MEETING ABSTRACTS

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ORAL PRESENTATIONS

01
Truncal asymmetry in school children: the effect of the parental age at birth
TB Grivas1, C Mihas2, C Mazioti3, S Sakellariopoulou4, N Ziiss1, A Akiroits1, RG Burwell5

1 Department of Trauma and Orthopaedics, “Tzianio” General Hospital of Piraeus, Piraeus, Greece; “General Hospital of Kiki, Kiki, Greece; “Tzianio” General Hospital of Piraeus, Piraeus, Greece; “Tzianio” General Hospital of Piraeus, Greece; “Centre for Spinal Studies and Surgery, Nottingham University Hospitals Trust, Queen’s Medical Centre Campus, Nottingham, UK

Background: Truncal back shape asymmetry (TBSA), as thoracic and/or lumbar humps, is the main indicator for referral to clinics during school-screening for IS, and also the most important sign for assessing IS. It is reported that maternal, but not paternal, age at birth is a risk factor for progressive IS.

Aim: This report assesses the relation of parental age at birth to the development of TBSA in school children, which has not been evaluated yet.

Methods: 11,832 (5,855 males, 5,977 females) children and adolescents (5-17 years old, mean age: 11.34±2.79) were screened at their school for TBSA using the Prujis scoliometer. A child was considered as having truncal asymmetry if measured angles was equal to or exceeded 6 or 7 degrees of scoliometer reading. The BMI of the child’s BMI were subsequently calculated. Asymmetries were tested for correlation with parental age at birth, which was transformed to a categorical variable in 5-year intervals. Pearson’s Chi-squared test for univariate and logistic regression for quantitative univariate and multivariate analysis were used. The SPSS and STATA v. 11.0 statistical packages were used.

Results: Maternal age (MA): Asymmetry6 and asymmetry7, only in boys, tended to decrease significantly as mother’s age at birth increased. The significant and inverse effect of MA at birth on the appearance of asymmetry remained, only in boys, after adjusting for the child’s age and BMI. Similar findings were documented for paternal age.

Conclusions: The findings of this report indicate that parental age may possibly influence the presentation of TBSA in males, and possibly also in females, but, unexpectedly, by younger more than older mothers. The importance of the present findings is based on the premise that the intratertiary environment is crucial for programming the fetus for various health and disease outcomes throughout life. We suggest the mechanism involves an environmental factor, and by implication, epigenetics.

References


02
Patient selection in genetic association studies in idiopathic scoliosis
P Harasymczuk1, P Janusz, T Kotwicki
Department of Pediatric Orthopedics and Traumatology, Poznan, Poland

Scoliosis 2013, 8(Suppl 1):O2

Background: Although phenotypic presentation of scoliosis may be similar among cases, its genetic background may differ in relation to sex, age at presentation, curve type etc. It is difficult to compare results of genetic association studies published in the last 10 years because of different inclusion criteria and research approach [1].

Aim: To analyze genetic association studies of IS, published up to date, with the aim of evaluating selection biases.

Methods: We have evaluated available English language articles from the past ten years (2001-2011). Initial search was performed through PubMed, Medline, and Google Scholar with key words such as: idiopathic scoliosis, gene, genetic, SNP, association studies. As a result, more than 700 papers were obtained. Research method of each study was assessed. We included only genetic association studies or genome wide association studies. We ascertainment 26 studies available for further analysis.

Results: In total, the studies report on 11,797 patients and 23,867 controls tested. Out of those, 15 were performed on Chinese population, 4 studies on Japanese population, 4 studies on Caucasian population, 1 on Korean population and 2 on mixed or uncertain populations. 13 of the studies were performed on females only and 13 on males and females with known or unknown male to female ratio. One study did not report any IS inclusion criteria. 3 studies did not report any Cobb angle inclusion criteria, 11 included patients with Cobb angle below 20, 8 included...
patients with Cobb from 20 to 30, and 4 with Cobb angle over 30. Sixteen studies did not report curve types, and 10 had mixed type curve pattern.

Conclusions: Most of the studies conducted up to date did not select cases on the basis of common inclusion criteria. This gives rise to risk of selection bias, population stratification and other biases rendering the results questionable. Common inclusion criteria for genetic association studies are needed.

Reference

O3
Scoliosis with hyperkyphosis combines in 20% of cases with Scheuermann’s disease, and is more frequent in males
S Atanasio1, S Donzelli1, F Zaina1, A Negrini1, S Negrini1,2
1ISC0 (Italian Scientific Spine Institute), Milan, Italy; 2University of Brescia, Italy; 3IRCCS Don Gnocchi Milan, Italy
Scoliosis 2013, 8(Suppl 1):O3

Background: For most scoliosis cases, the etiology is uncertain. It’s possible, however, that a certain number of idiopathic scoliosis cases could be classified by known vertebral spine pathologies. It’s been described in the literature that idiopathic scoliosis is related to dorsal hypokyphosis, but the existence of scoliosis in which this doesn’t happen has been proved. Scheuermann’s (SCH) disease, in addition to hyperkyphosis, sometimes presents also average severity scoliosis. We wondered in how many cases a SCH disease, with a prevailing lateral component, would cause important scoliosis in association with hyperkyphosis.

Aim: To verify the presence of vertebral alterations connected to Scheuermann’s disease in scoliosis considered idiopathic.

Methods: Design: Cross-sectional study. Population: inclusion criteria was principal diagnosis of Idiopathic Scoliosis with a curve of at least 20° Cobb; sum of the sagittal plane between C7 and L3 of 90 mm. From a database of 2,432 patients affected by scoliosis greater than 20°, 201 subjects (49 male and 152 female) satisfied those conditions. All the patient’s radiographs (769 overall) have been evaluated in order to identify the presence of the signs of Scheuermann disease in one vertebra at least.

Results: Scoliosis with combined increase of the curves on the sagittal plane is 8.3%. In this subgroup, males are 24.4%. Radiographic signs of Scheuermann’s disease have been found in 45 patients (23.3% of the 201 subjects under study). Among those, 14 were male (31.1%) and 31 female. Comparing to the classification according to Lenke, 6 of them were of type 1, 31 of type 3, and 8 of type 5.

Conclusion: Among IS with combined hyperkyphosis, the prevalence of the male sex is greater than what is reported for the common form of IS. According to our results, in a significant number of idiopathic scoliosis, alterations related to Scheuermann’s disease have been reported in one or more vertebrae: in these cases the rate of males slightly increases. This could imply the exclusion of this subgroup from IS.

Reference

O4
The neuromuscular factor in idiopathic scoliosis: Retrospective longitudinal study of a group of 308 adolescents treated with neuromuscular rebalancing
A Fimiani
Ischia, Italy
Scoliosis 2013, 8(Suppl 1):O4

Background: One of the etiologic agents of Idiopathic Scoliosis (IS) is the sensorineural and/or neuromuscular factor. J.P. Roll demonstrated that: 1) the muscle spindle is the postural adjustment source, 2) the right balance between agonist and antagonist muscles define the posture, 3) the feet are the gravity reference to the central nervous structures and 4) the sub-occipital muscles connect the head muscles with myofascial body lines.

Through the theory of the myofascial lines, T. Myers demonstrated the functional continuity of the muscular system in its entirety, thus justifying the huge sensitivity of the Postural System, and the opportunity to act on the myofascial lines by several receptor inputs. The neuromuscular imbalance is a factor favoring the onset, and conditioning the progress, of the IS. The neuromuscular error manages the irregularity of scoliosis below a 25° Cobb angle, accordingly, neuromuscular rebalancing involves a spine realignment to the gravity axis, making an improvement of the curves by braking the worsening push, and producing a clear improvement in aesthetic damages.

Aim: To present the results of neuromuscular rebalancing on adolescents with IS.

Methods: Retrospective longitudinal study. In the group of 308 adolescents (193 female and 115 male, age between 7 and 14 years) 182 completed the therapeutic protocol of 24 months neuromuscular rebalancing. At the starting visit, 50 had an aligned spine, 45 a scoliotic attitude, and 87 an IS (33 thoraco-lumbar, 30 double curve, 24 lumbar). All patients were: 1) checked by x-rays, 2) initially Risser zero and 3) carried out only the Neuromuscular Rebalancing according to B. Bricot.

Results: Considering the variations equal to, or greater than, 5° Cobb, among the 24 patients with lumbar scoliosis, only one of them (4.17%) had a curve worsening; among the 33 with a thoracolumbar 4 (12.2%); and among the 30 with a double curve 11 (36.6%). The aesthetic damage improves in all patients.

Conclusions: The multi-sensory cocktail managing the automatic balance of the Postural System is certainly one of the idiopathic scoliosis etiological factors, probably the predisposing factor to the onset, and conditioning the disease evolution. The double curve scoliosis remains always the most evolutionary. The aesthetic damage in IS is mainly dependent on the Neuromuscular System failure.

References

O5
The relationship between scoliosis and balance in a population of adolescents with AIS
P Knott1, J Musto2, S Thompson2, S Mardjetko3
1Rosalind Franklin University, Chicago, USA; 2Illinois Bone and Joint Institute, Morton Grove, USA; 3Spine Institute, San Diego, USA
Scoliosis 2013, 8(Suppl 1):O5

Background: The etiology of Adolescent Idiopathic Scoliosis has been investigated for years. Now that the genetic basis for the disease has been established, the actual mechanism for production of the curve still needs to be discovered. Several have proposed a theory involving balance, with the brain and spinal cord causing spinal curvature related to neurologic signals [1,2]. An opportunity to observe spinal curvature and balance simultaneously exists when using the Formetric 4D (Diers Medical Systems) to assess spinal deformity. As surface topography measurements are being taken on the standing patient, force plate data on balance is also being generated. This study looked at the balance data in patients being measured for scoliosis, to see if there was a correlation between balance and spinal deformity measurements.

Goals: To look for a relationship between balance data and spinal deformity measurements in adolescent patients with idiopathic scoliosis.

Methods: One hundred thirty patients were measured a total of 188 times using the Formetric 4D to evaluate their spinal deformity. While doing this, a 6-second balance test was also performed using the Pedoscan force plate integrated with the Formetric. The deformity measurements considered were Thoracic and Lumbar Scoliosis Angles, Thoracic Kyphosis, Lumbar Lordosis, Sagittal Vertical Axis, and Coronal Vertical Axis. The balance measurements considered were Center of Pressure (COP) Total Excursion, Mean Velocity of COP Movement, A/P COP Movement, and
Lateral COP Movement. Correlation coefficients were calculated for each pair of deformity and balance measurements.

Results: There were no significant correlations between any of the balance measurements and the magnitude of the deformity measurements in this population.

Conclusions: This study was not able to demonstrate that patients with larger deformity measurements also had more difficulty maintaining their balance. A number of future research possibilities are suggested to further evaluate this potential relationship.

References

06 Everyday postures in idiopathic scoliosis: is there any correlation with curve morphology?

A Negrini1, E Pasini1, M Romano2, S Donzelli1, F Zaina1, S Negrini1,2,3
1IRCCS Don Gnocchi, Milan, Italy; 2University of Brescia, Brescia, Italy; 3IRCCS Don Gnocchi, Milan, Italy

Scoliosis 2013, 8(Suppl 1):O6

Background: Postural control is considered important for hyperkyphosis treatment, but it has been defined of mean importance in the SOSORT Consensus on aims of idiopathic scoliosis (IS) treatment [1,2]. Nevertheless, no studies can be found on the usual everyday postures (UEP) of IS patients.

Aim: To verify if IS patients adopt specific asymmetric UEP.

Methods: Through parents and scoliosis experts’ consultation, we developed and validated a questionnaire for parents evaluating 7 UEP. Inclusion criteria were IS and age between 6 and 18 years. We collected 635 questionnaires from all IS patients coming to our Institute between September and November 2011 (n=435, response rate 98.5%) and through specific emails (n=199, response rate 15.7%). Since there were no differences between these two groups, we adopted the survey. We evaluated all questionnaires together. We had IS group (ISG: curves >10°; n=462) and controls (CG: curves <10°; n=462) and controls (CG: curves <10°; n=36).

We divided ISG into three pairs of subgroups: L: lumbar or thoraco-lumbar curve; left (LL-SG n=65); right (RL-SG n=56); T: thoracic curve; right (RT-SG n=79); left (LT-SG n=11). DC: double curves; left right L right T (LRDC-SG: n=215); right L left T (RLDC-SG n=36).

We compared ISG and all subgroups to CG, and each subgroup to its matched pair (e.g. LL-SG vs RL-SG). All answers were converted as follows: one side: +1; the other side: -1; no preference: 0. Maintaining only the UEP with statistical differences, and checking for the preferred direction, we developed three indices of symmetry (IoS) (one per pair of subgroups).

Finally, we checked correlations between Cobb degrees, UEPs and IoS.

Results: In the L subgroups, a correlation coefficient (r) significantly different between the matched pairs and 2 from CG in the T subgroups the differences were 2 and 2 respectively; in the DC subgroups, only LRDC-SG had 3 postures different from CG. The calculated IoS were significantly different in the T and L subgroups, but not in DC. There were no statistical correlations with Cobb degrees.

Conclusions: IS patients have preferred UEP, mainly in the case of single curves; postural control strategies should be considered in future rehabilitation protocols.

References

07 Quantitative ultrasound measurements of bone strength in female adolescent idiopathic scoliosis patients

H Wang1,*, Q Du1, PJ Chen1, JA Li1, XH Hei1
1Xinhua Hospital, Shanghai, China; 2Shanghai University of Sports, Shanghai, China; 3Jiangsu Province People’s hospital, Jiangshu, China; 4Palmer College of Chiropractic, Florida, USA

Scoliosis 2013, 8(Suppl 1):O7

Background: The etiology of adolescent idiopathic scoliosis (AIS) has been linked to many factors, such as asymmetric growth, neuromuscular conditions and genetics. Several studies have been focused on the relationship between bone and scoliosis [1,2]. However, very few studies have examined the effect of AIS on bone mineralization.

Aim: The purpose of this study was to determine bone strength by quantitative ultrasound (QUS) measurements of bone speed of sound (SOS) along the longitudinal axis of the radial bones in scoliosis children.

Methods: This study was approved by the Human Research Ethics Committee of the School of Medicine, Jiaotong University, China. Eighty-nine untreated female AIS patients were recruited in this study. The age range was from 10 to 16 years. Those who were using calcium supplements and those who had history of bone diseases were excluded from the study. The diagnoses of all AIS were confirmed by radiography based on American College of Radiology Guidelines and Recommendations. Cobb’s angles ranged from 10-52” (average 27.13°). The types of scoliosis included thoracic, lumbar, thoracolumbar and double curvatures. Patients’ menstrual conditions and family history were also taken in consideration. SOS was measured (by Sunlight omnisense) in the distal 1/3 of the radial bones. Data were compared to age and gender-matched norms (standard SOS value provided by Sunlight system).

Results: Radial SOS was significantly reduced in AIS patients compared to non-AIS subjects (P < 0.01); the radial SOS was also correlated to the age of the onset of menstrual cycle (lower in pre-menstrual cycle patients, 3626.92±124.35 vs. 3702.68±192.23, P < 0.05). No significant correlations were found among the types of curvatures, the degree of Cobb’s angle, family history and bone SOS (P < 0.05).

Conclusion: Bone strength measured by QUS is reduced in AIS patients. The onset of menstrual cycle may have an effect on the reduction of SOS. Bone SOS is not affected by the types and severity of the scoliosis.

References

08 A simple method of spinal length assessment in patients with idiopathic scoliosis

M Tyralikowska1, D Wojtura-Tyralikowska2, T Kotwicki1, J Czubak1
1Department of Orthopaedics, Pediatric Orthopaedics and Traumatology of the Medical Centre of Postgraduate Education, Warsaw, Poland; 2Department of Mathematics and Computer Science, Adam Mickiewicz University, Poznan, Poland; 3Spine Disorders Unit, Department of Pediatric Orthopaedics and Traumatology, University of Medical Sciences, Poznan, Poland

Scoliosis 2013, 8(Suppl 1):O8

Background: The height of patients with idiopathic scoliosis (IS) is diminished due to the curvature of the spine. Several clinical parameters (BMI, vital capacity, others) are dependent on the patient’s height [1,2]. We developed a formula to calculate the corrected length of the spine in patients with IS, based on the presumption that scoliotic curve may be considered a part of a circle.

Aim: The aim of the study was to calculate the corrected length of the spine using our own formula, and compare it with the length directly measured on radiographs.

Methods: On the AP long film standing radiographs of 40 consecutive patients, undergoing surgery for IS, the Cobb angle (α) and the direct distance (h) between the upper end vertebra and the lower end vertebra (centroid of vertebral body) were measured. The length of the spinal
curvature (c) was calculated in the computer program using the formula: c=αh/2sin²α. For each patient the calculated length was compared to the length of the curvature measured on the radiograph. Shapiro-Wilk W test, t-Student's t-test, and Pearson's linear correlation were used.

Results: There was no statistically significant difference between the length of the scoliotic curve measured on radiograph and the length calculated with software (p=0.54). A strong correlation between these two parameters was found, Pearson linear correlation coefficient 0.98.

Conclusions: The method of correcting the spine length according to the Cobb angle seems to be simple and accurate. It needs only one additional parameter measured on the radiograph – the distance between the two end vertebrae. However, it concerns only the frontal plane. The software may be used on personal computers as well as on mobile phones, and thus help in everyday clinical practice.

References

O9 Comparison between subjective perception of trunk deformity (TAPS) and objective assessment of back asymmetry (surface topography)
M Rigo, E D’Agata1
1Institut Elena Salvá, Barcelona, Spain; 2Fund. Hosp. Univers. Vall D’Hebron-Institut de Recerca. Barcelona, Spain
Scoliosis 2013, 8(Suppl 1):O9

Background: The Trunk Appearance Perception Scale (TAPS) is a valid instrument for evaluating the perception that patients have of their trunk deformity [1]. Bago J et al have showed a significant correlation between TAPS and Cobb angle (r=0.55). Subjective perception has not been compared with an objective method to assess trunk deformity (Formetric 4D).

Aim: The purpose of this study was to investigate the correlation between subjective perception of trunk deformity and objective evaluation of back asymmetry (Formetric 4D).

Material and methods: Prospective study including only non operated girls (n=54) diagnosed with IS. Mean age of 14.3±1.4 years (range 12-18). Mean Cobb angle of 31.7±12.5 (range 10-75). All patients performed the TAPS the same day they were measured with the Formetric system. Radiograph was taken on a different day, and sometimes in a different month, however this was not considered a problem because the TAPS has been already compared with radiographs following a proper methodology. According to our patient evaluation protocol, parents also performed TAPS in a blind way with children. Total sample and subgroups according to curve pattern, single or double as well as according to treatment (RSC brace, other brace type, exercises, no treatment) were analyzed.

Results: Lateral deviation max and minimums correlated well with the Cobb angle (r=0.76 and r=0.07 respectively) considering both explorations did not coincide in time. Correlation was higher in single than in double curves (lateral deviation max/Cobb angle r=0.83 and r=0.54 respectively), and less also in girls treated with RSC (r=0.45). Correlation between surface rotation max and minimums was lower (r=0.54 and r=0.60 respectively), as expected. TAPS (children) correlated with the Cobb angle not much less (r=-0.47) than previously reported in the study from Bago et al. Correlation between TAPS and Formetric was even lower than radiological (the higher r=-0.33 with lateral deviation max). TAPS from parents did not correlate with surface topography neither with Cobb angle.

Conclusion: Correlation between subjective perception of trunk deformity in treated and untreated girls with IS and back asymmetry assessed by surface topography is even lower than that observed with the Cobb angle.

Reference

O10 End growth results analysis related to Risser score, Cobb degrees, and curve types at the beginning of the treatment
S Donzelli1,2, F Zaina1, S Negri1,2,3
1ISICO (Italian Scientific Spine Institute), Milan, Italy; 2University of Brescia, Brescia, Italy; 3IRRCCS Don Gnocchi, Milan, Italy
Scoliosis 2013, 8(Suppl 1):O10

Background: Scoliosis treatment is the science of prediction and estimation. The strategy is based on the magnitude and pattern of the deformity, both related to age and Risser Score, to predict the potential progression. The efficacy of the conservative treatment of scoliosis is known, and analysis of factors potentially influencing the results is surely interesting.

Aim: To assess the final results stratified according to curve magnitude, Risser score, curves type, gender and age, of a prospective set of patients treated in a centre fully dedicated to the conservative treatment of Adolescent Idiopathic Scoliosis AIS.

Method: Study Design: Retrospective study. Population. 388 (31 males) patients respecting these inclusion criteria: AIS diagnosis, Risser test 0-3; all Cobb degrees; no prior treatment; who had reached the end of treatment since our institute database start in 2003. Methods: Clinical and radiographic (Cobb degrees) data at the beginning of treatment have been compared to end growth results. Treatments: All patients were treated respecting SOSORT standard of conservative treatment with observation, exercises, soft and rigid braces.

Results: At the start of treatment worst curves corresponded to highest Risser test. With treatment, the percentage of unchanged patients remained almost stable (40-50%), while progression was higher in Risser 0 then at other Risser stages (16.6% vs 7.4-5.9%); highest rates of improvement appeared at Risser 1 or 3 (45-47% vs 33-39%). Patients who begin the therapy at Risser 0 have a higher probability to end treatment under 30° Cobb. The probability of curve progression is highest at the lowest and highest initial sizes of curve (i.e. below 20° or over 40°). In this sample of treated patients, the rate of progressed curves was very low, with a high rate of stabilized and improved curves. The total number of patients who finished with curves over 30° increases proportionally with a starting Risser Score. Considering curve’s type, age and gender we didn’t find differences in final results.

Conclusion: The efficacy of conservative treatment has been demonstrated in some previous studies. Our data confirms this aspect, with a trend of all final results (82.6% below 30°C), telling us that therapy is the most important predictive factor. As expected, the lower the age and Risser at start the lower the curve magnitude, and the best the final results, confirming the importance of early AIS detection.

References

O11 Analysis of differences in pain and disability in people with adult scoliosis and nonspecific low back pain
L Bissolotti1,2, V Sani1,3, M Gobbi1,2,3, Corizzi1,2,3
1Servizio di Recupero e Rieducazione Funzionale, Casa di Cura Domus Salus, Brescia, Italy; 2Sezione di Fisiologia Umana, Dipartimento di Scienze Biomediche e Biotecnologie, Università degli Studi di Brescia, Brescia, Italy; 3LARIN: Laboratorio di Riabilitazione Neuromuscolare e Attività Fisica Adattata, Brescia, Italy
Scoliosis 2013, 8(Suppl 1):O11

Background: The cumulative effect of the aging process in patients with juvenile scoliosis and the appearance of new cases in adult scoliosis (AS)
The aim of this paper is to compare pain, and disability, in patients with AS and nonspecific low back pain (NL).

**Methods:** Crotel method was used to assess Cobb angle (CA) on plain x-ray. Only patients with Cobb angle >15° were included in the study. Numeric Rating Scale (NRS, 0-10) was used to assess pain during last 48 hrs. Roland Morris Questionnaire (RMQ) and Oswestry Disability Index (ODI1.0) were used to evaluate disability.

**Results:** Group included 40 patients, 10 men and 30 women (age 61.8±11.5 years, BMI 23.6±2.8kg/m2). A single curve was present in 32 patients (80%). Primary curve averaged 27.1±11.5° (range, 15–63°), thoracic curve averaged 25.5±22.3° (range, 8–58°). NL-Group included 40 patients, 9 men and 31 women (age 58.2±10.9 years, BMI 23.9±3.2kg/m2). NRS score for AS-group was 5.9±1.8 (range, 2–10), while for NL group it was 5.1±2.2 (p<0.05). According to RMQ, the disability derived by low back pain presented a mean value of 11.3±4.4 points in AS-group (range, 2–22), while in NL-group it averaged 11.5±5.5 points (p<0.05).

**Conclusions:** As partially expected by the literature, the two examined groups did not present any relevant difference in terms of pain or disability. Both groups presented a moderate level of pain according to NRS, and a moderate level of disability according either to OD1.0 or RMQ. In this cohort of AS patients, conversely to the findings reported in literature, sciatic pain had a lower incidence than NL-group. Patients with AS, and a mild to moderate grade of spinal deformity, are not showing worse clinical features than patients affected by NL, and seem not to necessarily require more aggressive treatments than those usually adopted to contain disability in aging patients affected by common NL.

**References**


**O12**

**Correlation between maturation, growth spurt, and the progression of adolescent idiopathic scoliosis**

C Coillard, AB Circo, CH Rivard
Ste-Justine Hospital, Montreal, Canada

**Scoliosis 2013, 8(Suppl 1):C12**

**Background:** The tendency is to start conservative treatment at a lesser Cobb angle, but this can be warranted only if the scoliosis is progressing. Duval-Beaupère [1,2] (1971, 1984) concluded that an "evolutional scoliosis" is progressing in a linear way during two periods: one from birth until the onset of puberty, and the second one during puberty until maturation. Changes in the evolution occur suddenly between these two phases (P point) as the first minor signs of puberty occur. Each patient has their own evolution rate; therefore, using clinical signs to determine the exact maturation state of a scoliotic patient and the risk of progression can be difficult.

**Aim:** The purpose of this retrospective cohort study was to verify if the scoliosis is indeed progressing in a linear way, and to find a correlation between the progression of the scoliosis, maturation and growth spurt.

**Study design:** Out of 1,310 patients treated using the SpineCor orthoses, only the patients that had a Risser sign 0 where considered for this study. 306 patients (out of 806 with Risser 0) finished the treatment and arrived at skeletal maturity. For each patient, we recorded the Height, Risser sign and Cobb angle every months. Correlation between the growth, maturation and the progression of the scoliosis was done using a mix model (linear regression).

**Results:** The scoliosis is indeed progressing in a linear way, but we found two main periods of progression: the first period is around Risser 1 (± 6 month), followed by a second risk period just before Risser 4 (United States grading system). The standing height was found to be essentially dependent of the curve progression; for every Cobb augmentation, we found a diminution, or stagnation, for the height (growth). The progression of the scoliosis, and the growth spurt, are directly correlated to the Risser sign.

**Conclusions:** The evolution of scoliosis is indeed bound to maturation. Although there are two main periods of progression, in the first period (just before Risser 1) the progression is much more important, and therefore, the evolution with treatment during this period determines the outcome.

**References**


**O13**

**Risser stages, menarche and their correlations with other growth parameters in a cohort of 3,553 Italian adolescent idiopathic scoliosis patients**

S Minnella1,2, S Donzelli1, F Zaina1, S Negri1,3
1ISICO (Italian Scientific Spine Institute), Milan, Italy; 2University of Brescia, Brescia, Italy; 3IRCCS Don Gnocchi, Milan, Italy

**Scoliosis 2013, 8(Suppl 1):C13**

**Background:** Risser sign is the parameter used most often to evaluate skeletal maturity. Menarche is also claimed to be a determinant factor. In fact, the SRS criteria propose Risser sign 0 to 2, and a maximum of 2 years post-menarche, for bracing studies. But, are these parameters still valid after many years since their determination, and in all populations in various countries?

**Aim:** The aim of this paper is to describe the relationship between Risser sign and other physiologic parameters in Italian patients with AIS.

**Methods:** Study Design: Retrospective observational study. Population: A total of 3,553 patients (2,862 females, 691 males), aged between 10 and 21 years were included; each one had at least a clinical evaluation by our physicians and spinal X-rays. Methods: The two groups of females and males were separately divided into five subgroups according to Risser sign, (R0, R1, R2, R3, R4, R5), in order to analyse data of physiologic parameters (age, weight, height, BMI, menarche and two years after menarche) for each Risser level.

**Results:** In females, average age of each subgroup was 13.1±1.1 (R1), 13.6±1.2 (R2), 14.6±1.2 (R3), 15.8±1.3 (R4), 17.8±1.7 (R5) with an average growth period from R1 to R5 of 4.7 years; and an average growth in height from R1 (158.8±6.9) to R5 (164.7±6.2) or 5.9 cm; as regard to weight, there was an increase of 6.3 kg from average value in R1 (47.9±8.7) to R5 (54.2±7.5); the percentage of patients who had menarche was 27% in R0, 79% in R1, 90% in R2, 97% in R3, 99% in R4, and 100% in R5; but, it’s important to point out that 3% in R1, 13% in R2, 53% in R3 and 87% in R4 were two years after menarche. In males, the average growth period from R1 to R5 was also 4.7 years; but average height increased 7.2 cm; and weight increased by an average of 11.7 kg.

**Conclusion:** According to our results, it’s important to relate all the parameters examined for timing the stop of conservative treatment in AIS patients. Our results also show that the parameter of two years after menarche cannot be considered to determine skeletal maturity.

**Reference**


**O14**

**Therapy objectives, treatments modalities and outcomes used by physiotherapists for adolescent idiopathic scoliosis in Alberta, Canada**

EC Parent1,2, D Buyik1, J Clough1, L Jessper1, J Gibson1, J Lessard1
1University of Alberta, Department of Physical Therapy, Faculty of Rehabilitation Medicine, Edmonton, Canada; 2Alberta Health Services, Glenrose Rehabilitation Hospital, Edmonton, Canada

**Scoliosis 2013, 8(Suppl 1):C14**

**Background:** Progression of scoliosis may lead to self-esteem issues, pain, respiratory complications and limited function. There is a paucity of
information regarding how physical therapists manage adolescent idiopathic scoliosis (AIS).

Aim: The aim of this study was to determine the objectives, treatments and outcomes addressed by physiotherapists in the non-operative management of AIS.

Methods: A web survey was emailed to 1599 outpatient physiotherapists in Alberta identified from the College of Physical Therapists of Alberta’s registry in 2009. The 30 question survey was adapted from previous back pain studies [1], and collected information regarding demographics, typical case load, experience and the objectives, treatments, and outcomes used in the treatment of AIS. Responses from subgroups of therapists based on experience (>0-10, >10-20, >20 years) and based on work settings (rural or urban) were compared using Chi-square tests. A retrospective review of the Edmonton scoliosis clinic charts (2000-08) was used to estimate the proportion of patients with AIS referred to physiotherapy.

Results: Only 15% of all patients with AIS were referred to physiotherapy with a mean age of 16 ± 3 years, and a mean Cobb angle of 26 ± 15 degrees. The response rate from therapists was 11.9%, after 2 reminders with valid responses from 147 therapists. The top objectives pursued by physiotherapists in Alberta were pain reduction (80%), stopping curve progression (57%) and improving body image (45%). Therapists with 0-10 years of experience ranked pain reduction and body image improvements significantly higher than therapists with 10-20 or over 20 years of experience. No therapist reported using scoliosis specific exercises. Stabilization exercises (76%), non-scoliosis specific postural approaches (73%), and mobilizations (55%) were the highest ranked treatment methods used, with mobilizations being used significantly more frequently in rural settings. The primary outcomes documented by physical therapists in Alberta were pain (75%), subjective postural observation (73%), and range of motion (69%).

Conclusion: The objectives, treatments, and outcomes pursued by Alberta’s physiotherapists while managing AIS are variable, depending on experience and practice settings. Alberta practices did not fully match published recommendations supporting quality of life as primary therapy objective [2] and the use of scoliosis-specific approaches [3].

References

O15 Chiropractic treatment of scoliosis: a systematic review of the scientific literature
J McAvney
Sydney Scoliosis Clinic, Sydney, Australia
Scoliosis 2013, 8(Suppl 1):S015

Background: Chiropractors are primary health care practitioners who specialise in the treatment of the spine using manual therapy, in particular spinal manipulation. Chiropractors are ideally placed to diagnose and treat scoliosis through conservative methods. However, in order for the chiropractic profession to assume this role, an understanding of the effectiveness of chiropractic treatment of scoliosis is required.

Methods: A systematic literature search was performed of the Cochrane Library, Medline, CINAHL and Google Scholar using the search terms, “chiropractic and scoliosis”, “chiropractic treatment and scoliosis”, “spinal manipulation and scoliosis”.

Results: No high quality RCT’s were found, and no studies reviewed used the Scoliosis Research Society inclusion criteria and 2-year post treatment follow-up. The studies fell into two categories: 1) studies primarily using spinal manipulation, and 2) those using a multimodal rehabilitation based approach. In studies where manipulation was the primary intervention, some case reports reported reduction in the Cobb angle. However, the strongest study from this group was a Cohort time-series trial which studied 42 patients aged 6 to 12 years of age. The intervention was manipulation and heel lifts. They found that “chiropractic adjustments with heel lifts and postural and lifestyle counselling were not effective in reducing the severity of scoliotic curves.”

Discussion: There is a lack of evidence for chiropractic treatment of scoliosis. From the rehabilitation based treatment studies, most were case series and reported reductions in the Cobb angle at the end of treatment. However, none of these studies reported any follow-up beyond the end of treatment, and most of the patients treated were adults or older adolescents at low risk of scoliosis progression. Available evidence suggests that spinal manipulation does not influence the progression of adolescent scoliosis, and although chiropractic rehabilitation programs may influence Cobb angle, this could be temporary, and only in patients that are not at risk of significant progression.

Conclusions: Given this evidence, chiropractic specific treatments of spinal manipulation and rehabilitation should not be recommended over treatments that have demonstrated evidence, such as bracing and scoliosis specific rehabilitation programs. If chiropractors wish to play a role in the management of scoliosis, then they should offer evidenced based approaches to scoliosis management.

Reference

O16 Game based physiotherapy for evidence based practice in children with juvenile idiopathic scoliosis
P Feistritzer-Gröbl1, A Nischelwitzer1, V Saraph2
1University of Applied Sciences FH JOANNEUM, Graz, Austria; 2Department of Pediatric Surgery Medical University of Graz, Graz, Austria
Scoliosis 2013, 8(Suppl 1):S016

Background: The performance of daily exercises of patients with “juvenile idiopathic scoliosis” (JIS) during the home-based exercise period is a challenge. Therefore the collection of evidence is a challenge.

Aim: The aim of this study was to use a specialized computer program to guide, monitor and evaluate therapeutic exercises. With this program, exercises are monitored so that they are carried out in a precise way, and children get a real-time feedback. Furthermore, data is recorded for further evaluation by the therapist.

Methods: Software and interfaces of a 3D input device were used to detect and measure smallest movements within a game scenario. To maintain motivation different games were used. The study group were 20 children between 9 and 13 years old, with the diagnosis JIS (Cobb curve of 23° +/- 4°, bracing with Chêneau-braces). The children exercised six months according to the Schroth concept; two standardized exercises of this concept were carried out guided by the computer program. Data was recorded for each patient regarding exercises time and scores, exercise fault rates, stability, and mobility scores and self-efficacy scores. Correlations were calculated between different variables.

Results: Considering the changes of faults over time, it can be seen that the variable date had a highly-significant negative influence on mistakes in the x, y and z- direction. (P-value: 0.004978)

Conclusions: The available computer program for patients with JIS is suitable for evaluating therapeutic exercises. The collected quantitative data gives valuable information on the exercise regime, and can be used to monitor and evaluate treatment process. Due to the monitoring of the precise performance of exercises, exercise times are used more efficiently. A randomized study with the same target group is currently being carried out to evaluate possibly different results of treatment with, or without, a computer game.

References
O17
Orthopedic treatment of children with scoliosis: what are the consequences on muscular force?

I Courtiol*, C Morzot
Unité Rachis, Hôpital Bellevue – CHU de Saint-Etienne, Saint-Etienne, France
Scoliosis 2013, 8(Suppl 1):O17

Background: We want to have a scientific answer to the question of many parents: does a brace affect the muscle structure of the trunk? Aim: We evaluated by isokineticism the development of muscular forces of the trunk, and the knee, in a group of adolescents undergoing orthopedic treatment for scoliosis; the study took place over 6 months

Methods: The study included 18 teenagers, mean age of 12.75 +/- 1.66 affected by a progressed idiopathic scoliosis, with mean Cobb angle of 29 +/- 10 degrees at Risser 0 to 3.

A Cybex dynamometer was used to measure isokinetic trunk, and knee muscle strength, before the start of orthopedic treatment and 6 months after treatment commenced.

The isokinetic parameters measured were the maximum momentum for the flexor and extensor muscles, of the trunk, and knee, at different angular velocities, as well as the agonist/antagonist ratios. Seven healthy subjects of comparable age (12.57 +/- 1.27) served as a control group, evaluated just at the first stage of the study. The statistical analysis included averages, standard deviation, and student test.

Results: In the follow-up, we observed a significant increase in both the height and weight of the scoliotic subjects, which shows they are growing. At the same time, Cobb angle has decreased a great deal. At the initial stage of analysis, before any treatment, all trunk parameter results for the scoliosis group are slightly lower than the control group, but the difference is not statistically significant. Moreover, there is a bigger gap between scoliosis and the control in extensor parameters than in flexor parameters. As far as the knee parameters, the comparisons between scoliosis and control groups are not conclusive. Whereas, comparisons between the pre-treatment stage and after 6 months, in scoliotic group, showed some increase but the different is not statistically significant. Comparisons between the pre-treatment stage and after 6 months in scoliotic group treated orthopedically showed a significant increase in strength of the flexor and extensor muscles of the trunk with a significant increase of the flexor- extensor ratio. So, the increase is more significant in flexor muscle than in extensor muscle. The main limits of this study were the small sample and the absence of a control adolescent group at 6 months, so that development of muscular strength in healthy teenagers is unknown.

Conclusions: It can be concluded, however, from the results of this study that there is no negative effect on muscular strength in the trunk caused by the on-going orthopedic treatment of scoliotic growing adolescents. Moreover, this study shows us that extensor muscles seem to be more affected in scoliosis than controls, and also more affected by the orthopedic treatment. This should be taken into account in physiotherapy exercises.

Reference

O18
Exercise capacity of adolescent girls with idiopathic scoliosis; analyzed in 6 Minute Walking Test (6MWT), with and without Chêneau’s brace - pilot studies

J Pajak, J Durmala, J Bugala-Szpak
Department of Medical Rehabilitation, Medical University of Silesia, Katowice, Poland
Scoliosis 2013, 8(Suppl 1):O18

Aim: Establishing if Chêneau’s brace decreases exercise capacity in adolescent patients with idiopathic scoliosis.

Methods: This is a prospective, randomized study. The research was done in 22 girls (mean age 15±1.7 y) with DM idiopathic scoliosis (mean Cobb angle -33 degrees). These patients were qualified to conservative treatment using Chêneau’s brace. Every studied person was acquainted with the technique of carrying out 6MWT, and realized the tentative test before proper exercise tests in the aim of the elimination of “the learning’s effect”. Tests were executed twice, in the brace and without the brace. The order or carrying out each test was random, so that half of the patients executed their first exercise test in the brace and the other half took their first test without the brace. Two various balls were used for the drawing.

Results: There was a statistically significant longer distance for the Chêneau’s brace - pilot studies

Conclusion: This initial study showed:
1. Chêneau’s brace essentially diminishes exercise capacity for patients with idiopathic adolescent scoliosis.
2. A higher value of the kyphosis angle can reduce the negative influence of Chêneau’s brace on exercise capacity.

References

O19
Sports, in association with specific exercises, can help to achieve better results in controlling the evolution of scoliosis

M Romano*, S Negrini1,2
1ISCI (Italian Scientific Spine Institute) Milan, Italy; 2University of Brescia, Brescia, Italy; 3IRCCS Don Gnocchi, Milan, Italy
Scoliosis 2013, 8(Suppl 1):O19

Background: SOSORT Guidelines recommend that patients, who follow a conservative treatment program for scoliosis, practice sport activities in association with Specific Physiotherapy Exercises (PSE). From a theoretical point of view, the sport activity combines well with the goals of treatment of a disease characterized by a postural dysfunction.

Aim: The purpose of this study is to compare the results at the end of rapid growth spurt (Risser 3), between a group of patients treated with a conservative protocol (exercise and/or brace), and a group of patients who have added some sport activity to the same protocol.

Methods: We evaluated 543 patients (497 females/46 males) treated for idiopathic scoliosis with either PSE only (144 patients, 15.5±9.3°Cobb), or brace and PSE (399 patients, 33.3±12.1°). Patients started treatment at Risser 0-1, with a minimum age of 10 years, and were followed up to Risser 3. A comparison was then made between the following subgroups: PSE + Sport (PSEP: 88 patients, 14.8±5.7°) vs PSE only (PSE: 56 patients, 16.6±13.1°)

Conclusions: In the context of conservative treatment, sport activity, in association with a specific exercise program, seem to be useful to contrast the evolution of scoliosis, especially for braced patients.

References

### 020

3-D geometric imaging of the trunk in normal adolescents and age-matched patients impaired with idiopathic scoliosis: selected effects of conservative intervention according to Schroth

S Stoler1, H Baraniu, U Givon, Z Dvir2

The Institute of Motor Functions, Sheba Medical Center, Ramat-Gan, Israel

**Background:** Research has indicated that combining the Schroth approach with corrective bracing may lead to a reduction in the number of interventions, and a deceleration in the progression of the scoliotic curve. Yet, it is still unclear whether the postural correction improves the critical factor of trunk symmetry.

**Objectives:** To investigate the effectiveness of the Schroth method on trunk symmetry, in standing, sitting, and walking, using 3-D motion pick up (3-DMP) based analysis.

**Method:** Twenty three adolescents, (12 healthy and 11 with AIS) participated in the study. All AIS patients had at least one curve of 20º, and were killed in postural corrections based on Schroth principles. Trunk symmetry was assessed using the Coda Cx1 3DMP system. Markers were applied on the head, acromioclavicular joints, suprasternal notch, scapular inferior angles, pelvis, knee, heel, lateral malleoli and the heads of the 5th metatarsus. All patients were measured twice in the same day, (with a 4-hour break between sessions), in natural sitting, standing, and walking. AIS patients were measured again in those three positions, during postural correction according to Schroth. From the test-retest paradigm the stringent cut-off for a true clinical change - the smallest real difference (SRD) - was derived.

**Results:** There was a significant and high correlation between the Cobb angle and scapular transverse misalignment. AIS patients showed significant correction of scapular rotation, in standing, and the location of the center of scapula relative to the center of the pelvis. At least 36% of the patients corrected the previous, and more than 45% that of the latter, beyond the SRD. With respect to shifting of the shoulder girdle relative to the pelvis in standing and walking, 55% of the patients have exceeded the SRD value.

**Conclusions:** 3DMP analysis enables identification of subtle spinal relationships, which are unrecognizable using visual inspection. Using an advanced 3DMP system, this study confirms the good reproducibility of trunk marking. Moreover, it supports the effectiveness of the Schroth approach in AIS patients who are able to reduce specific trunk asymmetries, particularly those related to shoulder girdle and scapular orientation.

**References**


3. O21

Feasibility and three months preliminary results of an RCT on the effect of Schroth exercises in adolescent idiopathic scoliosis (AIS)

S Schiebel1, J Durmala2, B Winuk, I Blacharska, K Wadowski, S Dybula, J Dzierzcega

Department of Rehabilitation, Medical University of Silesia, Katowice, Poland

**Aim:** The aim of this study was to assess the direct impact of different derotation techniques (OMT Kalternborn-Evjenth) on the trunk morphology of adolescents with idiopathic scoliosis – pilot studies

J Durmala, B Winuk, I Blacharska, K Wadowski, S Dybula, J Dzierzcega

Department of Rehabilitation, Medical University of Silesia, Katowice, Poland

**Scoliosis** 2013, 8(Suppl 1):O21

Derotation mobilization techniques were implemented, in accordance with the concept of OMT Kaltenborn-Evjenth, in a sitting position. Clinical examination of the lumbar spine was performed in a standing position. Surface topography examination was performed in a sitting position. Statistical analysis was performed using nonparametric tests.

Results: After performing mobilization techniques, there was a statistically significant reduction in the parameters values (absolute values) (scoliometer ATR, surface topography – ATR, Hump Sum, absolute rotation, total rotation) only in the active and passive group (first study vs second study). Improvement (as a percentage of patients with improvement = relative values) was observed in all measured parameters between the group of mobilization (passive and active) and the placebo group. Only in the POTSI case, improvement was registered (insignificant) only in the active group; and in the case of the lordosis value, there were no statistically significant changes. Better percentage improvement was observed (not statistically significant) for most parameters in the active vs. passive group.

Conclusions: Derotational mobilization techniques may be useful in the treatment of scoliosis therapy (used as a preparatory phase before the relevant active exercises of 3D correction). The use of derotational active mobilization techniques is slightly more effective than passive. Topic requires further investigation.

References

O23

Active thoracic kyphoskopisation: modifications in the shape of the trunk

M Romano1, F Saveri, A Negrini, S Negrini1,2

1ISCID (Italian Scientific Spine Institute), Milan, Italy; 2University of Brescia, Brescia, Italy; 3BICCS Don Gnocchi, Milan, Italy

Scoliosis 2013, 8(Suppl 1):O23

Background: The three-dimensional development of scoliosis has always led the experts in this field to say that the correction of curves in the sagittal plane is an important topic. Many experts propose that the thoracic correction should be done very carefully, to avoid any increase of kyphosis resulting in an increase of the hump.

Aim: The primary purpose of this study is to verify the changes of the shape of the trunk in subjects, when asked to actively increase their thoracic kyphosis. Secondary purpose was to investigate the differences in the results while the subjects inhaled, or exhaled.

Method: 37 consecutive patients (28 females - 9 males; Average age 14.9±3.4; Average Cobb 27.05±12.92) performed 4 different postural examinations with a Formetric system in orthostatic position.

(1) in the normal position (NP)
(2) in a position of Active Self-Correction (ASC)
(3) kyphoskopisation in the inspiratory phase (KI)
(4) kyphoskopisation in the expiratory phase (KE)

Results: In NP, the average measure of thoracic kyphosis was 37.8°±11.2. In comparison to the normal position, the extent of thoracic kyphosis actually increases when the patient tries actively to emphasize it, both during an inspiratory (43.7°±10.4), and an expiratory (45.6±39.7), phase. The average area of the hump doesn’t change significantly: 6.4±3.5 in NP, 6.5±3.5 in SC, 6.5±3.0 during KI, 6.5±3.1 during KE. The pattern of modification of the hump area is unclear. In 23% of subjects, we find the highest hump in NP, in 28% of patients in SC, in 28% during KI, and 21% during KE. The average value of lumbar plumbline distance (PD) is 40.3 in NP, 27.0 in SC, 61.4 during KI and 63.4 during KE. The average value of cervical PD is 29.4 in NP, 24.8 in SC, 27.9 during KI and 28.9 during KE.

Conclusions: In orthostatic position, it’s possible to actively increase the thoracic kyphosis. Performing this movement in inhalation, or exhalation, can help the subject, but the pattern is not the same for all subjects. Area of the hump changes differently, depending on the subject. In lumbar curves, we find a reduction of cervical PD during ASC, and an increase value both in KI than in KE.

References
**O25**

Analysis of anterior trunk symmetry index (ATSI). Preliminary report

L Stolinski1, T Kotwicki1, D Czaprowska1, J Chowanska1

1Rheasport Clinic, Poznan, Poland; 2Spine Disorders Unit, Department of Pediatric Orthopedics and Traumatology, University of Medical Sciences, Poznan, Poland; 3The Faculty of Physiotherapy, Jozef Rusiecki University, Olsztyn, Poland

Scoliosis 2013, 8(Suppl 1):O25

**Background:** Spinal deformities and postural disorders can be assessed by evaluation of trunk surface deformity. Usually, the back shape is assessed. However, the anterior trunk can also develop deformity, which is observed by the patient more easily than the back surface.

**Aim of the study:** To introduce a new parameter, Anterior Trunk Symmetry Index (ATSI), for anterior trunk deformity assessment.

**Methods:** Seventy primary school children, free of idiopathic scoliosis, both sexes, aged 6-7 years, mean 6.9 ± 0.3 years were examined with digital photography of their trunk, taken from the front in standardized conditions. The anatomical landmarks were: sternal notch, acromions, axilla folds, waist lines, and umbilicus. ATSI was defined as the sum of six indices: three frontal plane asymmetry indices (one for sternal notch, axilla folds and waist lines, respectively) and three height difference indices, (one for acromions, axilla folds, and waist lines, respectively). The software was developed for semi-automatic calculation of ATSI, after the anatomical points are indicated on a digital photo by the observer. The intra-observer error was calculated by the first author, by measuring four times the pictures of 20 children, in the interval of at least one day. The inter-observer error was calculated by one surgeon, and three experienced physiotherapists, by measuring the pictures of 20 children. The normal value limit was calculated as mean ± 3SD.

**Results:** The assessment of the ATSI on digital photography took around 1 minute. The mean ATSI value for 70 children was 22.6 ± 10.8. The intra-observer error was 1.23. The inter-observer error for the four observers was 3.08. The normal value limit was 32.3.

**Conclusion:** This new surface parameter can be easily calculated on regular digital photographs of the anterior trunk. Both intra- and inter-observer errors are small, indicating possible reliability of ATSI for the assessment of anterior trunk asymmetry in children. Further studies are needed to assess the clinical usefulness of the ATSI parameter.

**References**


**O26**

Micro: a useful and simpler tool to measure the magnitude of scoliosis curves on x-rays

M Romano1, F Zaina2, S Donzelli1, S Negrini1,2

1ISICO (Italian Scientific Spine Institute), Milan, Italy; 2University of Brescia, Brescia, Italy; 3IRCCS Don Gnocchi, Milan, Italy

Scoliosis 2013, 8(Suppl 1):O26

**Background:** The gold standard method for the measurement of the magnitude of a scoliotic curve on x-rays is the Cobb, or Cotrel, method. With these methods, it is necessary to draw on the radiograph a series of segments and to measure with a protractor the angle formed by the intersection of two of them.

**Aim:** The purpose of this study is to describe a different method for the measurement of the scoliosis angles on x-rays (Micro method), and to verify the concordance with the gold standard.

**Methods:** The Micro method is based on the use of a Bunnell scoliometer. The sum of the inclinations of the vertebrae limiting the curve determines the angle of the curve. Three experienced physicians measured 30 X-rays with the Micro method and the Cotrel method. The extent of correlation between the two measurements was performed using the Bland Altman plots.

**Results:** The differences between the 90 measurements made with two different methods has never exceeded the commonly accepted measurement error (+/-5°), while the average of these differences was 0.02 ° (St. Dev. 1.89). The normal distribution demonstrates the high degree of correlation between the two methods of measurement. To evaluate the degree of consistency among the 30 measurements performed by the three physicians with the two different methods of measurement, the average discrepancy in the following format was calculated:

- Mean discrepancy Cotrel Micro; Physician 1 vs Physician 2 (13.6° vs 0.16°)
- Physician 1 vs Physician 3 (0.16° vs 0.13°)
- Physician 2 vs Physician 3 (12° vs 0.05°)

All comparisons show a greater degree of agreement between the measurements performed using the Micro method compared to the gold standard.

**Conclusion:** For the measurement of a scoliotic curve on a conventional x-ray, the results of this study demonstrate a high reliability of the Micro method compared with the gold standard. The measurement with the Micro method is faster, and easy to obtain, even for non-experienced operators. The use of the scoliometer, in fact, reduces the errors of the correct identification of the vertebrae limiting the curve.

**References**


**O27**

Pedicle morphology using CT-based navigation system in adolescent idiopathic scoliosis

S Kurashii1, J Takahashi, H Hirabayashi, N Oghara, K Mukayama, M Shimizu, H Kato

Departments of Orthopaedic Surgery, Shinshu University, Matsumoto, Japan

Scoliosis 2013, 8(Suppl 1):O27

**Background:** Pedicle diameter in AIS patients was narrower on the concave side of the scoliotic curve. Many researchers have measured pedicle diameter and length of AIS patients by using standard CT, or magnetic resonance imaging (MRI), but only few have used three-dimensional (3D) imaging, especially CT-based navigation.

**Aim:** The purpose of this study was to use multidimensional analysis with a computed tomography (CT)-based navigation system to measure the outer cortical diameter, and the maximum screw trajectory length, of the pedicles of the thoracic and lumbar regions of the spine in adolescent idiopathic scoliosis (AIS) patients. Another objective was to identify pedicles that require cautious insertion of screws.

**Methods:** Fifteen patients with right-side thoracic AIS, who underwent pedicle screw fixation, were studied. CT-based navigation system was used to measure the pedicle diameter, defined as the widest outer cortical diameter at the narrowest part of the pedicle. Moreover, the maximum pedicle screw trajectory length was measured as the distance between the posterior cortical entry point of the pedicle screw, and the anterior vertebral cortex in line with the axis of the pedicle between T1 and L5. In addition, the values of each parameter taken using the CT navigation system, and the standard axial CT, were compared.

**Results:** Pedicles on the concave side of the main thoracic curve apex and proximal thoracic curve tended to have the narrowest diameters. The mean length, of the longest screw that could be fixed, was longer on the right side, except for T8 and T9. Our data showed screw size feasibility as follows: 25 mm or 30 mm screws were feasible from T1 to T5; 30 mm or 35 mm screws, from T6 to T12, and 35 mm or 40 mm screws, from L1 to L5. Pedicle
Can bending radiographs be useful for Lenke classification system of idiopathic scoliosis?

M Tyrańkowski1, T Kotwicki2, A Kochi, M Drwiega1, K Lisiecka1, D Lawnicki1, S Pietrzak1, J Czubak1
1Department of Orthopaedics, Pediatric Orthopaedics and Traumatology of Postgraduate Medical Education Centre in Warsaw, Poland; 2Spine Disorders Unit, Department of Pediatric Orthopaedics and Traumatology, University of Medical Sciences, Poznan, Poland
Scoliosis 2013, 8(Suppl 1):O28

Background: Lenke classification of idiopathic scoliosis (IS) is based on standing up and lateral radiographs, combined with assessment of scoliosis correction on bending X-rays.

Methods: The radiographs of 30 consecutive patients operated on because of IS were examined. Seven independent researchers assessed the X-rays, in 3 stages at one week intervals.

Stage 1: Lenke type was determined on AP and lateral long film standing X-rays.

Stage 2: Lenke type was established by use of AP and lateral standing X-rays, completed with supine traction films.

Stage 3: Lenke type was indicated using AP and lateral standing supine traction, and lateral bending films.

The order of the radiographs, in each stage, was different and random. The results were determined by calculating the inter-observer and intra-observer agreement, and were quantified using two-rater and multi-rater kappa statistics.

Results: The inter-rater agreement in the first, and second, stage was moderate (multi-rater kappa coefficient: 0.41 in the first stage and 0.43 in the second stage; percent agreement: 0.56 and 0.55 respectively). The inter-rater agreement in the third stage was less (multi-rater kappa coefficient: 0.34 and percentage agreement: 0.47). The intra-observer agreement was the highest between the first and second stage for each of the researchers (mean kappa coefficient: 0.69; mean percentage agreement: 0.76).

Conclusions: The use of lateral bending X-rays in classifying the IS, according to the criteria of Lenke, reduced the intra-rater and the inter-rater agreement. Supine traction radiographs of the spine improved the agreement. This may suggest that the supine traction X-rays may help in classifying the IS.

References
there is a difference between the two methods, nor if any agreement exists on what should be done.

**Aim:** To check if there is a difference between the two ways of measurement in treated patients.

**Methods:** Design is a nested cohort controlled study in a prospective database. Population Inclusion criteria: diagnosis of IS; Riser 0-3 at start; photos of x-rays at SOT, and end-of-treatment (EOT). We included 87 patients (24 treated with Physiotherapeutic Specific Exercises (Group PSE: 14.7±4.0° Cobb, 43 curves), (49) treated with Spinecor brace + PSE (Group SF: 34.5±8.4°, 78 curves), and (14) with SpineCor brace (Group SP: 19.6±6.4°, 22 curves). Every curve of each patient at SOT and EOT were measured blindly by an expert physician; EOT x-rays were blindly measured twice: on the EVs at EOT, and then on the EVs of the SOT x-ray.

**Results:** EVs didn’t change between SOT and EOT in 37.2% of curves: 35.9% in PSE and SF, 45.0% in SP. The difference among groups was mainly due to distal curves (71.4% didn’t change in SP). The measurement error in this study was 0.8°±1.8° (P<0.05), while measuring always the same EVs caused an overestimation of positive results of 3.5°±2.5° (P<0.0001), up to a maximum of 18° for a curve that completely changed morphology. Considering a 5° threshold as a real difference, 9% of proximal curves and 15% of distal curves showed a change.

**Conclusion:** According to our results, therapy modifies EVs. Measuring radiographs using the same EVs at SOT and EOT overestimates results. Since this study has been performed at EOT (no other changes can be expected), these results should be valid. We strongly suggest measuring the real EVs of each x-ray, particularly at EOT.

**Reference**


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### O32

#### Adult scoliosis and non-specific low back pain: analysis of trunk kinematics

**Aim:** To provide data about trunk kinematics performance in patients with AS, and to compare it with non-specific low back pain (NL).

**Methods:** Cotrel method was used to assess Cobb angle (CA) on plain x-ray. Bilateral trunk side bending (SB) and extension (TE) were evaluated with a two optoelectronic cameras (14markers, Gemini BTS spa, Milano, Italy) [2]. During active range of motion (aROM, °), speed of motion (SOM, °/sec) and error in trunk repositioning (ETR, °) were measured. Patients performed, as allowed by pain or discomfort, two movements for each direction.

**Results:** AS-Group included 40 patients (10 men and 30 women, CA >15°, age 61.8±11.5 years, BMI 23.6±2.8 kg/m2). A single curve was present in 32 patients (80%), CA of primary curve averaged 27.1±11.5° (range, 15–63°), thoracic CA averaged 25.5±22.3° (range, 8–58°). NL-Group included 40 patients, 9 men and 31 women (age 58.2±10.9 years, BMI: 25.0±3.8 kg/m2). NL-group averaged 35.7±12.3° in aROM on the right side, and 35.2±11.2° on the left (SOM 28.1±13.6°/sec (p<0.05). AS-Group averaged 34.6±10.6° of aROM on the right side, and 35.5±12.5° on the left side (SOM 31.8±11.7°/sec (p<0.05). Global trunk mobility during SB test averaged 71.0±21.2° in NL-group and 64.2±29.1° in AS-group (p<0.05), with no differences when considering the two different directions. During SB, 26% of the trunk aROM derived from the relative contribution of lumbar segment (L1-L5) (VS vs NL p<0.05, TE averaged 23.7±8.1° in NL-Group, (L1-L5: 54.5±26.3%) and 22.6±8.1° in AS-Group (L1-L5: 60.8±30.6%) (p<0.05). NL group ETR was 3.4±2.7° during SB and 3.6±2.0° during TE (p<0.05). In AS group, ETR was 3.4±1.5° during SB and 2.9±2.0° during TE (p<0.05).

**Conclusions:** In an AS-Group of patients, the kinematic performance, and the ability to control spinal motion (SOM and ETR), was similar to a NL-Group. Mild to moderate scoliosis is not influencing the motor control of the spine. As previously shown in NL[3], physiotherapy programs for AS do not require more attention in trunk proprioception.

**References**

O33
Lyon bracing in adolescent females with idiopathic scoliosis: assessment of results according to the SRS committee on bracing and nonoperative management standardization criteria
AG Aulisa1,2, V Guzzanti1,3, P Persiano1,4, G Scuderi2,5, L Bocchino4,5, S Teramo6, L Aulisa1
1Orthopaedic Department, Children’s Hospital Bambino Gesù, Rome, Italy; 2Department of Orthopaedics, University Hospital “Agostino Gemelli”, Catholic University of the Sacred Heart, Rome, Italy
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Background: The Lyon brace, devised by Stagnara in 1950, is commonly prescribed in many European countries, and is based on the three-point pressure system. The Lyon brace also applies derotational forces to the spine, with the main thoracic plate pushing the hump from the posterior convexity toward the anterior concavity of the scoliotic curve. Lyon bracing is considered to be an effective means for conservative treatment of scoliosis.

Aim: The purpose of the present study was to evaluate the efficacy of Lyon bracing in the correction of thoracic curves, in agreement with the Scoliosis Research Society (SRS) Committee on Bracing and Nonoperative Management Standardisation Criteria.

Methods: Sixty-eight adolescent females (mean age 11.8 ± 0.5 years) with a thoracic curve and a pre-treatment Risser score ranging from 0 to 2 were enrolled. All patients were prescribed with full-time Lyon bracing. The minimum duration of follow-up was 24 months (mean: 36.4 ± 27.0 months). Antero-posterior radiographs were used to estimate the curve magnitude (CM) at 5 time points: beginning of treatment (t1), one year after the beginning of treatment (t2), intermediate time between t1 and t4 (t3), end of weaning (t4), 2-year minimum follow-up from t4 (t5). Three situations were distinguished: curve correction, curve stabilization and curve progression.

Results: CM mean value was 34.1 ± 7.4 SD at t1 and 23.1 ± 10.4 SD at t5. Curve correction was accomplished in 83.8 % of patients, whereas a curve stabilization was obtained in 16.2 % of patients. None of the patients experienced a curve progression.

Conclusion: The Lyon brace, due to its biomechanical action on vertebral modelling, is highly effective in correcting thoracic curves.

References

O34
Prospective study of 136 adolescent scoliosis of more than 40° treated with the Lyon brace
JC De Mauroy
Clinique du Parc, Lyon, France
Scoliosis 2013, 8(Suppl 1):O34

Background: Due to a lack of prospective studies, which are difficult to perform, bracing adolescent scoliosis is discussed from 30°, and sometimes surgery is proposed at this angulation. It seems interesting to study the results of scoliosis over 40° with the Lyon brace, and to present the criteria for successful treatment.

Aim: To prove the effectiveness of the Lyon conservative treatment in the most difficult conditions. If treatment is effective for scoliosis over 40°, it is even more so for lower angularities.

Methods: We selected in our prospective database a cohort of 176 adolescent scoliosis patients with curves over 40° seen between 1998 and 2007. At this angulation, the Lyon management involves 2 plaster casts, each worn for two months, and a full time Lyon brace up to 18 months after the end of the growth, and a specific program of physiotherapy (Lyon method).

Results: 24 patients (13.6%) did not accept the protocol and chose surgery. 11 patients (6.25%) discontinued during the treatment. 136 patients (136 females and 18 males) can be studied statistically. Mean initial angulation is 45.4° (±6.33); reducibility in plaster cast and brace is 50%. At follow up 2 years after weaning, angulation is 40.5° (±13.1). 61 patients (45%) improved by more than 5°, 27 patients (20%) are stables, 48 (35%) are worsening by more than 5°. The results are worse in boys (57% failure). 21 patients were evaluated 10 years after weaning of the brace. Mean progression during this period is 5° (0.5°/year) identical to that of the general adult scoliotic population. The best results are obtained when the lower vertebra is L3 (89%); the worst when the lower vertebra is T12 (53%). The two significant predictors of failure of conservative treatment are:
- A prior treatment (p>0.05).
- Early onset scoliosis (EOS) and non-idiopathic scoliosis (p>0.01).

Conclusions: Conservative treatment with Lyon brace and physiotherapy was effective in halting scoliosis progression in 65% of patients including prior treatments. The results of this study confirm that bracing is effective even after 40°. For EOS and non idiopathic, it allows waiting until end of growth for surgery.

References

O35
Brace treatment is effective in idiopathic scoliosis over 45°: a prospective controlled study
M Lusini1, S Donzelli2, F Zaina3, S Negri2,3
1ISCDO (Italian Scientific Spine Institute), Milan, Italy; 2University of Brescia, Brescia, Italy; 3IRCCS Don Gnocchi, Milan, Italy
Scoliosis 2013, 8(Suppl 1):O35

Background: Recently, positive results in bracing patients with idiopathic scoliosis (IS) above 45°, who refused surgery, have been presented in a retrospective study. Obviously, this can only give an efficacy analysis, since there is no control group, nor is it possible to know failures due to drop out.

Aim: To present the prospective results of bracing patients affected by IS above 45° and still growing.

Methods: Design is a prospective study including all IS patients with 45° or more, Risser 0-4, who had their first evaluation in our Institute from March 1st, 2003 to December 21st, 2010, and utterly deny any surgical intervention. Population: out of 59 patients, we excluded 2 still in treatment. 57 (11 males) were included, who at start of treatment had a mean of: 15.03±1.10 years of age, 52.5° Cobb (range 45-93°), and Risser 2 (0-4). Thirty-nine accepted a full-time brace treatment (BG) to try avoiding surgery, 18 served as controls (CG). Outcomes: radiographic and clinical data. Statistics: efficacy analysis in patients who completed treatment (38 in BG; 10 in CG). Failures: surgery, progression 6° or more; intent-to-treat (failures also drop-outs). In CG, we had 8 patients not retrievable: they were considered as positive results (no progression or surgery) in the intent-to-treat analysis.

Results: Efficacy analysis: Failures were 23.3% in BG, and 100% in CG. Intent-to-treat: failures were 20.5% in BG and 35.6% in CG. The Relative Risks (RR) of failure in CG were 4.5 (95% Interval Confidence - IC95: 3.6- 4.9) and 2.7 (IC95 2.0-3.5) respectively in the two analyses (P<0.05). Conversely, the RR of improvement were 1.6 (IC95 1.46-1.9) and 1.9 (IC95 1.6-2.2) (P<0.05). Patients joining treatment achieved a 10.4±10.7° Cobb improvement, an ATR reduction of 4.2±4.3°, and an aesthetic improvement of 2.8±1.9 points (TRACE). At the end of treatment, 24 patients were below 45°, including 6 of below 35°.
Conclusions: Through this study, we conclude that conservative brace treatment (if correctly performed and managed) is a suitable alternative for those patients who reject any surgical intervention for idiopathic scoliosis above 45°. Indeed, this treatment largely provides excellent results, and in most cases stabilises the curve, with a subsequent improvement of the Cobb degrees and TRACe levels.

Reference

O36
Prospective study according to the SRS and SOSORT criteria on the effectiveness of a complete conservative treatment (bracing and exercises) for adolescent idiopathic scoliosis: efficacy and intent-to-treat analysis
S Negrini1,*, S Donzelli2, F Zaina3
1University of Brescia, Brescia, Italy; 2IRCCS Don Gnocchi, Milan, Italy; 3ISICO (Italian Scientific Spine Institute), Milan, Italy
Scoliosis 2013; 8(Suppl 1):036

Background: A Cochrane review suggests that, beyond RCTs, studies according to the SRS and SOSORT criteria are tools to obtain evidence on the effectiveness of bracing for adolescent idiopathic scoliosis (AIS). Even though the SRS criteria propose to follow a prospective design, until now only one of 6 published studies was prospective.

Aim: Present prospective results of bracing completely following the SRS and SOSORT criteria.

Methods: Study Design: Prospective - data extraction from a clinical database started in 2003. Population: According to SRS inclusion criteria (AIS, age 10 years or older; Risser test 0-2; Cobb degrees 25-40°; no prior treatment; less than one year post-menarche). 73 patients (60 females - 82.2% - and 13 males - 17.8%) have been included, age 12 years 10 months ± 17 months, with 39 single, 32 double, and 2 triple curves. Methods: Braces have been personalized (Sibilla 61.6%, Lyon 16.4%, Sforzesco 13.7%, SpineCor 6.8%). At the start of treatment, 30 patients used the brace 22-23 hours per day (h/d), 22 for 20-21 h/d, and 21 for 16-18 h/d; weaning was gradual after Risser 3; all patients performed exercises; SOSORT management criteria were respected. Outcome: SRS (unchanged; worsened 6° or more; over 45° at the end of treatment; surgically treated) and rate of improvement (6° or more); radiographic and clinical data. Analyses: overall results at the last evaluation of all patients. Intent-to-treat: failures included all drop-outs (treatment stopped before Risser 3, or without medical indication). Efficacy: end-of-treatment patients.

Results: Median reported compliance for patients that completed the 3 years 4 months ± 20 months of treatment was 99.1% (range 22.2-109.2%). Overall, 7 (9.6%) patients worsened, 1 (1.4%) progressed beyond 45° and was fused; 46 patients (49.3%) improved, others were stable. Intent-to-treat: failures were 11 (15.1%); at start, they had statistically significant low BMI and kyphosis, high thoracic ATR and °Cobb, and they showed reduced compliance and years of treatment. Successes had statistically significant improvements in all parameters. Failures also improved, but not statistically.

Conclusions: This study confirms the efficacy of conservative treatment respecting SRS/SCOR/SCORT criteria. Considering drop-outs as failures, even if they discontinued therapy with 22.7° (range 16-34°) scoliosis at Risser 1.3±1 stage, the rate of failure increased from 1.4% to 15.1%.

References

O37
A comparison approach to explain risks related to x-ray imaging for scoliosis
N Pace1,*, L Rizza2
1BIOtech - Interdepartmental Center on Biomedical Technologies, Università di Trento, Trento, Italy; 2Dipartimento di Fisica,Università di Trento, Trento, Italy
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Background: X-ray imaging is frequently used as a diagnostic approach for scoliosis in children and adolescents. X-ray procedures are justified only when expected benefits exceed related risks. While benefits are well known to physicians, radiological risk awareness can be vague, impeding an optimal communication with patients’ parents, and possibly leading to discomfort and anxiety.

Aim: To suggest a risk comparison approach for better communicating the radiological risks related to X-ray investigation of scoliosis.

Methods: Starting point of the analysis is the Linear Non Threshold (LNT) assumption for radiation stochastic effect [1]; for effective doses (E) below 100 mSv, the probability of future stochastic damage is linearly related to E. This allows to add E from different sources to calculate a cumulative risk of health detriment. Data coming from literature were gathered to determine the average E delivered during X-ray investigation of scoliosis. Subsequently, the major natural sources of radiation, namely cosmic rays, 40K, 222Rn and other radionuclides, were considered. The average E due to these natural sources was compared with E due to the imaging of the vertebral column.

Results: For a single standard scoliosis radiographic examination [2], E ranges from 0.2 to 0.35 mSv [3]. Therefore, the LNT assumption can be used. The main natural radiation source is 222Rn, which on average accounts for 1.2 mSv / y (range 0.2 +/-0.1 mSv / y). Cosmic rays (0.4 mSv / y, range 0.3 +/-1.0) and terrestrial gamma rays from other radionuclides (0.8 mSv / y, range 0.3 +/-1.4) are additional sources of natural radiation. Moreover, flying from Europe to North America accounts for 0.03-0.05 mSv, and because of the unavoidable presence of 40K, consuming 1000 bananas, or carrots, accounts for approx. 0.1 mSv. Overall, 65% of the world population is expected to be exposed to an annual E between 1 and 3 mSv (average 2.4 mSv) [1].

Conclusions: Data coming from literature show how, on average, the effective annual dose coming from natural sources greatly exceeds the effective dose due to x-ray imaging for scoliosis. This information can play a key role in the relationship between physicians and patients.

References

O38
The effect of radiographic vertebral body and intervertebral disc wedging on curve progression in idiopathic scoliosis
R Volz’, LA Dolan, F Masrouha, SL Weinstein
University of Iowa, IA, USA
Scoliosis 2013; 8(Suppl 1):O38

Background: Wedging of the apical vertebral body and the intervertebral disc are well-known characteristics of adolescent idiopathic scoliosis (AIS). Development of AIS may be secondary to vertebral wedging caused by primary abnormalities of the vertebral growth plate. Several studies have examined the relationship of vertebral body and disc wedging with scoliosis curve progression.

Aim: To estimate the reproducibility of apical vertebral and disc wedging, the correlation between wedging and Cobb angle, and the role of vertebral wedging in curve progression after skeletal maturity.

Methods: Baseline and 30-year follow-up x-rays from 56 AIS patients were evaluated. Wedging measurements included apical vertebral body height ratios (VBHR), apical vertebral body angles (VBA) and apical wedging.
Intra-rater tolerance limits were: VBHR ±12%; VBA ±7°; IVDA ±7°. Inter-rater tolerance limits were significantly larger: VBHR ±23%; VBA ±11°; IVDA ±11°. Cobb angles were moderately correlated with wedging at baseline (VBHR -0.51; VBA 0.46; IVDA 0.40) and with the VBHR at follow-up (-0.65). Average curve progression was 18° (range -11° - 126°). The average change in VBHR over time was ~5%. Adding VBHR to a regression equation including baseline Cobb angle, age, Risser and years of follow-up improved prediction of the future Cobb angle (increase in adjusted R2 from 0.65 to 0.71).

Conclusions: This study provides tolerance limits to judge if a true change in apical vertebral or apical disc wedging has occurred. These limits should be considered when evaluating bracing or other procedures which potentially unload the spine and affect wedging. Wedging measured using vertebral height ratios was much more reliable than when measured using angles. Despite the average curve progression of 18°, there was no appreciable change in vertebral wedging over time. Clinicians and researchers should consider including vertebral height ratios when estimating long-term curve progression in AIS patients.

References:

O39
Different material for the SPoRT concept brace: short term comparison of Sforzesco and Sibilla brace
F Zaina1, S Donzelli2, M Lusini1, S Negri1,2
1ISICO (Italian Scientific Spine Institute), Milan, Italy; 2Siena University, Siena, Italy; 3University of Brescia, Brescia, Italy; 4IRCSS Don Gnocchi, Milan, Italy
Scoliosis 2013, 8(Suppl 1):O39

Background: SPoRT braces include the Sforzesco and the Sibilla Brace. The difference in the two consists in the material; Sforzesco is more rigid, and thus used in more severe and rigid curves.

Aim: To compare the short term results of the Sforzesco and the Sibilla to check the influence of the material.

Methods: Design: retrospective pre-post study. Protocol: in our database we searched for all patients who were prescribed a Sibilla, or Sforzesco Brace, 21h per day or more for AIS, 35° Cobb, more than 10 years old at first evaluation, and no previous brace treatment. We compared data from the last visit before beginning the brace, and the first visit after 6 months of brace treatment. Sforzesco group (SF-G): 78 patients (10 males), age13.6±1.6, 32.9±1.9° Cobb, TRACE 6 - 5.8 (median, IQ), ATR 10.8±3° Bunnell, Risser 0.5; 0-2 (median, IQ), BMI 19.24. Sibilla Group (SI-G): 44 patients (5 males), age 12.6±1.6, 32.1±1.6° Cobb, TRACE 6.5±4.7, ATR 9.4±2.9° Bunnell, Risser 2; 1-3, BMI 19.34. Outcome measure: Cobb angle, TRACE, ATR. Statistical Analysis: ANOVA Chi Square, P<0.05.

Results: The SF-G had statistically significant larger curves, and larger ATR, more rigid spines, and slightly older, but the difference was not clinically relevant. The average wearing hour for the brace was 20 h for both groups. Both groups improved the Cobb angle (26.4° Sforzesco vs 25.2° Sibilla), TRACE (3.34 vs 4) and ATR (7.6 vs 6.1). No difference was statistically significant. Rigidity, BMI, ATR and initial Risser didn’t affect the Cobb correction.

Conclusion: Both SPoRT braces can improve curves between 30-35° in the short term. No differences have been noticed, so we can conclude that in this population the rigidity of the material doesn’t affect the result. It’s possible that for larger curves the difference would be more relevant, but we need further studies to verify.

References:

O40
Comparison of in-brace correction between supine, molded, asymmetric TLSOs and standing, CAD, symmetric TLSOs
D Speros, Scheck and Sissex Orthotics and Prosthetics, Chicago, IL, USA
Scoliosis 2013, 8(Suppl 1):O40

Background: Bracing for adolescent idiopathic scoliosis is a major component of conservative care. Many different brace designs exist, but they all must place corrective forces on the apex of the curves.

Aim: To determine whether asymmetric braces, molded supine, with manipulation during casting, compared to symmetric CAD designs, measured standing, offered better in brace correction.

Methods: 34 females (ages 7 – 14) with adolescent idiopathic scoliosis were treated with a TLSO, and initial in brace radiographs were evaluated for correction of the curves. 22 received a symmetrical, posterior open CAD design made from standing measurements, and 12 received an asymmetric, posterior open design made from a supine casting with correction of the curve(s) applied during casting.

Results: For the 22 symmetric CAD TLSOs, initial in brace correction of thoracic curves was 9.1 degrees, with average out of brace thoracic curve 25.2 degrees, and lumbar curve correction of 10.3 degrees, with average out of brace lumbar curve 27.8 degrees. The percentage of correction in CAD versions was 36.1% thoracic, and 37.1% lumbar. For the 12 asymmetric, TLSOs molded supine with manipulation, initial in brace correction of thoracic curves was 13.3 degrees, with average out of brace thoracic curve 26.7 degrees, and lumbar curve correction of 12.1 degrees, with average out of brace lumbar curve 26.6 degrees. The percentage of correction in supine, molded TLSOs was 49.8% thoracic, and 45.5% lumbar.

Conclusion: Supine, molded posterior TLSOs with correction during casting provide greater initial in brace correction of both lumbar and thoracic curves compared to posterior open, symmetric, CAD designs made from standing measurements.

References:

O41
CAD/CAM and biomechanical simulations vs. standard technique for the design of braces in adolescent idiopathic scoliosis: first results
F Desbiens-Blais1*, J Aubin CE, Parent S, Labelle H, CE Aubin1
1Ecole Polytechnique de Montreal, Montreal, Canada; 2CHU Sainte-Justine, Montreal, Canada
Scoliosis 2013, 8(Suppl 1):O41

Background: Brace design is mostly done using empirical methods. Recent advances in CAD/CAM and computer biomechanical simulations now allow designing, optimizing and fabricating a novel generation of braces with expected biomechanical improvements [9].
Aim: This study aims at comparing the effectiveness of this new brace design technique to a standard technique (TLSO) system for the treatment of adolescent idiopathic scoliosis (AIS).

Methods: So far, 4 AIS patients were recruited. Two braces were built for each patient: 1) a standard TLSO designed using the plaster-cast method (Std Brace), and 2) a brace designed and fabricated using a biomechanical 3D finite element model personalized to the patient’s geometry, and a CAD/CAM software (NewBrace). NewBrace was optimized using a computational brace simulator that allows virtual installation of the brace on the patient model, and prediction of its effect before fabrication. Several virtual braces were thus iteratively tested, and the one giving the best immediate correction was chosen for refinement by the orthotist, and fabricated using a computer-aided carver. Immediate brace effectiveness was assessed using radiographs in both braces.

Results: For the first 4 patients, the Std Brace corrected the thoracic and lumbar Cobb angles by 51% and 45% respectively, while NewBrace corrected these angles by 41% and 48%. There was little effect of the sagittal curves, and both braces maintained the coronal balance. The patients were more comfortable in the NewBrace. The predictions of the brace simulator were found to be reliable.

Conclusion: These first results showed the feasibility of a new technique, to design braces using a biomechanical simulation tool, and assess their effectiveness with respect to current design standards. The optimization process of the brace design is currently being improved. An extended study on more cases (10 to 15 patients should be included in the study before May) is under way to fully assess this new design paradigm.

Reference

042 It is possible to maintain a high compliance even in the long term: results from the Thermobrace study
S Donzelli 1, F Zaina 2, S Negrini 2.
1ISICO (Italian Scientific Spine Institute), Milan, Italy. 2University of Brescia, Brescia, Italy. 3RCCS Don Gnocchi, Milan, Italy
Scoliosis 2013, 8(Suppl 1):O42

Background: The importance of compliance monitors is well known: in a previous study, it has been demonstrated that it is possible to obtain a good real compliance (close to the referred one); in a setting respecting SOORT criteria for bracing. Still, we don’t know if, in the long term, compliance remains stable.

Aim: To verify if it is possible to maintain good brace compliance for scoliosis patients, and evaluate what factors could influence the adherence to the treatment in the long term.

Methods: Population. Prospective cohort of 98 Adolescents with spinal deformities (19 males) that have been monitored with a heat sensor (Thermobrace) at least twice: 94.9% had AIS. The average monitoring period was: 591.33 ± 119.31 days. All patients were treated with brace according to the SpO2RT concept, with a prescription from 8 to 23 hours per day; and SEAS exercises; team approach followed the SOORT Bracing Management Guidelines.

Results: Referred compliance remained close to the real, even in the long period. Most of the patients remained within 2 hours from the prescription. Median compliance was 92.3% (IC 95% 58.8-100.8) for the first download; for the second download the median was 92.8% (IC 95% 45.06-102.5%); for the third download the median was 95.5% (IC95% 58.1-105.5) for the fourth download the median compliance was 93.70 (IC95% 76.9-100.8) for all periods it was 94.6% (Range 9.0-118.9%). At first download 53.6% of the patients had at least 90% real compliance; this percentage showed a tendency to increase at the second check (60.9%; P=0.11), remaining at 59.6% at the third. In this sample, gender, age, Risser, curve magnitude, and brace type did not influence compliance. When the wearing period begins, compliance increases; in patients who need to continue with a full time prescription, compliance slightly decreases, even if it remains over 80%.

Conclusion: It is possible to maintain a high compliance, even in the long term; this underlines the importance of the treating team, whose aim is to guarantee good end of growth results. A longer period of monitoring is needed to clearly recognize factors influencing compliance.

References

043 Good brace compliance, reduced curve progression, and surgical rates in patients with idiopathic scoliosis
Jl Brox, J. Lange, RB Gunderson, H. Steen
Oslo University Hospital, Oslo, Norway
Scoliosis 2013, 8(Suppl 1):O43

Aim: To examine the association between brace compliance and outcome.

Methods: 495 (457 female) patients with late onset juvenile and adolescent idiopathic scoliosis were examined prospectively, before bracing, and at least 2 years after brace weaning. One spine surgeon examined all patients. 381 (353 females) answered a standardised questionnaire, and 355 had radiological examination after median 24 years. Compliance was defined as brace wear > 20 hours daily until weaning. Main outcomes were curve progression and surgery.

Results: At weaning, 76/389 compliers and 59/106 non-compliers had curve progression,1 6° (OR: 5.2; 95% CI: 3.3 to 8.2). At long-term, the numbers were 68/284 and 46/71 (OR: 5.8; 95% CI: 3.3 to 10.2), and 10/284 versus 17/71 had been operated (OR: 8.6; 95% CI: 3.7 to 19.9).

Conclusion: We conclude that the risk for curve progression, and surgery, are reduced in patients with good brace compliance.

Reference

044 Outcome of Rigo-Chêneau type brace treatment for adolescent idiopathic scoliosis - using the Scoliosis Research Society brace studies inclusion criteria
T Maruyama, H Yamada, Y Nakao
Dept of Orthopaedic Surgery, Saitama Medical Center, Saitama Medical University, Saitama, Japan
Scoliosis 2013, 8(Suppl 1):O44

Background: We have been using Rigo-Chêneau type brace for the treatment of idiopathic scoliosis since 2007. Curves other than the upper thoracic main curve were the subjects of the treatment. To analyze the outcomes of the brace treatment, use of the standardized inclusion criteria is essential.

Aim: To evaluate outcomes of Rigo-Chêneau type brace treatment using the Scoliosis Research Society (SRS) AIS brace studies inclusion criteria, which includes patients with age 10 years or older when the brace is prescribed, Risser 0-4, primary curve magnitude 25°-40°, and no prior treatment.

Results: A total of 32 patients, 27 females and 5 males, met the SRS inclusion criteria. Average age at the beginning of the treatment was 12.0 years (10 to 15). Risser sign was 0 in 13, 1 in 7, and 2 in 12 patients. Curve pattern was thoracic (T) in 12, thoracolumbar or lumbar (TL) in 12 and double (D) in 8 patients. Average Cobb angle before treatment was 30.9°. Initial correction rate by the brace was 53.5% on an average (42.4% for T, 77.4% for TL, and 34.8% for D curve). Most patients wore their brace as part-time, at home or at night. The average follow-up period was 19 months. Of 32 patients, 15 reached skeletal maturity during the treatment period. Four of them (27%) progressed more than 6°, and two of them (13%) exceeded 45°. Only one patient underwent surgical treatment during the study period.
Conclusion: Although the number of patients who reached skeletal maturity was relatively small, 73% of their curve could be stabilized by the treatment. Rigo-Chêneau type brace was effective for the treatment of adolescent idiopathic scoliosis.

Reference

O45 Side effects of braces; a cross-sectional survey
M Tavenera,1 F Tessadri,1 A Zonta,1 S Negrini2 1ISICO (Italian Scientific Spine Institute), Milan, Italy; 2Orthotecnia, Trento, Italy; 3University of Brescia, Brescia, Italy; 4IRCSc Don Gnocchi, Milan, Italy
Scoliosis 2013, 8(Suppl 1):O45

Background: Any therapeutic intervention causes side effects, that should be taken into account when prescribing it, and explained to patients and families to reach an informed consent to treatment. In the field of bracing, only psychological impact has been considered and, until now, as far as we know, nobody presented results on the bodily consequences of brace wearing.

Aim: To check through a questionnaire the bodily side effects of bracing.

Methods: Design: cross-sectional survey. Methods: a specific questionnaire has been developed and validated to evaluate the following domains: skin, respiration, mobility, Activities of Daily Life. The questionnaire was sent by emails to 1351 idiopathic scoliosis or hyperkyphosis patients of age between 10 and 18, including also patients not braced to have a control group; response rate was 11.0%. Population: 170 patients, 75.3% females, age 14±2.0: 30 controls (CG) and 140 braced (BG) for 1.1 years, either with SpineCor (BG-S n=14) or rigid orthosis (BG-R n=126); the last group was also divided into TLSO (BG-T n=104) and LSO (BG-L n=22). We compared each answer and the average indexes of all domains.

Results: The median of answers was never (100%) in CG; “sometimes” (13%), “almost never” (29%); and “never” (58%) in BG, where the answer “always” reached a maximum of 22.1% in one question (minimum 0.7%). BG and all BG subgroups had almost all answers, and all indexes, statistically significantly higher than CG. Conversely, there were almost no differences between the different BG subgroups: BG-S and BG-L had low samples, and some tendencies to differences among sub-groups. It is possible to conclude that there are bodily low-degree (maximum “sometimes”) side-effects of braces, with specific differences according to the brace used; moreover, no brace is without side-effect.

References

O46 Effect of Spinecor brace on pulmonary functions
O Enen,1 M Can,2 E Ozgu,3 B Bigc,4 A Sehrilug4 Gulhane Military Medical Academy, Ankara, Turkey
Scoliosis 2013, 8(Suppl 1):O46

Background: Brace treatment in idiopathic scoliosis is the only efficacious method of non operative treatment. The effect of dynamic SpineCor brace on pulmonary functions is not documented.

Aim: The aim of this study is to evaluate the immediate effect of SpineCor brace on pulmonary functions.

Methods: A total of 76 consecutive adolescent idiopathic scoliosis patients who were treated with brace included in this study. 20 of 45 patients who were treated with SpineCor brace, and 13 of 31 patients who were treated with rigid brace, were able to finish pulmonary function test (PFT). PFT is administered to 33 patients before and immediately after wearing the brace. TLC, RV, RV/TLC, FVC, FEV1, FEV1/FVC, FEF25-75 parameters of PFT are compared between SpineCor and rigid brace patients.

Results: Average age of SpineCor group was 12.6, and average age of rigid brace group was 12.3. Cobb angle was 36± 7° in SpineCor group, and 36±6° in rigid. According to pulmonary function tests, there were no differences between the groups. After wearing the brace, in both groups, restrictive changes were seen, and there were no statistical difference between groups, except FEV1 parameter (p=0,023).

Conclusions: Although SpineCor brace is a non rigid dynamic brace, it has a similar restrictive effect on pulmonary functions like rigid braces. Further studies with larger groups are needed.

References

O47 A prospective interventional cohort study of 175 patients treated by the Spinecor orthosis, following the Scoliosis Research Society Criteria
C Coillard1, A Circo, CR Rivard
Ste-Justine Hospital, Montreal, Canada
Scoliosis 2013, 8(Suppl 1):O47

Background: The mainstay of the conservative treatment still remains the orthosis, which was demonstrated to provide a reduction of curve progression, possibly a decrease in the need for surgery, and sometimes a correction of the existing deformity. The effectiveness of the SpineCor orthosis compared with the natural history of the disease has already been shown for milder and moderate curves[1].

Aim: To provide confirmation on the demonstrated effectiveness of the Dynamic SpineCor orthosis for adolescent idiopathic scoliosis, following the standardized criteria proposed by the SRS Committee on Bracing and Nonoperative Management[2], and to confirm the stability of the results two years after the end of the treatment.

Method: From 1993 to 2011, 390 patients treated using the SpineCor orthosis respected the criteria for inclusion recommended by the SRS committee. 198 have a definitive outcome, and 175 have at least 2 years of follow-up. Assessment of brace effectiveness included: 1) percentage of patients who have 5 degree or less curve progression, and the percentage of patients who have 6 degree or more progression at skeletal maturity, 2) percentage of patients who have had surgery recommended/undergone before skeletal maturity, 3) percentage of patients with curves exceeding 45 degree at maturity (end of treatment) and 4) 2-years follow-up beyond maturity to determine the percentage of patients who subsequently underwent surgery.

Results: At two years post skeletal maturity, successful treatment (correction >5 degree or stabilization ±5 degree) was achieved in 100 patients of the 175 patients (57.2%) from the time of the fitting of the SpineCor orthosis to the 2 years follow-up point. 41 immature patients (23.4 %) required surgical fusion,34 while receiving treatment and 5 in the follow-up period.

Conclusions: The SpineCor orthosis is effective for the treatment of adolescent idiopathic scoliosis. Positive outcomes are maintained after the weaning of the orthosis, since 86.1% of the patients stabilized or corrected their Cobb angle. Moreover, out of the 86.1%, 11.7 % of the patients still had correction of their Cobb angle 2 years after the end of the treatment.

References
Evaluation of TLSOS in the bracing in adolescent idiopathic scoliosis trial (BrAIST)
LA Dolan, KA Haggerty, SL Weinstein, BrAIST Study Team
University of Iowa Department of Orthopedics and Rehabilitation, Iowa City, IA, USA
Scoliosis 2013, 8(Suppl 1):O48

Background: The success of TLSOs in reducing the risk of curve progression varies widely across published reports. This variation has been linked to patient risk factors such as initial Cobb angle and maturity, and time in brace. Percentage correction has also been associated with outcomes. However, no reports have examined characteristics of individual braces, and how these characteristics influence percentage correction, compliance, and eventual outcome.

Aims: To report the BrAIST Bracing Evaluation Committee findings to date.

Methods: BrAIST includes evaluation of the bracing customization process and immediate outcome of each brace worn in the trial. Each is reviewed by an independent committee of at least 2 orthotists, and 2 pediatric orthopedic surgeons. The committee reviews all orthotist reports and pertinent radiographs (in-brace, initial out-brace and side-bending films). Customization process indicators include brace trimlines, pad placement, total contact fit, and upper thoracic alignment. Outcome indicators include curve correction relative to flexibility and decompensation. Overall process and outcome are classified as either “satisfactory” or “unsatisfactory” based on committee consensus. In case of a tie, the classification is based on the orthotists’ evaluation.

Results: 76 braces were reviewed from 20 institutions. In general, the orthotists responded with more detailed and critical comments than the surgeons. 62% of brace had a “satisfactory” customization process, and 63% a “satisfactory” immediate outcome. The average correction was 33%; only 25% of the braces resulted in >50% correction. Satisfactory process was associated with greater in-brace curve correction. In all but 7%, both the process and outcome carried the same evaluation. Process and outcome varied greatly across institutions, but the number of reviews is too small at this time to draw any conclusions.

Conclusions: Only 40% of the braces have been reviewed, but there is a clear trend linking proper customization process with the immediate outcome. The majority of braces did not achieve the goal of 50% correction suggested by the literature. Variation between centers indicates that not all orthotists are equally skilled at brace customization.

References:

Brace efficacy: meta-analysis of studies conducted according to the SRS criteria for brace studies

F Zaina1*, S Donzelli1, M Lusini1, N Negri1,4
1ISICO (Italian Scientific Spine Institute), Milan, Italy; 2Siena University, Siena, Italy; 3University of Brescia, Brescia, Italy; 4IRCCS Don Gnocchi, Milan, Italy
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Background: Bracing efficacy is questioned, since data are very variable, and comparisons are difficult, due to the lack of standard research protocols. The SRS criteria for bracing studies (SRS-C) aimed at comparing different braces, while the SOSORT Management criteria aimed at verifying the quality of brace treatment.

Aim: To compare the results of studies performed according to SRS-C, and to perform a meta-analysis.

Methods: Design: systematic review and meta-analysis. Inclusion criteria: studies respecting SRS criteria for bracing studies. Protocol: an electronic search was performed in Medline to retrieve all the articles respecting the SRS-C. Data have been pooled, and subgroup analyses for comparisons. Odds ratios were calculated.

Results: 5 studies have been included (4 retrospective, one prospective), with a total of 416 patients, Cobb Angle range 25-40°, Risser 0-2, more
than 10 years old, and less than 1 year post menarche at baseline. Pooling data, we had 40% of patients worsened >36° Cobb, including 27% with curves over 45°; 30% of patients were fused. Making subgroup analysis, we compared rigid braces managed according to SOSORT Criteria (SOSORT-C), with rigid braces managed without: 2% worsened (OR: 95.21; CI 93.75-96.66), without any patients exceeding 45°, or fused, versus 67% worsened (44%-45°Cobb), and 55% fused. Comparing rigid braces altogether with SpineCor, we had similar efficacy, 38% vs 42% worsened (24% vs 31% >45°), 30% vs 29% fused. We had better results for papers respecting SOSORT-C, intermediate for SpineCor, and the worst for the other rigid braces papers with significant OR.

Conclusion: Pooling data, from studies respecting the SRS-C, showed rate of efficacy that can alter favorably the natural history of AIS, 40% of worsening in high risk patients versus 60-68% described in literature. The SOSORT-C appears fundamental to obtain good results: when they are fulfilled, progression rate is close to zero; when they are not, the efficacy is significantly lower than the one of a soft brace (SpineCor). Bracing is not only a matter of technical efficacy, but also a matter of management. Data from this meta-analysis support the use of braces to change scoliosis natural history, and reduce the rate of surgery.

References

OS2
Conservative treatment of juvenile with Chiari I malformation, syringomyelia and scoliosis. Two case reports
M Rigo1, B Jansen2, R Campo3, L Tremonti4
1Institut Elena Salva, Barcelona, Spain; 2ScoliosisRehab, Stevens-Point, Wisconsin, USA
Scoliosis 2013, 8(Suppl 1):OS2

Background: Scoliosis improvement after surgical treatment of Chiari I and syrinx has been reported [1]. Incidence of scoliosis progression after decompression surgery has been reported as high as 48%. The conservative treatment with brace in these patients is not effective and scoliosis is typically progressive [2]. Spontaneous resolution of CT syrinx and Chiari I in paediatric population is uncommon. We have previously published a unique case report of an 8-year-old girl, showing resolution of syrinx and Chiari I, as well as scoliosis reduction of scoliosis during brace treatment [3]. We present results after longer follow up, together with a new case of good response to bracing, in a girl showing scoliosis progression after neurosurgical treatment.

Case Presentation: First case presentation: A 7-year-old girl who showed scoliosis progression from 44° to 55° six months after neurosurgical decompression to treat Chiari I (10-11 mm tonsillar ectopia) associated with C5-T11 syrinx was subsequently recommend going under scoliosis surgery (rejected). Eight months following neurosurgery, patient began full-time treatment with a Cheneau type brace (RSC). She started later a program of specific exercises based on Schroth-Barcelona (BSPTS). At 12 years of age (5 years follow-up) she shows a 6° main thoracic curve in her 4th brace, although still at Risser 0. Formetric reports a totally regressed back asymmetry and physiological sagittal profile. The patient is asymptomatic and continues full time bracing and exercises.

Second case presentation: A 13-year-old girl started full time bracing when she was 8 years old, after showing progression from 36° to 47° in five months in her right thoracic scoliosis associated with symptomatic Chiari I and C4-T9-10 syrinx. She showed spontaneous resolution of Chiari I and almost resolution of syrinx with no recurrence, and good response to bracing. At five years follow-up she continues partial-time bracing (16 H) and BSPTS exercises, asymptomatic, with a main thoracic curve of 17° (combined with 17° functional left lumbar), one-year post-menarche and Risser 3. Back asymmetry is totally regressed and sagittal profile physiologic.

Conclusion: Conservative treatment should be considered in patients with Chiari I/syrinx associated to progressive scoliosis, prior to or post-neurosurgical intervention, and prior to scoliosis surgery.

References

OS3
Using of Cheneau brace for early onset scoliosis treatment
D Chekryzhev, A Mezentsev, D Petrenko
Sytenko Institute of Spine and Joint Pathology, Orthospine LTD, Kharkiv, Ukraine
Scoliosis 2013, 8(Suppl 1):OS3

References
3. LM RWM: Spontaneous resolution of a Chiari malformation and cervicothoracic syrinx in a 9 years old girl with a 4th° scoliosis responding favorably to bracing. scoliosis 2009, 4(suppl) 110-58.
Background: Casting, halo-traction [1,2], Milwaukee or TLSO braces [1,3] are routinely used for the conservative treatment of early onset scoliosis (EOS). Some authors use brace only in a case of congenital scoliosis absence.

Aim: The purpose of this study is to assess outcomes of Chêneau brace use in EOS patients.

Methods: This is a prospective study of clinical outcomes in 17 EOS patients treated with Chêneau brace. Mean age was 4.3 years old. Follow-up was 2-7 years. There were 3 males and 14 females. 3 patients had mixed spinal anomaly (1st group), 10 patients had wedge hemivertebra (2nd group) and 4 patients had infantile idiopathic scoliosis (3rd group).

Results: Before treatment initiation, Cobb angle in the 1st group was 52.3° (43°-60°), in the 2nd group 33.2° (25°-48°), and in the 3rd group 40° (24°-75°). After 6 years follow-up on the 1st group, 1 patient had 7° correction, 1 patient had 8° progression and 1 patient had stable deformity. In the 2nd group, mean correction was 3° (2°-15°) and 8.75° (0°-30°) in the 3rd group.

Conclusion: Using a Chêneau brace results in getting EOS correction in 7 (41%) cases, stabilized deformity in 8 cases (47%), and in 2 (12%) cases progression was delayed. The results are the best we get in patients with infantile idiopathic scoliosis.

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OS5
An online survey investigating the information needs of adolescent idiopathic scoliosis patients and their families: preliminary results
S Wellburn1, J Bettany-Saltikov, S Hamilton Teesside University, Middlesbrough, UK
Scoliosis 2013, 8(Suppl 1):OS5

Background: Government policy documents have identified the need for good information for patients; a notion supported throughout the literature, in particular the need for written information. Despite a reported wealth of information provided, the majority of parents have a high expectation of written information. The need for reliable information to address the information requirements of patients and their families is consistently noted in the literature. A preliminary review of the literature regarding scoliosis did not find any studies that have investigated service users perspectives of what should be provided as written information. This would suggest that the information materials produced by scoliosis centres are based on what health professionals think the patients need to know rather than what they actually want to know.

Aim: To investigate the information needs of AIS patients and their families, from a national perspective.

Methods: A survey was conducted that consisted of 18 questions in total; these comprised pre-suggested responses for respondents to select and open-ended text boxes to illicit respondents perspectives. A link to the survey was attached to the Scoliosis Association UK Web site in order that visitors to the site could complete the survey.

Results: Twenty-two responses were received from 18 different postcode regions. Analysis showed a mean age of 12 years old, 82% of whom were female with 77% completing the survey with their parents, 23% on their own. The most common curve type was thoracic (45%) and over 80% had curves greater than 30 degrees at first diagnosis. Variability between centres in the quality of information received by respondents was suggested by respondents ratings of materials and information received.

Conclusion: Patients, and their carers, identified a need for additional information, and that verbal information was not sufficient as a standalone model. It was advocated that information should be made accessible between GP referral and first consultation with the consultant. It was recommended that in all formats information provided should be user friendly and in plain language. The opportunity to communicate with other AIS patients was suggested to be a potentially valuable resource.

References

OS6
The effects of scoliosis bracing on parent and child perception of adolescent’s quality of life
P Knott1, C Anderson, M Werner, H Wilson, D Speers Rosalind Franklin University of Medicine, Chicago, USA
Scoliosis 2013, 8(Suppl 1):OS6

Background: Improvement of quality of life is the most important reason for treating AIS, yet research on this topic is very limited with less than 2% of research on scoliosis including a QoL measurement [1]. The BrQ is a scoliosis quality of life survey that has been shown to be reliable, valid, and responsive to change in adolescents with AIS who are treated conservatively with bracing [2]. Although many studies have shown that adolescents with scoliosis have QoL indicators that are lower than their non-scoliosis
The goal of this study was to compare the BrQ results of adolescent patients with those of their parents to look at discrepancies between them.

Aim: The goal of this study was to compare the BrQ results of adolescent patients with those of their parents to look at discrepancies between them.

Methods: Thirteen consecutive patients with AIS returning to clinic for a follow-up visit, who had been wearing a TLSO brace for >3 months but <2 years, were recruited to participate. They were given a BrQ survey, and their parents were also given the same survey, with the wording changed to indicate that the questions were about the adolescent, and not the parent.

Results: The correlation between the overall BrQ scores between patient and parent were high (r = 0.79). When the sub-scores were evaluated, the scores for Emotion, Self Esteem, Social Functioning, and Bodily Pain correlated most strongly, General Health, Physical Functioning, Vitality, and School Activity correlated the weakest. Parent scores were higher than patient scores 80% of the time.

Conclusions: The subjective survey showed that although parent and patient scores were similar, the parent gives the adolescent higher scores than they give themselves.

References

OS57
Self image, stress level and quality of life in adolescents patients with idiopathic scoliosis
E Knieł1, T Kotwicki2, A Podałiska3, M Białecki4, W Styra1
1Department of Rehabilitation, University of Medical Sciences, Poznan, Poland; 2Department of Paediatric Orthopaedics and Traumatology, University of Medical Sciences, Poznan, Poland; 3HTS Center, Jawor, Poland
Scoliosis 2013, 8(Suppl 1):OS57

Background: Adolescent idiopathic scoliosis (AIS) is a complex and progressive condition, which can affect a patient’s quality of life (QoL).

Aim: The aim of the study was to evaluate the self-image, the stress level, and the quality of life in adolescents with idiopathic scoliosis, who are under brace treatment.

Methods: It involved 59 adolescents (50 girls, 9 boys), ages ranging between 10.0 and 17.0 years, all with Adolescent Idiopathic Scoliosis (AIS) with Cobb angle between 20-58 degrees. The adolescents were wearing the same kind of brace (Cheneau orthosis) for more than 6 months, for at least 16h per day. Three questionnaires were used: Trunk Appearance Perception Scale (TAPS), Bad Sobernheim Stress Questionnaire (BSSQ Brace, BSSQ Deformity), and Brace Questionnaire (BrQ). The TAPS is a tool to evaluate subjective impression of trunk deformity, which includes 3 sets of figures that depict the trunk, from 3 viewpoints: looking toward the back, looking toward the head with the patient bending over, and looking toward the front. BSSQ is the questionnaire that estimates the stress scoliosis patients have, whilst wearing their brace. The BrQ is an instrument for measuring quality of life of scoliotic adolescents, who are being treated conservatively, with wearing of a corrective brace. The analysis considered the type of treatment, curve location, correlation of the total scores with age, Cobb angle and Bunnell rotation angle.

Results: The age was 14.1 ± 1.7 years. Cobb angle was 33.2 ± 9.5 degrees. The TAPS median for the total score was 4. Adolescents revealed higher score with BSSQ Deformity (median = 14) comparing to BSSQ Brace (median = 11). The mean score for BrQ was 76.6 ± 12.1.

Conclusion: The adolescents who were under brace treatment suffered moderate level of stress from the deformity. Conservative treatment did not severely impact on the quality of life of scoliotic adolescents.

References

OS58
Use of kidscreen 52 questionnaire for quality of life evaluation in adolescents with idiopathic scoliosis after surgery
G Russov1*, O Audruple, J Oustis, A Vetra
Riga Stradins University, Riga, Latvia
Scoliosis 2013, 8(Suppl 1):OS58

Background: Improvement of patients quality of life is one of the main goals in the treatment of AIS. There are well known instruments to estimate the treatment outcomes for patients with AIS, such as SRS questionnaires. Although widely used with patients with AIS, there are still some important aspects of QoL less covered in those instruments. The KIDSCREEN-52-quality-of-life (KIDSCREEN-52-HRQOL) is a relevant, worldwide tool used for assessing the health-related quality of life in children and adolescents, and to compare the QoL of treated patients with healthy peers at the same age.

Aim: To describe and characterize health-related quality of life in girls with idiopathic scoliosis, after spine surgery, with the KIDSCREEN-52-HRQOL questionnaire.

Methods: Patients with idiopathic scoliosis completed an age-appropriate health-related quality of life questionnaire KIDSCREEN-52 test approved at country the research provided. The study involved 50 patients with AIS. Patients were 12-16 years old girls, post surgery. The results from this sample were compared with general population norms, taken from freely chosen peers without any orthopedic condition.

Results: The results where similar in the following blocks - "feelings", "family and home", "leisure", "school" and a "bad mood": AIS group had a higher scores at blocks as "to be happy as you are" = "feeling happy at home", "feel satisfied with life" and "happy to be alive". In the question blocks as "physical activity", "Self esteem" and "Money" AIS patients revealed lower results with statistically significant difference 24.8% (t = 13.237, p = 0.001), 16.3% (t = 8.923, p = 0.001) and 22.6% (t = 7.522, p = 0.001) respectively.

Conclusion: By using questionnaire KIDSCREEN 52, it is possible to compare HRQOL of AIS patients, after surgery, with the QoL of healthy peers, and reveal some aspects, not covered by widely used questionnaires, for estimation of treatment outcomes of AIS.

Reference

OS59
Findings from a small-scale, exploratory content analysis of information provided to AIS patients and their parents from NHS Scoliosis Hospital Clinics
L Arali, J Bettany-Saltikov, S Hamilton
Teesside University, Middlesbrough, UK
Scoliosis 2013, 8(Suppl 1):OS59

Background: The Patients Charter (1992) states that patients have a right to information about their condition. In patients with Adolescent Idiopathic Scoliosis (AIS) very little is known about the information provided to patients and their families. Failure to fully address patients’ and families’ health information requirements can lead to significant stress and anxiety.
Aim: The aim of this exploratory study was to evaluate the content of hospital information material currently provided to AIS patients at the first point of diagnosis in hospital scoliosis clinics in the UK.

Methods: Content analysis (CA) is an established and widely used method of document analysis, and can be used with quantitative or qualitative data and in a deductive or inductive way (Elo & Kyngäs, 2008). It has been defined as ‘any technique for making inferences by objectively and systematically identifying specified characteristics of messages’. The methods used here were ‘conventional’ (with a simple thematic analysis of the data) as well as ‘summative’ (though categories or key concepts were not counted but described in tabular and narrative form).

Results: Around 31 texts from nine sources were subjected to a CA. These texts were categorised according to type, content, tone and presentation and described in tabular and narrative form. Three main observations were made about the texts: they are focused primarily on provision of medical information; that quality of life issues are peripheral within them; and that they are sometimes confused about their intended audience (and, therefore, their purpose). Results were developed about what other information (in verbal form, written, electronic) is given to patients at the point of diagnosis.

It is possible that the texts used here are provided to patients with other documents. Patients may also be accessing the Internet for help and advice. Information garnered this way may be used to complement the information leaflets described here.

Conclusions: In many respects, the leaflets achieve their stated aim: they provide basic information to patients with AIS. The analysis here should be regarded as preliminary, and would be improved with a larger sample of (more diverse) texts from a wider range of sources.

References

O60 Quality of life and stress level in adolescents with idiopathic scoliosis subjected to conservative treatment

E Kinel1*, T Kotwicki2, A Podolska2, M Bielak2, W Styra1
1Department of Rehabilitation, University of Medical Sciences, Poznan, Poland; 2Department of Paediatric Orthopaedics and Traumatology, University of Medical Sciences, Poznan, Poland; 3HTIS Center, Jawor, Poland
Scoliosis 2013, 8(Suppl 1):O60

Background: The quality of life and stress level in adolescents suffering from idiopathic scoliosis and submitted to brace treatment is the object of increasing interest of the professionals.

Aim: The aim of the study was to evaluate the quality of life and stress level in adolescents with idiopathic scoliosis who are under brace treatment.

Methods: It involved 45 adolescents, ages ranging between 10.0 and 15.0 years, all with Adolescent Idiopathic Scoliosis (AIS), with Cobb angle between 20-45 degrees. The adolescents were wearing the same kind of brace (Chéneau orthosis) for more than 3 months for at least 12h per day. Two questionnaires were used: the Brace Questionnaire (BrQ) and Bad Söderheim Stress Questionnaire (BSSQ). The BrQ is an instrument for measuring quality of life of scoliotic adolescents who are being treated conservatively with wearing of a corrective brace. The BrQ consists of 34 Likert-scale items associated with eight domains. The BSSQ (Brace and Deformity) questionnaire estimates the stress scoliosis patients have whilst wearing their brace. The analysis considered the type of treatment, curve location, correlation of the total score with age, Cobb angle and Bunnell rotation angle.

Results: The age was 13.6 ± 1.3 years. Cobb angle was 31.7 ± 7.6 degrees. The mean score for BrQ was 78.1 ± 11.3 points. Adolescents revealed higher score with BSSQ Deformity (median = 15) comparing to BSSQ Stress (median = 12).

Conclusion: Conservative treatment does not severely impact on the quality of life of scoliotic adolescents. The adolescents who were under brace treatment suffered moderate level of stress from the deformity.

References

POSTER PRESENTATIONS

P1 Influence of self-stretch based on post-isometric relaxation, static stretch combined with stabilization exercises and stabilization exercises only on hamstring, one-joint and two-joints hip flexors flexibility and finger-to-floor test results

D Czaprowski1,2*, Leszczewska1, A Kolwicz3, P Pawłowska1, T Kotwicki2, L Stolńska1, A Kędra1
1Department of Physiotherapy, Józef Rusiecki University College in Olsztyn, Olsztyn, Poland; 2Department of Pediatric Orthopedics and Traumatology, University of Medical Sciences, Poznan, Poland; 3Department of Pediatric Orthopedics and Traumatology, University of Medical Sciences, Poznan, Poland
Stud Health Sound etiologic factors were disclosed with consequences for the ability of the muscles of the pelvic girdle.

Few papers demonstrated an impairment in postural stability in adolescents with idiopathic scoliosis on the sagittal plane, even after a full year, a significant correction was seen in the thoracic and thoracolumbar curves. In kyphosis (pure or with maximal scoliosis of 25º, N=79), values for the thoracic curve (p<0.01), the thoracolumbar curve (p<0.01), the lumbar lordosis (p<0.01) and the pelvic incidence (p<0.01), all in the sagittal plane, changed significantly in a paired t-test at one full year brace treatment in comparison with time of indication. Correction of high grade coronal curves (true bone remodelling) was still difficult and time consuming, whilst the end of growth is near. At all controls, active redressing was possible. Satisfied and very satisfied with the results were 84.6%. Choice for same treatment was 75.9%. Compliance was rated good in 60.2% and fair in 32%.

Discussion: Sound etiologic factors were disclosed with consequences for the ability of the muscles of the pelvic girdle.

Conclusions: TLI is capable of reduction of all coronal and sagittal curves with a single symmetric force. Stepwise restoration of thoracolumbar lordosis, preventing anterior overload in compression, and derotating the spine gives rerouting of growth paths to more optimal postures.

References

Adolescent scoliosis and kyphosis treated with TLI (thoracolumbar lordotic intervention) technique in a brace. Mechanism and results

By Van Loon PJ, Thunnissen M, Raudens Orthopedium Delta, Delta, The Netherlands Scoliosis 2013, 8(Suppl 1) P2

Background: Current braces in scoliosis only claim to stop progression [1]. Conventional forces in scoliosis and kyphosis push on bony structures. In etiology, lifestyle factors and exact knowledge on growth forces are important.

Aim: To show that restoration of natural lordosis at the thoracolumbar junction, by applying controlled symmetrical lordotic forces, corrects scoliotic curves, thereby offering an alternative for present braces in scoliosis and kyphosis[2].

Methods: Consecutive case control pilot study, with radiological results in coronal and sagittal curves, and scores for overall-satisfaction with TLI after one year of wearing. 91 consecutive children with scoliotic (one curve >25º) and kyphotic spinal deformities during growth, wearing a lordotic brace at least a full year. Measurements of Cobb angles on AP and sagittal standing X-ray’s were compared at indication time, first-in brace day, and out of brace after a full year. A questionnaire was filled in with scores for satisfaction.

Results: Mean age of start was late: 13.8 years (SD 2). Menarche in girls (n= 46) was mean12.8 yrs (SD 1.2). In scoliosis (one curve at least 25º, N=38), the in-brace correction of the Cobb angles of thoracic and thoracolumbar curves and the pelvic obliquity was significant (p< 0.01 in all three). For the left lumbar curves p< 0.02. In the sagittal plane, even after a full year, a significant correction was seen in the thoracic and thoracolumbar curves. In kyphosis (pure or with maximal scoliosis of 25º, N=79), values for the thoracic curve (p<0.01), the thoracolumbar curve (p<0.01), the lumbar lordosis (p<0.01) and the pelvic incidence (p< 0.01), all in the sagittal plane, changed significantly in a paired t-test at one full year brace treatment in comparison with time of indication. Correction of high grade coronal curves (true bone remodelling) was still difficult and time consuming, whilst the end of growth is near. At all controls, active redressing was possible. Satisfied and very satisfied with the results were 84.6%. Choice for same treatment was 75.9%. Compliance was rated good in 60.2% and fair in 32%.

Discussion: Sound etiologic factors were disclosed with consequences for the ability of the muscles of the pelvic girdle.

Conclusions: TLI is capable of reduction of all coronal and sagittal curves with a single symmetric force. Stepwise restoration of thoracolumbar lordosis, preventing anterior overload in compression, and derotating the spine gives rerouting of growth paths to more optimal postures.

References

Analysis of differences in postural stability in people with adult scoliosis and non specific low back pain

P3 L Bissolotti 1,3, V Sani 1,3, M Gobbo 2,3, C Orizio 1,3

1Servizio di Recupero e Rieducazione Funzionale, Casa di Cura Domus Salutis, Brescia, Italy, 2Istituto di Fisiologia Umana, Dipartimento di Scienze Mediche e Biotecnologie, Facoltà di Medicina e Chirurgia, Brescia, Italy, 3LAIRIN Laboratorio di Bioricerca Neuromuscolare e dell'Attivita Fisica Adattata, Italy Scoliosis 2013, 8(Suppl 1):P3

Background: Few papers demonstrated an impairment in postural stability control in patients with non specific low back pain (NL) [1,2]. However, it is not clear whether patients with adult scoliosis (AS) and NL can be considered a specific subgroup.

Aim: Present a study aimed to compare Postural Stability (PS) in patients with AS and NL[3].

Methods: Cotrel method was used to assess Cobb angle (CA) on plan x-ray. Using 14 markers, a two optoelectronic infrared cameras (Gemini, BTS spa, Milano, Italy) was used to perform a stabiometric test when patients were keeping a quite standing position with an eyes open trial (EOT), and eyes closed (ECT), and a distance between their feet (FD) as preferred. The Area of Reference Marker on the Ground (C7) (ARMG), Average Marker Speed (AMS) and length of the marker’s trajectory on the ground (LMG) were evaluated during ST.

Results: AS-Group included 40 patients, 10 men and 30 women, with Cobb angle >15º, mean age 81.8±11.5 years, BMI 23.6±2.6kg/m2. A single
curve was present in 32 patients (80%). Cobb angle of primary curve averaged 27.1±11.5° (range, 15–63°), thoracic Cobb angle averaged 25.5±22.3° (range, 8–58°). NL-Group included 40 patients, 9 men and 31 women. Mean age 58.2±10.9 years, BMI 23.9±3.2kg/m². In AS-group, the self selected mean FD during EOT was 160.1±53.8mm, and during ECT it averaged 160.9±56.2mm (p<0.05). In NL group it was 157.5±53.1mm during EOT, and 154.6±51.2mm during ECT (p<0.05). No differences were noted in both conditions between the two groups (p>0.05). In AS-group, ARMG values averaged 302.6±271.6mm2 during EOT, and 577.9±728.9mm2 during ECT (p<0.05). LMG was 156.9±37.2mm during EOT, and 211.5±72.7mm during ECT (p<0.05); while the AMS was respectively 53.6±1.2mm/sec and 71.7±2.4mm/sec (p<0.05). In NL group, ARMG averaged 296.1±387.6mm2 during EOT, and 876.1±1347.8mm2 during ECT (p<0.05). LMG was respectively 176.1±62.2mm and 246.1±183.5mm (p<0.05); while AMS has been 5.5±1.9mm/sec and 9.9±9.5mm/sec (p<0.05). Romberg Coefficient (RC) was 23.3±1.9 in AS group and 2.9±2.6 in NL group (p<0.05).

Conclusions: In AS-Group, the ability to control PS with EO and EC was not different than in NL-Group. Physiotherapy program does not require more attention to PS training in AS-Group than NL-Group.

References

P4

Biological background and biomechanical support explain similar effect in treatment of scoliosis and kyphosis with TLI bracing

PJ Van Loon
Orthopedium Delft, Delft, The Netherlands
Scoliosis 2013, 8(Suppl 1)P4

Background: Practice in bracing for scoliosis did not lead to consensus in methods. Sound etiologic factors like insight in growth will give better conservative therapy. In pre-Pubmed literature, concepts were found to formulate and apply consequences in treatment strategy.

Characteristics of progress in earlier research periods: Pre WW I literature showed doubtless relation between musculoskeletal function and morphogenesis, and knowledge on good and bad posture. Sitting of children got evidence a etiologic factor. After WW II all was based on the AP X-ray, and clinical aspects were forgotten. Bracing techniques start to prevent lordosis in scoliosis.

Opening the black box on morphogenesis: the work of Milan Roth

The work of Milan Roth was rediscovered. In his concepts of the ‘Nervous Skeleton’, an important science on neurovertebral and neuro-osseous growth relations and the tension induced possibility of incongruence of growth show that a ‘short cord’ can indeed cause scoliosis. Recent studies with MRI confirm much of this. Growth (muscular force) has to create wedged vertebral bodies in hindered stretch growth of the cord. Increased tension in the cord will give the easily assessable tension in muscles. MRI will fill the gap in visualization of the cord, the vertebras, discs, joints and the muscles involved in one time.

Can the proven instant correction be transformed in structural corrective growth?: On two usable issues for durable correction: the existence of a thoracolumbar kyphosis in scoliosis, confirmed by Ni et al. 15, and the possibility to correct double curved scoliosis by applying a symmetrical lordotic (and thus extending) force at the TL joint, the concept of Thoracolumbar Lordotic Intervention (TLI) was developed. By forcing the erecting muscles in their normal track the feared instability in thoracic lordosis is overcome by proper tension on muscles to overcome flabbiness. We have to disagree with Dickson and followers on their fear for lordosis.

The remaining potential of (fast) spinal growth in the growth (spurt) could then act as a helpful ally in this.

The design of a corrective brace: The TLI brace applies a complete controlled lordosis, and strain on the erector trunci is given, so normal growth forces are being brought back in their anatomical acts. It also prevents flexion, the rapidly increased and most prevailing "posture" in modern life of children. We brought promising results in a pilot study. Because of bringing a good posture, a good compliance can be expected.

References

PS
Changes in clinical and radiographic parameters after a regimen of chiropractic manipulation combined with soft tissue therapy and neuromuscular rehabilitation in 7 patients with adolescent idiopathic scoliosis

AJ Woggon1 , DA Martinez2
1*CLEAR Scoliosis Institute of Texas, Dallas, TX, USA; 2Independent Researcher, Dallas, TX, USA
Scoliosis 2013, 8(Suppl 1):PS

Background: The causes of idiopathic scoliosis (IS) are likely multifactorial, including genetic and environmental [1]. It is unlikely one therapy addresses all involved factors. Evidence supports a comprehensive approach to evaluation & treatment using a variety of outcome assessments [2].

Aim: This study presents a review of files of seven adolescent idiopathic scoliosis (AIS) patients treated with a comprehensive two-week treatment protocol including chiropractic manipulative therapy, massage, exercise, and whole-body vibration therapy, followed by a home rehabilitation regimen.

Method: Primary outcome measures reported include Cobb angle, disc index, apical vertebral deviation, vertebral rotation, digital spirometry, scolimetry, timed one-legged stability with eyes closed (TOLSWEC), and computerized dual inclinometry, as well as pain drawings and health-related quality of life questionnaires (RAND SF-36 and SRS-22). Data was recorded post-treatment and at follow-up ranging from four to seven months. A paired t-test and Wilcoxon test was performed to assess the statistical significance of the pre and post treatment radiographic parameters. Each patient underwent twenty treatment sessions over a two week period (2x five days) for an average length of 180 minutes/session. Treatment sessions were divided into three phases. The first phase of treatment addressed soft tissue deformations and improving spinal flexibility, the second phase influenced spinal biomechanics, and the third impacted neuromuscular function.

Results: The following changes were noted post-treatment: Cobb angle, 0 to 12 degrees; disc index, -0.11 to 0.44; apical vertebral deviation, -21.5 mm to 13 mm; vertebral rotation, 0 to 19.6°; forced vital capacity, 0 cc’s to 820 cc’s; forced expiratory volume in 1 second, -50 cc’s to 520 cc’s; peak expiratory flow, -960 cc’s to 1180 cc’s; forced expiratory rate, -2% to 18% scolimetry, -1 to 10 degrees; TOLSWEC, -8 to 24 seconds; spinal ranges of motion, -4.3 to 29 degrees; pain scale, +1 to -4; and, RAND SF-36 scores, -21% to 36%. The median changes pre and post –treatment were significant (p<0.05) for Cobb angle, apical vertebral rotation, thoracic Disc Index, and lumbar apical vertebral deviation. Three patients maintained some degree of improvement at follow-up, and two demonstrated continued improvement.

One patient was lost to follow-up.

Conclusion: The applied protocols effected positive functional and/or radiological changes in seven cases of AIS, with two cases demonstrating continued benefit at follow-up. Additional research is needed to determine the benefit of this multifactorial approach.

References
P6

Comparison of scoliosis research society-22 between thoracic curve and lumbar/thoraco-lumbar curve in patients with adolescent idiopathic scoliosis


Dept. Orthop. Surg., Shinsyu University Hospital, Matsumoto, Japan

Scoliosis 2013, 8(Suppl 1)P6

Background: The Scoliosis Research Society-22 (SRS-22) is a widely used instrument to measure clinical outcomes in patients with scoliosis. The comparison of domain scores in the SRS-22 between thoracic curve and lumbar/thoraco-lumbar curve has not been previously reported.

Aim: The purpose of this study is to evaluate the comparison of domain scores in the SRS-22 between thoracic curve and lumbar/thoraco-lumbar curve in patients with adolescent idiopathic scoliosis (AIS).

Methods: This is a cohort of 43 patients (all female) with AIS who underwent posterior spine fusion. The patients were divided into two group which were thoracic curve group (n=30), Lenke 1, 2, 3, 4) with a mean age of 14.6 years and a mean Cobb angle of 54° and lumbar/thoraco-lumbar group (n=14, Lenke 5, 6) with a mean age of 14.6 years and a mean Cobb angle of 56°. Each was compared for preoperative SRS-22 domain scores.

Results: In the thoracic curve group, the pre-operative mean values of appearance, activity, pain, mental, and sub-total were as follows: 2.8±0.5, 4.4±0.5, 4.1±0.4, 3.8±0.9, and 3.8±0.4, respectively. In the lumbar/thoraco-lumbar curve group, the preoperative mean values of appearance, activity, pain, mental, and sub-total were as follows: 2.7±0.5, 4.0±0.8, 3.8±0.9, 3.9±0.9, and 3.6±0.5, respectively. The pre-operative mean domain score of activity in the lumbar/thoraco-lumbar curve group was significantly smaller compared with that in the thoracic curve group (p=0.04).

Conclusion: The pre-operative domain scores of appearance, pain and mental were almost the same; however, the pre-operative mean domain score of activity in the lumbar/thoraco-lumbar curve group was significantly smaller compared with that in the thoracic curve group.

References

P7

Depression status in patient with adolescent idiopathic scoliosis: A comparative study

T Kuru1, H Umut2, E Dereli3, F Hozatlioglu1, B Celik1, I Coşak4

1Istanbul University, Faculty of Health Science, Department of Physiotherapy and Rehabilitation, Istanbul, Turkey; 2Halic University, Halic University, School of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Turkey; 3Istanbul Bilgi University, School of Health Science, Department of Physiotherapy and Rehabilitation, Istanbul, Turkey; 4Dr.Lütfi Kirdar Kartal Education and Research Hospital, Istanbul, Turkey

Scoliosis 2013, 8(Suppl 1)P7

Background: The adolescent years are one of the most stressful times in a person’s life and if they have idiopathic scoliosis, spinal deformity and brace treatment can cause psychological effects.

Aim: Our aim was to investigate depressive symptoms in children and adolescents with idiopathic scoliosis and their association with demographic and wearing brace variables.

Methods: Study included 47 (7 male, 40 female) participants, 23 were using brace (mean age: 13.3±4.161) and 24 were doing 3D- Schroth method exercises (mean age:13.66±1.76) for treatment. In the brace group, mean Cobb angle was 38.30±10.70 (range:20-60), mean ATR was 12.60±5.41 (range:3-25), in the exercise group mean Cobb angle was 32.16±11.62 (range:15-60), mean ATR was 8.45±4.04 (range:3-18). Both of the groups were receiving treatment for 6 months at least. Depressive symptoms in youth were assessed using the Children’s Depression Inventory (CDI), a self-report questionnaire consisting of 27 items. The CDI has wide use across chronic health conditions. A score of 13 is indicative of elevated depressive symptoms.

Results: In the brace group 5 of 23 (21.5%) and in the exercise group 4 of 24 (16.8%) patients were scored on the CDI at or above the clinical cutoff (p=0.554). There were no significant correlation between the Cobb angle, rotation angle, BMI, age and CDI scores (p=0.214, p=0.034, p=0.335, p=0.027).

Conclusion: Findings indicated that nearly one in five youth with adolescent idiopathic scoliosis met the clinical cutoff for depression by their own report. Study results showed that there are no significant differences between brace and exercise therapies on depression status. Multidisciplinary scoliosis teams are in an ideal position to offer early identification and optimum treatment for adolescent idiopathic scoliosis.

References

P8

Difference between spinecor brace and rigid brace during treatment

O Ensü1, B Bileki2, S Bilgic3, E Oguz2, A Sehioglu4

Gulhane Military Medical Academy, Ankara, Turkey

Scoliosis 2013, 8(Suppl 1)P8

Background: Brace treatment in idiopathic scoliosis is the only efficacious method of non operative treatment. The effectiveness of dynamic SpineCor brace with corrective movement principle has been shown, but differences between rigid braces and SpineCor brace is still unclear.

Aim: The aim of this study is to evaluate differences between rigid brace and SpineCor brace in terms of curve progression, spinal height increase, and SRS-22 questionnaire during treatment.

Methods: A total of 76 consecutive adolescent idiopathic scoliosis patients who were treated with brace were included in this study. 45 patients were treated with SpineCor brace, 31 patients were treated with rigid braces. After detailing braces and their costs, choice was made by patients’ family. Patient’s height, T1-Coccyx distance, gibbosity, and Cobb angles were documented at the beginning of the treatment and last control. At last visit SRS-22 questionnaire applied to the patients to evaluate clinical effect of braces.

Results: Average age of SpineCor group was 12.8±1.5 and average follow up period was 25±10.6 months. In rigid brace, the group average age was 12.2±1.3 and average follow up period was 23±6.7 months. There were no differences between groups according to age, gender, height, T1-Cx distance, Cobb angles, gibbosity before brace treatment initiated. In both groups, height and T1-Cx distance increased and there were no difference. Cobb angle decreased 1.5° in SpineCor group and increased 1.1° in rigid brace group (p=0.137). Gibbosity decreased 0.6° in SpineCor group and increased 0.3° in rigid brace group (p=0.086). According to SRS-22 questionnaire, SpineCor brace patients’ pain, self image and activity/function scores were statistically better than rigid brace patients’ scores, while mental health and satisfaction from treatment scores were similar.

Conclusions: Although SpineCor brace and rigid braces have similar effects on curve correction, height and spinal height, the real benefits of SpineCor brace is less pain, less anxiety about self image and more activity, and function.

References
P9 Does rigid bracing provide the best outcome for children with neurological onset scoliosis?
M Matthews
DM Orthotics Ltd, Redditch, UK
Scoliosis 2013, 8(Suppl 1):P9

Background: Rigid bracing has been the mainstay of orthotic intervention for children with neurological onset scoliosis. The use of rigid braces, however, often do not provide the expected outcomes clinicians are hoping for with Cobb angles curve increasing over time [1], linked to worsening sitting ability and hip pain [2]. The time has come for a review of this particular type of scoliosis intervention.

Aim: This paper will discuss the use of dynamic elastomeric fabric orthoses (DEFO) in this client group and question whether rigid bracing is most appropriate for long term outcomes. It will also discuss whether waiting for the 25 degree Cobb threshold, before treatment, is prudent.

Methods: This study will use single case presentations (n=5) to demonstrate the advantages of early intervention using both radiographs and pre and post intervention photographs to illustrate the outcomes possible. All of the children have neurological onset scoliosis and show short/medium term outcomes.

Results: The use of DEFOs to control scoliosis has provided clinicians with an opportunity with which to reduce the number of children presenting for orthopaedic spinal surgery. Clinically the scoliosis clinic at the Norfolk & Norwich University Hospital has seen a declining number of children referred for scoliosis surgical management over the last ten years due to early intervention. The DEFO scoliosis suits appear to work by providing heightened proprioceptive input to the brain coupled with dynamic corrective forces to correct and re-align the spinal segments [3]. The DEFO suit provides a cosmetic orthosis capable of providing a continuous low level dynamic force capable of re-educating the brain to accept an improved posture. This process can be seen clinically over years resulting in relearnt spinal symmetry and a reduced referral to the orthopaedic department. The use of rigid braces to control neurological onset scoliosis should now be reviewed by clinicians with a view to using more dynamic and cosmetic DEFO intervention options, which can reduce the need for surgery in the long term. Further larger scale research is required.

References

P10 Effectiveness of pressure biofeedback / pbu (pressure biofeedback unit) in the process of learning of self-correction in patients with scoliosis: a pilot study
D Pennella1, F Maselli2, G Giovannino3, M Cannone4, A Rhaïnö5, A Ciuro2
1Sant Raffaele – Cittadella della Cantà, Taranto, Italy; 2Genova University, Genova, Italy; 3Padova University, Padova, Italy; 4Fondazione Centri di riabilitazione Padre Pio Foggia, Italy; 5Istit. Sant’Agostino Noicattaro, Taranto, Italy
Scoliosis 2013, 8(Suppl 1):P10

Introduction: The self-correction or active correction on all levels, in the treatment of scoliosis, is now a key tool with, or without, brace treatment [1]. The primary difficulty that the patient found is to understand which muscles to activate, and how to do it to achieve significant changes in the spine, since each patient adopts a personal strategy, hardly ever fair and efficient.

Aim: The aim of this study is to verify the usefulness of the BPU to facilitate the learning processes of the Self-Correction, in patients with adolescent idiopathic scoliosis, in free or brace treatment. Through a BPU, each patient can be facilitated, by learning a right activation of the deep muscles of the spine [2], the clinician can also objectify the course of treatment.

Methods: We enrolled 10 patients (5 for the experimental group, and 5 for control group) with adolescent idiopathic scoliosis, treated for up to 4 individual sessions of 40 minutes, according to a Self-correction of the scoliotic curve learning approach. Inclusion criteria: - Adolescent Idiopathic Scoliosis - Cobb degrees range between 15 ° and 30 ° - Patients with, or without, brace treatment

The control group, mean age 12.4 years, Risser 2.6 and degrees Cobb 14.8 °, was driven to the learning of Self-correction in the traditional way verbal approach and passive movement while with the experimental group, mean age 13.2 years, Risser 3 and Cobb 15.2, we introduced using of the BPU to obtain the vertebral derotation [3]. Patients were subjected to analysis of posture with Formetric in 1 ^ seated (at rest) and 2 ^, 3 ^ and 4 ^ session (position of Self-correction), to evaluate the timing, and the ability to learn.

Results: The experimental group used an average of 96 minutes (2.4 sessions) to learn Self-correction, unlike the control group, which required 120 minutes (3 sessions).

Conclusions: The results of this pilot study define the usefulness of further research in this field, through an RCT of appropriate size.

References

P11 First experiences in the treatment of juveniles and idiopathic scoliosis with SpineCor braces
A Sarchioto
ASL B11, Benevento, Italy
Scoliosis 2013, 8(Suppl 1):P11

Introduction: The standardized treatment of juvenile, and adolescent, idiopathic scoliosis is accepted everywhere: physiotherapy for curves until 15-20° Cobb, rigid brace between 20 and 30-35° Cobb, cast between 30 and 40-45° Cobb and surgery over 45° Cobb.

Aim: The aim of this work is to verify the efficacy and effectiveness of the SpineCor dynamic brace, in juvenile and adolescent idiopathic scoliosis with curves between 20 and 50° Cobb

Methods: All patients (range of age 5 to 15 years) were treated with a SpineCor dynamic brace. All braces were ordered, fitted and used, following the standard canons of the appropriate procedure. A photographic control was carried out, just after fitting, a clinical control in a month, a clinical and photographic in three months, and a clinical, photographic and radiographic in six months.

Results: Over 90% of patients had a very important change in their posture and cosmetic appearance. None of them left the treatment.

Conclusion: The SpineCor dynamic brace used is efficient and effective. Because it does not limit any movement, and allows practicing all sports, (but swimming), and dance, and since it is virtually invisible under clothing, no patient has complained of the treatment. Both patients and parents were satisfied. This good result allows, and encourages, us to continue in using this brace.

References
P12

Geometric structure of spinal curves: application to adolescent idiopathic scoliosis
J Deceuninck1, JC Bernard1, E Berthonnaud2,2,3 1Croix Rouge française CMCR Les Massues, Lyon, France; 2Hôpital Nord Ouest, Villefranche sur Saône, France; 3Laboratoire de Physiologie de l’Exercice, Université de Lyon, Saint Etienne, France
Scoliosis 2013, 8(Suppl 1) P12

Background: The spinal pattern of asymptomatic subjects is generally described using sagittal radiographic images. Frontal radiographic exposures allow clinical people to access to spinal deformations due to scoliosis. Biplanar radiographic examination, coupled with photogrammetric reconstructions, may be used for reconstructing the 3D spinal curve.

Aim: This communication presents a new study of the geometric structure of 3D spinal curves in adolescent idiopathic scoliosis.

Discussion: The spine is considered as an heterogeneous beam, and is modeled as a deformable wire, along which vertebrae are beads rotating about the wire. Each vertebra can rotate about the 3D spinal curve. 3D spinal curves are compound of plane regions connected together by zones of transition. The 3D spinal curve is uniquely flexed along the plane regions. The angular offsets between adjacent regions are concentrated at the level of the middle zones of transition. The plane regions along the 3D spinal curve must satisfy two criteria: i) a criterion of minimum distance between the curve and the regional plane and ii) a criterion controlling that the curve is continuously plane at the level of the region.

Conclusion: The geometric structure of spinal curve is characterized by the sizes, and functions, of zones of transition. Spinal curves of asymptomatic subjects show three plane regions corresponding to spinal curves. In some scoliotic spines, four plane regions may be detected, and zones of transition may be lengthened, and not at the same place.

Reference

P13

Latero-posterior directed migration of trunk to the concave side of the curve: a biomechanical principle in treating the three dimensional deformity of idiopathic scoliosis with a custom molded high profile TLSO
SH Jang1, JA Hutson
Assistive Technology Department, Gillette Children’s Specialty Healthcare, St. Paul, MN, USA
Scoliosis 2013, 8(Suppl 1)P13

Background: The biomechanical principles that guide orthotic treatment for Idiopathic Scoliosis (IS) are not fully defined, except for the ‘three point correction’ principle.

Aim: This study aims to discover the underlying biomechanical principles, used by experienced orthotists, in treating the three dimensional deformity of IS, with a custom molded TLSO.

Methods: Semi-structured individual interview, and focus group methodology, were the primary methods of data collection. Detailed descriptions of orthotic treatment, for a specified case example, were obtained from seven experienced spinal orthotists; participants held an average of 16.7 years experience in IS treatment. Sessions were audiotaped, transcribed and data was analyzed using a systematic approach to identify themes. Triangulation of data was completed.

Results: Achieving a ‘balanced and aligned spine and trunk in all 3 planes’ emerged as the primary biomechanical goal for all 7 participants (100%). The orthotists identified specific techniques of the treatment process such as: i) drawing an iliac-clavicle box on the PA x-ray; ii) determining the location and the degree of forces and finding flexibility of the curve with a hand technique; iii) reducing lumbar lordosis during casting; iv) de-rotating the trunk; v) centering the upper torso at the axillae over the pelvis; vi) creating space on the lateral posterior area of the concave side of curve and the mid-posterior area of the spine; vii) carving the model to achieve desired forces; viii) applying abdominal pressure; ix) building a sternal extension and a trochanteric extension.

Conclusion: To achieve the biomechanical goal, and re-align the 3-dimensional deformity of IS, orthotists apply de-rotational, anterior, and lateral translational forces on the lateral side of the convex curve, and create space on the side opposite the applied force. These factors result in a biomechanical principle called latero-posterior directed migration of the trunk to the concave side of the curve.

Reference

P14

A local internal lateral fixation (LILF) of dura mater (DM) to the wall of the vertebral channel as the main reason of the serious idiopathic scoliosis (IS). How to see it with the MRI test, and how to forecast early the scoliosis worsening (bad scenario). How to stop this scoliosis
V Drobyshevskii
The S&R Research Institute for Child Orthopaedics, Saint-Petersburg, Russia
Scoliosis 2013, 8(Suppl 1) P14

Introduction: There are post-mortem investigations of serious scoliosis cases. These are serious scoliosis in future. How to see it with the MRI test, and how to forecast early the scoliosis worsening (bad scenario). How to stop this scoliosis
eighty years ago (Movshovich, 1964).

Aims: First, to prove that the LILF of the DM is not the secondary phenomenon. On the contrary, the LILF of the DM, like a hooked bowstring, causes a serious idiopathic scoliosis. Second, to create an MRI test, so any competent scoliosis expert, could see an initial LILF of the DM, and predict early a dangerous development of scoliosis.

Methods: We used the Cheneau - Abbott type braces with the non-magnetic parts, and the side position of patient for MRI-test. We investigated the form, and the locations, of the spinal cord in the corrected position of the scoliosis spine.

Results: We find that the starting scoliosis has LILF of DM in several cases. These are serious scoliosis in future.

Conclusions: The MRI test, for a LILF of the DM, can help to make a forecast of the future development of scoliosis. We can make the early scoliosis treatment easy, by separation of the LILF of the DM, like Edville Gerhardt Abbott (1913), by overcorrection brace, or maybe by micro invasive surgical releasing in the future.

References

P15

Modified Lyon brace: with antero-lateral pressure to allow Kyphosis
G Notin1, L Journoud1, J Deceuninck1, C Lecante2, F Barra1, JC Bernard1
1Lecante company Lyon, France; 2Croix Rouge française CMCR Les Massues, Lyon, France
Scoliosis 2013, 8(Suppl 1)P15

Background: In the 50’s, Pierre Stagnara introduced the « Lyon treatment ». It included an Abbott plaster cast, followed by a Lyon brace.

Aim: Can 3D analysis help us today?

Methods: Lyon braces are designed as Abbott plaster casts. Using a study on plaster cast, and 3D analysis, (called « is Abbott cast still relevant today? » by Dr. Jean Claude Bernard, from the Massues center in Lyon, presented at the SOSORT 2011), we decided to modify a Lyon brace. If a plaster cast is modified, in order to improve sagittal plane by inverting band, and so having antero lateral push in the thoracic part, instead of a classical postero lateral push, the design of the Lyon brace used for the same patient will have an antero lateral pad too.

Results: The improvement of sagittal plane shown is maintained with the modified Lyon brace

Conclusion: Introducing 3D analysis, in the design of braces, seems as relevant to maintain sagittal plane as shown last year for plaster cast.
Reference

P16
Radiation exposure to staff members during traction X-rays
P Knot*, M McGirk, A Markovic
Rosalind Franklin University, Chicago, USA
Scoliosis 2013, 8(Suppl 1):P16

Background: Determining the flexibility of a scoliosis curve is important, during both conservative and surgical management, and traction x-rays of the patient’s spine are frequently done as part of this evaluation. The traction x-ray is done with the patient in the supine position, and with staff members pulling on the patient’s arms and legs. The use of staff to produce the traction radiograph has two major disadvantages: the pull on the arms and legs is not standardized, and the staff is exposed to x-ray each time they perform a radiograph. Ingegno [1] determined that exposure to personnel applying arm traction, for cervical radiographs, was 0.01mGy. But there are few studies that assess the radiation exposure to staff during imaging for AIS. It has been determined that a typical spinal radiograph exposes the patient to 3.2 (+/-1.6) mGy of radiation. [2]

Aim: The aim of this study was to measure the amount of radiation a staff member is exposed to while participating in a traction x-ray of a patient with AIS.

Methods: The x-ray table was set up and a phantom block of plastic was used to provide the same x-ray scatter as a human body. An electronic x-ray survey detector was used at the head and foot of the table, in the same position that a staff member’s head would be during traction. Radiographs were taken, and measurements of the amount of scatter were recorded.

Results: The scatter produced was 0.003 to 0.009 mGy at the level of the staff member’s head. Given that staff wears a lead apron, the torso dose would be negligible, so the exposure to the eyes and thyroid would be the most clinically important.

Conclusion: The recommended limit of exposure to the eyes for a staff member is 150 mGy per year [2]. With the exposure that we measured, the staff member would not reach this limit until they performed 17,000 to 50,000 procedures. However, since this dose of x-ray to the staff member has no therapeutic benefits, it should still be reduced whenever possible.

References

P17
Radiological parameters of sagittal plane in children with cerebral palsy, walking or wandering
J C Bernard*, J Deceuninck*, A Combye*, E Berthonnaud1,2,3
1Croix Rouge française CMCR des Massues, Lyon, France; 2L'Hôpital Nord Ouest, Villefranche sur Saône, France; 3Laboratoire de Physiologie de l’Exercice, Université de Lyon, Saint Etienne, France
Scoliosis 2013, 8(Suppl 1):P17

Background: The population of cerebral palsy (CP), walking or wandering, often has an abnormal profile clinically, unlike some aged adolescents without neuro-motor dysfunction.

Aim: So, we wanted, in this work, to realize a radiological assessment of the static data in the spine-pelvis-thigh complex, in children with CP, and made a comparison with an asymptomatic population.

Methods: The population of CP is made up 119 children, and the asymptomatic population made up of 652 children. The radiographs of the sagittal plane, in large format (30cmx90cm), are realized in a comfortable position, knees and hips in maximal extension. Analyses were performed, using the Optispine® software, to measure radiological parameters of the whole spine-pelvis-thigh.

Results: Comparing the two populations, we found no difference in the shape parameter (pelvic incidence) for against a significant difference was demonstrated on the positional parameters (pelvic tilt and sacral slope) of the pelvis. Regarding the spine, we found a difference in the angulation of lumbar lordosis, and the orientation of the latter, as well as the number of vertebrae included in the kyphosis, and its orientation. There is also a significant difference in the C7 plumb line.

Conclusion: We can say that the CP population is not specifically different from the control population. Growth disrupts the settings, with the need to prevent these troubles, as soon as possible, to the condition to be concerned, and able to search for.

Reference

P18
Scoliosis from the perspective of a fifteen year old patient
NC Bykosh
Scoliosis Patient, Barrington Hills, IL, USA
Scoliosis 2013, 8(Suppl 1):P18

Background: The self-body image and mentality of scoliosis patients, not only the body physically, is affected by scoliosis treatment, including bracing. Through wearing a brace for five years, I look back on my past, and analyze my encounters with physicians, friends, and family, to see which actions they took, or words they spoke, that were comforting, or helpful, and also, examine those of which were not as helpful, to confront physicians and all people affected by scoliosis to express my opinion on how to address scoliosis.

Aims: To inform physicians of my own perspective on scoliosis, as a scoliosis patient, and answer several questions regarding my experiences. I feel that it is important to discuss my experience as a patient, so physicians come to understand how bracing affects a child physically, emotionally, and socially.

Methods: As a scoliosis patient, I feel I am able to evaluate and express my opinion of my experiences with having scoliosis. I have worn a brace for five years, four of which included 22 hours a day of wearing the brace. I have travelled to doctors in the United States, Germany, Poland, and Spain, and have also been doing back exercises for years, and spoken to other scoliosis patients.

Results: Having scoliosis can change a patient’s life, both positively and negatively. Bracing is a physical, but also mental, challenge, especially in children.

Conclusion: Scoliosis is a struggle, and not only a temporary problem. Scoliosis is an ongoing conflict. Scoliosis is hard for both patients, and physicians, to fully comprehend. Patients need time to adjust, and come to good terms with their situation. Patients must be able to understand what scoliosis is, the different treatment options they have, and how scoliosis will affect their lives in many ways as well. Physicians must also learn how to speak to their patients, in unbiased terms towards different methods of scoliosis treatment, and additionally, come to acknowledge that patients are humans that can feel pain, and are emotionally affected by scoliosis.

P19
The development of a classification system for the use of the (modified) side-shift approach to conservative management of scoliosis
T Betts
Royal National Orthopaedic Hospital, London, UK
Scoliosis 2013, 8(Suppl 1):P19

Background: Classification systems exist to guide the management of surgery (the King and Lenke systems) and Brace treatments (Chêneau, Rigo and SpineCor). Few exist for the management of physical exercise (Lehnerth-Schroth classification system). The side shift approach to correction of scoliosis curves has been used by therapist at the RNOHT
for over 15 years. The side shift approach was developed by Mrs Min Mehta, and has been Modified using consensus based evidence of SOSORT. Clinical observations had indicated that not all patients could actively (Auto) correct to beyond the trunk midline, a key principle of Side Shift. At the RNOHT a classification system based upon the ability of an individual to auto-correct the spine during a side shift movement has been developed to aid the appropriate application of the shift exercises, and allow future comparative analysis. Consecutive patients who have AIS, seen by the author and I colleague in the calendar year of 2011, were tested for the application of the Side-Shift Classification System. Three types of Side-Shift were developed.

**Aim:** To develop a Clinical Classification System for Physical Therapy, To demonstrate if clinical spinal mobility correlates with indications of Side-Shift exercises.

**Methods:** Types of Side-Shift Correction are being analysed and compared to diagnosed Curve types, measurements are being recorded of Cobb Angle and Hypermobility Scores (using Beighton Hyperlaxity scale) and scoliometer measurements. Database statistics are also being recorded. Inter-observer and Intra-observer reliability is to be measured to demonstrate the consistency of the Classification System.

**Results:** To date too few consecutive patients have been collated to be able to provide numerable results. The Author aims to present Validation results after comparing thirty consecutive AIS patients. Currently, 13 consecutive patients have been reviewed by two Physical Therapist, who have independently categorized the Side Shift Type of each presenting patient.

**Conclusions:** The author presents this article as a preliminary study in to the development of the Side Shift Classification system. The author requests analysis into the usefulness of the scale, and advice on future research and development. Interim analysis suggests that this is a useful descriptive basis for classifying Side Shift mobility in a population with Scoliosis.

**References**


**P20**

The effect of eight-week core stability training program on the dynamic balance in young elite footballers

J Abdii1, H Sadeghi2

1Islamic Azad University, Central Tehran Branch, Teheran, Iran; 2Orthopedic & Rehabilitation, Tehran Tarbiat Moallem University, Teheran, Iran

**Background:** Core stability is the central motor control and muscular capacity of the lumbar-pelvic-thigh to maintain stability of this region against various postural and external forces [1]. Studies, have shown different roles of core stability to improve performance; Lewarchik (2003) tend to stabilize the core in footballers not observed significant using the stability exercise program and plyometric [2]. Kahle(2009) have shown improved postural control after six weeks core stability training program in healthy and young adults [3]. Accordingly, there are different results of research, and important training on postural stability in the football skills.

**Aim:** The purpose of this study was the effect of eight-week core stability training program on the dynamic balance in young elite footballers.

**Methods:** Statistical 15 football players, 19 to 24 years in FC Tehran Damash with mean age 21.10 ± 1.25 years, height 179.53 ± 6.83 cm, weight 71.80 ± 7.42 kg, body mass index 22.23 ± 1.27 kg/m2 and a maximum vertical jump was 51.66 ± 5.58 cm. performance eight-week core stability training program with three sessions a week for 30 minutes was run. Control of dynamic balance on the force plate, at the dominant and non dominant leg, through jump-landing with a 50% vertical jump maximum, in pre and post test was evaluated by dynamic postural stability index. The data analysis by paired t-test, one-way analysis of variance (ANOVA) and Tukey post hoc test at significance level 0.05 was used.

**Results:** Results findings a high level significantly in progress dynamic balance in the medial-lateral, anterior-posterior and vertical directions and dynamic postural stability of the whole proved.

**Discussion:** The results of the study are dissimilar with the Lewarchik study. Possible causes of dissimilation are age of subjects and measuring. And similar with the Kahle study, possible reasons can be exercise protocol. Core muscle contraction of the member, the reaction between postural disorders of the central nervous system that prevents postural and core stability exercise program, can result in improved prediction of activity, and thereby reducing the disruption displacement and fluctuations of the center of gravity.

**References**


**P21**

The influence of lateral spinal curvature on range of motion

N Nelic1, V Seper2, E Davidovic-Cvetkovic3

University of Applied Sciences Lavoislar Rubicka Vukovar, Hungary

**Background:** This study was conducted in Primary school on 97 pupils, age12±2, on 55 girls and 42 boys.

**Aim:** The objective of this research was to establish the existence of lateral spinal curvature, as well as its influence on range of motion of the spine.

**Methods:** Height, body mass, spacing between hands, and length of the upper limbs were measured in all of the examinees. Lateral spinal curvature was identified using a bob (plummet) and clinical examination. Examinees performed five spinal flexibility tests: right and left mobility test, forward bending test, shoulder static flexibility test, and neck and trunk static flexibility test. Results gathered using a bob (plummet) and clinical examination were compared to the results of flexibility tests. Difference between these methods in children with, and without, lateral spinal curvature was determined with statistical T-test. Medcalc program was used for statistics. Statistical significance was affirmed at p=0.01 level.

**Results:** Results on the prevalence of lateral spinal curvature in this study show less incidence in male population, 35.71%, over female population, 40%. Results of all four flexibility tests were in favor of healthy population. Neck and trunk static flexibility test showed difference of 4.11cm with statistical significance of p=0.0021, shoulder static flexibility test 4.41cm (p=0.0078), right lateral mobility test 2.62cm (p=0.0008), and left lateral mobility test 2.52cm (p=0.0017). There was no statistical significance for forward bending test.

**Conclusion:** According to above mentioned results, it can be concluded that lateral spinal curvature has a considerable significance on spinal mobility.

**References**