

2nd International Symposium



**CURRENT TRENDS IN RESEARCH ON
SCOLIOSIS AND OTHER SPINAL DEFORMITIES**

Book of Abstracts

ISSN 2787-320X (Online)

Vol. 1 (2021)



Dear colleagues and friends,

I am honoured to welcome you at our second International ScoSym Symposium, and at the same time express my gratitude for the support we have received from you since its very beginning. I am sure that the event will be a great opportunity for all of us not only to learn from the leading experts in the field of scoliosis treatment and research, but also to learn from each other, as well as to improve our knowledge, make new friends and spend quality time in Novi Sad. For those who are in Novi Sad for the first time, this will be a great opportunity to feel the hospitality and spirit of the city which proudly wears the title of the European Capital of Culture 2022.

Welcome to ScoSym Symposium and to Novi Sad, the place in which we write history - together!

Nikola Jevtić

A handwritten signature in blue ink, appearing to be 'N' followed by a flourish.

President of the ScoSym Symposium

CURRENT TRENDS IN RESEARCH ON SCOLIOSIS AND OTHER SPINAL DEFORMITIES

SCOSYM Symposium is an international event which brings together experts from around the world dealing with operative and non-operative treatment of scoliosis it aims to provide participants with new knowledge, exchange of experiences, through which they gain new insights, which leads to better application of newly acquired knowledge in practice.

In addition to lectures by renowned professors and experts, participants have the opportunity to participate in workshops, as well as to present their work and their latest research in these areas.

An integral part of the symposium is the exhibition part, where international companies and institutions present their latest products in the treatment of scoliosis: Asklepios Klinik, Sanomed, Klub Korektivne Gimnastike Stav, Acibadem, Spine Laser Center, DigiMe, Hedef Spine, Scolioscan/Telefield.

The program of the Symposium is accredited by the Medical Chamber of Serbia under the serial number A-1-1399 / 21. The symposium is accredited for doctors, physiotherapists and occupational therapists, and carries:

- 10 points for lecturers
- 6 points for passive participation
- 9 points for oral presentation
- 7 points for poster presentation

Local hosts



Local Organising Committee

President of the Symposium

Nikola Jevtić

President of the Organising Committee

Nemanja Dimić

Sponsorship & Exhibition Coordinator

Jelena Farkić

Special Advisors

Sanja Tomčić

Marina Maljurić

Violeta Jevtić

Marketing Manager

Izabela Đermanov

Marketing & Media Manager

Nikoleta Morotvanski

Publisher

Scoliosis Patients Society, Novi Sad, Serbia

Editorial Board

Editor in chief : Dr Nemanja Spasojević

Annual Publication

Scientific Committee



President of the scientific committee

Alexandros Kastrinis MSc, PhD. Cand., PT, Scoliosis Spine Laser Center, Greece
Health Assessment and Quality of Life Research Lab, Physiotherapy Department, University of Thessaly, Greece

Nachiappan Chockalingam PhD, CEng, CSci, PFHEA, FIPEM, Staffordshire University, Faculty of Health Sciences, United Kingdom

George Koumantakis PhD MSc, PT, Assistant Professor, Laboratory of Advanced Physiotherapy (LAdPhys), Physiotherapy Department, University of West Attica (UNIWA), Athens, Greece

Sanja Schreiber Ph.D, MSc., Schroth instructor, Adjunct Professor, Faculty of Rehabilitation, Medicine University of Alberta, Canada

Josette Bettany-Saltikov, PhD MSc Dip physiotherapy PGCE, Senior Lecturer, Teesside University, UK

Lukasz Stolinski, PT, MSc, PhD, Spine Disorders Centre, Skierniewice, Poland
Spine Disorders and Pediatric Orthopedic Clinic, Department of Pediatric Orthopedics and Traumatology, University of Medical Sciences, Poznan, Poland

Maria Tsekoura PT MSc PhD, Physiotherapy Department, School of Health Rehabilitation Sciences, University of Patras, Greece

Dariusz Czaprowski, Associate Professor, PhD, PT, Head of the Center of Body Posture, Department of Health Sciences, University College, Olsztyn, Poland

International Organising Committee

Evangelos Theodosopoulos

Physiotherapy & rehab

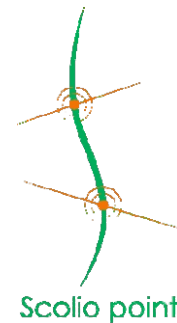
37 amazonvn str & 59-61 iasonidou str.
16777 Elliniko-Athens-Greece



Petra Šimac

Scolio Point

Velebitska 38 (Head office: Žrnovnička 16)
Split, Croatia
<https://scolioipoint.com/>



Vedrana Grbavac

Sveučilišta klinička bolnica Mostar

Ulica Kralja Tvrtka bb
88000 Mostar, Bosnia and Herzegovina
<https://www.skbm.ba/>



Nanyeong Ji

THINK BODY

2, Sapyeong-daero 52-gil, Seocho-gu
Seoul, South Korea



Georgiana Cojocaru

Spinal Care

Mihai Eminescu, nr. 1, bis
Bacau, Romania



Jasminka Dedović
Korektiva.med j.d.o.o.
I.B.Mažuranić 22
Zagreb, Croatia



Marko Baricanin
Klub korektivne gimnastike "Stav"
Sremska br. 2
Bijeljina, Bosnia and Herzegovina



Elżbieta Piątek
Centrum Skolioz "Promyk Słońca"
Swobodna 8A
50-088 Wrocław, Poland



Deniz Aktan
Alpha Med
Uzuncayir cad. Kont Is Merkezi No:2G,
Hasanpasa, Kadikoy, Istanbul, Turkey



Peter Petrov
Scolio Centar
14 Dondukov Blvd
Sofia, Bulgaria



Welcome to Novi Sad



Novi Sad is situated alongside the main highway E-75, and the highway E-70 is about 70 kilometres (43miles) away in the south, towards Belgrade. The nearest airport to Novi Sad is Nikola Tesla Airport in Belgrade, which is only an hour's drive away (70km). Nikola Tesla Airport is connected to many well-known world destinations and has a large number of direct flights.

Novi Sad attracts visitors with its safe and cozy positioning across the Petrovaradin fortress – the Gibraltar on the Danube, with its various languages that are spoken by its inhabitants, and with leisurely rhythm that is in contrast to the usual fast-paced and chaotic urban life. In the vicinity of the city nucleus loaded with Baroque, Neo-Renaissance, Classical and Bauhaus buildings, one can find picnic sites, preserved ecosystems and a complex of Orthodox monasteries scattered across the Fruška Gora National Park. The farmhouses, vineyards and wine routes at the outskirts of Novi Sad provide visitors with the opportunity to experience the richness of gastronomy and rural customs

The central city square – Trg Slobode (Liberty Square) is the starting point of many Novi Sad tourist routes. The City Hall and Roman Catholic Church of the Name of Mary are some of the buildings dominating this square. Zmaj Jovina and Dunavska Street intersected with passages accommodating a multitude of shops, restaurants, craft shops, museums and galleries make the parts of always lively pedestrian zone of the central city core. Pašićeva Street with Zlatne Grede, Grčkoškolska, and Miletićeva Street and Marija Trandafil's Square makes another important zone of the old core of Novi Sad. This is where you can see the Serbian Orthodox Congregational Church of Saint George, Platoneum, the building of the former Serbian Orthodox Grammar School, Serbian Orthodox Church of Relocation of the Relics of St. Nicholas – Saint Nicholas' Church, Matica Srpska ... Jevrejska Street, with a reputable Novi Sad Synagogue also belongs to the old core of Novi Sad in historical and architectural sense.

Petrovaradin Fortress belongs to the most significant, preserved European fortifications. In addition to being the symbol of the city it is also the witness to multiconfessional tradition that relies strongly on European culture and most attractive tourist zone of Novi Sad. It is currently the area with around one hundred of art studios, restaurants, cafes, museums, galleries... Petrovaradin Fortress is the venue of the EXIT Festival, one of the most significant music festivals in Europe. A baroque Suburbium, a part of Petrovaradin is located in the foothills of the Upper Fortress and Roman Catholic Church of Saint George can be singled out there due to its significance.

Index

Introduction	3
Local Hosts	4
Local Organising Committee	5
International Organising Committee	6
Welcome to Novi Sad	8
Keynote Presentations	10
Workshops	45
Oral Presentations	55
Poster Presentations	65



Keynote presentations

René Castelein
Dutch Scoliosis Center, The Netherlands



Dr René Castelein is professor of orthopedic surgery and chairman of the department of orthopedic surgery at the University Medical Center Utrecht, The Netherlands.

He trained as a general orthopedic surgeon in the Netherlands but was also formed by a fellowship at the the Alfred I du Pont Hospital for Children (Head at that time: Dr. Dean MacEwen), in Wilmington, Delaware. He started his professional life in general practice, but since joining the academic practice in Utrecht, has mostly focused on spinal deformity, both clinically and scientifically, especially in the field of etio-pathogenesis of idiopathic scoliosis.

He has published over 150 scientific peer reviewed papers, a number of book chapters, has supervised around 30 PhD Theses and presented Key Note Lectures, mostly on scoliosis, at international society meetings. He has been a visiting professor at a number of prestigious international universities, has been the president of the Nordic Spinal Deformities Society (NSDS), of the International Research Society of Spinal Deformities (IRSSD), holds committee positions in the Scoliosis Research Society, is a board member of the International Group for Advancement in Spinal Science (IGASS) and was the vice president and scientific secretary of the Dutch Orthopaedic Society.

He is a member of, and has received research support from, a number of international scientific societies like SRS, Eurospine, AO-Spine, and the Fondation Yves Cotrel.

Scoliosis in 3D

Idiopathic scoliosis is a classical orthopaedic enigma that has been the subject of many years of dedicated research. No single cause for this intriguing disorder has yet been identified, but the important role of the unique biomechanical loading of the human spine, and the role of the sagittal and transverse plane in its aetiology and pathogenesis, has become much more clear. Furthermore, in recent years, much knowledge was gathered on the important contributions of genetics, metabolics, the possible role of the central nervous system and the maturation patterns of the spine including the inter vertebral discs. Treatment has been revolutionized because the role of brace treatment was established beyond doubt, different brace concepts were developed and surgical techniques have become much better than ever before, with more predictable outcome with better and more sustained correction and with more rapid recovery. Nevertheless, problems still remain. First of all, scoliosis can be considered mainly a condition of the soft tissues, predominantly the intervertebral discs, and not so much of the bone. So it seems logical that conservative treatment, if started at an early stage, and done in the right way, should be able to really improve the deformity and possibly even prevent an operation. It has been known for a long time that infantile scoliosis can, in many cases, be fully cured with conservative means such as serial casting, but for later forms of scoliosis this has not been possible so far. In order to achieve that idealistic goal, profound knowledge of the three-dimensional (3D) character of the disorder is of great importance, as well as an understanding of the sequence in which the deformity develops.

Already long before the discovery of radiography, the three-dimensional nature of scoliosis was well understood by anatomists and orthopaedic surgeons of that time. They based their knowledge on observations on the human body in 3D, and on anatomical specimen, not on X Rays that are merely 'shadows of reality'. It may be said that X-Rays actually disturbed the true understanding of the disorder, during a large part of the 20th century scoliosis was considered a problem that occurred mainly in the coronal plane. Naturally, much effort in its treatment was directed at that coronal plane, disregarding the so important sagittal and transverse planes.

In this lecture, the true three-dimensional morphology of idiopathic scoliosis will be described based on a large number of studies. Correlations will be made with other types of scoliosis to describe the rather uniform way in which the spine decompensates into scoliosis. The important consequences for treatment, mainly conservative, will be presented.

Theodoros B. Grivas

Department of Traumatology and Orthopaedics,
"Tzaneio" General Hospital of Piraeus, Piraeus, Greece
tgri69@otenet.gr; grivastb@gmail.com



Dr Theodoros B. GRIVAS, MD, PhD Orthopaedic and Spinal surgeon, graduated the Medical School at "Aristotle" University of Thessaloniki, Central Macedonia, Greece. He completed his training in General Surgery, in Paediatric and Adult Orthopaedics and Traumatology in Greece and received the MD Diploma. He also received a PhD degree. He worked at the "University Hospital", Queen's Medical Centre, at Nottingham, "Harlow Wood" Orthopaedic Hospital, at Mansfield, UK, under Mr. JK Webb and Professor RG Burwell, at "Evangelismos" and "Thriasio" Hospital at Athens Greece. He is a member of the Hellenic Association of Orthopaedic Surgery and Traumatology and of numerous other scientific societies. He is a member and Traveling Fellow of both AAOS, AOA and SRS. He served as an IRSSD, SOSORT (one of this Society's founders as well) and Hellenic (Greek) Spine Society president. He completed several research projects, studied and implemented the School Screening program and established a National Training Center for school-screening examiners (www.schoolscreening.gr), published numerous peer-review articles and chapters in books and was invited to lecture on various general orthopaedic and spinal topics. He wrote or was the editor of 9 books, and numerous (630) scientific (128 Medline indexed, see <http://www.ncbi.nlm.nih.gov/pubmed/?term=grivas+t>) publications and presentations. He was scientific responsible/principal investigator or collaborator of 20 research projects, financed by Greek national or European sources (see also at https://www.researchgate.net/profile/Theodoros_Grivas/contributions).

He served as the Chief Editor of BMC open access "Scoliosis and Spinal Deformities" former "Scoliosis" journal and is member of editorial board or reader for several peer-review journals. He served, during 2019-2020, as a member of the National Examination Committee for the specialty of Orthopaedics and Traumatology

He is a member of the Crisis and Selection Council of Hellenic National Health System, the competent authority for the appointment of Orthopaedic Surgeons in State Hospital Positions, in the 2nd Health District of Piraeus and the Aegean.

His department currently was invited to provide the "Trialect platform" Fellowship – Traineeship in Orthopaedics and Traumatology.

Currently he is the Director of the Orthopaedic and Traumatology Department at "Tzaneio" General Hospital of Piraeus, Greece.

A School-Screening program in Greece: our twenty-five years “journey”: what we have learned, succeeded and published

The aim of school scoliosis screening, (SSS), is to identify all, or most of the individuals with unrecognized idiopathic scoliosis (IS) at an early stage, when a less invasive treatment is more effective. We presented the history our SSS program, the policy, the organization, the examination protocol, the students examined, the referees for the scoliosis outpatient clinic, our Dynamic Derotation Brace (DDB) and the direct cost of our SSS program. Analysis of program’s collected data yielded the somatometric parameters, the body mass (BMI) index and the trunk asymmetry (TA) in normal juveniles and adolescents and the IS epidemiology in our region. Findings showed that a relatively lower body mass index is associated with an excess of severe truncal asymmetry in healthy adolescents. This raises the question whether white adipose tissue, leptin, hypothalamus and sympathetic nervous system influence truncal growth asymmetry

Beyond the original aim of the SSS, this program contributed to the knowledge of IS scoliogeny. This program is actually probably the only “human evidence- based” “clinical research” tool of IS scoliogeny based on the study of humans not animals & established on the concept that the “morphology” expresses-reflects & deciphers-decodes the physiology & pathology.

Study of our referrals’ data and reviewing of pertinent publications provided some clues for the role of biological factors, such as the menarche in scoliotics and non-scoliotics, why there is a great variety of prevalence of IS, which may be due to environmental factors such as the light, the geographical latitude and the role of melatonin in IS prevalence and scoliogeny. The association between AIS prevalence and age at menarche in different geographic latitudes, the IS prevalence in blind females, and the relation of menarche and laterality of IS curves were also assessed. We appraised the effect of growth on the correlation between the spinal and rib cage deformity and the role of the lateralization of the brain in terms of handedness on truncal asymmetry. We proposed a novel radiological sign, the double rib contour sign (DRCS) and the rib index (RI), for the assessment of the rib cage deformity in IS. The RI services the documentation of the rib-cage deformity on the transverse plane before any treatment, the assessment of PSSE and of brace treatment efficacy and pre- and post-operative assessment of the rib-cage deformity correction. We proposed a facilitating rather than aetiological role of the sagittal spinal profile in mild IS. We discovered that in initiating IS curves the commencement of the Cobb angle happens in the apical and periapical intervertebral discs, yet at this stage there is no vertebral body deformity. The rib cage deformity study in mild late onset IS using the segmental RVAs method and study of idiopathic and normal lateral lumbar curves and muscle effects interpreted by 12th rib length asymmetry with pathomechanic implications for lumbar IS was presented. Associations were proposed for the influence of epigenetic factors dictating the epidemiology and scoliogeny related to the role of parental age at birth. It was found that the industrial environmental

factors probably do not significantly influence the prevalence of AIS. We found an absence of relationship between IS and cavus foot. Studying the truncal changes in children and adolescents with mild limb length inequality, using the surface topography method and the scoliometer, it was showed that back trunk asymmetry changes in the forward flexion and standing erect positions. The quantitative image processing in IS, using Infrared thermography were also presented. The HRQoL of our IS treated children led to the creation of our Brace Questionnaire (BrQ), a tool which has been translated, validated and used in numerous foreign languages and countries.

We suggested methods for a more efficient SSS program, and were invited to lecture on this issue and disseminate this experience in various countries.

This practice gave us the opportunity to formulate a hypothesis on IS deformity progression, suggesting a comprehensive patho-biomechanical model, based on the deforming "three joint complex", namely the "Diurnal variation "accordion-like phenomenon" of wedged intervertebral discs: a progression factor in IS".

The consequences of involvement and implementation of our SSS and IS non-op treatment were numerous. These included the participation of the author as founder and president of SOSORT, his 10yrs service as EiC in the open access journal "Scoliosis and Spinal Disorders", his authoring or co-authoring numerous consensus publications of SOSORT and SRS, his servicing as an international external examiner in various pertinent to the issue theses, as well as the establishment of the Hellenic State legislated center for training in SSS the Greek health care providers.

To the question "To screen or not to screen?" our answer is YES, since "Preventing is better than treating" "το προλαμβάνειν κάλλιον του θεραπεύειν εστί" Hippocrates of Kos, (460 - 377 b.c.)

Fabio Zaina

ISICO (Italian Scientific Spine Institute), Milan, Italy

fabio.zaina@isico.it



Since 2006 Medical Doctor in ISICO (Italian Scientific Spine Institute) (www.isico.it) in Milan, working in the field of spinal deformities and low back pain treatment. Since 2006 Member of the Scientific Secretary Board of the Italian Study Group on Scoliosis and spinal diseases (GSS) (www.gss.it). Since 2009 Member of the ISSLS (International Society on the Study of the Lumbar Spine), currently Chair of the Membership Committee. Formerly Senior teaching assistant and currently Site Director at the "Principle and Practice of Clinical Research" organized by the Harvard Public Health School. Chair of the "Spinal Deformity Module" of the EDISC course by Eurospine. President of SOSORT (Society on Scoliosis Orthopaedic and Rehabilitation Treatment) in 2016. Author and co-author of more than 130 scientific papers about spinal rehabilitation, back pain and scoliosis.

New insights about Scoliosis during adulthood and its conservative approach

It has been noticed that scoliosis affects up to 35% of the population over 60, and it's frequently associated with a reduced quality of life. The most important factors predicting the clinical impact of scoliosis during adulthood are the severity of the curve on the frontal plane and the sagittal profile of the spine. The Cobb angle is meant to measure the curve severity in the frontal plane and can predict the risk of progression of the deformity, which is negligible for curves below 30° Cobb, and very high for curves over 50° Cobb. The severity of the curve in the frontal plane is also correlated with respiratory restrictive syndrome when the Cobb angle exceeds 70° in thoracic curves. The sagittal balance and its impairment are associated with back pain and disability; thus, its evaluation has become more relevant for both the conservative and the surgical approach. Lumbar scoliosis is particularly relevant for its significant correlation with back pain. There are two main common aetiologies for this pattern, degenerative scoliosis and idiopathic. Degenerative curves, also called "de novo" scoliosis, derive from pathological changes at the level of the facet joints and discs in the lumbar spine. Usually, they are not very large but frequently very painful and rapidly progressive. The other type is an idiopathic scoliosis appeared during growth that start its progression in adulthood, usually depending on the size of the curve. There is a further type of adult scoliosis called metabolic, which is less frequent. The most common treatment for scoliosis patients with chronic low back pain, according to current practice, is the surgical one. This has the aim to prevent progression and improve pain and quality of life. Unfortunately, surgery in such patients is associated with a relevant number of complications, so that it cannot be considered appropriate for every patient, especially those with relevant comorbidities. Moreover, some patients don't want to be operated. These issues should give more relevant to the conservative treatment, but unfortunately so far there is scant literature about. Recently, some papers reported some promising results in effectively reducing pain, increasing the quality of life, and preventing or sometimes even stopping the progression with bracing and/or exercises. This is a very common approach about which we evidence is gradually rising, and data are very promising.

Tom Shannon

**Centre for Biomechanics and Rehabilitation Technologies,
Staffordshire University, Stoke-on-Trent, United Kingdom**
tom@oxfordmetrics.com



Dr Tom Shannon is a chartered professional engineer with over 35 years of international, commercial experience as a practising biomedical engineer, medical physicist and computer scientist with a focus on clinical and machine vision applications applied to the analysis of human motion and shape.

Tom is a co-founder of the Oxford Metrics Group plc headquartered in Oxford, and a Director of Vicon Motion Systems located in Oxford and Denver. He is a Fellow of the Institution of Engineers, Australia, College of Biomedical Engineering, of the Royal Society of Medicine and of the Royal Society for the encouragement of Arts, Manufactures and Commerce.

Tom is also a Visiting Professor at the Faculty of Health Sciences, Staffordshire University, researching the application of vision science to the measurement of cosmetic defect and physical capability among children diagnosed with Adolescent Idiopathic Scoliosis. Tom is a part of the Centre for Biomechanics and Rehabilitation Technologies, Staffordshire University.

Quantifying the impact of AIS using spinal imagery, Schroth classification, clinical assessment, proposed cosmetic deformity measures, and imagery amongst a cohort of patients.

Thomas Shannon, Nikola Jevtić, Samra Pjanić and Nachiappan Chockalingam

INTRODUCTION

The Schroth method is a well-known non-surgical option available to patients exhibiting mild to moderate scoliotic curves. The technique employs customised exercises with the aims of restoring muscular symmetry, postural alignment and awareness coupled with introducing new breathing strategies. The goal of the exercise regime is to de-rotate, elongate and stabilise the spine in three dimensions and to prevent progression amongst Adolescent Idiopathic Scoliosis (AIS) cases. Bracing may also be part of the treatment, dependent on a patient's age, bone maturity and degree of curvature but does require a long-term commitment to make the method a successful option. Although previous reports have shown the clinical effectiveness of this option, there is a lack of structured studies on the cosmetic changes of the technique. Published research have also established that there is no universal correlation for all curve types between the progression of a scoliosis and changes in body asymmetry but cosmetic concerns, quality of life and the psychosocial impacts of AIS remain important factors in any clinical decision-making. In conjunction with radiological, ultrasonic, and physical measures, the addition of validated body asymmetry metrics and surface imagery could be included in future efficacy studies; when designing patient specific treatment plans, and assessing individual outcomes.

OBJECTIVE

The primary objective of our longitudinal study over the past three years has been to investigate the relationship between Cobb angle(s), curve type, clinic reports, photographs, Schroth classifications, and back topography with the goal to develop, test, and to validate derived cosmetic deformity metrics and imagery.

METHODS

After ethical approval, we captured the back surface of 190 presentations from Schroth camps in Serbia, Bulgaria and Romania, and from 108 patients in Bosnia and Herzegovina using commercially available depth cameras (Kinect™ One, Microsoft Corporation) and analysed the resultant point clouds using contemporary computer vision algorithms. In this study we compared the shape data with supporting clinical information to establish the potential efficacy of upright angles of trunk rotation measures, calculated from differences in araspinous sagittal cross-sections, and derived surface imagery.

We reviewed the data from a group of 44 typically developed adolescents, not exhibiting any musculoskeletal disease, and 31 non-scoliosis Schroth patients to identify the potential impact of both structural contra-indications and postural artefacts on the sensitivity and specificity of proposed sagittal section asymmetry metrics and imagery. We then compared the outcomes with data acquired from amongst the AIS patient cohort.

RESULTS AND DISCUSSION

Our results indicate differences in the surface topography of the back between the typically developed subjects and those within the patient groups. This has provided a useful first step to develop a better understanding of how these measures could be applied clinically. As a part of this pilot investigation, we present single presentation results and cases measured over a three-year period to demonstrate how the derived surface imagery and metrics compare with spine deformity measures, photographs and clinical reports.

CONCLUSION AND SIGNIFICANCE

Correlating surface, clinical assessment, radiological/ultrasonic imagery and metrics observed amongst those attending Schroth clinics and camps will help design further structured studies with the aim of establishing the efficacy of potentially useful metrics and imagery that can contribute to the effective clinical management of individual patients.

References:

1. Jevtić, N. et al. Intensive Schroth treatment for patients with scoliosis in Balkans. *Scoliosis and Spinal Disorders* 2017 12 (Suppl. 1):17 031.
2. Shannon, T.M.L., et al. The Radiological and Clinical Assessment of a Cohort of AIS Patients in Serbia and Bulgaria. *The Spine Journal* (2017); Volume 17, Issue 11, Page S329.

Christian Hülstrunk

Asklepios Katharina Schroth Klinik, Germany

c.huelstrunk@asklepios.com



Dr. Christian Hülstrunk trained as a general paediatrician at the University Children`s Hospital in Mainz. In his fellowship, he became a specialist for paediatric intensive-care medicine. In the meantime, he obtained a master of business administration in Health Care Management. In 2019, he changed to the Katharina-Schroth-Klinik in Bad Sobernheim. There he works as a senior physician in paediatrics. Furthermore, he is involved in the research department of the genuine Schroth-clinic. In his scientific researches, he focuses on the problems of adherence in the conservative treatment of scoliosis. In addition, he interests himself in the effectiveness of scoliosis-specific physiotherapies and in brace therapy. Since the summer, he has been using an ultrasound scan to check the effect of scoliosis-specific physiotherapy as part of a four-week rehabilitation program.

Validation of the three-dimensional scoliosis therapy according to Katharina Schroth for adolescent idiopathic scoliosis using a newly introduced radiation-free sonographic measurement method Scolioscan® - a preliminary study

Christian Hülstrunk, Benjamin Schmitt, Axel Hennes and Omar Zabar

INTRODUCTION

Three-dimensional scoliosis treatment according to Katharina Schroth is an essential part of conservative therapy for adolescent idiopathic scoliosis. Due to the peculiarities of the German social system, patients with adolescent idiopathic scoliosis are in many cases paid annually for intensive rehabilitation until they reach adulthood. Over a period of four weeks, they learn the three-dimensional scoliosis treatment according to Katharina Schroth and receive a home exercise program specifically designed for them. The goals of intensive rehabilitation correspond to those published by SOSORT(1). For this purpose, the Asklepios Katharina Schroth Clinic follows a multidisciplinary therapy approach.

In the past, however, for ethical reasons, it was not possible to validate the success of the therapy with regard to the angle of curvature by means of a radiological examination. In recent years, specific ultrasound devices have been developed that allow radiation-free measurement of the curvature angle (2, 3).

The primary aim of the study is to analyze whether there is a significant change in the angle of curvature in the intervention group compared to the control group.

METHOD

Patients meeting the required inclusion criteria will receive sonographic measurements of their scoliosis angle at the beginning of rehabilitation by two ultrasound-experienced examiners. For the determination of a correlation coefficient, the subjects need an X-ray not longer than four weeks ago. During admission to the clinic, a very comprehensive query of all scoliosis-relevant data (incl. SRS-22, BSSQ) takes place. After four weeks of intensive three-dimensional scoliosis treatment, the scoliosis angle is determined again by sonography during the final examination.

Patients in the scoliosis outpatient clinic serve as the control group. These patients also receive an ultrasound measurement of the curvature angle during a regular visit to the outpatient clinic and four weeks later.

DISCUSSION

As a preliminary study, 14 female patients initially underwent sonographic measurement of the angle of curvature using an automated measurement of the spinous processes of the spine at the beginning and end of intensive rehabilitation. The users received extensive training from the manufacturer in advance and gained experience in spinal sonography over a period of two months. During the evaluation, the user receives nine different representations of the spine depending on the depth of the ultrasound waves. Nevertheless, our measurements revealed statistically relevant differences in the selected images. These difficulties were not described in previous studies and are now considered in the following study.

For thoracic and lumbar curvatures, the equation described in the study by de Reuver et al. (4) again showed a good correlation to the Cobb angle. In the preliminary study, we found very good inter- and intra-reliability of the measurements.

Due to the low number of cases, it was not yet possible to make a statement about the success of therapy with regard to curvatures after intensive rehabilitation. In single measurements, improvements of the scoliosis angle were shown.

CONCLUSION

A determination of the validity of the three-dimensional scoliosis treatment according to Katharina Schroth can be made with Scolioscan. The fast and simple examination method also allows repeated progress checks in a short period of time, so that in the future the number of X-ray examinations may have to be reduced until the skeletal growth is completed. In the preliminary study, improvement in scoliosis angle was observed in some subjects. The planned nonrandomized controlled trial will test the validity of intensive rehabilitation with respect to significance.

Lukasz Stolinski
Department of Health Sciences,
Medical University, Poznań, Poland
stolinskilukasz@interia.pl



Dr Lukasz Stolinski graduated from physical education (in 2005) with a MSc degree and physiotherapy (in 2006 and 2019) with a bachelor's degree and MSc degree. In 2016, he graduated his healthy science on photographic assessment of the body posture of children with PhD degree. He works from 2007 until now in private physiotherapy clinic – Spine Disorders Centre in Skierniewice with patients with functional and structural spine disorders. Since 2009, he was cooperating also as a physiotherapist in Rehasport Clinic in Poznan and since Spine Disorders and Pediatric Orthopedic Clinic, Department of Pediatric Orthopedics and Traumatology, University of Medical Sciences in Poznan (Poland), directed by orthopaedic surgeon Professor Tomasz Kotwicki, with clinical and research activity.

He was a SOSORT Award Winner as a co-author in 2011 for the following article: Czaprowski D, Kotwicki T, Pawłowska P, Stoliński Ł. Joint hypermobility in children with idiopathic scoliosis: SOSORT award 2011 winner. *Scoliosis* 2011. 6:22. He is an author and co-author of polish and international scientific papers in a field of body posture diagnostic and physiotherapy treatment for patients with scoliosis.

He is a member of the scientific committee of the International Society on Scoliosis Orthopaedic and Rehabilitation Treatment (SOSORT). From 2016 to 2020 he was a member of Task Force directed by the Polish Academy of Sciences for the field of scoliosis diagnostic. From 2020 he is a member of Physioprophylactic Task Force from The Polish Chamber of Physiotherapists. His current research focuses on photographic assessment of healthy children and children with faulty postures and scoliosis. He is an author and co-author of polish and international scientific papers.

Digital photography in qualitative/quantitative assessment and documentation of body posture

Lukasz Stolinski and Dariusz Czaprowski

Spine Disorders Center, Skierniewice, Poland

Querqus, Lodz, Poland

Department of Health Sciences, Medical University, Poznań, Poland

Department of Health Sciences, Olsztyn University, Olsztyn, Poland

Digital photography technique is a good way to assess child's body posture. Current studies present some new diagnostic possibilities by use of this simple tool. Digital photography for a 2D assessment of the body shape is a reliable and valuable method to document the body posture and calculate quantitative parameters in our clinical practice. The simplicity makes the technique reliable in terms of child's posture documentation and corrective therapy effects' monitoring. Fast assessing the posture on the photos is the goal of the technique which has advantages of being objective, easy to use and low cost. The technique is non-invasive and can be very effective. That's why digital photography is becoming an increasingly popular tool for assessing the musculoskeletal system in clinical practice and research. This proposition of assessing of posture is done without external markers. Dots based on anatomical points of the body are drawn by investigator with the use of non-toxic color pencil on undressed child (only with the underwear and with bra (in girl)). Standardized procedure for photographic body posture evaluation including the photos in spontaneous and corrected standing posture in sagittal profiles as the part of global photographic evaluation including photos from front, left side, back, right side and during bending forward and bending lateral. Photographic documentation of trunk rotation/trunk inclination deformity revealed during Adams' forward bending test (slow progressive forward bending). Photographic documentation including also the photos in spontaneous and corrected sitting posture in sagittal profiles. This standardized proposition of photographic evaluation is based on previous study of 7,782 polish children aged 7-10 years old. There are some frontal and sagittal useful parameters which should be assess on the photos and which gave us some quantitative results about child's posture. The semi-automatic, free software SCODIAC, prepared by IT specialist can be used to calculate the photographic parameters on the photos on PC's and smartphones.

Digital photography process is simply and quick. There is a possibility to make a photographic measurement with the use of simple digital camera or mobile camera in standardized conditions for photographic documentation. The tripod is a helpful element to stabilize the camera but we also use a smartphone as a tool for assessment. Time for preparing the child for evaluation and time for taking photographic measurements is short as a time required for calculation of some standardized parameters. Most of previous studies confirm the usefulness of photographic method for body posture documentation and evaluation. A significant number of technical errors can be done during photographic

evaluation process but digital documentation of current silhouette and quantitative results seems very satisfying ... These errors can influence for photographic evaluation and should be avoided. Although proposed technique can be successfully used by trained professionals, its use during school screening postural programs requires staff education in order to achieve strict respect to technical standards. Photographic documentation and evaluation can be the future because of it's usefulness during current pandemic time.

References:

1. Stolinski L, Kozinoga M, Czaprowski D, Tyrakowski M, Cerny P, Suzuki N, Kotwicki T. Two-dimensional digital photography for child body posture evaluation: standardized technique, reliable parameters and normative data for age 7-10 years. *Scoliosis Spinal Disord* 2017 Dec 19;12:38.
2. Stolinski L, Kotwicki T, Czaprowski D, Chowanska J. Analysis of anterior trunk symmetry index (ATSI). Preliminary report. *Scoliosis* 2013, 8 (Suppl 1): O25;
3. Stolinski L, Czaprowski D, Kozinoga M, Korbek K, Janusz P, Tyrakowski M, Kono K, Suzuki N, Kotwicki T. Analysis of Anterior Trunk Symmetry Index (ATSI) in healthy school children based on 2D digital photography: normal limits for age 7-10 years. *Scoliosis* 2013, 8(Suppl 2): P10.
4. Stolinski L, Kotwicki T, Czaprowski D, Chowanska J, Suzuki N. Analysis of the Anterior Trunk Symmetry Index (ATSI). Preliminary report. *Stud Health Technol Inform* 2012; 176: 242-246.
5. Stolinski L, Kotwicki T. Change of the child's posture after sacroiliac joint manipulation: improved symmetry assessed with the POTSI index. *Scoliosis* 2012, 7(Suppl 1): O65.

Axel Hennes

Asklepios-Sanomed, ISST-International, Germany
a.hennes@sanomed.de



Axel Hennes was one of the senior PTs of the Asklepios Katharina Schroth Clinic in Germany. Since 1990 he was in charge of the educational part of the Schroth method. He has mainly influenced the course system in Germany and started in 2008 as an international Schroth Senior Instructor to offer international Schroth courses in the English language. Since that time, he has developed the ISST (International-Schroth 3dimensional Scoliosis Therapy) program concentrating on a conservative out-patient therapy approach. He is a member of the SOSORT society since 2008. He is working more autonomous since 2015, together with a multidisciplinary team of scoliosis experts in the Asklepios out-patient Scoliosis-Centre, Sanomed. ISST-Schroth is part of the Spine-Concept-Asklepios, which he and his colleagues have developed for scoliosis patients.

In 2015 he founded ISST-International providing educational programs for experts in the conservative treatment team for scoliosis, especially for physical therapists, orthopedic technicians, and physicians.

Courses all around the world have fostered his experience in teaching and developing Schroth therapy.

Schroth Therapy – Physical therapy for scoliosis

The introduction of the Schroth therapy method leads from a historical aspect to the modern version of a highly standardized, individualized, evidence based, conservative treatment approach for scoliosis.

Standards are a specific patient examination using an inherent nomenclature and classification followed by a documentation derived from long experienced patient education and teaching concept for professionals.

Main objectives of the Schroth therapy are detection of typical scoliosis features, restoration of normal postural alignment, static-dynamic postural control, function, and improvement of postural stability.

The treatment also includes teaching and planning scoliosis specific exercises and breathing techniques and encourage patients to perform a home-exercise program and achieve postural changes in activities of daily living by adapting the principles of the Schroth posture variations. The intensity of the treatment program has to be individually tailored to the exercise capacity of the patients and the inherent risk of progression. Specific passive-assistive and active mobilization techniques are mandatory in case of structural-functional limitations.

Motivation, compliance, commitment, and discipline of the patients are following a deep understanding of the therapeutic goals and limitations and the recognition of the main focus on long-term postural changes.

The therapist should be able to accompany patients sometimes for months, years, even lifelong. This requires the ability for self-reflection and empathy as well as the capacity for communicative talent and expert know-how.

The combination between active self-correction and brace treatment helps to improve the compliance and the quality of the home exercise program.

Benjamin Schmitt
Asklepios Katharina-Schroth-Klinik
Bad Sobernheim, Germany
b.schmitt@asklepios.com



Benjamin Schmitt is a sports scientist at the Asklepios Katharina-Schroth-Clinic in Germany, an orthopaedic rehabilitation centre for scoliosis and other spinal deformities. There he works as an experienced therapist, treating national and international patients according to the method of Katharina Schroth. Furthermore, he works as a scientist in the research department of the genuine Schroth-Clinic to provide answers to the many opened questions about idiopathic scoliosis.

Asklepios Katharina-Schroth-Klinik –The multidisciplinary conception of scoliosis inpatient treatment in Bad Sobernheim

The Asklepios Katharina-Schroth-Klinik Bad Sobernheim (Germany, Rhineland Palatinate) is an inpatient rehabilitation clinic for patients with spinal deformities. The original concept of the Schroth-Method invented by Katharina Schroth (1894 – 1985) mainly aimed at the three-dimensional therapy of idiopathic scoliosis based on neurophysiological principles. Exercises with asymmetrical muscle tension, a special way of breathing and the consciousness-raising for a non-scoliotic postural behavior in everyday life are the major pillars of the treatment. Beside the primary physiotherapeutical treatments, the clinic complies with the biopsychosocial model of health (WHO) so that the multilayered needs of scoliosis patients are regarded as well. If we want to understand a scoliosis-patient's medical condition, it is not enough just to focus on the orthopedic and biological factors. There are also psychological stresses that could affect the self-estimation and generate psychosomatal problems. Thoughts of being the only one with this disease, helplessness, visible body deformities or a brace therapy could be possible triggers. In addition, social factors should be recognized regarding the opportunity to fully participate in familiar, occupational and educational sectors. To achieve such an all-round care for the patients there are many other offers besides the approximately thirty hours of active physiotherapeutical scoliosis exercises a week. To name just a few, there are psychological consultations, occupational therapies, nutrition counselling, social counselling and school lessons for all the school-age children. This full-service package should help the patients to improve dealing with the scoliosis in their everyday life, working life and in their social environment.

The lecture will introduce the Asklepios Katharina-Schroth-Klinik Bad Sobernheim with its different treatments and the concept of the interdisciplinary collaboration between physicians, physiotherapists, psychologists, social counselors, nurses and educators. It will show you a typical day of a patient and will give you insights in the Schroth treatment and the whole in-patient stay.

Ahmet Alanay

Acibadem Mehmet Ali Aydinlar University,
School of Medicine, Turkey
aalanay@gmail.com



Ahmet Alanay MD is a spine surgeon treating both adult and pediatric spinal disorders. He graduated from Ankara University Faculty of Medicine in 1988. He completed his residency in Hacettepe University, Department of Orthopedics and Traumatology from 1991 to 1996. He started his career as an assistant professor in the same department and became an associate professor in 2002 and a professor in 2007. He also completed a fellowship program on spinal deformities at University of Kansas Medical Center and was a visiting professor from 2005 to 2006 in UCLA School of Medicine.

Dr. Alanay established the Comprehensive Spine Center at Acibadem Maslak Hospital in 2013. Since then, he is the medical director of the center and is also a faculty member at Acibadem University School of Medicine. Each year, with his team, he treats over 2500 outpatients, operates approximately 200 patients and publishes more than 20 peer-reviewed publications in high-ranking international journals along with numerous national and international presentations at scientific meetings.

Dr. Alanay is an active member of medical associations including American Academy of Orthopaedic Surgeons, Scoliosis Research Society, North American Spine Society, Spine Society of Europe and many others. He was a member of the Board of Directors of Scoliosis Research Society between 2014 and 2016, where he still serves in the Education Committee and Safety & Value Committee. He was also in the executive committee of Spine Society of Europe between 2006 and 2012.

Dr. Alanay has been the pioneer of Vertebral Body Tethering surgery in Europe and has received many national and international honors and awards for his scientific studies. He personally contributes to the training of surgeons through the courses he organizes in all around the world.

He has been a founding member of the European Spine Study Group.

2 to 5-years Follow-up Results After Thoracoscopic VBT: A Single Surgeon's Experience

INTRODUCTION

There is a paucity of information on clinical and radiographical outcomes of Vertebral Body Tethering (VBT) surgery. Current information is not yet strong enough to convince surgeons to include this surgical technique to their armamentarium. The aim of this study was to report clinical and radiographic outcomes of thoracoscopic thoracic-only anterior VBT surgery.

METHODS

Retrospective analysis of prospectively collected data. Data were collected preoperatively, at 6-weeks, 1-year, 2-years and latest follow-up. Demographic, perioperative, clinical, radiographic data and complications were analyzed. Curve sizes at each follow-up were compared using repeated measures ANOVA. Respiratory function was compared between preop, 1-year and 2-years postop.

RESULTS

42 (40F, 2M) consecutive Adolescent Idiopathic Scoliosis (AIS) patients with a mean age of 12.1 ± 1.5 years at surgery, and a mean follow-up of 33 (24-62) months who underwent thoracoscopic VBT surgery between 2014 and 2018 were included. 95% of the patients showed Lenke 1 curve pattern (21 A, 4 Ar, 11 B and 1 C modifier) and 5% were Lenke 2. Preoperatively, 25 (62.5%) patients were premenarchal (median Sanders: 3 (1-7), median Risser: 1 (0-5)). A median of 7 (6-9) levels were tethered. Mean surgical time was 240 ± 70 (123-360) minutes. Patients grew 8 cm on average; height measurements showing significant increase at each follow-up time point ($p < 0.001$). 88% of the patients reached skeletal maturity at final follow-up. Upper Thoracic (UT), Main Thoracic (MT) and Thoracolumbar/lumbar (TLL) curves showed significant decrease at each follow-up time point. No significant changes were noted in kyphosis and lordosis ($p < 0.05$). FVC% and FEV1% showed significant increase from preop to 1 year, as well as from 1 to 2 years (Mean FVC% 80.5, 85.2 and 87.6, respectively; mean FEV1% 80.5, 87.8 and 90.4, respectively, $p < 0.001$). Pulmonary, mechanical and curve behavior complications rates were 12%, 19% and 33%, respectively. 2 (4.8%) patients were converted to fusion. At final follow-up, 92% patients had $\leq 30^\circ$ residual curve. SRS-22 mental health, self-image and subtotal scores increased significantly.

DISCUSSION & CONCLUSIONS

This study reports a single European center experience on 42 consecutive patients with ≥ 2 -years follow-up who had undergone thoracic-only VBT surgery. Surgical correction was followed by growth-dependent correction attained during follow-up. Spontaneous correction was also noted in the non-operated upper thoracic and thoracolumbar levels. Pulmonary function showed a gradual increase. Thoracoscopic VBT surgery prevented fusion in 95% of patients of whom 92% had good radiographic ($\leq 30^\circ$ residual curve) and clinical

outcomes; however, it is not without complications. Overall pulmonary, mechanical and curve behavior complications rates were 12%, 19% and 33%, respectively. Some complications may be avoided with a better understanding of the growth modulation and advancement of technical skills and technology.

References:

- 1 AF Samdani, et al (2014) Anterior vertebral body tethering for idiopathic scoliosis: two-year results, Spine.
- 2 A Alanay, et al (2020) Thoracoscopic Vertebral Body Tethering for Adolescent Idiopathic Scoliosis: Follow-up Curve Behavior According to Sanders Skeletal Maturity Staging, Spine.

Caglar Yilgor

**Comprehensive Spine Center, Acibadem
University Maslak Hospital, Turkey**
caglaryilgor@gmail.com



Caglar Yilgor MD is a spine surgeon treating both adult and pediatric spinal disorders. He obtained his medical degree in 2007 at Hacettepe University in Ankara, where he also completed his residency in 2012 at Department of Orthopedics and Traumatology. During his training, he was a visiting doctor at University of Perugia in 2009. While he was there, he also followed a fellowship program at “Let People Move” Biomechanics Laboratory.

After finishing his Obligatory Medical Civil Service, he followed a combined neurosurgical and orthopedic spinal surgery program from 2014 to 2016 at Acibadem University Maslak Hospital, Comprehensive Spine Center. After completing the program he joined Dr. Ahmet Alanay’s team. He started his academic career as an assistant professor at Acibadem Mehmet Ali Aydinlar University, School of Medicine in 2014 and became an Associate professor in 2018. Currently he is the director of the spine fellowship program at Comprehensive Spine Center.

Dr. Yilgor is an active member of medical associations including Scoliosis Research Society, Spine Society of Europe, AO Spine and many others. He has published many scientific articles, authored several book chapters and presented his research both nationally and internationally at scientific meetings. He is an associate member of AOSpine Knowledge Forum Deformity (SKFD) and is a reviewer for various scientific journals. He has received numerous national and international awards, including Best Paper and Academic Achievement Awards.

Sagittal Profile and GAP Score

The load distribution on the spine depends more on its shape and curvature in the sagittal plane than in the coronal plane. Although the restoration of “normal sagittal alignment” is a critical goal for reconstructive spine surgery, “normal” and “pathologic” alignment remain poorly defined. The conclusion from numerous studies that have sought to uncover ideal spinal curvatures and alignment is that these curvature metrics must be viewed in light of each other. As the only (relatively) constant parameter is the pelvic incidence (PI), the authors propose that all other parameters should be evaluated in relation to PI.

As PI is a continuum, no “categorization” or “classification” can adequately define the complex spinopelvic alignment for all PI values. The Global Alignment and Proportion (GAP) Score was formulated to fill this void. The GAP score denotes “normal” and “pathologic” standing sagittal alignment and shape as a single score for every size of PI. The radiographic parameters of the GAP score describe the spatial orientation of the pelvis (RPV), the magnitude and distribution of lordosis (RLL and LDI) and the extent of malalignment (RSA) with regard to ideals defined by the magnitude of the PI.

This was a retrospective analysis of data collected in the multicenter, consecutive, prospective study of the European Spine Study Group (ESSG), a collaboration of spine surgeons from six sites across Europe.

GAP score parameters comprised Relative Pelvic Version (Measured minus Ideal Sacral Slope), Relative Lumbar Lordosis (Measured minus Ideal Lumbar Lordosis), Lordosis Distribution Index (L4-S1 lordosis/L1-S1 lordosis \times 100), Relative Spinopelvic Alignment (Measured minus Ideal Global Tilt) and age factor. Proximal and distal junctional kyphosis/failure, rod breakage and implant-related complications were considered mechanical complications.

Using the derivation cohort, the Chi-squared test was performed to compare the frequencies of mechanical complications in parameter subgroups. Univariate logistic regression was applied to develop a practical prognostic score predicting mechanical complications. A weighted scoring system was created by rounding β regression coefficients to the nearest integer. The diagnostic performance of the GAP score was tested using the area under curve (AUC), sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy in predicting mechanical complications.

Using the validation cohort, the predictive ability of the GAP score in predicting complications was obtained by plotting Receiver Operating Curve Characteristics (ROC) curves and Cochran-Armitage tests of trend. Differences in HRQoL scores between GAP categories were analyzed using one-way analysis of variance (ANOVA).

Theoretically, when a patient needs compensation after instrumented fusion, the distribution of loads on implants, instrumented vertebrae, adjacent segments and grafts cannot be normalized. Therefore, instrumented fusion should aim to stabilize the patient in a position that would require no or minimum compensation after surgery. The current study proposes that this state equates to a GAP Score ≤ 2 .

PI-based proportional parameters were associated with mechanical complications, the latter being lower when subgroups were categorized as aligned. As opposed to absolute values, these parameters better fit the individual variability of the human anatomy. Understanding spinopelvic alignment according to PI-based global alignment and the “proportion concept” allows for the setting of personalized radiographic targets for preoperative planning. It also enables early postoperative recognition of a non-ideal shape/alignment, allowing for bracing, osteoporosis treatment, and rehabilitation and activity modifications if needs be.

In conclusion, the GAP Score is a new PI-based proportional method of analyzing the sagittal plane. Setting surgical goals in the sagittal plane on the basis of the proportional indices reflected by the GAP Score may decrease the rate of mechanical complications.

Josette Bettany-Saltikov
Teesside University, United Kingdom
j.b.saltikov@tees.ac.uk



Dr Bettany-Saltikov qualified as a physiotherapist in 1986 and is now an active researcher, writer, and senior lecturer. She has been working in the field of spinal deformities and postural disorders for over 30 years and has written many papers in this area, in various orthopedic journals. She has presented her studies extensively all over the world.

She is heavily involved in both supervising and teaching doctoral students (both PhDs and professional doctorates) and is a manuscript reviewer for a number of journals. She is a grant reviewer for a number of national and international societies such as the National Institute for Health Research (NIHR), Health Technology Assessment Programme, the Dutch Arthritis Society, as well as the Hong Kong and South African research councils.

She is very passionate about developing the underpinning objective and evidence-based research demonstrating the effectiveness of physiotherapy approaches in this area. She sincerely hopes that empowering service users (patients, parents, clinicians, and researchers) with the best evidence-based knowledge available will enable all involved in this area to both provide and access best practice.

Promoting scholarship and improving standards when writing for publication: Preparing an abstract or paper in spinal deformities

This presentation will discuss the skills needed to disseminate knowledge through publication, with a focus on writing and submitting a journal article or abstract to a peer-reviewed journal. The presentation will include clarifying appropriate knowledge for dissemination, preparing a journal article for publication, and negotiating the journal submission process. This session will focus on the following: How do researchers communicate?, Which journal is best for your work? Brief overview of the peer review process. The importance of selecting the right journal, What are preferable journals and how do you spot them? What are the harms of predatory journals? Journal analysis- how to do it Using on-line tools to decide where to publish, Preparing a high quality conference abstract and Issues to consider when writing a conference abstract. Common pitfalls when writing an abstract and finally how do you know if your abstract is at the right standard for presentation or publication?

Knowledge of all the above should help researchers and clinicians improve the standard of their work and thus improve communication and ultimately practice.

Nachiappan Chockalingam

**Centre for Biomechanics and Rehabilitation Technologies,
Staffordshire University, United Kingdom**

n.chockalingam@staffs.ac.uk



Nachiappan Chockalingam is the Director of Centre for Biomechanics and Rehabilitation Technologies at Staffordshire University and a Professor of Clinical Biomechanics within the School of Life Sciences and Education.

He is a Fellow of Institute of Physics and Engineering in Medicine. He is also an Affiliate Professor at the Faculty of Health Sciences, University of Malta and a Visiting Professor at Sri Ramachandra University, India. He is a Chartered Engineer, a Chartered Scientist and a member of various professional organisations, who have been elected to the executive board in some of these international societies. His research interests span the general area of biomechanics and gait analysis with a special interest in Spine/ Scoliosis, foot and footwear biomechanics.

Nachi is one of the Research Editors for Scoliosis, Associate Editors for Footwear Science and serves as the senior editorial board member for a number of other international journals, including Prosthetics and Orthotics International and the Foot.

He also reviews for several international grant funding bodies and professional/scientific journals.

Importance of assessing subtle functional characteristics in patients with AIS

Scoliosis or curvature of the spine is one of the major skeletal diseases in growing children wherein the majority of patients the cause is unknown (adolescent idiopathic scoliosis or AIS). There have been several papers on plausible causes and a plethora of information on clinical intervention. However, there is still a lack of information on the subtle locomotor function in these patients. If we can establish a relationship between shape and size of the spinal curvature and the day to day activities of patients with AIS, we can contribute to the development of effective treatment options.

This talk will provide an outline of the current study that is designed to collect structured baseline data for simple activities of daily living and gait in patients with AIS. This data will provide information on the movement variability within these patients for the first time. The movement variability assessed through dynamical systems perspective is a step change to current clinical practice. This data will provide information for delivering effective clinical management for patients with AIS.

The talk will showcase novel techniques for data collection and analysis proposed within study that has not been carried out in a clinical population of this nature. The talk will highlight some data that has already been shown useful in describing human movement in a different way which makes it easy for the practitioner to understand the relationship between various body segments in question. The talk will also argue for the use of this technique in a clinical setting, which has a huge potential to have an impact on not only the development of instrumentation but also surgical techniques.

Andreas Würsching

Kuca zdravlja d.o.o. and 3D Scolio, Croatia

wuersching@kuca-zdravlja.com



After his certification as a German Meister and Dipl Orthot. and Prothetist in 1995 at the BUFA, he worked as product manager, developer and international trainer for Otto Bock / Duderstadt.

Moved to Croatia in 2001 where he founded his own company with his wife, Suncica Bulat Würsching, Dr. med.

The company specialises in development and production of orthopaedic devices, especially for spinal and limb deformations in children, treating patients from Croatia and abroad. Since 2015 they are developing a new method to design and construct braces for the spine with the means of 3D printers. They are now one of only a handful of companies worldwide which have established a successful in-house production process of sophisticated individually designed devices, our own R&D department constructing and building our printers. Apart from serving individual patients, they act as educators for colleagues from all over the world. In 2018 they organized the world convention of conservative treatment of scoliosis in Dubrovnik with over 300 participants from 36 countries. 2021 Kuca zdravlja was certified as ISO 13845 conform.

Comparison of 3D printed braces vs. thermoformed braces for treating scoliosis

Andreas Würsching and Sunčica Bulat Würsching

After a short overview of the work steps of 3d printing a brace, the author will compare the traditional fabrication method vs. the new possibility of manufacturing a brace via 3d printing. While the scanning and modeling by means of CAD has already been widely accepted, the full digitalization of the process has not been implemented in many places so far. A comparison between the two type of production will be conducted also in regards to the new European law and regulations of the MDR (since May 2021), such as advantages and disadvantages in different braces and the connected documentation of work process and safety requirements, post process and application documentation and warrantee obligations. Does standardization mean lack of individualization? In the digital age and patients having access to more information in making decisions, it is up to us as professionals to provide the correct information and manufacture best possible device for each patient, adding comfort and compliance without sacrificing effectiveness.

Michael Rexing
Fa. Sanomed Bad Sobernheim Germany
mrexing2@gmail.com



Certificated prosthetist/orthotist (CPO Germany)

Senior consultant and clinical specialist at adViva GmbH Heidelberg, Germany;
Rehabilitation company focused on paediatrics orthotics and spinal braces.

Member of ISPO, VTO, FOT, Board Member of Human Study e.V.. International School of
Rehabilitation, Member of Course Committee OT-World Leipzig.

International Trainer for Specialised Courses in Spinal Bracing and Dynamic Orthotics.
Lectures in AIS and Neuromuscular Spine Deformity Treatment at Mahidol University
Bangkok, PFH Göttingen/Orthobionic, MSOT Munich, Ankara University, CRRC Peking,
Mastercourses in Germany for Brace-Treatment.

Board Member of ISST, International Schroth Scoliosis Therapy, Bad Sobernheim.

Trainer on adViva Academy Heidelberg for Dynamic Brace Solutions, Seating and Positioning.

Pattern-specific Brace Treatment – Principles and Limits

In the conservative therapy of idiopathic scoliosis, classifications of curvature patterns play a major role. The aim of this division into samples is to standardize the treatment and to enable comparability of treatment results. Adams (Adams, 1882) was one of the first to attempt to classify the curvature patterns in his book on the treatment of lateral curvatures of the spine. This classification was based on the description of the external visible signs and the findings from the dissection of cadavers long before x-ray imaging found its way into medicine. He made statements that are still eminently important for corset fitting about posture compensation and changes in the sagittal profile. It describes the formation of wedges in the thoracic apex and the proportion of the intervertebral discs on the lumbar curve and the resulting different types of treatment for thoracic and lumbar curves. With the X-ray, the knowledge about the 3-dimensionality of scoliosis disappears only to be revived 40 years later with the Schroth treatment and 100 years later with the Cheneau corset. In the collaboration of Cheneau with the doctors and physiotherapists of the Katharina Schroth Clinic in Bad Sobernheim, the modern Cheneau corset was then created with its corset classification named after the respective protagonist (HR, 2010) (Rigo, 2010).

In Bad Sobernheim, the corset classification was adjusted in 2014 together with the new Schroth classification. The common element of these classifications is the concentration on the therapeutic relevance of the curves to be treated, the importance of the pelvis and the influence of posture on the design of the orthotics. The therapy principles have been revised and there are now 6 years of experience with the application. The model has been successfully integrated into a training program and has proven to be trainable and applicable.

Nevertheless, classifications are always only models that are intended to make our work easier and to minimize the risk of errors and treatment failure. In practice we certainly see cases in which we come to the limits with the strict application of the system. In particular in children with hypermobile spine, discrepancies between the radiological and clinical picture and the unpredictability of the compensatory movements during curvature correction, a differentiated approach is necessary. Free spaces sometimes have to be limited, the shape and direction of the padding have to be adapted or the corset has to be raised higher than specified in the classification.

If these risk factors and individual peculiarities are taken into account in the corset construction, a pattern-specific approach is recommended.

References:

- 1 Adams, W. (1882). Lectures On The Pathology And Treatment Of Lateral And Other Forms Of The Curvature Of The Spine. London: J. & A. Churchill.
- 2 HR, W. (13. October 2010). "Brace technology" thematic series - the Gensingen Brace TM in the treatment of scoliosis. Scoliosis, S. 22.
- 3 Rigo, e. a. (5 2010). A specific scoliosis classification correlating with brace treatment: description and reliability. Scoliosis, S. 1.



Workshops

Tony Betts

Royal National Orthopaedic Hospital, United Kingdom

tonybphysio@hotmail.co.uk; t.betts@nhs.net



Tony Betts is a highly specialist Physiotherapist with 30 years of clinical and teaching experience. He has worked at the World renowned Orthopedic Hospital for 27 years. During this time, he has developed a special interest in the treatment and assessment of Scoliosis patient, including infantile, congenital, adolescent and adult Scoliosis. He has developed post-operative spinal exercise programs and taught specialist exercise and care following scoliosis surgery and /or conservative management. He worked for 10 years with Min Mehta and has helped teach and expand the Side Shift program. He is a Honary Spinal teacher for University Colleague. He has taught regionally and Nationally on the subject of exercises to the spine for conservative and post-operative care.

The Side Shift approach to Scoliosis

The Side Shift method is an out-patient scoliosis specific exercise for the treatment of scoliosis. It has been developed and modified by Min Mehta, Tori Maruyama and Tony Betts (1,2,3,4,5). It was originally conceptualised by Stendahl in the 1930s (5). It is based upon the principle that specific targeted movements can be used to correct the profile/posture of a scoliosis curve by emphasising the correction in the coronal and sagittal planes, over time with repetition movements and cognitive volitional postural awareness. It is an outpatient approach which places the emphasis upon postural corrective exercises to the patient. It is an exercise approach which aims to provide minimal therapeutic input. The patient is taught to stabilise their curve through curve specific motions, which are held by isometric muscle stabilisations and repeated regularly throughout the day. It is an approach that has been used and analysed across the world and provides a cheap, effective alternative to inpatient rehabilitation centres (1-4). The patient is assessed, categorised and an exercise approach is developed for each individual. It is based upon the direction of correction, in three movement planes and with sustained active, muscular, holding forces adding time as the fourth corrective dimension. It is evidence based approach with levels 3-5. Case series report, prospective and retrospective studies. Basic science analysis of side shift movements (2,3), clinical reports and comparative studies, against and supplementary to bracing approaches (5). The SOSORT guidelines provide the criteria and indications for its application (1).

1. Hagit Berdishevsky†Email authorView ORCID ID profile,Victoria Ashley Lebel†, Josette Bettany-Saltikov, Manuel Rigo, Andrea Lebel, Axel Hennes, Michele Romano, Marianna Białek, Andrzej M'hango, Tony Betts, Jean Claude de Mauroy and Jacek Durmala: Physiotherapy scoliosis-specific exercises – a comprehensive review of seven major schools: scoliosis and Spinal Disorders; 2016 11:20
2. Mehta M.H: Active Correction by Side-Shift: An alternative treatment for early idiopathic scoliosis. In: Scoliosis prevention, Praeger, New York, 1985, 126-140.
3. Maruyama T, Kitagawa T, Takeshita K, Mochizuki K, Nakamura K. Conservative treatment for adolescent idiopathic scoliosis: can it reduce the incidence of surgical treatment? *Pediatr Rehabil.* 2003;6(3-4):215-9
4. A. Steindler MD, FACS, Treatment of Scoliosis by the Compensation Method, *Physical Therapy*, Volume 9, Issue 2, April 1929, Pages 74-75.
5. Den Boer WA, Anderson PG, Limbeek JV, Kooijman MA. Treatment of idiopathic scoliosis with side-shift therapy: an initial comparison with a brace treatment historical cohort. *Eur Spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc.* 1999;8(5):406-10.

Maksym Borysov
Orttech Plus Rehabilitation Service,
Kharkiv, Ukraine
Info@schrothbestpractice.com.ua



Scoliosis rehabilitation specialist (PT and Bracing). Physical Therapy master degree graduation in 2000, Technical Orthopedics and Prosthetics, Bionic and Medical Devices and Systems master degree graduation in 2006, Chêneau and Chêneau-light brace course (Dr. HR Weiss, Bad Sobernheim, Germany; 2008) "Shroth Best Practice" PT course. (Dr. HR Weiss, Gensingen, Germany; 2010) Three dimensional therapy by Katharina Schroth method course (A. Hennes PT, Bad Sobernheim, Germany; 2010), P&O studying in Human Study 2017-2019, Graduation in ISPO 2020.

Started working with scoliosis treatment since 2000. Specialist for custom made Chêneau brace, Scoliologic Chêneau-Light Brace and CAD-CAM Gensingen-Brace. Schroth therapist. Senior Advanced Instructor of Schroth Best Practice Academy (Bracing and Rehabilitation). At present time Director of Orttech Plus Rehabilitation Service in Kharkiv, Ukraine.

The Schroth Best Practice Program

INTRODUCTION

Exercise treatment for scoliosis today is used all over the world and can be regarded as being evidence based. The most important method of treatment applied worldwide is the threedimensional treatment according to Katharina Schroth.

The application of the original Schroth program has been started in 1921. It was originally designed for thoracic curves of 80° and more. These curves were very stiff and hard to correct. Katharina Schroth defined high corrective exercises mainly in upright positions to stimulate the postural muscles and postural control.

The curves as treated with exercises today are mainly of minor to moderate degrees and are more flexible. This at first has lead to the first changes as suggested by Christa Lehnert-Schroth, daughter of Katharina Schroth. She started with exercises in prone and supine position but mainly used the upright exercising positions which are more powerful.

METHODS

The new approach, the Schroth Best Practice program was developed by grandson of K. Schroth, can be regarded to be the latest development of the original Schroth program. The main exercises are in upright position, the focus being on high corrections and pattern specific activities of daily living (ADL) first described in 2006 by Dr. Weiss. Because small and moderate curvatures are more easy to correct the principles of the new Schroth Best Practice program can easily be simplified.

The original Katharina Schroth method is still the very best for thoracic curves exceeding 70°. This is why Christa Lehnert-Schroth, mother of Dr. Hans-Rudolf Weiss, has agreed to coauthor the recent textbook and write the chapter for treating big thoracic curves exceeding 70°. Small to moderate curves, however, can be treated with the new program easily and effective.

The program consist of:

- physio-logic®
- Activities of daily living (ADL)
- 3D made easy
- Schroth exercises
- Rehabilitation of walk
- De-tethering exercises

CONCLUSION

Because the new Schroth Best Practice program is easy to perform and easy to learn (teach), patients can learn to manage themselves within a few days only.

There is no need for constant supervision by a therapist for months or even years after initial guidance and safe aquisition of the concept. With this program we aim to make the patient independent from the therapist and to automate the ADLs.

Nikos Karavidas
Schroth Scoliosis & Spine Clinic, Greece
info@skoliosi.com



Nikos is the owner of “Schroth Scoliosis & Spine Clinic” in Greece, specializing in the conservative treatment of spinal deformities. He is one of the very few physiotherapists that have been certified in every Schroth approach (ISST, BSPTS, Best Practice). He is also certified in two more Physiotherapeutic Scoliosis Specific Exercises (PSSE) schools, SEAS method and Lyon method.

Nikos is BSPTS instructor in Greece, Egypt and Turkey. His course in Cairo (2019) was the first ever Schroth course in the whole Africa region. In 2020, he will also be a faculty member and educator for the Eurospine EDISC Diploma.

International Societies Member:

- Society on Scoliosis Orthopedic and Rehabilitation Treatment (SOSORT)
- International Research Society of Spinal Deformities (IRSSD)
- European Spine Society (Eurospine)
- Panhellenic Spine Society

Physiotherapeutic Scoliosis Specific Exercises - BSPTS

Barcelona Scoliosis Physical Therapy School (BSPTS) is a school created to offer education to Physiotherapists in treating patients with scoliosis and other spinal disorders, according to the general principles of the so called Physiotherapy Scoliosis Specific Exercises –PSSE (SOSORT Guidelines). It was founded by Elena Salvá, a Catalan Physiotherapist, who introduced the German ‘Schroth Method’ in Barcelona during the 60’s. Thus, BSPTS, was initially inspired and based on the original physiotherapy method created by Katharina Schroth in 1921.

The Schroth method became popular in Germany through K. Schroth’s daughter, Christa Lehnert-Schroth. Elena Salvá learned from both women before bringing the method to Barcelona.

At the late 80’s, Dr Manuel Rigo and his wife, Dr. Gloria Quera Salvá, Elena’s daughter, started educating Spanish Physiotherapists in accordance with Lehnert-Schroth and Dr H.R. Weiss methodology, Christa’s son. BSPTS was certifying physiotherapists, National and International, under the name of Schroth until the end of 2008.

Since then, three different branches emerged, the ISST from A.M. Hennes; Best Practice, From Dr. H-R- Weiss; and the BSPTS-Concept by Rigo. These three branches are based in some way, on the original Schroth method, but now days can be considered relevantly different, conceptually as well as technically.

BSPTS-Concept by Rigo is an evolution of the original Schroth method, with influences from the French and Italian schools. It is an approach of Physiotherapy Scoliosis Specific Exercises (PSSE) that is integrated within a Multidisciplinary Scoliosis Care Team, following a Bio-Psycho-Social Model, working in accordance with evidence-based medicine.

BSPTS has evolved paying attention to three spheres of knowledge:

1. Specific knowledge on Scoliosis and other spinal disorders
2. The BSPTS-Concept by Rigo. Based on four general principles: 3D stable postural correction; Expansion Technique; Muscle activation and Integration.
3. The BSPTS-Technique. Based on: Self-elongation from a 3D stable and corrected pelvis; Asymmetrical Sagittal Straightening; Frontal Plane Correction.

Nikola Jevtić
Scolio Centar, Novi Sad, Serbia
njevticns@gmail.com



Nikola was born in 1986 in Kruševac, Serbia. He graduated from the Medical School in Kruševac in 2005, and in 2011 he obtained the title of Professor of Physical Education - Graduate of kinesiologist at the Faculty of Sports and Physical Education in Novi Sad. He graduated from the same faculty in 2013 earning a master's degree in physical education and sports.

From 2009-2010 Nikola was engaged as a demonstrator in the subject Kinesitherapy and professional practice of kinesitherapy at the Faculty of Sports and Physical Education. During this period, he gained work experience whilst working on improving motor skills in preschool children in a sports school. The aim of this approach was to establish adequate growth and development through the application of corrective exercises.

After one more year of work at the Faculty as a teaching assistant in the subject Kinesitherapy in the period 2011-2012, Nikola went to ASKLEPIOS, Katharina - Schroth Clinic in Germany, specialising in the Schroth three-dimensional method for the correction of scoliosis and kyphosis. Upon returning from Germany, he began to professionally apply the knowledge of the Schroth method to working with people with scoliosis and/or kyphosis. From 2014-2015 he was involved in a team of researchers at the IPA-spinelab international project entitled "Improving Postural and Spinal Status Assessment", which was successfully conducted by the Faculty of Sport and Physical Education in Novi Sad in cooperation with the Faculty of Sport and Physical Education in Sarajevo. Upon completion of the project, he became a visiting lecturer at the Faculty of Kinesiology in Split on the subject Kinesitherapy.

Having become a regional Schroth instructor on behalf of the German Spine-Concept-Sobernheim Institute in 2017, he became entitled to conduct Schroth education. So far, he has conducted education in Serbia, Croatia, Bosnia and Herzegovina, Bulgaria and the Netherlands.

He is the founder of the ISST Schroth Camp for people with scoliosis and kyphosis. The camp is now being implemented in several countries: Serbia, Bulgaria, Croatia, Romania, Canada, Turkey, America.

ISST Schroth Method according to Asklepios-Katharina Schroth

Nikola Jevtić, Samra Pjanić and Danka Ljubojević

Schroth therapy has a long tradition. It all started in the second decade of 20th century, when Katharina Schroth developed her three-dimensional scoliosis treatment. She founded it in 1921 in Meisen, the eastern part of Germany. Katharina herself had scoliosis and by observing the development of deformity, she was able to develop specific corrective mechanism and corrective breathing technique (Weiss HR at all 2015). Katharina's daughter Christa continued her work and refined the orthopedic–breathing treatment. In 1995 the clinic was sold to the Asklepios Company – a health care provider in Germany. Further improvement of the method was enabled mainly by the head of the therapeutic department Udo Roevenich and Axel Hennes and scientifically proven by the orthopedist HR Weiss, Christa's son, who was also medical director of the clinic until the 2008. (Hennes A. 2019). First scientific evidence was published in 1995 as a prospective study in German language and in 1997 in English language by dr Weiss et al.

The basic elements of Schroth therapy include information, trained and experienced experts and treatment. The patients need to have information about the scoliosis in order to develop pro-active coping strategy. The Schroth therapists should have specific knowledge to adjust the therapy plan according to the physical and radiological examination of the patient. Treatments could be individual or in groups based on standardized teaching and clinical reasoning management. The main objective of Schroth method is to avoid surgery, stabilize or reduce spine curvatures and improve aesthetics via postural correction and muscle endurance and control affected by scoliosis (Schreiber S. At all 2015).

The Schroth approach is dividing the body into four body block. The Schroth classification pattern is determined by 3D position of the body blocks and weight bearing of scoliotic patients. The Schroth classification system was changed by Axel Hennes 2013, and that is time when Schroth approach started using new classification.

The method, beside therapeutic exercises, also includes training in activities of daily living (ADL) in order to help the patients to change their routine. Braces can also be included in treatment since there their efficiency is evidence based in the treatment of scoliosis (Weinstein, Dolan, Negrini 2009, 2013, 2014). The further development of Schroth method is going in the direction of developing the multidisciplinary team that will include physician, physiotherapist – Schroth therapist, orthotic technicians and psychologists. The advantage of multidisciplinary approach is standardization of treatment and increase of patients' safety.

References:

1. Dolan LA, Wright JG, Weinstein SL. Effects of bracing in adolescents with idiopathic scoliosis. *N Engl J Med*. 2014;370(7):681
2. Weinstein SL, Dolan LA, Wright JG, Dobbs MB. Design of the Bracing in Adolescent Idiopathic Scoliosis Trial (BrAIST). *Spine*. 2013;38(21):1832–41
3. Hennes A. Textbook ISST-Basic Courses, 2019/2020, unpublished
4. Negrini S, Atanasio S, Fusco C, Zaina F. Effectiveness of complete conservative treatment for adolescent idiopathic scoliosis (bracing and exercises) based on SOSORT management criteria: results according to the SRS criteria for bracing studies - SOSORT award 2009 winner. *Scoliosis* 2009;4:19
5. Schreiber S, Parent EC, Doug L Hill; Douglas M Hedden; Marc Moreau; Sarah C Southon (2017) Schroth Physiotherapeutic Scoliosis-Specific Exercises for Adolescent Idiopathic Scoliosis: How Many Patients Require Treatment to Prevent One Deterioration? - Results from A Randomized Controlled Trial "SOSORT 2017 Award Winner". *Scoliosis and Spinal Disorders* (2017) 12:26
6. Schreiber S, Parent EC, KhodayariMoez E, Hedden DM, Hill DL, Moreau M, et al. (2016) Schroth Physiotherapeutic Scoliosis-Specific Exercises Added to the Standard of Care Lead to Better Cobb Angle Outcomes in Adolescents with Idiopathic Scoliosis – an Assessor and Statistician Blinded Randomized Controlled Trial. *PLoS ONE* 11(12): e0168746
7. Schreiber S, Parent EC, Moez EK, Hedden DM, Hill D, Moreau MJ, et al. The effect of Schroth exercises added to the standard of care on the quality of life and muscle endurance in adolescents with idiopathic scoliosis-an assessor and statistician blinded randomized controlled trial: "SOSORT 2015 Award Winner". *Scoliosis*. 2015;10(24):1–12
8. Weiss HR, Lehnert-Schroth C, Moramarco M. (2015) Schroth Therapy – Advancements in Conservative Scoliosis Treatment, book.



Oral Presentations

Investigation of the effects of three-dimensional Schroth exercises on Cobb angle, trunk rotation and pedobarographic gait parameters in adolescent idiopathic scoliosis

Hikmet Kocaman⁽¹⁾, Mehmet Hanifi Kaya⁽²⁾, Nilgün Bek⁽³⁾,
Buket Büyükturan⁽⁴⁾, Öznur Büyükturan⁽⁴⁾

1) Hacettepe University, Faculty of Physical Therapy and Rehabilitation, Ankara, Turkey

2) Ahi Evran University Faculty of Medicine, Kırşehir, Turkey

3) Lokman Hekim University Faculty of Health Sciences Department of Physiotherapy and Rehabilitation, Ankara, Turkey

4) Ahi Evran University, School of Physical Therapy and Rehabilitation, Kırşehir, Turkey

INTRODUCTION

In AIS, Cobb angle and trunk rotation, which expresses the severity of the deformity in the horizontal plane, are accepted as the main prognostic and clinical indicators in the evaluation of curve progression. AIS, which is a three-dimensional deformity, can also affect individuals' gait patterns. The aim of the study was to investigate the efficacy of the three-dimensional Schroth exercise's effect on Cobb angle, trunk rotation, and pedobarographic gait parameters in adolescent idiopathic scoliosis (AIS).

METHOD

36 patients with AIS were included in the study. The patients were randomly divided into two groups: the Schroth group (n = 18) and waiting list group (n = 18). The Schroth group received Schroth exercises, for 3 days per week for a total of 10 weeks. The assessments were included Cobb's angle on the radiograph, trunk rotation with scoliometer, and pedobarographic gait parameters with DIASU Digital Analysis System and Milletrix software.

RESULTS

It was found that the Schroth group had a significant decrease in the Cobb angle and trunk rotation angle compared to the waiting group after the exercise program ($p < 0.05$). The Schroth group also had a significant improvement in pedobarographic gait parameters after the exercise program compared to waiting list group ($p < 0.05$).

CONCLUSION

The Schroth exercises were effective in decreasing Cobb angle and trunk rotation in the AIS. In addition, the Schroth exercises were effective in improving pedobarographic gait parameters. It can be concluded that pedobarographic gait parameters are positively affected by the decrease in Cobb angle and trunk rotation.

The effect of core stabilization exercises on scoliosis severity, cosmetic deformity perception and quality of life in adolescent idiopathic scoliosis

Mehmet Hanifi Kaya⁽¹⁾, Hikmet Kocaman⁽²⁾, Nilgün Bek⁽³⁾,
Buket Büyükturan⁽⁴⁾, Öznur Büyükturan⁽⁴⁾

1) Ahi Evran University Faculty of Medicine, Kırşehir, Turkey

2) Hacettepe University, Faculty of Physical Therapy and Rehabilitation, Ankara, Turkey,

3) Lokman Hekim University Faculty of Health Sciences Department of Physiotherapy and Rehabilitation, Ankara, Turkey

4) Ahi Evran University, School of Physical Therapy and Rehabilitation, Kırşehir, Turkey

INTRODUCTION

Stabilizing therapeutic exercises such as core stabilization (CS) exercises have been used recently in the conservative treatment of AIS. These exercises focus on core strength training and spine stability. CS exercises are commonly used to improve neuromuscular control, strength, and endurance of different muscles around the spine to correct and maintain vertebral alignment. The aim of this study was to examine the effects of CS exercises on scoliosis severity, perception of cosmetic deformity, and quality of life in adolescent idiopathic scoliosis (AIS).

METHOD

A total of 30 patients with AIS were included in the study. The patients were divided into two groups: the CS group (n=15) and the waiting list group (n=15). The CS group participants received CS exercises, for 3 days per week for a total of 10 weeks. The outcome measures included Cobb angle (radiography), Cosmetic deformity perception (Walter Reed Visual Analog Scale-WRVAS), and Quality of life (SRS-22).

RESULTS

It was found that The CS group had a significant decrease in the Cobb angle values compared to the waiting group ($p<0.05$). The CS group also had a significant improvement in SRS-22 and WRVAS scores after the treatment program compared to the waiting group ($p<0.05$).

CONCLUSION

The CS exercises were effective in decreasing Cobb angle and improved Cosmetic deformity perception and quality of life in the AIS. CS exercises can be an effective therapeutic exercise in AIS. In the clinic, CS exercises should not be ignored in the rehabilitation program.

Investigation of the effects of Schroth exercises on scoliosis severity, spinal mobility and perception of cosmetic deformity in adolescent idiopathic scoliosis

Öznur Büyükturan⁽¹⁾, Hikmet Kocaman⁽²⁾, Mehmet Hanifi Kaya⁽³⁾, Nilgün Bek⁽⁴⁾,
Buket Büyükturan⁽¹⁾, Mehmet Canlı⁽¹⁾

- 1) Ahi Evran University, School of Physical Therapy and Rehabilitation, Kırşehir, Turkey,
- 2) Hacettepe University, Faculty of Physical Therapy and Rehabilitation, Ankara, Turkey,
- 3) Ahi Evran University Faculty of Medicine, Kırşehir, Turkey,
- 4) Lokman Hekim University Faculty of Health Sciences Department of Physiotherapy and Rehabilitation, Ankara, Turkey

INTRODUCTION

There are various therapeutic approaches to adolescent idiopathic scoliosis from various perspectives. The main goal of conservative treatment is to correct, stop or decrease the progress of bending. The aim of the study was to investigate the efficacy of the three-dimensional Schroth exercise's effect on scoliosis severity, spinal mobility, and perception of cosmetic deformity in patients with adolescent idiopathic scoliosis (AIS).

METHOD

A total of 33 patients with AIS has been included in the study. The patients were randomly divided into two groups: the Schroth group (n = 17) and waiting list group (n = 16). The Schroth group received Schroth exercises, for 3 days per week for a total of 10 weeks. The outcome measures included Cobb angle (radiography), spinal mobility (Spinal Mouse®), and perception of cosmetic deformity (Walter Reed Visual Analog Scale-WRVAS).

RESULTS

It was found that the Schroth group had a significant decrease in the Cobb angle compared to the awaiting group after the exercise program ($p < 0.05$). The Schroth group also had a significant improvement in spinal mobility and perception of cosmetic deformity after the exercise program compared to awaiting group ($p < 0.05$).

CONCLUSION

The three-dimensional Schroth exercises decreased Cobb's angle, increased the spinal mobility and perception of cosmetic deformity in AIS. We know from previous studies the effect of Schroth exercises on the Cobb angle. However, the effect of these exercises on spinal mobility should not be ignored.

Hypermobility in the lumbar back is the consequence of postural disorders

Vesela Dimitrova
NSBFTR "Ovcha kupel", Sofia, Bulgaria

INTRODUCTION

Standing is part of human evolution. This is a challenge for the human skeleton, muscles and nervous system. The spine is part of the axial skeleton and one of its main tasks is to keep the body upright and to change its position to help maintain its balance. Its S-shape makes it much more resistant to axial load. Fatigue and insufficient endurance of the muscles supporting the upright position and posture of the body in space lead to biomechanical changes in different parts of the spine, which can lead to compensatory changes and dysfunctions.

METHODS

60 patients with nonspecific chronic low back pain, were studied. The age of participants of the study were between 25 and 65 years. Patients were measured for spinal mobility in the lumbar and thoracic regions by Ott and Schober tests, hamstring shortening, VAS.

RESULTS/DISCUSSION

Hypermobility in the lumbar region was found, as well as limitation of the range of movement in the thoracic spine, as well as shortening in the muscles of the thighs. An increase in thoracic kyphosis and lumbar lordosis was observed in patients. This is a compensatory adaptive mechanism of the body in order to maintain a stable equilibrium position of the body.

CONCLUSION

Reduced mobility in the adjacent parts of the lumbar region leads to over-mobility in this region and is a prerequisite for the excessive strain on the muscles in the region that maintain stability and cause pain.

Effect of physiotherapy scoliosis-specific exercises on weight distribution in adolescent idiopathic scoliosis: a pilot randomized controlled trial

Zengin Alpozgen A⁽¹⁾, Arsoy SE⁽²⁾, Arman SN (a), Akyurek E⁽³⁾, Akgul T⁽⁴⁾

1) Istanbul University-Cerrahpasa, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Turkey

2) Florence Nightingale Hospital, Istanbul, Turkey

3) Istanbul University-Cerrahpasa, Institute of Graduate Studies, Department of Physiotherapy and Rehabilitation, Istanbul, Turkey

4) Istanbul University, Istanbul Faculty of Medicine, Department of Orthopedics and Traumatology, Istanbul, Turkey

INTRODUCTION

There are studies showing that bodyweight distribution varies according to the location, level, and shape of scoliotic curvature in Adolescent Idiopathic Scoliosis (AIS). However, studies investigating the effect of Schroth exercises on changing body statics are quite limited. In this study, we aimed to examine the effect of Physiotherapy Scoliosis-Specific Exercises (PSSE) (Schroth Method) on weight distribution in the AIS.

METHODS

Eighteen participants with AIS were randomly allocated to two groups. While the PSSE group received 'Schroth' exercises for 8 weeks, no intervention applied to the Control group. Static and dynamic pedobarographic measurements (FreeMed Baropodometric Platform) were used to assess weight distribution and location of the center of gravity at the baseline and at the end of 8 weeks.

RESULTS

The initial demographic characteristics, Cobb and rotation (°) and Risser sign parameters of the groups were similar ($p > 0.05$). For static analysis of pedobarographic measurements, the distance to the center (mm) for left and right foot was examined, a significance was found for the distance right to center in the PSSE group, at the end of 8 weeks (PSSE group: $p = 0.075$; $p = 0.024$, Control group: $p = 0.139$; $p = 0.326$ for left and right sides, respectively). Although the difference between left and right side total load (%) is decreased in the PSSE group and increased in the Control group there was no significant difference at the end ($p = 0.173$; $p = 0.406$, respectively). For dynamic pedobarographic analysis, the stay on the ground of the left and right foot significantly changed in the PSSE group, while there was no significant difference in the Control group (left: $p = 0.008$, right: $p = 0.038$, left: $p = 0.161$, right: $p = 0.093$, respectively). Delta CoF (Center of Force) (mm) is increased for the left side and decreased for the right side in both groups at the end of 8 weeks, but there was no significant difference (PSSE group: $p = 0.093$; $p = 0.327$, Control group: $p = 0.237$; $p = 0.674$, respectively).

CONCLUSION

Based on findings, this pilot study demonstrates that the Schroth method could affect weight distribution and center of gravity. This effect can be demonstrated in more detail with long-term exercise interventions and follow-up studies.

The Effect of Physiotherapeutic scoliosis-specific exercises (PSSE) on sensorimotor control of patients with Adolescent Idiopathic Scoliosis. A Narrative Review

Alexandros Kastrinis*⁽¹⁾, Nikos Strimpakos⁽¹⁾, Giorgos Koumantakis⁽²⁾, Maria Tsekoura⁽³⁾, Eleni Nomikou⁽⁴⁾, Zacharias Dimitriadis⁽¹⁾

1) Physiotherapy Department, University of Thessaly, Greece

2) Physiotherapy Department, University of West Attica (UNIWA), Athens, Greece

3) Physiotherapy Department, School of Health Rehabilitation Sciences, University of Patras, Greece

4) The House Rehabilitation Center for Children, Athens, Greece

BACKGROUND

The causes of adolescent idiopathic scoliosis (AIS) are largely unknown. However it is believed to be a multifactorial problem, where a number of factors have been proposed for its pathogenesis. Patients with idiopathic scoliosis are believed to have a distorted proprioceptive internal imprint of their body together with a distorted image of their body shape and spine. Proprioceptive disorders in patients with idiopathic scoliosis have been studied but there are conflicting views on whether they precede or follow the deformity. However, independent of the causality order, Scoliosis has also been associated with changes in both static and dynamic balance as well as the proprioception of peripheral joints such as the elbow and knee.

The development of awareness of the body's position and shape and the 3-dimensional auto-correction are common features of the PSSE approaches. A number of PSSE Schools include in their program education about motor control, proprioception and balance exercises.

The effect of PSSE is mainly measured in terms of controlling and reducing the Cobb angle, aesthetics, QOL and pain reduction in adults. However, the importance of sensorimotor control within this clinical population renders the investigation of the effectiveness of these methods on balance and proprioception very important. Therefore, the purpose of this review is to gather evidence and evaluate the effectiveness of PSSE on sensorimotor control in patients with AIS

METHODS

Web search on Pubmed, Scopus, Google Scholar and Ebsco for experimental studies up to 20 years old, in the English language, took place in June 2021. Keywords included the terms PSSE, motor control, Scoliosis, Balance, Proprioception, joint position sense, COP. Four studies were included involving Schroth, SEAS and FITS methods.

RESULTS

Literature provides limited evidence regarding the effectiveness of PSSE on sensorimotor control. The Schroth exercise approach was found to be more effective in changing weight distribution compared to Pilates while in another study it also proved effective in improving static balance. The SEAS approach was found to have superior results when treating the balance in AIS patients as compared to the control group that was not treated with SEAS approach exercises. No significant results were noted in improving skin deep perception of the back using the FITS approach. No studies were found regarding the effects on joint position sense of the extremities or the spine.

CONCLUSION

Despite the fact that idiopathic scoliosis is theoretically linked to deficits in proprioception, research evidence for the effectiveness of specific physiotherapy exercises is minimal. Further studies are needed that investigate the effectiveness of PSSE on sensorimotor control in patients with AIS.

Initial in-brace correction in Cheneau Sobernheim brace as a predictor of short term treatment outcome in patients with idiopathic scoliosis

Samra Pjanić

Institute for Physical and Rehabilitation Medicine "Dr Miroslav Zotović",
Banja Luka, Bosnia and Herzegovina

INTRODUCTION/AIM

Idiopathic scoliosis represents three-dimensional spine deformity with unknown cause. Brace treatment is indicated for spine curvatures $20\pm 5^\circ$ in skeletally immature children. Cheneau Sobernheim brace as the most recent Cheneau brace model is used since 2017. The aim of our study was to show initial in-brace correction in Cheneau Sobernheim brace as indicator of brace efficacy and possible predictor of short term treatment outcome.

METHODS

This retrospective study involved 143 patients with IS who were treated with Cheneau Sobernheim brace and PSSE in the Institute for physical and rehabilitation medicine „Dr Miroslav Zotović" in Banjaluka from 2019 to 2021. Short term treatment outcome was defined as 6-months interval follow up of patients with first brace. Evaluation of treatment effects was done by comparison of Cobb angle of primary curve in X-ray before brace application, in-brace X-ray 4 weeks after brace application (initial in-brace correction) and X-ray out of brace 6 months after brace application.

Statistical analysis included use of t-test, univariate regression analysis, post hoc Tukey test and Pearson correlation coefficient. Statistical significance was defined as $p < 0.05$.

RESULTS

In our sample there were more girls (75,5%) than boys (24,5%), average age $12,59\pm 2,04$ years, average initial Cobb angle $28,10^\circ\pm 8,94$ (range 16 to 59°). Average initial in-brace correction was $61,7\pm 26\%$, 65,7% of those patients had correction above 50%.

Positive treatment outcome had 98,6% of our patients: improvement (reduction of Cobb angle $> 5^\circ$) in 65,03%, stable scoliosis (Cobb $\pm 5^\circ$) in 33,57%. In 2 patients (1,40%), treatment outcome was negative (increase of Cobb angle $> 5^\circ$).

There was a positive correlation between initial in-brace correction and short term treatment outcome ($r=0,595$, $p < 0,001$). Initial in-brace correction significantly contributed in prediction of short term treatment outcome ($\beta=-0,479$, $p < 0,001$).

CONCLUSION

Cheneau Sobernheim brace showed significant efficacy in treatment of idiopathic scoliosis, considering high in-brace corrections and positive treatment outcome in most patients. In this study, initial correction in Cheneau Sobernheim brace was significant predictor of short term treatment outcome.

Rigo Concept: Physiotherapeutic Scoliosis Specific Exercises and 3D Brace for adolescent idiopathic scoliosis

Garikoitz Aristegui
Scoliosis & Posture Center, San Sebastian, Spain

INTRODUCTION

Physiotherapeutic Scoliosis Specific Exercises and 3D Brace for adolescent idiopathic scoliosis by Garikoitz Aristegui, PhD, PT, OT. Scoliosis & Posture Center. San Sebastian. Spain
Background Following the SOSORT GPC criteria to treat patients with moderate scoliosis, the recommendation is to apply PSSE and brace. Recent studies showed the PSSE effect in the minor scoliosis curvature and Weinstein concluded bracing significantly decreased the progression of high-risk curves to the threshold for surgery in patients with AIS. Combining the effect of the both treatments in moderate scoliosis could increase the result.

METHODS

Objective Assess the effectiveness of Rigo Concept PSSE combining with Rigo 3D brace in AIS, based on SOSORT GPC criteria. Methods This is a retrospective study of prospectively collected on patients with AIS treated with Rigo Concept PSSE and 3D brace. The protocol included Rigo Concept principles applied to Physiotherapeutic Scoliosis Specific Exercises and applied to the 3D brace design, including the 3D postural correction, expansion technique, muscle activation and integration. Exercises made one hour every week and brace was prescribed to use full-day. The inclusion criteria: AIS patient with Cobb angle between 20-50°, Risser 0-4, age 10-16, xRay control before and after skeletal maturity.

RESULTS

The study group (20 patients) consisted of 90% females and 10% males, age 13 ± 1.8 years old, Cobb angle $36 \pm 9^\circ$, scoliometer Th 10 ± 3 ; Lum 9 ± 3 . 9 patients (45%) remained stable decreasing the Cobb angle less than 5° , average 2° . The in-brace correction presented in all cases, Thoracic Cobb angle average $17,9^\circ$, Lumbar Cobb angle average $12,9^\circ$.

CONCLUSION

The treatment with Rigo Concept combining Rigo 3D brace and Rigo Concept PSSE, applying the same knowledge in both treatments, show effectiveness for AIS based on SOSORT GPC criteria. It's necessary to do a RCT study to confirm this result



Poster Presentations

The effectiveness of a hybrid telerehabilitation intervention, based on Schroth method, on the Cobb angle of a 12 year old girl with idiopathic scoliosis. A case report

Alexandros Kastrinis⁽¹⁾ Dionisios Tzatzaliaris⁽²⁾ Evangelos Theodosopoulos⁽³⁾

1) Physiotherapy Department, University of Thessaly, Greece

2) Scoliosis Spine Laser Center, Greece

3) Physiotherapy & Rehab Clinic, Greece

BACKGROUND

The Cobb angle magnitude is a very important, decision making, factor. Curves bigger than 500 Cobb tend to progress even after the child has reached skeletal maturity. This may lead to respiratory problems, reduced quality of life and other health problems.

It's been suggested that surgical treatment is indicated for curves > 450-500 Cobb.

The purpose of this study is to evaluate the effectiveness of the ISST Schroth method combined with Scoliosis™ Brace treating an AIS with severe thoracic scoliosis.

CASE DETAILS

12 year old girl, premenarche, diagnosed with AIS in August 2019 - Cobb angle 600, ATR 170, Risser 0

Surgical treatment was suggested by orthopedic surgeons based both in Greece and in the UK. The parents have decided against it as an immediate treatment option and sought a conservative treatment approach. The patient began an intensive Schroth program with a certified ISST Schroth PT and the treatment was combined with Scoliosis™ Brace a month later. The patient is UK based and spends only vacation time in Greece.

METHOD

On the initial visit the patient has been classified as a TriHSle according to the ISST Schroth classification system. She has been provided with the relevant therapy plan. An intensive program of 2 hours per day of Schroth Exercises has been followed and she has been provided with the Scoliosis™ Brace that she was supposed to wear for 18 hours daily. Then the patient started working for 30 minutes per day unsupervised and every two weeks under supervision via Skype from the ISST Schroth Therapist. Supervision turns face to face when she visits Athens. In brace correction was checked with an x-ray a month after the fitting. And X-Rays were taken out of brace 12 months and 23 months after the initial diagnosis

CONCLUSION

Almost two years after the initial diagnosis the major curve has dropped to 480 Cobb angle and ATR was measured 120. The combination of Schroth method, delivered face to face and via Skype with a 3D orthotic brace have been effective in reducing a severe scoliosis in a significant level.

Idiopathic Scoliosis (IS) screening & Infrared Thermography (IT) – current applications and future perspectives: A Narrative Literature Review

Dimitra Dadakaridou

Panhellenic Physiotherapists' Association, Thessaloniki, Greece

Medical applications of Infrared Thermography (IT) assessment depend on the human body's property to emit radiation within the infrared range. Different anatomical areas may imprint various skin temperatures, thus thermographic patterns, according to each area's anatomical and physiological features.

Thermal asymmetries in contralateral body areas seem to be linked with ongoing pathophysiological processes. Idiopathic scoliosis (IS) represents a common pediatric musculoskeletal condition accompanied by a triplanar deformation of the spine and the rib cage, asymmetrical loading patterns and body position, as well as neuromuscular and proprioceptive imbalances of the trunk's musculature. It is suggested that, thermography of the skins' temperature distribution could provide a safe, simple, quantitative and indirect method to evaluate the metabolic aspects of contralateral spinal muscles disturbances that come along with the scoliosis progression. Previous scientific data report that scoliotic patients display alterations in contralateral sides' thermographic patterns of posterior trunks' and lower limbs' areas. Moreover, the magnitude of contralateral sides' thermographic variance seems to be congruent with the degree of scoliosis. When compared to the gold standard radiographic method for screening scoliotic patients, thermographic assessment studies refer to high levels of sensitivity and specificity indexes (98%, 91%), however it is acknowledged that further studies should be conducted in order to establish the most appropriate testing protocols and methodological considerations.

Due to its non-invasive and clinical-friendly setting, it has been proposed that thermography could be implemented as a supplementary assessment tool for scoliosis progression and treatment effects. This method could also serve as a preliminary screening tool to target early diagnosis of adolescent idiopathic scoliosis, especially for large-scale evaluations like school screening programs. Finally, it would be interesting for future research to elaborate the thermography method to investigate the short-term and long-term effects of Physiotherapeutic Scoliosis-Specific Exercise (PSSE) along with the already well-established scoliosis evaluation methods.

Acute effects of the single Schroth intervention on postural control in girls with adolescent idiopathic scoliosis

Elżbieta Piątek, Anna Badowska and Bożena Ostrowska
University School of Physical Education in Wrocław, Poland
"Promyk Słońca" Diagnostic and Rehabilitation Center, Poland

INTRODUCTION

The aim of this study was to investigate the effects of a single Schroth (PSSE) intervention on postural control immediately after the exercise in girls with adolescent idiopathic scoliosis AIS.

MATERIAL AND METHODS

Twenty-eight girls with AIS (mean age: 15.6 ± 1.9 years) were evaluated on a force plate in four series of two 20-s quiet standing trials with eyes open or closed: just before and 30 minutes after the Schroth exercise. The blocks were randomly arranged: normal quiet stance (QS) and quiet stance with active self-correction (ASC). On the basis of centre-of-pressure (COP) recordings, the spatial and temporal COP parameters were computed.

RESULTS

In the study with eyes open, no significant differences were found of the COP variability values between QS and ASC, both before and after therapy. In the study with eyes closed, after the Schroth intervention, there was a significant decrease of the COP variability in QS ($p = 0.002$, difference 0.92), whereas increase of the COP variability in the ASC was not statistically significant ($p = ns$). Before the single Schroth intervention, the differences between QS and ASC of the COP sample entropy were significant ($p < 0.001$). While after the therapy, they were not.

A Schroth therapy decreased entropy in ASC at a level close to statistical significance ($p = 0.063$), and increased entropy in QS which was not statistically significant ($p = 0.369$).

CONCLUSION

In conclusion, our results indicate that a single Schroth intervention did not interfere with postural control. Additionally, a Schroth intervention has a desirable effect on some aspects of postural control as evidenced by reduction of COP amplitude during eyes closed. The Schroth exercises may result in benefits for the vestibular system and sensory integration.

Quality of life in girls with adolescent idiopathic scoliosis treated with the Schroth method

Joanna Kurzawa and Elżbieta Piątek

Centrum Skolioz "Promyk Słońca" Diagnostic and Rehabilitation Center , Poland

INTRODUCTION

In the recent years, the approach to treating AIS has changed, greater attention has been given to the quality of life (QoL).

The aim of this study was to assess the quality of life in girls with adolescent idiopathic scoliosis treated with the Schroth method and examine the correlations between the quality of life and the time they are in conservative therapy (Schroth method).

MATERIAL AND METHODS

Overall, 29 patients with adolescent idiopathic scoliosis (mean age: 15.6 ± 1.9 years; 100% women) and no prior surgical treatment were included. Each patient completed the Quality of life SF-36 questionnaire and underwent a complete radiographic study of the spine (Cobb angle). Additionally, questions were asked on participation in Schroth therapy (years). A correlation analysis between all variables was performed with Spearman correlation coefficient.

RESULTS

The average SF-36 questionnaire score was 23,55. There was no difference in physical and mental health. Nonsignificant correlation was found between SF-36 and the duration of their Schroth's therapy by girls with AIS.

CONCLUSION

The present study will help bring about a more accurate understanding of the psychosocial situation of girls with AIS. Patients treated with the Schroth method show a high level of quality of life. The time duration treatment does not contribute to increasing life quality.

Perception of body image and spinal deformity in Adolescent Idiopathic Scoliosis: The cultural adaptation of the Greek version of the Spinal Appearance Questionnaire (SAQ)

Marianna Oikonomaki⁽¹⁾, Georgios Kelalis⁽²⁾, Theodoros Grivas⁽³⁾, Apostolos Skouras⁽¹⁾, Spiridon Sotiropoulos⁽¹⁾, Georgoudis George^(1,4)

1) Musculoskeletal Physiotherapy Research Lab, University of West Attica, Greece

2) Department of Orthopaedics, EuroClinic Hospital, Athens, Greece

3) Department of Orthopaedics, Tzaneio General Hospital, Piraeus, Greece

4) PhysioPain Group, Rehabilitation & Pain Management Clinics, Athens, Greece

BACKGROUND

The perception of body image and spinal deformity in Adolescent Idiopathic Scoliosis (AIS) is an important construct for the young patients, measured by the Spinal Appearance Questionnaire (SAQ). The initial study and all eight cultural adaptations have shown its validity, reliability and responsiveness. However, there is no published Greek version of the SAQ until today.

PURPOSE

The aim of this study was to develop a valid, reliable and psychometrically sound Greek version of the Spinal Appearance Questionnaire (GR-SAQ).

METHODS

The cross-cultural validation and adaptation of the SAQ was performed according to the international guidelines. A sample of 51 AIS patients was employed. The internal consistency using Cronbach's α and the test-retest reliability using the Intraclass Correlation Coefficient (ICC) were examined with 5-7 days apart. The GR-SAQ and the domain "Appearance" of the Greek version of the Scoliosis Research Society-22 (GR-SRS-22) tools were correlated in order to assess for convergent validity. The Cobb angle and the "Trunk shift" domain were compared to further evaluate the convergent validity. Divergent validity was demonstrated by the relationship between the GR-SAQ "Kyphosis" domain with the Cobb Angle, the Angle from Formetric 4D Diers and the angle produced by the scoliometer using the Pearson's (r) statistic. Ethical Approval was granted on the 22-2-2018 (University-of-West-Attica Ethics Committee)

RESULTS

The internal consistency was shown to be good with Cronbach's $\alpha = 0,71$. Test-retest reliability was excellent with ICC=0,95 (0,88-0,97), except from the "kyphosis" domain (ICC=0,64). Correlation analysis between GR-SAQ and the "Appearance" domain of GR-SRS-22 demonstrated a significant inverse moderate correlation ($r = -0,39$, $p < 0.005$, $n = 51$). The "Trunk" shift domain correlated well with the Cobb Angle ($r = 0,47$, $p < 0.001$, $n = 46$) confirming convergent validity. No statistical significance ($p > 0.1$ at all cases) was noted among the GR-SAQ "Kyphosis" domain and the Cobb angle, the Formetric 4D Diers angle, and the scoliometer angle confirming the different constructs.

CONCLUSION

The GR-SAQ was shown to be a valid and reliable tool with similar psychometric properties to the original, capable to assess the perception of the spinal deformity in Greek AIS patients.

The Effects of the Cognitive-Affective Treatment Modules on the Postural Perception Scale, Focused on Music Tuned to 432Hz and Motivationally Directed Communication, as a Supplement to the Cobb Angle

Nanyeong Ji
THINKBODY, South Korea

INTRODUCTION

The Cobb angle has long been recognized as the "primary disease process outcome," despite some research calling for its alternatives. Given the widely perceived necessity for Cognitive-Affective(CA) therapies for scoliosis, music and communication can lead to improvements in the postural perception scale, as a supplementary index to the Cobb angle.

METHODS

We carried out experiments with 50 scoliosis patients, by combining Schroth exercise with CA therapies including music tuned to 432Hz and communication with the patients and their family for 12 weeks. The average age was 21(14-28) and their Cobb angles ranged from 35 to 78. Before and after the 12-week, the participants rated their "postural perception scale," ranging from 1 to 10, reflecting their perception of pain, whether they could maintain good posture, and their own body images.

RESULTS

The participants' average rating on their postural perception scale was 1.4, whereas their overall rating increased to 8.7 following the therapy. In particular, the patients reported higher sense of concentration after using music tuned to 432 Hz, which resulted in their higher sensitivity to and focus on their muscular movements. Furthermore, the majority of the patients (86%) mentioned that they feel "cherished" and respected as when communicating with the therapists, with the results that they were able to stay focused on incorporating good posture in their everyday lives.

CONCLUSION

Today humans' natural desire for connection is felt more palpably and urgently than ever, and treatment of scoliosis may need to go beyond just improving the Cobb angle, taking into account the research findings of related disciplines. With the Cobb angle continuing to serve as the primarily desirable outcome of scoliosis treatment, our CA treatment modules, given its inclusion of the postural perception scale as an objective index of quality of life of scoliosis patients, may function as a supplement to the conventional intervention methods, warranting further research on the interdependence of body and mind in scoliosis treatment.

Reliability and validity of a new digital scoliometer

Georgios Krekoukias*, Georgios Koumantakis, Vasilios Nikolaou,
Alexandros Kastrinis and Konstantinos Soultanis
National and Kapodistrian University of Athens, Greece

INTRODUCTION

Early detection of scoliosis with school screening and quick, easy and reliable assessment of its progress, are of paramount importance in the management of patients. There have been several tools described with the most common being the Bunnell scoliometer. Most recently, smart phone applications –have entered this area with and without the use of sleeves for the phone device. There is no research that has evaluated the accuracy of the measurements both left and right in either the digital or analogue devices. On this study, we evaluated the reliability and validity of a new digital scoliometer.

METHODS

Regarding the reliability, 35 subjects with scoliosis will be evaluated. The intra-rater reliability and test-retest values will be extrapolated using the Intra Class Correlation coefficient-ICC and the two way mixed for consistency respectively. Regarding validity, the scoliometer will be assessed against 15 different angles set on a sine bar for both left and right readings. The difference between the actual (sine bar) and the measured (scoliometer) reading will be assessed.

RESULTS / DISCUSSION

The preliminary results of this ongoing study show high accuracy and reliability readings of this new scoliometer. This new tool provides digital and precise readings with an accuracy of a hundredth of a degree, it's specific to measure angles, will not need to be updated as a smart phone would and has high reliability.

CONCLUSION

This new digital scoliometer, is suggested as an accurate and reliable tool for scoliosis patients.

