the process of mechanical damage. The good management of the variety of patients with FAI syndrome requires the availability of all of these approaches. [3]

Aims

Surgical treatment is well described in all/most of cases but there is a paucity of evidence on conservative physiotherapy care as well as postoperative rehabilitation after hip arthroscopy or open

surgery. The aim of this study is to find what physiotherapeutic methods and techniques which should improve the patient's condition and satisfaction in sport and other activities of daily living.

Methodology

Use research methods to find common elements of physiotherapeutic methods and techniques to improve the patient's condition and evaluate the available evidence in conservative physiotherapy care, post-operative rehabilitation programs following FAI hip arthroscopy or open surgery. For complementation of a systematic review (SR) we will work according to preferred reporting items for systematic reviews and meta-analyses (PRISMA) and PRISMA checklist. [12, 13] PRISMA-P consists of a 17-item checklist intended to facilitate the preparation and reporting of a robust protocol for the systematic review. [12] Literature search strategies will be developed using medical subject headings (MeSH) and text words related to FAI physiotherapy. We will search in MEDLINE (OVID interface), EMBASE (OVID interface), the Cochrane Central Register of Controlled Trials (Wiley interface) Science Direct (Elsewier interface). The review authors will independently screen the titles and abstracts yielded by the search against the inclusion criteria. We will obtain full reports for all titles that appear to meet the inclusion criteria or here there is any uncertainty. Review authors will then screen the full text reports and decide whether these meet the inclusion criteria also we will seek additional information from study authors where necessary to resolve questions about eligibility and resolve disagreement through discussion. We will record the reasons for excluding trials, list and define all variables for which data will be sought, including prioritization of main and additional outcomes, with rationale. When studies will be sufficiently homogeneous in terms of design and comparator, we will conduct meta-analysis to find goals of our topic.[13]

Discussion and conclusions

Systematic review, in the context of Evidence Based Medicine's approach and philosophy, is the most significant and most valuable type of study within the level of scientific evidence. Treatment of FAI is evolving as evidence based medicine do. The natural history of the condition and the efficacy of various surgical and nonsurgical interventions are still not fully understood. We are convinced that FAI treatment will be object of debate and ongoing studies for several next year's so we are on the long way to say what approach should be the most ideal for an individual patient. Systematic review according to PRISMA protocol is a useful tool which represents a very important link between scientific evidence and its implementation into clinical practice and helps us to fulfill the principles of Evidence Based Medicine: the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients.[14]

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ABSTRACT OF ORIGINAL PAPER

(Pohybové ústrojí, 22, 2015 No. 3-4, p. 294-326)

DIASTROPHIC DYSPLASIA

Povysil Ctibor[1], Marik Ivo[2,3], Zemkova Daniela[2,4], Krepelová Anna[5], Kuklik Miloslav[4], Kozlowski Kazimierz[6]

[1] Institute of Pathology, 1st Faculty of Medicine, Charles University, Prague, Czech Republic

[2] Ambulant Centre for Defects of Locomotor Apparatus; Prague; Czech Republic

[3] Faculty of Health Care Studies, West Bohemia University; Pilsen, Czech Republic

[4] Dept. of Paediatrics; University Hospital Motol; Prague; Czech Republic

[4] Genetic Dept.; Czech Republic, Prague 3; Czech Republic

[5] Dept. of molecular genetics, Institute of biology and medical genetics, University Hospital Motol; Prague; Czech Republic

[6] New Children Hospital, Westmead, Sydney, Australia

Email: ctibor.povysil@lf1.cuni.cz

Keywords: Diastrophic dysplasia, variant of diastrophic dysplasia, diagnostics, pathomorphology, molecular genetics

The authors try to give a short review of knowledge on Diastrophic dysplasia (DD). Chief clinical manifestation and radiologic features are demonstrated on archive pictures from Ambulant Centre for Defects of Locomotor Apparatus in Prague as well as primary histological and electron microscopical investigations. DD is a generalize disorder of cartilage tissue distinguished in perinatal period by short limbed dwarfism, clubfeet and abnormal thumbs, deformity of external ears, progressive scoliosis, small femoral head centres, epiphyseal invaginations and joint contractures. Mutations in gene DTDST (more than 30) cause synthesis of insufficiently sulphated proteoglycans in chondrocytes and fibroblasts. Consequence are generalized mesenchymal disorders that belong to a family of bone dysplasia. It contains two lethal diseases with severe and a mild involvement. Mild cases are called as a variant of DD or autosomal recessive multiple epiphyseal dysplasia.

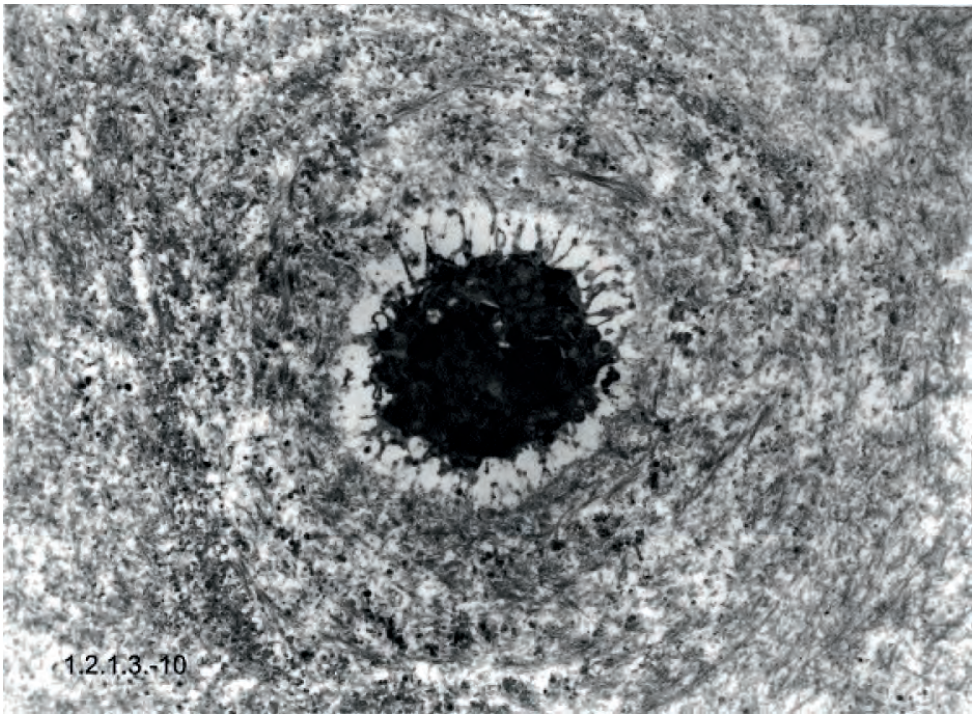

Fig. 1. Electronmicroscopic investigation of the iliac bone apophysis. Regresively changed chondrocyte of the resting zone. In the neighbourhood of it you see intercellular matrix and abnormal collagen fibres concentrically arranged.

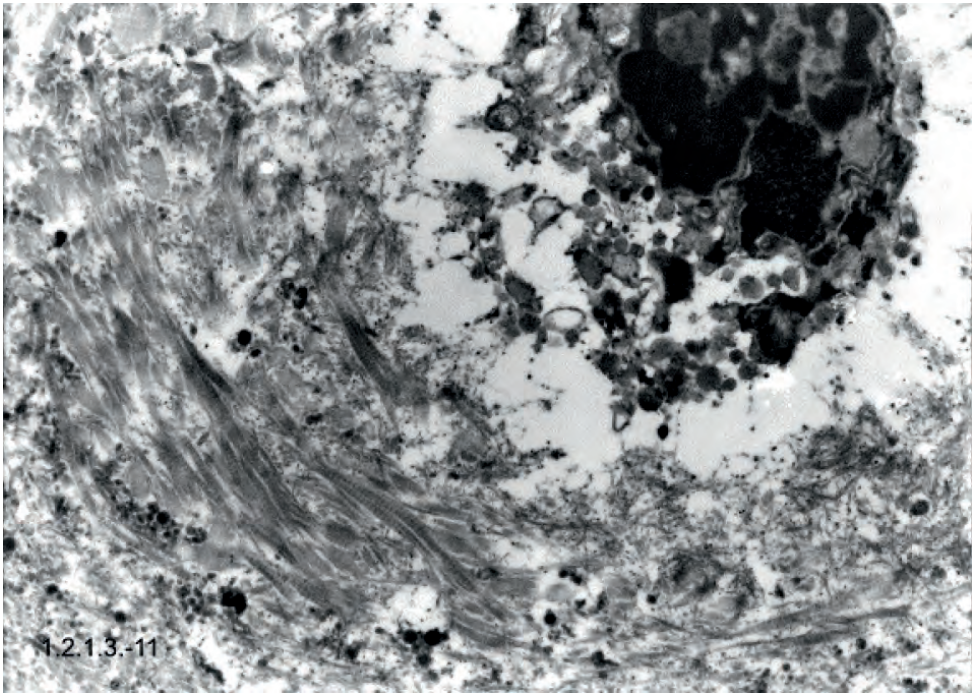

Fig. 2. Electronmicroscopic investigation of the iliac bone apophysis. Regresively changed chondrocyte of the resting zone. In the neighbourhood of it you see intercellular matrix and abnormal collagen fibres concentrically arranged.

On a case of DD variant the chief clinical and roentgen manifestation and long term result of the surgery of both hip joints is exposed. Original finding is molecular genetically proved so pathogenic variant of gene SLC26A2: c.532C>T p. (Arg178Ter) in exon 2 as most likely pathogenic variant c.1343>T p. (Ser448Leu) in exon 3. Our patient is a compound heterozygot of mentioned mutations in gene SLC16A2. Both established variants are greatly presumable molecular cause of autosomal recessive variant of DD and correlate with phenotype of the proband.

ABSTRACT OF PERSPECTIVE REVIEW ARTICLE

CHALLENGES OF BIOMOLECULAR PALEOPATHOLOGY

Smrcka Vaclav
Institute for History of Medicine and Foreign Languages, Prague, Czech Republic
Email: sedlcany1@seznam.cz

Keywords: Biomolecular paleopathology, trace element, stable isotope, PCR analysis

The aim of this lecture is to present the significance of innovative or innovated methods in biomolecular paleopathology, which examines skeletons of past populations for traits of diseases at the molecular level. It has even proved its importance in cases where there are no macroscopic skeleton changes. It uses methods based on trace element (ICP), stable isotope (MS) and DNA (PCR) analysis adopted from molecular biology.

Even though the foundations for these methods have been laid earlier, their application has undergone substantial development in the past few years. I would like to present the application of the above mentioned methods on several case studies which we have conducted.

In terms of the study of trace elements in bone tissue, together with Dr Jambor we were the first in the Czech Republic to work on diet reconstructions of prehistoric peoples using 33 trace elements, especially Zn, Sr and Pb. 1044 samples originating from 522 skeletons from 25 European locations ranging from the Neolithic era (cca 5 000 BC) till the Mediaeval times were analysed.

The study resulted in the detection of premature osteoporosis at the age range of 20-30 years, not only in women but also in men, in connection with developed agriculture due to excessive fibre intake from cereal bran.

At the same time, a map of lead contamination in the Roman Empire was created in cooperation with Sara Bisel and Tony Waldron. In cadaverous bone matter from the end of the 20th century lead was replaced by tin in Central Europe. (1)

Stable isotopes of C and N were used for further specification of the diet reconstructions of the first farmers in Vedrovice (N=17) and Těšetice (N=12) who came to South Moravia 5300 years BC.

Migration waves of the Neolithic era to Moravia were documented by using stable strontium isotopes in the case of Linear Pottery culture (N=25) with a migration rate of -28%, in the case of Stroked Pottery culture (N=9) -33% and Moravian Painted Pottery culture (N=11) -36%. Together with Douglas Prince and colleagues we reviewed the migration of the Eneolithic Bell Beaker Culture throughout Europe. In the case of women and children the migration rate reached up to 68%. (2).

We were commended by Douglas Price to participate in a Europe-wide study of population genetics of Bronze Age migrations. This collective work based on the principles of genomic analyses proved the expansion of Indo-European languages to Europe in this period, the spreading of lactose tolerance in adulthood, but also the expansion and evolution of plague (3).

Untreated paleopathological cases allowed us to apply paleopathology in clinical practice for differential diagnosis as well as in the development of new surgical procedures (4, 5).

In conclusion it can be said that the field paleopathology which was first taught by prof. Strouhal and prof. Vyhnánek in 1988 at the 1st Medical Faculty within the scope of the History of Medicine Course at Charles University in Prague, which was one of the few European universities to introduce the subject, holds further significant potential for the future in the development of a new field - biomolecular paleopathology.

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ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

THORACOLUMBAR LORDOTIC INTERVENTION (TLI) IN SPINAL DEFORMITIES. EFFECTIVE MECHANICAL GROWTH MODULATION BY MUSCULAR FORCES INDUCED BY BRACING

Piet J.M. van Loon[1]; Ruud HGP van Erve[1]; Andre J Grotenhuis[2], Eric BTM Thunnissen[3] /Deventer, Nijmegen & Amsterdam, Netherlands/

[1] Orthopedic surgeon, Care to Move, Centre for Orthopedics, Deventer, Netherlands

[2] Professor of neurosurgery, RadboudMC, University of Nijmegen, Netherlands

[3] Pathologist, epidemiologist VUMC, Free University, Amsterdam, Netherlands

Email: pvanloon@caretomove.nl

Keywords: neuro-osseous growth; spinal deformity; bracetreatment; thoracolumbar spine; scoliosis

Introduction

Spinal deformities during growth are caused by mismatch in neuro-osseous growth relations, also responsible for increased neuromusculair tension.[1] Nonsurgical etiology-based-treatment in spinal deformities should give correction with dynamic and mechanic factors incorporated that can reverse this mismatch. Pathologic tension must be regulated. Exercises and bracing are the main parts of non-surgical treatment. Knowledge on posture-deforming aspects of sitting and concomitant neuromuscular thightness (by neuro-osseous growthdiscongruency) is putin an innovative brace technique that counteracts these issues. The newly found relation between patho-anatomy and pathophysiology can lead to new interventions. Two studies were performed.

Method and material

91 growth deformitiesin otherwise healthy children were treated with TLI bracesproviding forced lordosis at TL-junction. Two groups were formed: Scoliosis group (one coronal curve > 25°) and kyphosis group (coronal curves< 25°). Radiographs (AP and Lateral) were made i) at start, ii) "in brace" and iii) after one year treatment. All Cobb angles in the coronal and sagittal plane were compared.

Results

'In brace' radiographs showed strong reduction of Cobb angles (sagittal n=5 all p<0.001, pelvic obliquity p<0.001), some less in thoracic and lumbar coronal curves. Oneyear treatment shows improvement in all Cobb angles. In scoliosis group coronal curves showed averaged "progression rate" of 12.4%, higher for thoracic right and lumbar sagittal curves than for thoracolumbar left (4.2%) and pelvic obliquity (4.3%). In sagittal curves "progression rate" averaged 1%.

Method and material

In a Spine published study (2008) we gave proof of the strong scoliosis correcting forces by applying forces in the sagittal plane to restore position and lordotic aspect of Th10-L2 thoracolumbar joint. In a subgroup with double scoliosis C-angles were compared in standing, supine and supine on a thoracolumbar fulcrum. Group A had radiographs in 3 positions: Standing and supine with and without fulcrum (n= 12), group B in 2 positions (n= 28): standing vs. supine with fulcrum.

Results

Group A (standing/supine) correction of Cobb angles was 15.4% at the thoracic level and 27.5% lumbar (*P* <0.001). Adding a lordotic fulcrum atTL junction showed **further** correction at the thoracic level of 15.7% and lumbar 18.1% (*P* <_0.001). In group A (standing vs fulcrum) total reduction of 31% and 45.6%. For group B this reduction in 1 step is 38% and 44.4%.Compliance proofed to be very good by the advantages of offering a optimal posture to the body instead of of forcing an asymmetric body in a reversed asymmetric TLSO brace.

Conclusion

TLI bracing ct by remodelling the deformed spine by reposition of the TL- joint in a dynamic process, regulating concomitant pathological tension showed effective and will prevent surgery. [2,3,4] Passive sitting postures should be avoided during growth as a basic prevention advise together with extension providing exercises.

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SHORT ABSTRACT OF PERSPECTIVE REVIEW ARTICLE

PRACTICAL USE OF SENSOMOTORIC INSOLES FORNEUROLOGIC PATIENT
PRAKTICKÉ VYUŽITÍ SENZOMOTORICKÉ VLOŽKY U NEUROLOGICKÉHO PACIENTA

Šnytr Jan
OttoBock I.l.c., Senec, Czech Republic
Email:

Keywords: sensomotoric, insole, neurologic patient, ICP, Stroke, Morbus Parkinson

Presentation describes the basic principle of sensomotoric insoles, their use in children and adult neurological patients treatment both in Czech Republic and Germany and combination with orthoses. Video and visual documentation shows the advantages and disadvantages of sensomotoric insoles, possible errors and problems. Finally the cooperation of a multidisciplinary team in the diagnosis of neurological patient is emphasized.

Klíčová slova: senzomotorika, vložka, neurologický pacient, DMO, cévní mozková příhoda, Morbus Parkinson

Prezentace popisuje základní princip senzomotorických vložek, jejich využití u dětských a dospělých neurologických pacientů v ČR i v Německu a kombinace s ortézou. Video i obrazová dokumentace ukazuje výhody a nevýhody řešení senzomotorickou vložkou i případné chyby a problémy. Závěrem je zdůrazněna spolupráce multidisciplinárního týmu v problematice diagnózy neurologického pacienta.

ABSTRACT OF PERSPECTIVE REVIEW ARTICLE

CHARCOT FOOT THE NEGLECTED COMPLICATION OF DIABETES
CHARCOTOVA NOHA – ČASTO PŘEHLÍŽENÁ KOMPLIKACE DIABETU

Bem Robert, Fejfarova Vladimira
Diabetes Centre, Institute for Clinical and Experimental Medicine, Prague, Czech Republic
E-mail: bemrob@yahoo.co.uk

Keywords: diabetic neuropathy, Charcot foot syndrome, treatment

Charcot foot syndrome (CF) is an uncommon complication of diabetes but is potentially devastating in its consequences. It is a destructive process affecting bones, joints and soft tissues of the foot in patients with diabetic neuropathy, characterized by inflammation in the earliest phase. There is no singular cause for the development of the Charcot foot, but there are factors that predispose to its development. Diabetes, diabetic neuropathy (including autonomic), trauma, and metabolic abnormalities of bone results in an acute localized inflammatory condition that may lead to varying degrees and patterns of bone destruction, subluxation, dislocation, and deformity. The deformity associated with this condition is midfoot collapse, described as a "rocker-bottom" foot. Morphological diagnosis and the evaluation of disease activity play an important role in the management of CF. The diagnosis of active CF is based on clinical signs - a warm, swollen foot and skin temperatures increase more than 2 °C compared to the contra lateral foot. The clinical suspicion of active CF has to be confirmed by plain x-ray and three-phase technetium bone scan/MRI. Early detection and adequate treatment appear to minimize progression of fractures and deformities. Standard treatment of active Charcot foot is based on off-loading. In non-acute phase, patients were instructed to use appropriate footwear to reduce plantar pressures and avoid foot ulceration.

Charcotova noha (CN) není častou komplikací diabetu, ale může mít velmi závažné následky. Jedná se o destruktivní proces postihující kosti, klouby a měkké tkáně nohy u pacientů s diabetickou neuropatií, který je charakterizován přítomnosti neinfekčního zánětu v časné fázi. Příčina vzniku Charcotovy nohy není jasně známa, ale je zde řada faktorů, které jsou s touto komplikaci spojeny. Diabetes, diabetická neuropatie (včetně autonomní), trauma a metabolické abnormality kostí vedou k lokálním zánětlivým změnám, které mohou vyústit až k destrukci kostí, subluxacím, dislokacím a ke vzniku deformit. Deformita ve středonoží spojená s propadem klenby pak bývá nazývána

jako "houpačka". Morfologická diagnóza a hodnocení aktivity onemocnění jsou zásadní pro vedení terapie. Diagnostika CN se opírá zejména o klinické známky onemocnění – otok, zarudnutí a zvýšenou lokální teplotu nohy, s rozdílem kožních teplot o více než 2 °C ve srovnání s druhou končetinou. Klinické podezření je pak nutno potvrdit rentgenologicky, dynamickou scintigrafií skeletu nebo magnetickou resonancí. Časná diagnóza a terapie minimalizuje rozvoj fraktur a deformit nohy. Standardní terapie CF je založena zejména na odlehčení postižené končetiny. V neaktivní fázi je pak třeba používat adekvátní obuv tak, abychom zabránili rozvoji ulcerací.

ABSTRACT OF PERSPECTIVE REVIEW ARTICLE

CONSERVATIVE TREATMENT OF CHARCOT FOOT
KONZERVATIVNÍ LÉČBA CHARCOTOVY OSTEARTHROPATIE

Fejfarova Vladimira, Bem Robert, Navratil Kamil
Diabetes Centre, Institute for Clinical and Experimental Medicine, Prague, Czech Republic
Email: vlfe@ikem.cz, kamil.navratil@ikem.cz

Keywords: diabetic neuropathy, Charcot foot, conservative treatment

We can meet with Charcot neurosteoarthropathy (CNO) not only in patients with diabetes and diabetic peripheral neuropathy but also in patients with peripheral neuropathy of other etiology. This disease affects predominantly feet, in rare cases less common areas – f.e. smaller joints (wrists), carrier joints (knee joints) and also spine. The process of bone destruction and soft tissue damage seen in active CNO can be reduced or stopped by complex therapy. It includes diabetes control and stabilization of bone osteoresorption process (the key role of osteoclasts) causing local osteopenia / osteoporosis that lead to microfractures and later to fractures and subluxation / luxation of joints. We can manage this progression through re-calcification therapy (calcium and vitamin D supplementation), in indicated cases through anti-resorption therapy with calcitonin or bisphosphonates. Medicament treatment reduces healing times and also a risk of CNO reactivation. A perspective drug for the CNO therapy is a denosumab - a monoclonal antibody affecting the function of osteoclasts.

Key role in the CNO therapy plays an off-loading modifying a stabilization of the affected area. Depending on the location of the process and skeleton stability, we select the type of stabilization / off-loading device. If the carrier skeleton is not damaged (CNO according to Sanders type I-III) and the foot is stable without significant deformities, it is possible to indicate the use of prefabricated AFO orthoses or special total contact casts. In the case of minor deformities with a risk of pressure ulcers, we choose special total contact casts or individual AFO orthosis. Devices that are able to completely off-load the whole foot are preferred (Sarmiento orthosis with a stirrup) in those CNO where carrier structures (CNO according to Sanders type IV or V) of lower limb are affected or the

lower limb is unstable. Surgical intervention (internal / external fixation) is also indicated in selected cases. CNO of a knee joint should be off-loaded by a wheel chair or at least by a KAFO orthosis.

In summary the type of off-loading is chosen according to the availability of prosthetic aids, the experience of the workplace with the individual types of off-loading devices and to other factors including, for example, patient weight.

In the case of inactive CNO, medicament treatment is not indicated. We prefer to focus on preventive care – to monitor regularly both legs (changes of afoot shape, swelling, home skin temperature monitoring), to perform regular podiatric controls (preferably in out-patient foot clinics) and to wear preventative shoes (diabetic preventive shoes, more often individual orthopedic footwear with individual insoles, exceptionally individual orthoses). Preventive footwear is able to prevent the ulcer formation in predilection sites, mostly in deformities locations.

In conclusion, the CNO maysignificantlymutilatepatientswiththis type ofdisease, but ifthe CNO ispromptlydiagnosed andproperlytreated, wecanpreventfurtherdestructiveprocessesthatmaylead to lower limb amputation.

Supported by VZ 00023001

S Charcotovou neuroosteoarthropatií (CNO) se můžeme v naší klinické praxi setkat nejen u pacientů s diabetem a distální senzorimotorickou neuropatií, ale i u nemocných s periferní neuropatií jiné etiologie. Kromě nejčastěji postižené lokality (noha od kotníku dolů) se může v raritních případech vyskytnout toto onemocnění i v méně obvyklých oblastech - CNO může postihnout menší klouby (př. zápěstí), větší nosné klouby (nejčastěji kolenní), ale i páteř.

Proces destrukce kostních struktur a měkkých tkání v rámci aktivní CNO můžeme zpomalit nebo zastavit pomocí komplexní léčby CNO. Kromě kontroly diabetu se zaměřujeme na stabilizaci kostního osteoresorbčního procesu (klíčové je ovlivnění funkce osteoklastů). Ten způsobuje lokální osteopenii/osteoporózu, při níž snáze dochází k mikrofrakturám, které později přechází do fraktur a subluxací/luxací kloubů. Medikamentózně můžeme tento proces ovlivnit pomocí rekalcifikační terapie v podobě kalcia a vitamínu D, v indikovaných případech pomocí antiresorbční terapie kalcitoninem nebo bisfosfonáty. Medikamentózní léčba vede ke zkrácení doby hojení a taktéž snižuje riziko reaktivace CNO. Perspektivním lékem pro terapii CNO by mohl být denosumab - monoklonální protilátka ovlivňující funkci osteoklastů.

Klíčové v terapii CNO je odlehčení. Dle lokalizace procesu a stability skeletu volíme typ stabilizační/odlehčovací pomůcky. Pokud není postižen nosný skelet (CNO dle Sandersetyp I-III) a noha je stabilní, bez významných deformit, je možno indikovat použití sériově vyráběných AFO ortéz nebo speciálních kontaktních fixací. V případě menších deformit, kde by hrozil otlak ze sériově vyráběné pomůcky, volíme speciální kontaktní fixace nebo individuální AFO ortézy. Pokud jsou postiženy

nosné struktury (CNO dle Sanderse typ IV nebo V) nebo je dolní končetina nestabilní, měly by být voleny pomůcky odlehčující kompletně celé chodidlo – nejlépe AFO ortézy s přenosem zátěže přes ligamentum patellae (ortéza typu Sarmiento se třmenem).Ve vybraných případech je indikována chirurgická intervence (vnitřní, lépe zevní fixace). Při postižení kolenního kloubu je nezbytností odlehčit dolní končetinu pomocí pojízdného vozíku či minimálně KAFO ortézy.

V určení typu ortézy hrají v současné době roli také dostupnost protetických pomůcek, zkušenost pracoviště s jednotlivými druhy odlehčení, ale i další faktory včetně např. hmotnosti pacienta.

V případě neaktivní CNO (chronická CNO) se medikamentózní léčba neuplatňuje, pouze preferujeme preventivní opatření ve smyslu pravidelného sledování dolních končetin (změny tvaru nohou, sledování výskytu otoků, s výhodou domácí monitorace kožních teplot), pravidelných kontrol specialistou (nejlépe v podiatrických ambulancích) a nošení preventivních pomůcek (preventivní obuvi, častěji individuální ortopedické obuvi s individuálními stélkami, výjimečně individuální ortézy). Preventivní obuv je schopna zamezit tvorbě defektů v predilekčních místech, kterými jsou právě u neaktivní CNO deformity.

SURGICAL MANAGEMENT OF CHARCOT FOOT

Navratil Kamil
Transplantation Surgery Department, Institute for Clinical and Experimental Medicine, Prague, Czech Republic
E-mail:

Keywords: Podiatry, Podiatric Surgery, Charcot foot, External Fixation, Foot Reconstruction

Introduction

Charcot neuro-osteoarthropathy (CN) is the most challenging surgical issue for podiatric surgeon. Many procedure types developed through times to solve three main problems: foot deformity, osteomyelitis and ulceration. Sophisticated foot reconstruction must provide deep eradication of all infected bone by trepanation with enclosure of cavities, ulceration excision with dermal reconstruction, osteosynthesis and fixation with surgical offloading (SO) preferably in one time. Experience confirms, that fixation and surgical offloading takes the biggest part of the task. There are several types of fixation, the most common one – external fixation (EF) will be discussed.

Aim

To find useful modifications of "Δ-frame" external fixator (EF) used for stabilization and surgical offloading after reconstructive surgery for diabetic foot (DF) and Charcot neuroosteoarthropathy (CN) suitable in case of partial foot ischemia or major patient discomfort.

Method

A tube-to-bar EF (ProSpon, Medin, CZ) was used in three variants: standard Δ-frame (Bonell pins with a central thread were passed through the metatarsal heads, then into the calcaneus and tibia and stabilized by double framed rods), hybrid frame (the same placement in tibia and calcaneus, but one or two semicircles with crossed tarso-metatarsal K-wire fixation), used in case of partial ischemia and unilateral frame (Schantz half-pins used instead of full-pins, with lateral rods) in cases of discomfort from metallic-part traumatization. Sixteen diabetic patients (11 men, 5 women), mean age 58 (40-76) years were included into the study and observed prospectively within years 2014-2016 (follow-up 2-36 months). Twelve patients were diagnosed by CN, other types of DF in 4 cases. Δ-frame was used in 6, hybrid EF in 7 and unilateral EF in 3 cases. Repeated hospitalisations, major complications – pin-tract infection (PTI), osteomyelitis recurrence (OM), non-union rate, hardware failures and EF adjustment episodes were tracked in all EF groups.

Results /Discussion

No major amputation was performed, we observed only one re-hospitalisation for severe osteomyelitis without need to disassemble EF. Overall PTI rate was 44% (80% around crural pins), in one case (hybrid group) a premature EF removement was needed. Two non-union cases underwent further fixation (1 from Δ-frame and 1 from hybrid group). No serious hardware failure occurred, 8 patients needed outpatient EF adjustments.

Conclusion

Despite the size of the group our results showed that there are no differences in complications between EF types, so all of them might be safely used. Hybrid EF lowers the risk of blood vessels traumatisation due to thinner diameter of the pins. The main advantage of unilateral EF is decreased traumatisation of the surrounding skin by sharp edges, but this technique does not tolerate higher loads because of high risk of pin breaking, therefore it should not be applied in patients with higher BMI.

ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

CAPABILITIES OF ULTRASOUND DIAGNOSTICS OF PARAVERTEBRAL MUSCULES IN HEALTHY CHILDREN. PRELIMINARY REPORT

Rybka Dina Olegovna, Dudin Mikhail Georgiyevich, Sharova L.E.
Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia
E-mail:dolspb@mail.ru

Abstract

Paravertebral muscles have a special role in maintaining both the vertical position of the person and the pathogenesis of spinal deformity. It makes their study in patients with scoliosis very relevant. In the literature available to us, research work in this direction is extremely meager.

Keywords: method of ultrasonic diagnostics, scoliosis, mm.transversospinalis.

Introduction

To create a database with the characteristics of paravertebral muscles, which is necessary to detect their pathological abnormalities in children with scoliosis, an ultrasound examination of paravertebral muscles in healthy children was done.

Material and methods

There were 20 children aged 9 to 11 years under our supervision, who had no clinical signs of deformity of the spinal column, which was confirmed by the instrumental method of computer-optical topography. All patients were evaluated in the prone position and standing, on the right and left side of the spinal column.

At the first stage, the ultrasound scan of the paravertebral muscles was performed using an Aloka SSD-1100 ultrasound scanner. For the study, a linear sensor with a frequency of 5-10 MHz was used, which was alternately installed transversely and longitudinally of the muscle fibers at the level of all segments of the lumbar spine at a distance of 1-2 cm from the line of spinous processes. In the ultrasound range of the transverse position of the sensor, a group of deep paravertebral muscles came into contact, namely: mm.transversospinales, mm.semispinales, mm.intertransversales, mm.rotatores, mm.multifidii, the cross-sectional area of these muscles (cm^2) was estimated. With the longitudinal position of the sensor, the width (mm) of the surface paravertebral muscles was estimated.

In the second stage of ultrasound, the function of the device "Histogram changes" was used, which used to estimate the average level of intensity in a given muscle region (MN).

Results

As a result of ultrasound of healthy children, the presence of symmetry of characteristics of the right and left groups of paravertebral muscles, both superficial and deep, was revealed. The symmetry of the indices is maintained both in the standing position and in the prone position. (**Tab. 1**).

Patients	Levelresearch L4	Deep paravertebral muscles				Superficial paravertebral muscles			
		left		right		left		right	
		The cross- section area cm^2	Echomension %	The cross- section area cm^2	Echomension %	Width cm	Echomension %	Width cm	Echomension %
9 years	Lying	2,552 ±3	17,9 ±4	2,482 ±0,4	16,8 ±4	8,11 ±2	23,3 ±4	9,05 ±2	19,73 ±4
n=10	Standing	2,679 ±3,5	17,3 ±3	2,617 ±0,4	19,4 ±4	9,39 ±1,4	17,3 ±6	7,81 ±1,4	19,45 ±4
10 years	Lying	2,432 ±3,5	16,2 ±3	2,391 ±0,4	16,6 ±4	9,123 ±1,4	20,1 ±6	9,912 ±1,4	19,16 ±4
n=5	Standing	2,541 ±3,5	16,7 ±3	2,981 ±0,4	17,4 ±4	9,11 ±1,4	18,1 ±6	8,31 ±1,4	18,98 ±4
11 years	Lying	2,543 ±3,5	17,1 ±3	2,634 ±0,4	18,1 ±4	8,97 ±1,4	18,4 ±6	7,89 ±1,4	19,11 ±4
n=5	Standing	2,154 ±3,5	17,8 ±3	2,989 ±0,4	17,1 ±4	9,76 ±1,4	17,9 ±6	8,99 ±1,4	18,45 ±4

Table 1.

Conclusion

1. Normally the ultrasound parameters of the paravertebral muscles are symmetrical, however, it is possible to note some trends in their changes when the position is changed.

2. There are no age features.

3. The obtained primary data allow to consider them as a reference point in the evaluation of paravertebral muscles in children with scoliosis.

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ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

PARAMETERS OF ELECTROMYOGRAM OF PARAVERTEBRAL MUSCLES OF HEALTHY CHILDREN FROM 6 TO 12 YEARS OLD

Nikitina A.A., Dudin Mikhail Georgiyevich
Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia
E-mail: alexandra.eremichewa@ya.ru

Abstract

At present, there is no doubt about the role of paravertebral muscles in pathogenesis and mecanogenesis of vertebral column deformation. The surface EMG is a standard technique for the research of the muscular activity of children.

For the correct interpretation of the unilateral pathological tone of the paravertebral muscles, first of all, parameters of the EMG research of the back muscles of healthy children are necessary. Currently there is not enough information in the world literature on this issue. And this is the reason of our interest in this subject.

Keywords: method of electromyografic diagnostics, paravertebral muscles, asymmetry of muscle activity.

Introduction

The purpose of our study was to determine the degree of acceptable asymmetry in the electrogenesis of paravertebral muscles of healthy children belonging to different age groups. And also to obtain numerical EMG-parameters characterizing the normal activity of the muscles beyond the pathological changes of the spine.

Material and methods

We examined 29 children aged 6 to 14 years old, who, according to clinical and instrumental (roentgenography of the spine, computer optical topography) examinations, showed no signs of deformity of the spine.

EMG examination was carried out in a *standing position at rest*, *lying position at rest* and lying down while raising arms and legs (*the position of the "swallow"*) with the Neuro-MVP-4 electromyograph. Cumulative EMG electrodes were located at a distance of 1 cm from the line of spinous processes of the vertebrae from the right and left sides of the spine. Two-channel registration of EMG of paravertebral muscles was carried out at 12 points longitudinally to the vertebral column from level C2 to S1 vertebrae. At each level, the electromyogram was recorded three times for 2 seconds to calculate the mathematical average of the data obtained.

Results

As a result of the EMG examination of healthy children, we obtained numeric EMG data of the activity of paravertebral muscles in normal at different positions of a child: at rest and in tension, which are presented in **Table 1**.

Position	Total EMG of paravertebral muscles											
	Group of children 6 years old (n=6)						Group of children 8 years old (n=8)					
	Amplitude (μV)		Δ	Frequency (Hz)		Δ	Amplitude (μV)		Δ	Frequency (Hz)		Δ
	D	S		D	S		D	S		D	S	
Standing	22	22	0	242	243	1	19	20	1	266	253	13
Lying	26	27	1	246	209	37	17	17	0	235	221	14
Swallow	105	114	9	538	507	31	53	60	7	446	453	7

Position												
	Group of children 10 years old (n=9)						Group of children 12 years old (n=6)					
	Amplitude (μV)		Δ	Frequency (Hz)		Δ	Amplitude (μV)		Δ	Frequency (Hz)		Δ
	D	S		D	S		D	S		D	S	
Standing	22	23	1	244	257	13	24	22	2	220	211	9
Lying	36	35	1	343	287	56	20	22	2	121	92	29
Swallow	126	137	11	545	486	59	119	127	8	593	584	9

Table 1

Discussion and conclusion

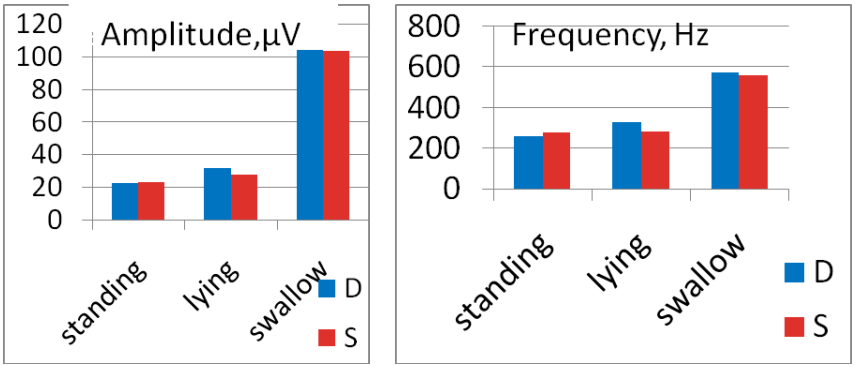
1. All the EMG parameters of the paravertebral muscles that we obtained showed a symmetry of the activity of the right and left sides of the spine.

The smallest dispersion of the data was observed in the standing position, no more than 5-9%, which we estimate as the most optimal position of the child for diagnosing the function of the back muscles with respect to their symmetry. The greatest dispersion of the data was observed when recording the bioelectrical activity of the muscles in the lying position at rest - up to 24%, which may indicate a high activity of the respiratory muscles in this position, since the dispersion was mainly expressed in the thoracic spine.

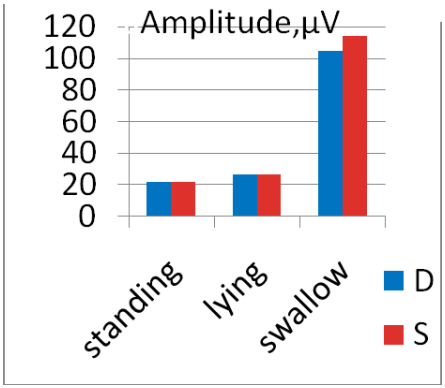
2. The defining of the numerical EMG parameters of the allowable asymmetry of paravertebral muscle activity is a necessary task for studying asymmetric muscle tension in scoliosis.

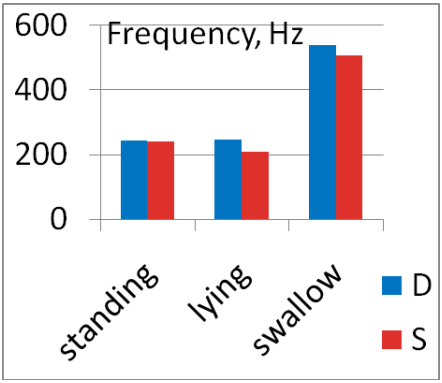
For better perception of the obtained data, there are diagrams N1-4.

1. Dependence of amplitude on frequency during registration of EMG of paravertebral muscles in the group of children 6 years old (n=6)

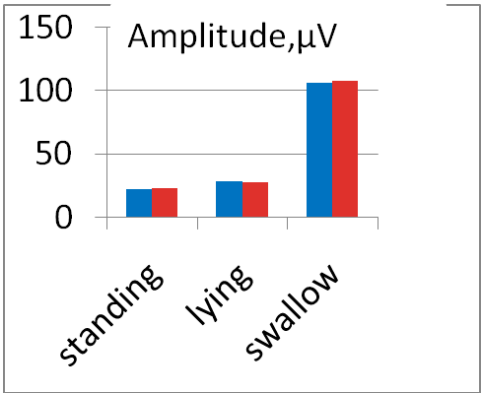


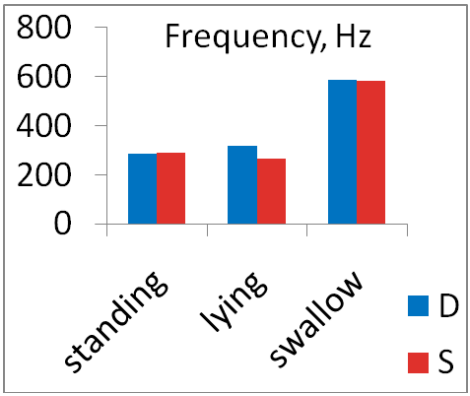
2. Dependence of amplitude on frequency during registration of EMG of paravertebral muscles in the group of children 8 years old (n=8)



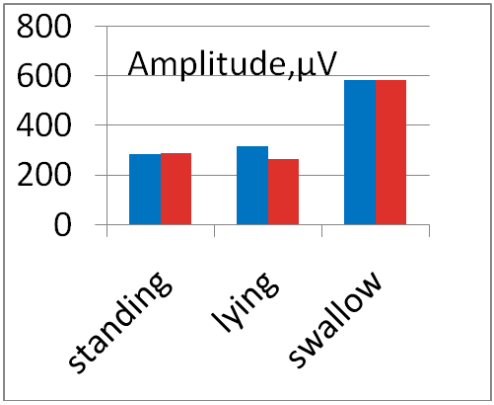


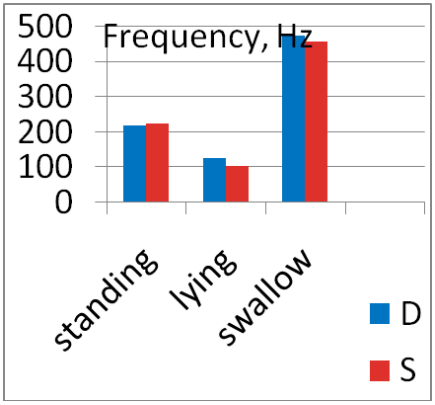
3. Dependence of amplitude on frequency during registration of EMG of paravertebral muscles in the group of children 10 years old (n=9)





4. Dependence of amplitude on frequency during registration of EMG of paravertebral muscles in the group of children 12 years old (n=6)





ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

VITAMIN D 3 AND VDR GENE ROLE IN AIS PATHOGENESIS WITHIN INFANT POPULATION. PRELIMINARY REPORT

Bazanova Marin, Dudin Mikhail Georgiyevich, Koloskova L.E.
Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia
Email: moy_son@mail.ru

Keywords: Vitamin D3, Vitamin D3 receptor, children population with AIS.

Introduction

The most indisputable fact in theory and practice of AIS is relationship of it's genesis and further development with infant growth process. The one of leading osteogenesis stimulators is Vitamin D3, its role in AIS pathogenesis is undeservingly less described in existing literature. However data regarding its role in various common skeleton and non-skeleton (cardio-vascular, oncology, allergic) diseases are available.

The aim of our presentation is the quantitative evaluation of Vitamin D3 level at blood serum and relationship between its concentration and genetic polymorphism of Vitamin D3 receptor within children population with AIS.

Material and method

the matter for current study is laboratory diagnostic results of 40 children from 9 to 13 years old with confirmed AIS diagnosis who has no obvious verified chronic pathology. 20 of them with corpus vertebrae compression fracture with no idiopathic scoliosis vertebral deformation and 20 of them with AIS (20-35^0 Cobb's degrees).

As study object, the stable non active 25-OH Vitamin D form has been chosen. Its stable concentration and long half-life period sufficiently precisely reflect active Vitamin D concentration in human body. It is confirmed that Vitamin D3 receptor is coded by gene VDR, which is located at short shoulder of 12th chromosome (12q12-q14) and it regulates mineral metabolism genes activity and parathyroid hormone secretion finally controlling calcium and phosphor homeostasis. But the most important VDR gene characteristic is genetic polymorphism in other words existence of different allelomorphic variants of such a gene within population. Previously study regarding existence of relationship between character of AIS progression within children population with VDR gene polymorphism under Taq1 marker (Dudin, Pinchuk 2017). However according to current data the most promising at VDR gene research associated with osteogenesis process pathology is CDR gene polymorphism under Bsml-b/B marker (when G63980A gene is changed in non coded regulatory gene area). If allel B is "mutant", receptor production level is elevated, which results in parathyroid hormone level decrease at blood serum and bone fracture risk increases independently from bone tissue density.

As technology of 25-OH vitamin D quantitative characteristic investigation ELISA method has been chosen. And for gene VDR polymorphism investigation PCR technology has been chosen. Apart of listed above objectives patient's osteotropic hormone type and calcium-phosphor metabolism condition had been evaluated by investigation of cortisone, calcitonin, somatotropic, parathyroid, adrenocorticotropic hormones levels and evaluation of general calcium, non organic phosphor and general alkaline phosphatase concentration at blood serum.

Results

Within infant group with AIS diagnosis high frequency of mutant allel B carriership – 65% has been recognized in compare with control group of infants with compression fracture diagnosis - 36%. Average 25-OH vitamin D value at group of infants with AIS was 55 ng/ml and at control group of infants with compression fracture diagnosis average 25-OH vitamin D value was 32 ng/ml. The optimal 25-OH vitamin D concentration at human blood serum is 30 – 50 ng/ml. At group of children with progressive AIS allel B prevails. This to a certain extent corresponds with results of previously mentioned VDR gene polymorphism under Taq1 study at infants with AIS.

Conclusion

In such a manner we can conclude that allel B as well as Taq1 predispose to progressive current of AIS.

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ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

SELECTIVE BIOFEEDBACK TRAINING OF THE M. TRANSVERSOSPINALIS METHOD FOR AIS

Dudin Mikhail Georgiyevich, Bober S., Maximova N., Gaiduk T., Bogdanova N.
Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia
Email: ogonek@zdrav.spb.ru
Translator: Podonina V.N. victoria.podonina@gmail.com

Key words. Biofeedback from EMG, m. transversospinalis, autochthonous muscles, 3D spine deformation, AIS

Summary

Selective training of m. transversospinalis under EMG guidance is a promising tool for combatting 3D spine deformation. For gaining EMG online, the wireless complex of biofeedback training "Kolibri", manufactured by "Neurotex", Russia (http://neurotech.ru/product.aspx?prd=31) is used. The aim of this training is the activation of muscles that can counter the deformity, simultaneously excluding muscles, that may form it, by means of finding the desirable primary position.

Introduction

The fact that idiopathic scoliosis is polyethiologic and mono-form is indisputable. The main realizer and, simultaneously, constraining factor of the deformity development is m. transversospinalis [1]. Considering this, staff of Children's Rehabilitation Centre of Orthopedics and Traumatology "Ogonyok" in St. Petersburg, Russia, design the technology of selective biofeedback training of indicated muscles under EMG guidance.

Materials and methods

At first, intercomparison of the EMG of paravertebral muscles protocols, TOSD (topographic optical spine diagnostics) (http://www.metos.org) and the radiography of each patient takes place, the scoliotic curves location and muscle work habit relative to the arches are defined.

We point out three muscle work variations:

1. Relatively symmetric frequency of EMG at the left and right sides to the spinal column.
2. The frequency of EMG is higher from the curve concavity side - active deformity curve formation.
3. The frequency of EMG is higher from the curve convexity side - countering (derotation) to the deformity.

Next, under EMG guidance, the primary position selection is performed, in which the muscles, countering deformity are active, whereas the ones forming it are excluded, or their activity stays at a minimal level.

After the selection of the correcting position, under the guidance of the specialist, who is observing the EMG data online, the passenger undergoes playful training exercises. The end of the training comes at the first sights of lassitude in the patient's EMG presentation.

Results

This method has been tested on a group of children n=7 (six girls, one boy), aged 9-13, average age being 10.5, four children had scoliosis to 10^0, three - had scoliosis 30-36^0 (Cobb's scale).

Taking the duration of the training being 3-5 minutes 10 times a day patients showed lowering of the difference of EMG presentation on both sides of the spinal column, this result was seen in patients with minimal scoliosis appearance to 10^0, as well as in patients with 30-36^0 deformation (Cobb's scale), also the positive dynamics of erectness correction was seen, which is proved by TOSD. The research is still being conducted.

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ABSTRACT OF PERSPECTIVE ORIGINAL PAPER

TREATMENT OF PAIN SYNDROME OF VERTEBROGENIC GENESIS IN CHILDREN AND ADOLESCENTS USING DIFFERENTIATED METHODS OF ACUPUNCTURE

Zaltsman P.L.
Children's Rehabilitation Center of Orthopaedics and Traumatology "Ogonyok", St. Petersburg, Russia
Saint Petersburg, Russia
Sankt-Peterburgskoye sh., 101, Strelna, Saint-Petersburg, 198515
Email: saltman@yandex.ru
Tel. +7 (921) 631 80 70

Keywords: Vertebrogenic pain syndrome, differentiated reflexotherapy technique

Abstract

A differentiated method of reflexotherapy for children and adolescents with pain syndrome of lumbosacral localization of vertebrogenic genesis has been developed. Its influence on the relief of the pain syndrome has been investigated.

Introduction

This research aims at analyzing the effects of differential reflex therapy technique on the pain syndrome of lumbosacral localization of vertebrogenic genesis of children and adolescents.

Patients and methods

Ninety-three patients aged 8 to 18 years were observed and treated, thereof 48 female and 45 male patients. The pain syndrome was differed by nature. Lumbodynia (acute or subacute) was diagnosed in 79 cases (88%), while fewer cases, i.e. 11 (12%) were related to the radicular syndrome.

No one patient revealed the pain of lumbago type at the examination moment, but anamnesis indicated its occurrence for 18 patients (20%).

For the patients undergoing the treatment, the following orthopedic pathologies were presented: degenerative-dystrophic changes in the lumbar spine, lumbosacral spine dysplasia, instability of the sacral spine, scoliosis of the spine.

According to MRI results, disk protrusions were detected in 62 (72%) cases, disc hernias were found in 26 (28%) cases.

All patients were divided into two groups. Patients of the main group were treated using the differentiated reflexotherapy technique apart from generally accepted treatment (remedial gymnastics, massage, physiotherapy, medication). Acupuncture was not provided for patients of the control

group. All patients were comparable by the clinical symptoms. For the statistic evaluation, the following detailed anamnestic data were used: date of lumbar spine degenerative-dystrophic changes detection, age when the pain syndrome sprang up for the first time, probable cause of it origination, character of neural disorders history from their origination to date, dynamics of their manifestations and remissions.

Clinical neurologic examinations of patients have been performed two times for both groups (before and after the treatment), to define the qualitative symptoms and their quantitative evaluation with gradation. Besides, electroneuromyographic examination (H – reflex, M – response), computer optical topography (COT) and thermal imaging diagnostics with analysis of thermograms of spine and lower extremities were conducted. To improve the objectivity of the pain evaluation, apart from the verbal characteristic of pain, the patients' algesia was measured using the Visual Analog Scale (VAS).

The developed technique was applied in accordance with age of patients, degree of clinical symptoms evidence, results of auricular diagnostics and concomitant pathology of functional systems confirmed by instrumental methods.

The following principles of acupuncture point's selection were applied:

1. the local points in lumbar region at the level of maximum pain, including those that located in close proximity to changed intervertebral disks, in other words, the points located in a projection of nidus or area of the clinical manifestation;
2. the points nearby the nidus (at the level of over- and underlying segments);
3. the segmental and remote points at lower extremities (with point selection options): along the tract extending above nidus; selected by "tract" dependence, that is, acupuncture points of the "tract" system which requires correction because its dysfunction is the core of the leading clinical syndrome; the acupuncture points of contralateral side.
4. the points of pain (out of the "tracts")

The interval of procedures depended on the severity of the pain syndrome. In the case of intensive pain, the procedures were conducted daily. As the pain subsided, intervals between procedures decreased. The numbers of procedures have been determining by the dynamics of neurologic disorders during the treatment. The course of the treatment consisted of no more than 12 procedures.

Results

Comparative analysis of the treatment results demonstrates that the most effective treatment proved to be exploiting the differentiated reflexotherapy technique which made the pain syndrome reduced in shorter terms. The pain syndrome in the main group disappeared at 3rd-27th day from the beginning of the treatment while in the control group it happened only at 23rd-55th day from the beginning of treatment.

ABSTRACT OF REVIEW PAPER

SEGMENT MODIFICATIONS OF CORRECTIVE SPINAL ORTHOSES

Pavel Cerny [1], Petr Kawczyk [2], Ivo Marik [1]

[1] Faculty of Health Care Studies, University of West Bohemia, Pilsen, Czech Republic

[2] Faculty of Physical Education and Sport, Charles University, Prague, Czech Republic

[3] Ambulant Centre for Defects of Locomotor Apparatus; Prague; Czech Republic

E-mail: pavel@ortotika.cz

Keywords: spinal orthosis, modification of Cheneau brace, technical sollution

Introduction and methods

We have been for a long time using in-depth forming of scoliotic braces, based on certain modifications of the original shapes of Cheneau braces. At the beginning of the 90s, we developed a dynamic spinal orthosis, allowing inclinations while preserving the correction effects. Vertical stability is ensured by a mechanism with a lumbar pad and nowadays commonly used hole for the iliac wing below the lumbar pad. Another modification of the basic shell was the possibility of step-by-step elevation of the left axilla in the course of growth. In order to elevate the left axilla line in this manner, we performed a specialcut in the shell that was subsequently heated to modify the shape. This temporary solution was later replaced with the installation of a special splint, where by the height of the shell could be modified merely by shifting the splint. After 2000, the preference has been steadily shifting towards night-wear spinal orthoses that are optimised for the application in lying position. For this reason, we have added a special splint which allows height setting according to the previous modification, there by creating a two-variant spinal orthosis, which combines the elements of day time-wear and night-wear braces. The final design of the splint has been achieved by adding a hinge that makes the adjustments easier. Classic modification of the spinal brace by gluing in the pads has its limitations. Therefor we use the principle of suspended pads. That is why we have decided to segment the plastic shell with geared belts and fasteners, which enables us to easily modify the impact of the lumbar pad.

Results

Through the long-term applications of dynamic orthosis with inclinations, we have discovered that this type of orthosis is suitable only for a flexible spine with thoracic curve (King 3 or 5) and that it is not optimal for lumbar curves (King 1 and 2) and "C" type curve (King 4). The two-variant brace is suitable in all cases where the night-time positioning is combined with any high type of a day time-wear brace, on condition that the upper part of the brace is losed or sufficiently rigid. The use of geared belts for the adjustment of the corrective pad is suitable primarily for lumbar curves, but under certain construction conditions can be applied for thoracic curves as well. The possibility of

that adjustment very much facilitates the process of the patient's adaptation to the new orthosis and his vertical compensation.

Discussion and conclusion

Practically each workplace uses its own brace modifications in order to provide its patients with the best treatment possible. These include not only the actual medical effects of the orthoses, but also the patient's acceptance of the orthosis. Segmented shell has been commonly used on a long-term basis in different types of braces. Some of the presented adjustments of the plastic shells enable quick modifications not only at the orthotic workshop, but also by the patients themselves, who can easily set their orthosis in the prescribed mode. In the case of the two-variant brace, this applies to the axillar height adjustment and in the case of suspended pads this applies to the choice (step by-step fastening) of the support belt impact. Although segmented structure of spinal orthoses is quite usual, this article describes certain additional possibilities of the technical solutions of brace issues in this field.

Note

This abstract and poster (P27.51) was presented in SOSORT Lyon 2017 in Book of Abstracts, p. 184-185

DR. DANESOVA, PHD.

The date of birth: 6th May 1945

Education

1968: graduated at Mathematical and Physical Faculty of the Charles University in Prague (focussed on the mathematical analyses);

1968–1971: Pedagogical Assistant at the Department of Mathematics in the Faculty of Civil Engineering of the Czech Technical University in Prague;

since 1971: Assistant Professor in the Faculty of Civil Engineering of the Czech Technical University;

1977: espoused the Doctorate of Natural Sciences (RNDr.) at the Mathematical and Physical Faculty of the Charles University in Prague;

1984: espoused the PhD dissertation thesis focused on functional analyses with specialization on differential and integral equations.

Scientific activities

Co-author of a row of final research reports (the faculty research, the research for Ministry of Education, the research for Ministry of Health etc.);

since 1990 co-investigator of 4 grants and 2 scientific intentions (with main themes of mathematical applications in biomechanics).

Publications

Author and co-author of many scientific papers, specialized articles and reports. The most important work is the General theory of bone remodelling. Processes of bone remodelling were exactly expressed in this works by means of original stoichiometric equations and linear differential equations. Exactly were defined the bifurgation points. Many variations of metabolic processes begin in cortical bone by reaching of bifurgation points. The general theory of bone remodelling was the first zooming to the exact view on the remodelling processes of bone tissue. Dr. Danesova, PhD. meaningfully cooperated at priority work about exact definitions of limited cycles of functional bone stability. Exact describing of processes of thickening and thinning of bone tissue and ways of regulation of these processes, their slowing down and acceleration became worldwide famous. Her clinical verification of formation of new hyaline cartilage at the local osteochondral defects and in the long-term cooperation at the work on specification of domains of nanostructure and domains of submicrostructure of cortical femoral bone in older patients were significantly beneficial.

Dr. Danesova, PhD. has been a member of The Society for Connective Tissues Czech Medical Association J. E. Purkyne (SCT CMA JEP) from the year 2004. She helps with organization of conferences by the Society for Connective Tissues CMA JEP every year. The Society for connective tissues CMA JEP appreciates her work in the field of theoretical biomechanics and decided to award Dr. Jana Danesova, PhD. by the Diploma of Honourable Membership of the Society for Connective Tissues.

Some relevant publications

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RNDr. JANA DANESOVA, PHD.

Paní RNDr. Jana Danešová, CSc. se narodila v roce 1945 v Sychrově u Havlíčkova Brodu. V roce 1968 promovala na Matematicko-fyzikální fakultě Karlovy univerzity se zaměřením na matematickou analýzu. V letech 1968–1971 působila jako asistentka na katedře matematiky Stavební fakulty ČVUT a poté, od roku 1971, jako odborná asistentka. V roce 1977 vykonala rigorózní zkoušku na Matematicko-fyzikální fakultě Karlovy univerzity v Praze a obhájila doktorát přírodních věd- RNDr. V roce 1984 obhájila kandidátskou disertační práci se zaměřením na funkcionální analýzu se specializací na diferenciální a integrální rovnice a získala titul CSc. Po celou dobu svého působení na

Českém vysokém učení technickém v Praze byla spoluautorkou řady dílčích a závěrečných výzkumných zpráv, a to nejenom fakultních, ale také resortních a ministerských výzkumných úkolů. Od roku 1990 byla spoluřešitelkou 4 grantů a dvou vědeckých záměrů, v nichž se věnovala aplikacím matematiky v biomechanice.

Její nejvýznamnější spoluautorské vědecké práce jsou:

Formulace obecné teorie remodelace kostní tkáně. V této práci byly exaktně formulovány remodelační procesy v kortikalis prostřednictvím originálních stechiometrických rovnic, následně pomocí nelineárních diferenciálních rovnic a získání bifurgačních bodů, jejichž dosažením dochází v kortikální kosti k mnoha variacím metabolických procesů. Tato obecná teorie remodelace byla prvním přiblížením k exaktnímu pohledu na remodelační procesy v kostní tkáni. Významně spolupracovala na prioritní práci o *exaktních definicích limitních cyklů funkční stability a zániku kostní tkáně v jejím objemovém elementu*. Celosvětovým přínosem byly *exaktní popisy procesů houstnutí a řídnutí kostní tkáně a způsoby regulace těchto procesů*, jejich zpomalování nebo zrychlování.

Významné jsou také její přínosy, týkající se *klinických verifikací vzniku nové (histologicky prokázané) hyalinní chrupavky u lokálních osteochondrálních defektů* a dlouholetá její spolupráce na *zpřesnění domén nanostruktur (nanofibril, nanoprutů, nanoskořepin) a domén submikrostruktur kortikální kosti femuru* u starších pacientů.

Paní doktorka je spoluautorkou a autorkou několika desítek vědeckých prací, odborných článků a zpráv.

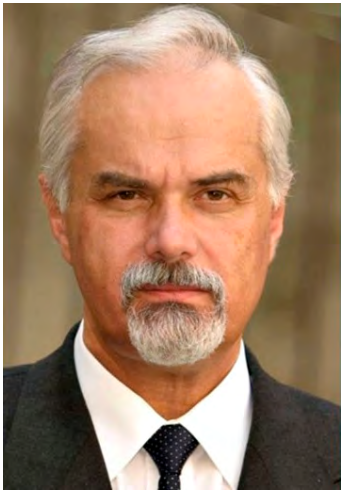
Nejvýznamnější její publikace jsou uvedeny in English výše.

Paní RNDr. Jana Danešová je členkou Společnosti pro pojivové tkáně ČLS JEP (SPT) od jejího znovu založení v roce 2004 až do současnosti.

Členové výboru SPT ČLS JEP si velmi váží vědecké práce paní Dr. Danešové v oboru experimentální biomechaniky. Výbor děkuje za aktivní pomoc při organizování každoročních symposií (Kubátovy dny a Praha-Lublin-Sydney-St. Petersburg symposium) a odbornou reprezentaci Společnosti pro pojivové tkáně ČLS JEP z.s. na těchto mezioborových akcích. Je nám ctí ocenit zásluhy paní doktorky udělením diplomu *Čestného členství ve Společnosti pro pojivové tkáně ČLS JEP.*

Jménem výboru Společnosti pro pojivové tkáně
České lékařské společnosti J. E. Purkyně

prof. MUDr. Ivo Mařík, CSc.
předseda SPT ČLS JEP z.s.



VLADIMÍR PALIČKA, MD, PHD, DR.H.C.

(Osteocentre and Institute of Clinical Biochemistry and Diagnostics Charles University, University Hospital Hradec Králové, Sokolská 581, 500 05 Hradec Králové, Czech Republic, palicka@lfhk.cuni.cz)

CURRICULUM VITAE

EDUCATION

1970 MD, Faculty of Medicine, Palacký University, Olomouc, CZ
1987 PhD, Charles University in Prague, CZ
1990 Associate Professor of Biochemistry
1999 Associate Professor of Internal Medicine
2001 Full Professor of Internal Medicine
2008 Doctor honoris causa, University of Pecs, Hungary

PROFESSIONAL CAREER

1984–2012 Head of the Institute for Clinical Biochemistry and Diagnostics, Charles University and University Hospital Hradec Králové
1995–2016 Head of the Osteocentre, University Hospital Hradec Králové
Since 2016 Director, University Hospital Hradec Králové

EDUCATIONAL CAREER

2003–2010 Charles University, School of Medicine in Hradec Králové, Dean
2010–2017 Charles University, School of Medicine in Hradec Králové, Vice-Dean
Since 2009 Association of Medical Schools in Europe, Executive Board Member

MEDICAL QUALIFICATIONS (Specializations)

Clinical Biochemistry
Internal Medicine
Endocrinology
Osteology

MEMBERSHIP IN MEDICAL SOCIETY

IFCC (International Federation of Clinical Chemistry and Laboratory Medicine), Former Vice-President
EFCC-FESCC (European Federation of Clinical Chemistry and Laboratory Medicine), Former President
Czech Medical Association J.E,.Purkyne, Vice-President
Czech Society of Clinical Biochemistry, Honorary President
Czech Society for Metabolic Bone Diseases, President
American Association of Clinical Chemistry, Member
Scientific Committee of Ministry of Health Czech Republic, Member
Scientific Committee of the Medical Faculty, Charles University, Hradec Králové, Member
Scientific Committee of the Medical Faculty, Palacky University, Olomouc, Member
Scientific Committee of the University of Pecs, Szentagothai Research Center, Hungary, Member

Czech Society of Clinical Biochemistry, Honorary Member
Czech Society for Rheumatology, Honorary Member
Hungarian Society for Clinical Pathology, Honorary Member
Polish Society for Laboratory Diagnostics, Honorary Member
Slovak Society for Clinical Biochemistry, Honorary Member
Slovak Society for Metabolic Bone Diseases, Honorary Member

FIELDS OF SCIENTIFIC ACTIVITY

Member of many scientific committees of the International Congresses in the field of Clinical Chemistry and Clinical Osteology

Editorial Boards and Advisory Boards

Annals of Clinical Biochemistry (UK)
Biochemia Medica (Croatia)
Biomedical Papers (CZ)
Clinical Chemistry and Laboratory Medicine (Germany)
International Journal of Orthopaedics (Hong Kong) – Honorary Editor-in-Chief
Journal of Pediatric Biochemistry (Turkey)
Journal of Turgut Ozal Medical Center (Turkey)
Revista del Laboratorio Clínico (Spain)

Revista Romana de Medicina de Laborator (Rumania)
Casopis lekaru ceskych (CZ)
Klinicka biochemie a metabolismus (CZ)
Osteologicky bulletin (CZ)
Postgradualni Medicina (CZ)

Up to now published more than 500 articles and presented about 1.400 lectures and posters. Oriented mostly to the metabolic diseases, clinical biochemistry of diabetes mellitus, clinical biochemistry in intensive care and in metabolic bone diseases.

Actual H-Index = 20, Citation index (WoS) without self-citation 1.427

Professor. George P. Lyritis, MD, PhD (right) and professor Jaroslav Blahoš, MD, DSc.

PROF. GEORGE P. LYRITIS, MD, PHD

CURRICULUM VITAE

EDUCATION

- Postgradual studies in several university institutions in Great Britain
- 1973 – Doctor of Medicine, University of Athens (essay: 'Contribution on the Effect of an Anabolic Steroid on Fracture Healing of Radial Fractures of Rabbits Treated with Cortisone')
- 1988 – Associate Profesor in orthopaedics (Thesis: „The Effect of Calcitonin on the Metaphyseal Osteogenesis of Growing Rats")
- Professor in orthopaedics and bone metabolic diseases at the Faculty of Medicine, University of Athens, Greece
- 2008 – Emeritus Professor in orthopaedics, University of Athéna

OCCUPATIONAL POSTS

- Head of the Postgraduate Course on Metabolic Bone Diseases (since 2007)
- Director of the Laboratory for the Research of Musculoskeletal System in the Faculty of Medicine, University of Athéna (KAT Hospital) (1991–2008)
- Founder and president of the Hellenic Society for the Study of Bone Metabolism (EEMMO)
- Founder and president of the Hellenic Osteoporosis Foundation (HELIOS)
- Founder (2000) and past president of the International Society of Musculoskeletal and Neuronal Interactions (ISMNI)
- Member of the Board of the International Osteoporosis Foundation (IOF)
- Member of the Committee of Scientific Advisors of IOF
- Co-editor of the Journal of Musculoskeletal and Neuronal Interactions (JMNI) since 2000
- Editor of Ostoun (Greek Journal of EEMMO) since 1990
- Member in several editorial boards of well known medical journals

PUBLICATIONS

- 25 books
- 400 articles (half in international journals)
- Over 4000 citations in literature

AWARDS IN CZECH REPUBLIC

- Honorary membership of the Czech Medical Society JEP (2010)
- Medal of the Czech Medical Society JEP (2010)
- Honorary membership of the Society for Connective Tissues, Czech Medical Association JEP (2010)

PROF. DR. MED. HANS ZWIPP

CURRICULUM VITAE

Born 1st March 1949 in Neustadt (near Coburg)

- 1969 – A-levels at Martin-Butzer High School in Dierdorf in Westerwald
- Since 1971 married, father of three children.
- 1969–1975 Study of veterinary medicine, theology and human medicine in Vienna, Berlin, Bochum and Essen
- 1975 – graduated med. at Medical Faculty in Essen

- 1975–1977 – medical assitent in St. Vincenz hospital/ Bethesda in Essen
- 1978–1993 – surgery practise at Teaching Hospital in Hannover (MHH) in Lower Saxony (headed by Prof. Dr. med. H. Tscherne)
- 1982 – specialist in surgery
- 1984 – specialist in orthopaedics and traumatology
- 1984 – superintendent doctor at Trauma and Surgery Clinic in Hannover (MHH)
- 1985 – expert in trauma surgery problematics
- 1993 – specialist in urgent medicine Leitender Oberarzt der (MHH) 7/1992–9/1993.
- 1992 – 1993 – the head of Trauma and Surgery Clinic in Hannover (MHH)
- Since 1994 – Department of Trauma and Reconstruction Surgery of University Hospital „Carl Gustav Carus" in Dresden
- 1994 – professor of surgery and recostruction surgery
- 1995 – specialist in hand surgery
- 2007 – the head of Surgery Clinic at University Hospital „Carl Gustav Carus" in Dresden

Research and publication activity

- Research projects (36)
- Publications (409)
- Lectures (394)
- Leadership of dissertations (30)

Honours and awards

- 1987 – Hermann – Kümmel´s Price from NWD - Surgeons
- 1988 – Hans – Liniger´s Price of German Association for Trauma Surgery (DGU)
- 1994 – founding member and the president of ESFAS (European Foot and Ankle Society), Dresden
- 1994–2006 – chairman of the board AOI for surgery of foot and ankle
- 1998/99 – president of Surgery Association in Saxony
- 1999–2001 – member of the bord of German Association for Trauma Surgery
- 2000–2004 – member of consulting board od German AO
- 2002–2008 – head of Working Association for Foot of DGU
- 2003 – Honorary membership of AO Alumni Association, Chile
- 2005–2007 – member of the board of DGU
- 2006 – Commemorative Medal of 3rd Medical Faculty, Charles University, Prague
- 2011 – Honorary membership of Czech Society for Trauma Surgery

Jiří Vosátka,MD (left) and professor Ivo Marik, MD, PhD

MUDR. JIŘÍ VOSÁTKA

Udělení čestného členství v Ortopedicko-protetické společnosti ČLS JEP z.s.

Pan MUDr. Jiří Vosátka je dlouholetým členem Ortopedicko-protetické společnosti ČLS JEP. Svou činnosti se velmi zasloužil o rozvoj této odborné společnosti, kterou rovněž jako její předseda řadu let vedl. Významnou měrou se podílel na přípravě vzdělávání v tomto oboru. Je autorem řady publikací v odborných časopisech a kapitol v monografiích.

Členové výboru OPS ČLS JEP si velmi váží přínosné práce pana MUDr. Jiřího Vosátky Výbor proto navrhuje ocenit zásluhy pana doktora udělením diplomu Čestného členství v Ortopedicko-protetické společnosti ČLS JEP.

CURRICULUM VITAE

Narozen 15.3.1950

Po absolvování Lékařské fakulty UK v Praze atestoval v oboru ortopedie, ve kterém získal atestaci I. a II. stupně. Více jak 30 let své odborné praxe se věnuje oboru Ortopedická protetika jak na poli klinické práce, tak také pedagogické a publikační.

Od roku 1997 řídí Oddělení Ortopedické protetiky v Praze na Roztylech.

Svůj život zasvětil pomoci těžce tělesně postiženým. Aktivně se zapojoval do organizace péče o hendikepované jako krajský i hlavní odborník ČR pro Ortopedickou protetiku. I v současné době je aktivním členem Ortopedicko-protetické společnosti ČLS JEP při diskusi nad návrhy zákonů a vyhlášek.

From right: Karel Čížek, MD, professor Ivo Marik, MD, PhD, assoc. professor Ivan Hadraba, PhD, Jiří Vosátka, MD and Aleš Mareček MD.

MUDR. KAREL ČÍŽEK

Udělení čestného členství v Ortopedicko-protetické společnosti ČLS JEP z.s.

Pan MUDr. Karel Čížek je dlouholetým členem Ortopedicko-protetické společnosti ČLS JEP. Svou činnosti se velmi zasloužil o rozvoj naší odborné společnosti, kterou rovněž jako její předseda řadu let řídil. Významnou měrou se podílel na přípravě vzdělávacího programu pro obor Ortopedická protetika. Je autorem řady publikací v odborných časopisech.

Členové výboru OPS ČLS JEP si velmi váží přínosné práce pana MUDr. Karla Čížka Výbor proto navrhuje ocenit zásluhy pana doktora udělením diplomu Čestného členství v Ortopedicko-protetické společnosti ČLS JEP.

CURRICULUM VITAE

Narozen 18. srpna 1948 v Českých Budějovicích.

1. LF Univerzity Karlovy v Praze, absolvoval v roce 1974. V průběhu let atestoval v oborech Ortopedie a Ortopedická protetika. Od roku 1994 působí v Centru ortopedické protetiky v Českých Budějovicích a jako primář na Protetickém oddělení v Nemocnici České Budějovice.

A LIST OF SPEAKERS AND CO-AUTHORS OF PAPERS

Arsenev Aleksey Valentinovich, MD, PhD *(St. Petersburg, Russia)*
Balik Karel, Eng, PhD *(Prague, Czech Republic)*
Baloshin Yuriy Aleksandrovich, Professor, Eng, DSc. *(St. Petersburg, Russia)*
Bayer Milan, Professor, MD, PhD *(Prague, Czech Republic)*
Bazanova Marina, MD *(St. Petersburg, Russia)*
Bem Robert, MD, PhD *(Czech Republic)*
Blahos Jaroslav, Professor, MD, DSc *(Prague, Czech Republic)*
Boryga Bartosz, MD *(Lublin, Poland)*
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Bogdanova N., MD *(St. Petersburg, Russia)*
Braun Martin, Dr, PhD *(Prague, Czech Republic)*
Buzga Marek, MSc, PhD *(Ostrava, Czech Republic)*
Cerny Pavel, Eng, PhD *(Prague, Czech Republic)*
Cikajlo Imre, MD *(Ljubljana, Slovenia)*
Culik Jan, Professor, Eng, DSc *(Prague, Czech Republic)*
Czaprowski Darius, MSc, PhD *(Olsztyn, Poland)*
Domagala Marian, MD *(Laszczów, Poland)*
Dniprovska Alyona *(Vinnitsa, Ukraine)*
Dudin Mikhail Georgiyevich, Professor, MD, DSc *(St. Petersburg, Russia)*
Dvorakova Hana, Eng, PhD *(Prague, Czech Republic)*
Fejfarova Vladimira, MD, PhD *(Prague, Czech Republic)*
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Gaiduk T., MD *(St. Petersburg, Russia)*
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Gresko Igor Bladimirovich *(Lviv Ukraine)*
Groleger-Srsen Katja *(Ljubljana, Slovenia)*
Grotenhuis J. Andre, Professor, MD, PhD, IFAANS *(Nijmegen, Netherlands)*
Hill Martin Eng, DSc *(Prague, Czech Republic)*
Honzik Tomas, Assoc. Professor, MD, PhD *(Prague, Czech Republic)*
Hrusková Lucie, MSc *(Prague, Czech Republic)*
Hudakova Olga, MD, PhD *(Prague, Czech Republic)*
Hyanek Josef, Professor, MD, DSc *(Prague, Czech Republic)*
Jakub Jozef, MD *(Ostrava, Czech Republic)*
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Jandacka Daniel, Assoc. Professor, MSc, PhD *(Ostrava, Czech Republic)*
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Kałakucki Jarosław, MD *(Lublin, Poland)*
Kandzierski Grzegorz, Professor, MD, PhD *(Lublin, Poland)*
Karsi Jacek, MD, PhD *(Lublin, Poland)*
Karska Katarzyna, MD *(Lublin, Poland)*

Karska Klaudia, MD *(Lublin, Poland)*
Karski Tomasz, Professor, MD, PhD *(Lublin, Poland)*
Kazemirsky Viktor Yevgenyevich, MD, PhD *(St. Petersburg, Russia)*
Kedzierski Zbigniew, MD *(Lublin, Poland)*
Klezl Zdenek jr., MD *(Prague, Czech Republic)*
Klezl Zdenek, Assoc. Professor, MD, PhD *(Prague, Czech Republic)*
Kobyzev Andrey Yevgenyevich, MD, PhD *(Kurgan, Russia)*
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Krawczyk Petr, MD *(Ostrava, Czech Republic)*
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Krizkova Martina *(Prague, Czech Republic)*
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Kuklik Miloslav, MD, PhD *(Prague, Czech Republic)*
Kurchenko Sergey Nikolayevich,MD *(St. Petersburg, Russia)*
Kwiatkowski Michal, MD *(Bialystok, Poland)*
Lambrou George I., Dr., PhD *(Athens, Greece)*
Lodewijk W.van Rhijn, Professor, MD, PhD *(Maastricht, Netherlands)*
Lyritis George, Professor, MD, PhD, *(Athens, Greece)*
Marik Ivo, Professor, MD, PhD *(Prague, Czech Republic)*
Marik Jan *(Prague, Czech Republic)*
Marikova Alena, MD *(Prague, Czech Republic)*
Martasek Pavel, Professor, MD, DSc *(Prague, Czech Republic)*
Marsik František, Professor, Eng, DSc, *(Prague, Czech Republic)*
Maximova N., *(St. Petersburg, Russia)*
Mazanek Jiri, Professor, MD, DSc *(Prague, Czech Republic)*
Mazura Ivan,, Assoc. Professor, Dr, PhD *(Prague, Czech Republic)*
Mazurova Stella, MD *(Prague, Czech Republic)*
Mihaljevič M., Dr, PhD *(Prague, Czech Republic)*
Muranova Jana, Bc *(Prague, Czech Republic)*
Musalek Martin, Dr, PhD *(Prague, Czech Republic)*
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Nikolaou Dimitros, BSc *(Athens, Greece)*
Okoński Marek, MD *(Lublin, Poland)*
Pallova Iveta, Dr, PhD *(Dobrichovice & Prague, Czech Republic)*

Palička Vladimír, Professor, MD, PhD, Dr.h.c. *(Hradec Kralové, Czech Republic)*
Parizkova Jana, Professor,MD, DSc. *(Prague, Czech Republic)*
PetrasovaSarka, MSc *(Prague, Czech Republic)*
Petrtyl Miroslav, Professor, Eng, DSc *(Prague, Czech Republic)*
Piet, J. M. van Loon, MD *(Deventer, Netherlands)*
Pokorný Jaroslav, Professor, MD, DSc *(Prague, Czech Republic)*
Povysil Ctibor, Professor MD, DSc *(Prague, Czech Republic)*
Popko Janusz, Professor, MD, PhD *(Bialystok, Poland)*
Repko Martin, Assoc. Professor, MD, PhD *(Brno, Czech Republic)*
Rizou Stavroula, MSc *(Athens, Greece)*
Rybka Dina Olegovna, MD *(St. Petersburg, Russia)*
Ryba Lukas, MSc *(Pilsen, Czech Republic)*
Rybova Stepanka, MSc *(Pilsen, Czech Republic)*
Ryglova Sarka, Eng, PhD *(Prague, Czech Republic)*
Ruud HGP van Erve, MD, PhD *(Deventer, Netherlands)*
Sedlak Petr, Assoc. Professor, Dr, PhD *(Prague, Czech Republic)*
Senolt Ladislav, Professor, MD, PhD *(Prague, Czech Republic)*
Serdjuchenko Sergei, Assoc. Professor, MD, PhD *(Minsk, Belarus)*
Sharova L. E. *(St. Petersburg, Russia)*
Slowinska Beata, MD *(Lublin, Poland)*
Smrcka Vaclav, Professor, MD, PhD *(Prague, Czech Republic)*
Snytr Jan, Bc *(Pilsen, Czech Republic)*
Sorokin A. A., MD *(St. Petersburg, Russia)*
Stolinsky Lukasz, MD *(Poznan, Poland)*
Staskova Sarka, MSc *(Pilsen, Czech Republic)*
Sorfova Monika, Assoc. Professor, Eng, PhD *(Prague, Czech Republic)*
Sucharda Zbynek, Eng *(Prague, Czech Republic)*
Suchy Tomas, Eng, PhD *(Prague, Czech Republic)*
Sukhov T. M., MD *(St. Petersburg, Russia)*
Sukhova M. A., MD *(St. Petersburg, Russia)*
Supova Monika, Eng, PhD *(Prague, Czech Republic)*
Svatos Filip, MD *(Prague, Czech Republic)*
Sykora Ales, Bc *(Ostrava, Czech Republic)*
Tesař Karel, Eng *(Prague, Czech Republic)*
Thunnissen Eric, MD, PhD *(Amsterdam, Netherlands)*
Tichy Miroslav, Assoc. Professor, MD, PhD *(Usti nad Labem, Czech Republic)*
Uchytil Jaroslav, MSc, PhD *(Ostrava, Czech Republic)*
Vasilevich Sergey Viktorovich, MD *(St. Petersburg, Russia)*
Volf Jaromír,Professor, Eng, DSc. (Prague, Czech Republic)
Vyskočil Václav, Assoc. Professor, MD, PhD *(Pilsen, Czech Republic)*
Wanka Pavel, MSc *(Pilsen, Czech Republic)*
Wilczyński Michal, MD *(Lublin, Poland)*
Yudin Pavel, MD *(St. Petersburg, Russia)*

Zaloudkova Margit, Eng, PhD *(Prague, Czech Republic)*
Zarkovic Dragana, MSc *(Ljubljana, Slovenia)*
Zaltsman P. L., MD *(St. Petersburg, Russia)*
Zemkova Daniela, Dr, PhD *(Prague, Czech Republic)*
Zwipp Hans, Professor, MD, DSc *(Dresden, Germany)*

Ortopedická protetika Praha s.r.o.

Výrobce individuálních ortopedicko-protetických pomůcek

zajišťuje:
- Lékařské vyšetření pacienta a předpis pomůcky
- Zhotovení všech individuálních ortopedických pomůcek (protézy HK a DK, končetinové a trupové ortézy, měkké bandáže, ortopedickou obuv, ortopedické vložky apod.

provozní doba:
po 7.30–17.00; **út–čt** 7.30–16.00; **pá** 7.30–15.00

Ortopedická Protetika Praha s.r.o., Kloknerova 1/1245, 148 00 Praha 4
tel.: 733 116 622, tel.: 272 932 241
e-mail: ortopedickaprotetika.praha@seznam.cz, **www.protetikapraha.cz**
Metro C stanice Chodov, dále autobus č. 135 stanice Dědinova – budova MEDICENTRUM

Partner všech zdravotních pojišťoven v ČR

HANDICAP CONSEIL CZ
PROTEOR

Lékařská péče v oborech ortopedie a ortopedická protetika

Zdravotní péče v ortotice a protetice

Konsilia pro zdravotnická zařízení

Výjezdová pracoviště v kraji

Zakázková činnost pro zdravotnická zařízení

Smluvní partner všech zdravotních pojišťoven

Skoliotická poradna pro léčbu skolióz páteře mladistvých

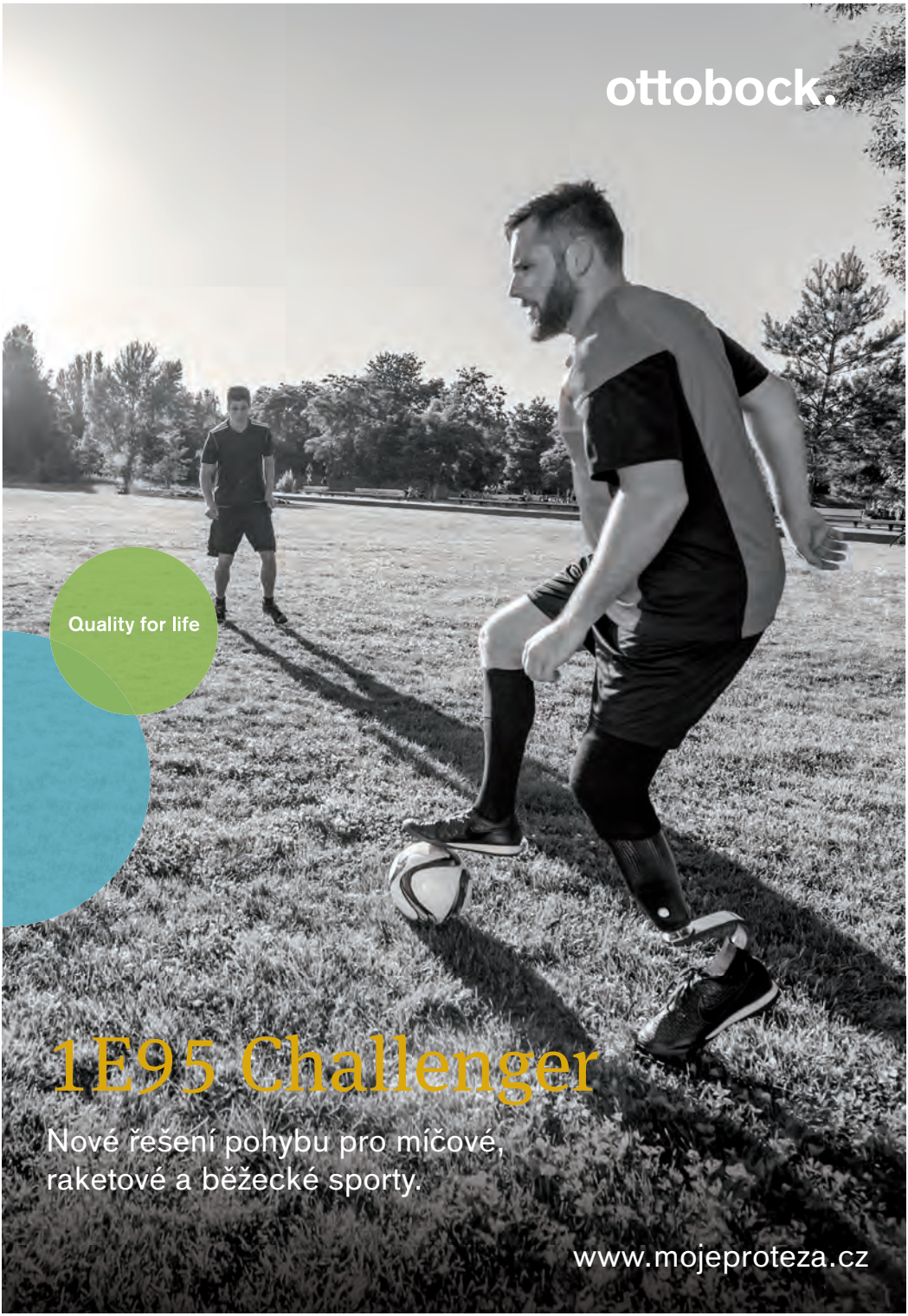
Aplikace a výroba individuálních ortopedických vložek pro sport

Výroba individuálních zdravotnických prostředků – protéz končetin, ortéz, ortopedických vložek

Podologická poradna pro pacienty s problémy nohou (syndrom diabetické nohy, bolesti nohou)

Specializované centrum pro aplikaci a výrobu myoelektrických protéz horních končetin

PROTEOR CZ s. r. o. – nestátní zdravotnické zařízení
Ostrava | U Parku 2/2720 | 702 00 Ostrava | tel.: 596 139 259, 596 139 297
Provozovna Olomouc | Mošnerová 7/1184 | 779 00 Olomouc | tel.: 585 414 776, 585 414 823
Provozní doba: Po, St, Čt: 7.30–15.00 | Út: 7.30–17.00 | Pá: 7.30–12.30
Loc: 49°51'0.177"N, 18°17'4.035"E | ostrava@proteorcz.cz | olomouc@proteorcz.cz | www.proteorcz.cz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