Results: Convex side paraspinal muscle activity revealed versus time). The surface beneath the integrated EMG curve (plot of voltage bioelectrical activity of the muscles was calculated as the area of after a single 60-minute session of specific soft tissue therapy.

The difference in convex versus concave was not significant in the prone position (p > 0.05). After therapy the convex to concave ratio decreased from the mean value of 1.66 to the mean value of 1.20. The difference was not significant (p = 0.32).

Conclusion: A single session of specific soft tissue therapy decreased the bioelectrical activity of the paraspinal back muscles at the concave side of thoraco-lumbar scoliosis.

Reference

S2 Monitoring of changes in trunk rotation during scoliosis physiotherapy
Marianna Białek1, Andrzej M'hango2 and Tomasz Kotwicki3
1BMK Functional Therapy, Wroclaw, Poland
2Rehabilitation Center Terapeuta, Kielce, Poland
3Department of Pediatric Orthopedics and Traumatology, University of Medical Sciences, Poznan, Poland
E-mail: terapeuta@kielce.home.pl

Scoliosis 2007, 2(Suppl 1):S2

Objective: The aim of the study was to assess angle of trunk rotation (ATR) in primary scoliosis and in secondary curvatures in a cohort of adolescent girls during Functional Individual Therapy for Scoliosis (FITS) physiotherapy.

Materials and methods: Sixty-four girls with scoliosis (age 13.9 ± 1.9 years, mean Cobb angle 30.6 ± 14.7 degrees, Risser sign median 2.0), underwent a 14-day intensive in-patient physiotherapy program according to FITS. The monitoring of curve behavior was clinical, using the Bunnell scoliometer [1] to measure ATR. Measurements were performed in a relaxed and in actively corrected posture. Sum of rotation (SR) was calculated as equal to primary curve rotation (PCR) plus upper compensatory curve rotation (UCR) plus lower compensatory curve rotation (LCR). Fourteen girls were followed for one year, while undergoing outpatient FITS therapy and part-time (12 hours per day) brace treatment.

Results: Intensive in-patient FITS physiotherapy reduced primary curve rotation measured in a relaxed posture from 9.5 ± 4.7 to 8.5 ± 4.5 degrees (p = 0.0004, paired t test) as well as the sum of rotation from 13.1 ± 6.7 to 11.6 ± 6.4 degrees (p = 0.0002, paired t test). Trunk rotation in the upper compensatory curve was not affected (p = 0.11, Wilcoxon matched-pairs test). Trunk rotation in the lower compensatory curve slightly increased from 0.9 to 1.7 degrees (p = 0.0065, Wilcoxon matched-pairs test). In actively corrected posture, PCR angle decreased from 8.2 ± 4.3 to 7.2 ± 4.6 degrees (p = 0.046).
(p = 0.0063, paired t test), while SR angle decreased from 12.4 ± 6.1 to 11.4 ± 6.0 (p = 0.0054, paired t test). In fourteen girls examined one year later in a relaxed posture there was no deterioration of the PCR angle (9.1 degrees versus 10.1 initially, p = 0.16, NS) nor the SR angle (12.2 degrees versus 13.1 initially, p = 0.18, NS), while in the corrected posture the PCR angle decreased from 7.7 ± 4.7 to 5.6 ± 3.4 (p = 0.04, paired t test) and the SR angle decreased from 11.4 ± 5.4 to 8.7 ± 5.5 degrees (p = 0.04, paired t test).

**Conclusion:** (1) We recommend to monitor ATR both in primary and in compensatory curves during scoliosis therapy. (2) Fourteen days' in-patient FITS therapy reduced trunk rotation in the primary curve and reduced the sum of rotations measured at three levels of the back, as well as increased the patient's capacity for active posture correction. (3) For patients who received out-patient exercises combined with half-time bracing, the result was stable after one year.

**Reference**

**S3**

**Physical efficiency of girls with conservatively treated idiopathic scoliosis**

Jacek Durmala 1 and Krystyna Dobosiewicz 2

1Department of Rehabilitation, Medical University of Silesia, Katowice, Poland
2GWSH, Katowice, Poland
E-mail: jdurmala@gcm.pl

Scoliosis 2007, 2(Suppl 1):S3

**Objective:** The aim of the study was to estimate the influence of conservative treatment on physical efficiency in girls with idiopathic scoliosis (IS). Physical efficiency was estimated by maximal minute oxygen uptake, ventilatory anaerobic threshold (VAT), and maximal workload.

**Study design:** A study group consisting of eighty-seven girls with IS, aged ten to seventeen years (mean 13.5 ± 1.61 years) with thoracic scoliosis (n = 44) and double major scoliosis (n = 37). Mean Cobb angle was 39 degrees (SD 17.8) and mean apical vertebral rotation (AVR) was 12 ± 7.1 degrees.

**Methods:** A subgroup of sixty-four girls was treated conservatively using 3D exercises by Dobosiewicz and a second subgroup of twenty-three girls were treated using 2D (symmetric) corrective exercises [1, 2]. A subgroup of twenty-six girls with IS who received 3D exercises by Dobosiewicz (n = 18) or symmetric exercises (n = 8), were tested before and after treatment. The ergospirometry test was performed using cycle ergometer. Percentage of predicted values was used for analysis.

**Results:** All girls with IS were classified within the normal range of predicted values of maximal minute oxygen uptake, VAT and maximal workload. Among twenty-six girls tested before and after treatment, a statistically significant increase in the value of VAT occurred during intensive hospital rehabilitation (Table 1).

**Conclusion:** The exercise efficiency of girls with IS, conservatively treated by physiotherapy, is normal.

**References**

**S4**

**Respiratory muscle strength in adolescents with idiopathic scoliosis**

Jacek Durmala 1 and Waldemar Tomalak 2

1Department of Rehabilitation, Medical University of Silesia, 40-170 Katowice, Poland
2IGChP o/Rabka Zroj, Poland
E-mail: jdurmala@gcm.pl

Scoliosis 2007, 2(Suppl 1):S4

**Objective:** The aim of the study was to assess the respiratory muscle strength in adolescents with idiopathic scoliosis (IS), conservatively treated using exercises by Dobosiewicz [1].

**Study design:** The study group included eighty-one subjects (65 female, 16 male) aged 7 to 17 years (mean age 14.3 ± 2.3 years) with thoracic scoliosis (n = 44) and double major scoliosis (n = 37). Mean Cobb angle was 39 degrees (SD 17.8) and mean apical vertebral rotation (AVR) was 12 ± 7.1 degrees.

**Methods:** Vital capacity (VC) was measured using Jaeger’s spirometer and values were compared to Zapletal’s recommendations [2]. Maximal static respiratory pressures including maximal inspiratory pressure (MIP) and maximal expiratory pressure (MEP), were measured according to W. Tomalak’s recommendations for Polish children [3]. Measurements were made using a portable, digital pressure meter equipped with the Omega PX25 pressure transducer (ZETA product – model MMM2).

**Results and conclusion:** The maximal static respiratory pressures (percent predicted value) in children with scoliosis conservatively treated using exercises by Dobosiewicz were normal (MIP mean 119.1 ± 40.25%). For MEP, values (mean 164.9 ± 35.96%) were even higher than predicted, which may be related to age (the norm of adolescents is extrapolated) and/or the effect of rehabilitation on physical performance.

**Table 1 (abstract S3)**

<table>
<thead>
<tr>
<th>Percentage of predicted value of</th>
<th>Girls with IS treated using</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dobosiewicz’s method</td>
<td>symmetric exercises</td>
</tr>
<tr>
<td>Maximal minute oxygen uptake</td>
<td>98</td>
<td>90.5</td>
</tr>
<tr>
<td>VAT</td>
<td>97</td>
<td>93.3</td>
</tr>
<tr>
<td>Maximal workload</td>
<td>101</td>
<td>93.9</td>
</tr>
</tbody>
</table>
S5
Stabilisation of progressive idiopathic scoliosis in the period of maturation in girls treated using Dobosiewicz’s method (period of the observation >36 months)
Jacek Durmala1, Krystyna Dobosiewicz2 and Jerzy Piotrowski1
1Department of Rehabilitation, Medical University of Silesia, Katowice, Poland
2GWSH, Katowice, Poland
E-mail: jdurmala@gcm.pl

Objective: The aim of the study was the retrospective analysis of effectiveness of conservative treatment of progressive idiopathic scoliosis (IS) in the period of maturation.

Study design: The analysis included twenty girls with IS (thirty-one curves; eleven double major, six thoracic, three thoracolumbar). The mean initial Cobb angle was 27.7 ± 7.52 degrees (range 15–45 degrees). Progression was defined as radiological documentation of a >6 degree increase in Cobb angle in six months. All patients were treated using Dobosiewicz’s method [1, 2, 3, 4, 5]. The criteria of inclusion was a minimum observation period of >36 months spanning one year before and after first menstruation, with hospitalization at least two times in the Department of Rehabilitation. The mean duration of observation was 50.9 ± 16.7 months (range 37–91 months). Patient compliance was not taken into account in this analysis.

Results: Mean progression of Cobb angle in the study group was 0.6 ± 6.45 degrees (range −14 to +15°). Mean progression of AVR angle was 1.0 ± 5.76 degrees (range −15 to +15°).

Conclusion: The radiological results demonstrated prevalent stabilisation of scoliotic curves in girls with progressive IS, treated using Dobosiewicz’s method.

References
3. Dobosiewicz K, Durmala J, Czernicki K and Piotrowski J: Radiological results of Dobosiewicz method of three-dimensional treatment of progressive idio-
Conclusion: Surgery can be avoided in most patients if effective conservative treatment is performed correctly and initiated with appropriate timing. Follow-up studies of patients are needed.

S7
Effect of specific exercises on the sagittal profile of scoliotic spines
M Rigo, G Quera-Salva, M Villagrasa, M Ferrer and A Casas
E. Salvà Spinal Deformities rehabilitation Institute. Via Augusta 185, 08021 Barcelona, Spain
E-mail: lolo_rigo@hotmail.com
Scoliosis 2007, 2(Suppl 1):S7

Objective: To evaluate the three-dimensional (3D) correction effect, particularly in the sagittal plane, of Schroth exercises [1, 2] in patients with idiopathic scoliosis (IS) by using a surface topography system.

Study design: A retrospective unselected series of fifty consecutive patients (48 females, age 15.7 years) diagnosed with IS, were measured with the formetric system [3] before and after an intensive course of rehabilitation. This system provides quantitative values to asses the spine in the frontal, sagittal and transversal planes. We have designed a specific scale based on objective data in order to define the vertebral column in the sagittal plane as harmonic (minimum score 0) or disharmonic (maximum score 20).

Results: During the course of treatment, trunk imbalance improved from 11.6 to 8.1 mm (p < 0.001), and lateral deviation in the frontal plane decreased from 14.1 to 11.3 mm (p < 0.005). Surface rotation also decreased, from 7.4 degrees to 6.6 degrees (p < 0.01). Although maximum and regional sagittal angles decreased, the harmonic score improved from 10.4 to 9.6 (p < 0.05).

Conclusion: Scoliotic patients tend to keep their sagittal regional angles close to normal values but showing a disharmonic configuration. Schroth exercises can correct the spine in 3D, reducing such a disharmony.

References

S8
Does quality of exercises affect results in adolescent idiopathic scoliosis treatment to avoid braces? SEAS.02 results at two years
Michele Romano, Stefano Negrini, Fabio Zaina, Alessandra Negrini and Silvana Parzini ISICO (Italian Scientific Spine Institute), Via Carlo Crivelli 20, 20122 Milan, Italy
E-mail: stefano.negrini@isico.it
Scoliosis 2007, 2(Suppl 1):S8

Objective: After documenting the short term higher efficacy of SEAS.02 (Scientific Exercises Approach to Scoliosis, version 2002) versus classical physical therapy [1], with this study we aim at verifying it in a longer term.

Study design: The design was a prospective controlled study of AIS patients who were prescribed exercises only, to avoid progression to brace treatment. All patients were enrolled consecutively. These results report on the second year of radiological follow-up. We had three groups: (1) SEAS exercises according to the SEAS.02 protocol (n = 20); (2) CONT, classical physical therapy (n = 29); (3) MIX, patients who changed protocol during treatment (n = 8). Mean age was 12.7 ± 2.2 years, mean Cobb angle was 15.3 ± 5.4 degrees, and Bunnell angle of trunk rotation (ATR) [2] was 8.9 ± 2.8 degrees. There were no differences among the groups, using t-test for uncoupled data, Mann-Whitney, Fisher’s Exact and chi-square with α = 0.05.

Results: The difference in the number of braced patients was statistically significant: 10% in SEAS vs. 27.6% in CONT and 25% in MIX. During the observation period, only three patients have been discharged and were considered as success of treatment: 7% in CONT, 5% in SEAS, and 12% in CONT. Overall, SEAS had better results than both CONT and MIX.

Conclusion: Not all exercises for scoliosis have the same efficacy. This study reveals again the efficacy of SEAS.02 when compared to classical physical therapy. In an age at risk, the group with the qualitatively better treatment (SEAS) has demonstrated an improvement of median values. The less effective treatment, moreover, has allowed a higher stabilization if compared to natural history. In our view, the most important difference is in terms of bracing, because when scoliosis is of low degree, the aim of treatment is mainly to avoid more aggressive treatments with higher impact on quality of life of patients.

References

S9
The “Chéneau light” brace in patients with scoliosis – in-brace corrections
Hans-Rudolf Weiss1, Mario Werkmann2 and Carola Stephan1
1Asklepios Katharina Schroth Spinal Deformities Rehabilitation Centre, Korczakstr. 2, D-55566 Bad Sobernheim, Germany
2Orthomed Scolicare, Orthopedic Technical Services, D-55566 Bad Sobernheim, Germany
E-mail: hr.weiss@asklepios.com
Scoliosis 2007, 2(Suppl 1):S9

Objective: The “Chéneau light” brace promises a lesser impairment of quality of life in the brace. However material reduction should not result in reduced effectiveness. Therefore the primary correction effect in the “Chéneau light” brace has been evaluated.

Study design: The correction effects of the first eighty-one consecutive patients, treated according to the principles of the “Chéneau light” brace [1], were evaluated after an average treatment time of six weeks. Outcome was based on comparison of a full-spine radiograph before and after bracing. At the start of treatment, the average Cobb angle was 35.6 degrees, the average age 12.9 ± 1.9 years, average Risser sign 1.3 ± 1.5, and average Tanner rating 2.75 ± 0.7.

Results: The Cobb angle was reduced by 16.4 degrees, which corresponds to a correction effect of fifty-one percent. The
correction effect exhibited a slight negative correlation with age (r = −0.24; p = 0.014), Risser stage (−0.29; p = 0.0096) and the Cobb angle measured before treatment (r = −0.43; p < 0.0001).

**Conclusion:** The use of the “Chêneau light” brace leads to correction effects above average when compared to the correction effects of other braces described in literature. The reduction of material seems to affect the desired correction in a positive way.

**Reference**

**S10**
**Brace related stress in different braces for scoliosis treatment**
Hans-Rudolf Weiss¹, Mario Werkmann² and Carola Stephan
¹Asklepios Katharina Schroth Spinal Deformities Rehabilitation Centre, Korczakstr. 2, D-55566 Bad Sobernheim, Germany
²Orthomed Scolicare, Orthopaedic Technical Services, D-55566 Bad Sobernheim, Germany
E-mail: hr.weiss@asklepios.com
Scoliosis 2007, 2(Suppl 1):S10

**Objective:** The BSSQbrace questionnaire has been shown to be reliable with good internal consistency and reproducibility in estimating the stress scoliosis patients experience while wearing their brace. Eight questions are provided focusing on this topic. A maximum score of 24 can be achieved (from 0 for most stress to 24 for no stress). The subdivision of the score values is: 0–8 (strong stress), 9–16 (medium stress) and 17–24 (little stress).

**Study design:** Two BSSQbrace questionnaires were posted to sixty-five patients under brace treatment from our “Chêneau light” data base [1]. All patients had another kind of brace prior to the “Chêneau light”. The patients were asked to rate their stress level using one questionnaire for the current brace and the other for the previous one.

**Results:** Sixty-three patients returned their fully completed questionnaires (mean age 13.6 years, mean Cobb angle 43.7 degrees). Stress level in the previous brace was 11.04 and in the “Chêneau light” 13.87. The differences were highly significant in the t-test; t = −4.67; p < 0.001.

**Conclusion:** The use of the “Chêneau light” brace leads to reduced stress and/or impairment for the patients under treatment compared to heavier brace models used so far.

**Reference**

**S11**
**A series of patients with adolescent idiopathic scoliosis treated with a Rigo System Chêneau (RSC) brace. Primary correction in brace improved by technical evolution**
Manuel Rigo
E.Salvá Spinal Deformities Rehabilitation Institute, Via Augusta 185, 08021 Barcelona, Spain
E-mail: lolo_rigo@hotmail.com
Scoliosis 2007, 2(Suppl 1):S11

**Objective:** To compare the current primary correction in brace with that achieved in a previous series [1], after gaining personal experience and forcing a technical evolution of the original Chêneau technique.

**Study design:** Retrospective unselected case series of thirty-two patients (29 females, 3 males) with adolescent idiopathic scoliosis (AIS). The mean age for the group was 12 ± 1.2 years, mean Risser was 0.7 ± 1.1 and mean Cobb angle was 34.1 ± 7.1 degrees. Only those patients receiving brace treatment for the first time were included, in order to minimize the influence of factors other than technical changes. They were matched to those from the previous series (n = 66, 12 ± 2.1 years, Risser 0.8 ± 1.1, Cobb angle 32.8 ± 9.4 degrees). All the patients treated during years 2005–2006 and fulfilling the following inclusion criteria were included: 1. First brace; 2. A diagnosis of AIS; 3. Age: 10–14 years; Risser 0–3; Cobb angle > 25 degrees.

**Results:** The patients from the present study showed a primary correction of 41.5% ± 16, which was significantly higher than the previous 32.8% ± 9.4.

**Conclusion:** Primary correction can be improved by both experience and technical evolution based on: 1. Better definition of the passive and active de-rotational mechanism; 2. More physiological sagittal profile; 3. Well defined principles of correction, based on curve pattern.

**Reference**

**S12**
**Long term efficacy of the Boston brace for the treatment of idiopathic scoliosis**
K Soultanis, G Mantelos, N Pyrovolou, M Athanasakopoulos, G Karaliotas, B Sakelariou and PN Soucacos
University of Athens School of Medicine; 1rst Department of Orthopaedic Surgery, “ATTIKON” Hospital, Rimini 1 Haidari Athens P.C. Greece 12462
E-mail: ksoultanis@otenet.gr
Scoliosis 2007, 2(Suppl 1):S12

**Objective:** To evaluate the efficacy of Boston brace treatment [1] in preventing progression of idiopathic scoliosis (IS) in long term follow up.

**Study design:** Between January 1988 and December 1999, ninety-two children have been managed for juvenile and adolescent IS with a Boston brace. There were eighty-two girls and ten boys with a mean age of thirteen years and four months (range, eight to seventeen years). Most of these young patients were followed up for at least six years after skeletal maturity or until failure of treatment (surgical intervention). The patients had a mean initial Cobb angle of 27 degrees (18–40 degrees) and an apical level between T6 and L2. Fifty-five curves were thoraco-lumbar, while thirty-seven were thoracic.

**Results:** Eighty-three patients (ninety percent) who reached skeletal maturity were followed up for a mean of five years and seven months after the cessation of treatment. They had an average final Cobb angle progression of eight degrees. The majority of the patients were complainers about bracing. Failure of treatment occurred in nine patients (ten percent) who underwent surgical treatment.

**Conclusion:** Although progression of the curve after discontinuation of brace treatment was recorded in 29.6% of the test
group, ninety percent of the patients ultimately avoided surgical treatment. Reviewing the failed cases, we found that skeletally immature children with an initial thoracic curve with a Cobb angle of more than thirty degrees are at high risk for severe progression of the curve. These high risk patients should be identified early and managed with a brace, considering surgical treatment as the next treatment option.

Reference

S13
Proportion of correction and compliance to determine success in brace treatment
F Landauer and Th Hofstädter
Orthopaedic Department, PMU – University of Salzburg, Muellner Hauptstr. 48, 5020 Salzburg, Austria
E-mail: flandauer@salk.at


Objective: The aim of the study is to obtain information regarding impact of technician input on outcome of thoracolumbar sacral orthosis (TLSO) treatment of idiopathic scoliosis (IS). Study design: A group of patients (n = 205) with a diagnosis of IS (Cobb angle twenty to fifty degrees) were evaluated. Braces were made by two different groups of technicians. Measurements were taken from standing anterior posterior (AP) radiographs. Two groups of patients, with good and poor compliance, were formed.

Results: No significant difference of Cobb angle was found at the beginning of brace treatment in the two groups of technicians: (Group 1: n = 134, mean Cobb angle 31 ± 5 degrees); (Group 2: n = 71, mean Cobb angle 33 ± 6 degrees). Among patients with good compliance (n = 167) and also good initial correction (n = 125), a continuous correction of about 7 ± 6 degrees Cobb angle was evident. Patients with good compliance but poor initial correction (n = 42) can only expect prevention of progression (32 ± 5 degrees). Patient with poor compliance (n = 38) have shown progression of curvature with high variation (32 ± 6 to 37 ± 9 degrees). At follow up, no significant difference was found between the two groups of technicians (Group 1: Cobb angle mean 23 ± 6 degrees and Group 2: 26 ± 7 degrees).

Conclusion: The results depend on brace correction as well as input of the technician. The basis for poor correction in the brace may be multifactorial. Success can only be expected with good brace correction and compliance as input of the patient.

S14
How much does the Dynamic Derotation Brace affect the surface deformity of children with idiopathic scoliosis?
Theodoros B Grivas, Elias Vasiliadis, Georgios Koufopoulos, Georgios Triantafyllopoulos and Vasilios Mouzakis
Orthopaedic Department, “Thriasio” General Hospital, G. Gennimata Av. 19600, Magoula, Attica, Greece
E-mail: grivastb@panafonet.gr

Scoliosis 2007, 2(Suppl 1):S14

Objective: The effect of the Dynamic Derotation Brace (DDB) on angle of trunk inclination (ATI) in adolescent idiopathic scoliosis (AIS) children was studied.

Study design: A prospective clinical study for the assessment of the influence of the DDB, a modified Boston Brace [1] with antirotatory blades, on the surface deformity of conservatively treated scoliotics was performed.

Methods: Thirty-six scoliotic children (32 female, 4 male) with a mean age of 13.9 years (range 12–17 years), a mean Cobb angle of 28.2 degrees (range 19–38) and a mean angle of trunk inclination (ATI) of 7.8 degrees (range 4–17) were included in the study. The examined children were divided in three subgroups according to the curve type. All the children were treated with the DDB with antirotatory blades and they wore the brace for twenty-three hours per day for a minimum duration of two years. The ATI was assessed using the Pruijs scolimeter [2] during the first examination and during the follow up, with the children out of the brace.

Results: For double curves, statistical analysis for ATI changes revealed that improvement in the thoracic region was not statistically significant (p < 0.088) but it was significant (p < 0.01) in the thoracolumbar and in the lumbar region (p < 0.013). For right thoracic curves, ATI improvement was not significant for all the examined regions. Finally for thoracolumbar curves ATI improved significantly in the thoracolumbar (p < 0.018) and in lumbar region (p < 0.027), but not in the thoracic region (p < 0.248).

Conclusion: The above findings indicate that in curves with a compensatory component (e.g. primary thoracic with compensatory lumbar curve), a deforming rotatory force is present, blocked by the derotatory action of the blades of the DDB, and seems to be more active in the lumbar spine. However DDB beneficially affects the surface deformity of AIS children with all but right thoracic curves.

References

S15
Adolescent girls with idiopathic scoliosis >45 degrees, treated with TLSO brace, reveal less clinical deformity than non-treated girls having similar scoliosis angle
Edyta Kinel1, Tomasz Kotwicki2, Wanda Strylä1 and Andrzej Szulc3
1Department of Rehabilitation, University of Medical Sciences of Poznan, ul. 28 Czerwca 1956 roku nr 135; 61-545 Poznan, Poland
2Department of Pediatric Orthopedics and Traumatology, University of Medical Sciences of Poznan, ul. 28 Czerwca 1956 roku nr 135; 61-545 Poznan, Poland
E-mail: kotwicki@amp.edu.pl

Scoliosis 2007, 2(Suppl 1):S15

Objective: The aim of the study was to compare clinical deformity in two groups of girls with curves >45 degrees: Group
I admitted for surgical treatment, and Group 2 under brace treatment.

**Study design:** Two groups, matched for age and Cobb angle (unpaired t test with Welch correction), were compared with respect to surface deformity. Group 1 consisted of twenty-two girls, aged 14.1 ± 1.8 years, Cobb angle 59.7 ± 14.6 degrees (range 45–86 degrees, median 54 degrees), admitted for surgical treatment. Group 2 consisted of 23 girls, aged 14.9 ± 1.3 years, Cobb angle 55.0 ± 6.8 degrees (range 45–68 degrees, median 55 degrees), who refused surgical treatment and had been wearing a Cheneau thoraclolumbar sacral orthosis (TLSO) for more than one year. We examined the hypothesis that wearing the brace for more than one year may significantly reduce clinical deformity (trunk rotation) in adolescents with curves >45 degrees.

**Methods:** Angle of trunk rotation was measured using Bunnell scoliometer [1] at three levels of the spine: upper thoracic (Th1–Th5), main thoracic (Th5–Th12), lumbar or thoracolumbar (Th12-L4). The maximal angle was noted at each level and the sum of three levels was calculated. Posterior trunk symmetry index (POTSI) was measured using surface topography [2].

**Results:** The value of angle of trunk rotation in the main curvature was 15.1 ± 5.6 degrees (range 6–25) in non-treated girls and 11.9 ± 3.4 (range 5–18 degrees) in braced patients; this difference was significant at p = 0.027 (unpaired t-test with Welch correction). The value of the sum of angles of trunk rotation at 3 levels of the trunk was 21.8 ± 6.1 degrees (range 14–32 degrees) in non-treated and 17.9 ± 4.7 degrees (range 10–26 degrees) in braced patients; this difference was significant (p = 0.024). The POTSI did not differ significantly between groups (p = 0.78).

**Conclusion:** (1) Adolescent girls with Cobb angle above 45 degrees who have been treated with TLSO brace for more than one year, reveal smaller clinical rotational deformity of their back than non-treated girls having similar Cobb angle. (2) Parameters describing clinical deformity (trunk rotation) have to be considered together with radiological data for evaluation of the outcome of scoliosis treatment. (3) Systematic radiological exam during brace treatment is mandatory because scoliometer readings may underestimate radiological deformity.

**References**


**S16**

Adolescent girls with idiopathic scoliosis <40 degrees, treated with TLSO brace, reveal less clinical deformity than non-treated girls having similar scoliosis angle

Edyta Kinel1, Tomasz Kotwicki2, Wanda Stryla1 and Andrzej Szulc2

1Department of Rehabilitation, University of Medical Sciences of Poznan, ul. 28 Czerwca 1956 roku nr 135; 61-545 Poznan, Poland
2Department of Pediatric Orthopedics and Traumatology, University of Medical Sciences of Poznan, ul. 28 Czerwca 1956 roku nr 135; 61-545 Poznan, Poland
E-mail: kotwicki@amp.edu.pl

**S17**

Outcomes of brace treatment for adolescent idiopathic scoliosis

Toru Maruyama, Makoto Miura, Gou Sasaki and Tomoaki Kitagawa

Department of Orthopaedic Surgery, Saitama Medical Center, Saitama Medical University, 1981 Kamodatsujido, Kawagoe, Saitama 350-8550, Japan
E-mail: tmharuyama17@yahoo.co.jp

Scoliosis 2007, 2(Suppl 1):S16

**Objective:** The goal was to compare clinical deformity among two groups of girls with adolescent idiopathic scoliosis (AIS), with curves <40 degrees: Group 1 was treated with a thoracolumbar sacral (TLSO) orthosis; and Group 2 was non-treated.

**Study design:** Group 1 consisted of twenty-four girls wearing the brace and Group 2 consisted of twenty-six girls without the brace, matched for Cobb angle. We examined the hypothesis that girls wearing the brace for more than six months, when compared to scoliotics without brace, may present distinct morphology of the trunk, in spite of having similar Cobb angle.

**Inclusion criteria:** Female gender, a diagnosis of AIS, age 10–16 years, out of brace Cobb angle minimum 25 degrees, maximum 40 degrees. The braced group consisted of girls wearing a TLSO brace (Cheneau) a minimum of sixteen hours per day for more than six months. The unbraced group consisted of girls first seen for their spinal deformity, previously not treated.

**Methods:** Angle of trunk rotation (ATR) at three levels of the spine – upper thoracic (Th1–Th5), main thoracic (Th5–Th12), lumbar or thoracolumbar (Th12-L4) – was measured using a scoliometer [1]. The maximal angle was noted at each level and the sum of three levels was calculated. Posterior trunk symmetry index (POTSI) was measured using surface topography [2].

**Results:** Cobb angle was 35.0 ± 4.8 degrees in braced and 33.0 ± 4.9 degrees in un-braced patients (difference not significant, unpaired t-test). The age was 14.1 ± 1.6 years in Group 1 and 13.1 ± 1.9 years in Group 2 (p = 0.046, unpaired t-test). Risser sign value was less than three in twelve girls from Group 1 and in twenty-three girls from Group 2. Both groups presented similar curve patterns. The value of ATR in the main curvature was 8.4 ± 2.7 degrees in Group 1 and 11.4 ± 2.7 degrees in group 2 (difference highly significant, p = 0.0003, unpaired t-test). The value of the sum of ATR at three levels of the trunk was 12.8 ± 4.6 degrees in Group 1 and 16.5 ± 3.8 degrees in Group 2 (difference significant, p = 0.0038, unpaired t-test). The POTSI did not differ significantly between the groups (p = 0.18).

**Conclusion:** Girls with Cobb angle of 25 to 40 degrees, wearing the brace, revealed less clinical deformity than non-treated girls having similar radiological deformity. Evaluation of results of scoliosis treatment should consider clinical deformity and not be limited to radiological data.

**References**

Study design: The subjects of the study were patients with AIS, whose Cobb angle was larger than 25 degrees and Risser sign was smaller than 3 at the start of the treatment, and who were followed for more than one year and at least until Risser sign of 4. Cervico-thoraco-lumbo-sacral orthosis (CTLSO) was used for thoracic curves and thoraco-lumbo-sacral orthosis (TLSO) was used for thoracolumbar and lumbar curves. 

Results: The study sample consisted of thirty-nine girls, whose average age was 12.8 years and average Cobb angle was 37 degrees at the start of the treatment. The average curve magnitude increased to 45.4 degrees after a follow-up period of 2.8 years. Curve magnitude of eleven patients (28%) increased more than 10 degrees: in the remaining twenty-eight patients (72%) the change of their curve was ≤10 degrees. Presence of menarche, rib hump magnitude, and initial correction rate by the brace were the factors affecting the results. 

Conclusion: Results of the brace treatment were better than the natural history reported by Bunnell [1]. The outcomes of the brace treatment for AIS may be improved if the correction by the brace can be improved. 

References 

S18 
Bracing patients with adolescent idiopathic scoliosis: design of the first randomised controlled treatment trial 
Eveline M Bunge1 and Harry J de Koning1,2 
1Erasmus MC – University Medical Center Rotterdam, Dept. of Public Health, P.O. Box 2040, 3000 CA Rotterdam, The Netherlands 
2For the brace trial group 
E-mail: e.bunge@erasmusmc.nl

Scoliosis 2007, 2(Suppl 1):S18

Objectives: The effectiveness of bracing patients with adolescent idiopathic scoliosis (AIS) has not been convincingly established due to lack of Randomised Controlled Trials (RCT). The aim of this study is to evaluate whether bracing patients with AIS in an early stage will result in at least five degrees less mean progression of the curvature compared to the control group after two years of follow up. 

Study design: Ten Dutch hospitals will participate in this (RCT). Eligible patients are girls and boys with AIS, aged eight to fifteen years old, who have not yet been treated by bracing or surgery and for whom further growth of physical height is still expected (Risser sign <3). The Cobb angle of the eligible patient should either be minimally twenty-two and maximally twenty-nine degrees with established progression of more than five degrees, or should be minimally thirty and maximally thirty-five degrees (established progression for the latter is not necessary). A total of 100 patients will be included in this trial. The intervention group will be treated with full-time Boston brace wear; the control group will not be braced. Every four months, a physical and an X-ray examination will take place for each patient. 

Main outcomes: Cobb angle two years after inclusion and quality of life outcomes. 

Acknowledgements 
Brace trial group: HD Been (Academic Medical Hospital Centre Amsterdam, the Netherlands), FC van Biezen (Erasmus MC Rotterdam, the Netherlands), JPW van Jongbergen (Deventer Hospital, the Netherlands), A.J. de Gruijter (Medical Centre Alkmaar, the Netherlands), LWL de Klerk (Erasmus MC Rotterdam, the Netherlands), M de Kleuver (Sint Maartenskliniek Nijmegen, the Netherlands), PHJ. Klop (Ziekenhuis Walcheren, the Netherlands), F de Nies (Onze Lieve Vrouwe Gasthuis Amsterdam, the Netherlands), JHJ Pruiks (University Medical Center Utrecht, the Netherlands), MP Teeuw (Oosterscheldeziekenhuis Goes) and PBJ Tilman (Maasland Ziekenhuis Sittard, the Netherlands).

S19 
The conservative treatment of thoracolumbar and lumbar idiopathic scoliotic curves with the Progressive Action Short Brace (P.A.S.B.) 
Angelo Gabriele Aulisa1, Stefano Negri1, Marco Galli1, Stefano Lupparelli2 and Aulisa Lorenzo3 
1Orthopaedic Department, Children’s Hospital Bambino Gesù, Institute of Scientific Research, Via della balduna 63 00136 Rome, Italy 
2ISICO (Italian Scientific Spine Institute), Milan, Italy 
3Department of Orthopaedics, “A. Gemelli” Hospital, Universita Cattolica del Sacro Cuore, Rome, Italy 
4Clinic Orthopaedic, Università degli studi dell’Aquila, Italy 
E-mail: aulisa@libero.it


Objective: The aim of the study is to evaluate the clinical effectiveness of the Progressive Action Short Brace (P.A.S.B.). The action of this brace, developed by the authors, is based on the corrective effect of the forces generated during spine dynamics, when spine dynamics are limited by the brace. 

Study design: A prospective roentgenographic study was carried out on sixty-seven patients affected with adolescent idiopathic scoliosis (AIS). Treatment with the PASB was preceded by corrective plaster casts (1 or 2 depending on the stiffness of the curve). The magnitude of the curve was measured with the Cobb’s method and vertebral torsion within the major curve with Perdriolle’s method [1, 2]. Radiographic measurements were obtained at the following times by three observers: t1 (start of treatment), t2 (best correction in brace), t3 (intermediate time between t2 and t4), t4 (end of weaning) and t5 (last follow-up, 36.37 ± 11.71 months after t4). 

Results: The results showed the following changes from time t1 to t5: Cobb’s angle was improved from 23.66 ± 6.37 degrees at t1 to 16.20 ± 8.51 degrees at t5; apical vertebra torsion improved from 12.46 ± 5.99 at t1 to 9.70 ± 6.59 at t5); mean torsion of the whole curve improved from 9.11 ± 3.97 at t1 to 7.20 ± 5.00 at t5. 

Conclusion: The statistical analysis supports the clinical effectiveness of the P.A.S.B. Results show that treatment not only stops the progression of the curve, but is even able to reduce, to a variable extent, the values of Cobb magnitude in thoracolumbar and lumbar curves. 

References 
S20
Sforzesco brace (SPoRT Concept) versus Risser cast in adolescent idiopathic scoliosis treatment: similar efficacy, with reduced spinal side effects for the brace
Stefano Negrini1, Fabio Zaina1, Francesco Negrini1, Gianfranco Marchini2 and Angelo Aulisa2
1ISICO (Italian Scientific Spine Institute), Via Carla Crivelli 20, 20122 Milan, Italy
2COL, Milan, Italy
E-mail: stefano.negrini@isico.it
Scoliosis 2007, 2(Suppl 1):S20
Objective: To compare the results of the recently introduced Sforzesco brace with the classical Risser cast in the treatment of adolescent idiopathic scoliosis (AIS).
Study design: From our prospective database we included all patients with AIS, followed up for eighteen months during Risser cast (twelve months plus six month in Lyon brace full time) or Sforzesco brace treatments. Risser cast treatment [1] was our standard treatment for worst curves until January 2004. The Sforzesco brace method is our current approach. We had eighteen patients in cast (83% female, 14.3 ± 1.11 years of age, Cobb angle 39.5 ± 7.5 degrees) and thirty-three patients in brace (79% females, 14.1 ± 1.10 years of age, Cobb angle 40.9 ± 12.1). Analysis included measurement of Cobb angle, Bunnell angle of trunk rotation (ATR) [2], rib hump magnitude, aesthetic index, and sagittal distances from the plumbline.
Results: No significant differences were present between the two groups, at the start. After treatment, mean values for clinical parameters between the two groups were statistically distinct. An exception was thoracic Cobb angle (+1 degree) for cast treated patients, and thoraco-lumbar Cobb angle (−5.4 degrees, p = NS) for brace treated patients. Comparing the groups, Cobb reduction was higher for brace (−5 degrees vs −3.5 degrees) but the difference was statistically significant only for thoracic curves. The cast achieved better results on ATR and rib hump, but resulted in a significant sagittal curve reduction (−11 mm at C7 p < 0.001, versus −3 mm p = NS).
Conclusion: Clinical results with the Sforzesco brace are similar to results with the Risser cast. Considering the reduced costs, both personal (Quality of Life) and social (outpatient only for the brace, versus four weeks’ inpatient treatment for the Risser cast), brace treatment should be preferred.
References

S21
Effectiveness of the Spinecor brace based on the new standardized criteria proposed by the Scoliosis Research Society for adolescent idiopathic scoliosis
Christine Coillard1,2, Valerie Vachon1,2, Alin Circo1,2, Marie Beauséjour1, Nancy Shawafaty1 and Charles H Rivard1,2
1Research Center, Sainte-Justine Hospital and University of Montreal, Canada. 3175 ch. Côte Ste-Catherine, Montréal, Québec, Canada, H3T 1C5
2University of Montreal, Montreal, Canada
E-mail: chrivard@gmail.com
Scoliosis 2007, 2(Suppl 1):S21
Objective: To evaluate the effectiveness of the Dynamic SpineCor brace [1] for adolescent idiopathic scoliosis (AIS).
Study design: From 1993 to 2006, 493 patients were treated using the SpineCor brace. Of these patients, 249 subjects fitted the criteria for inclusion and seventy-nine were still actively being treated. Ultimately, 170 patients have a definitive outcome. Assessment of brace effectiveness included the following criteria: 1) percentage of patients who have five degrees (Cobb angle) or less curve progression and the percentage of patients who have six degrees or more progression; 2) percentage of patients for whom surgery was recommended or was carried out, before skeletal maturity; 3) percentage of patients with curves exceeding 45 degrees at maturity (end of treatment); and 4) two years’ follow-up beyond maturity to determine the percentage of patients who subsequently underwent surgery.
Results: Successful treatment (correction >5 degrees or stabilization ± 5 degrees) was achieved in 101 of the 170 patients (59.4%) from the time of the fitting of the SpineCor brace to the point at which it was discontinued. Thirty-nine immature patients (22.9%) required surgical fusion while receiving treatment. Two patients out of 170 (1.2%) had curves exceeding 45 degrees at maturity.
Conclusion: The SpineCor brace is effective for the treatment of AIS. Moreover, positive outcomes for 45 patients out of 47 (95.7%) treated with the SpineCor brace were maintained after two years.
Reference

S22
Positive outcome in obese patients with adolescent idiopathic scoliosis treated with the SpineCor Brace
Valerie Vachon1, Alin Circo1,2, Christine Coillard1,2 and Charles H Rivard1,2
1Research Center, Sainte-Justine Hospital, 3175 Côte Ste-Catherine, Montréal, Quebec, Canada, H3T 1C5
2University of Montreal, Montreal, Canada
E-mail: chrivard@gmail.com
Scoliosis 2007, 2(Suppl 1):S22
Objective: To compare outcomes of SpineCor brace treatment [1] in AIS patients who were obese with the outcome in patients of normal weight.
Study design: From December 1994, 503 patients were treated using the SpineCor brace. One hundred eighty patients have a definitive outcome. The cohort of patients was divided into two groups according to body habitus. Obese patients were defined as those with a body mass index in the 85th percentile or greater [2]. Assessment of brace effectiveness included 1) number of patients whose curves progressed by ≤5 degrees; 2) number of patients whose curves progressed by ≥6 degrees; 3) number of patients with curves exceeding forty-five degrees at the end of treatment.

A retrospective study of twenty-three adults treated for scoliosis using the Spinecor Orthosis
Gary Deutchman, Marc Lamantia, Joseph Indelacato and Marianna Raykhman
The Scoliosis Care Foundation, 1085 Park Ave, Suite 1E, New York, NY 10128, USA
E-mail: info@scoliosiscare.org
Scoliosis 2007. 2(Suppl 1):S23

Objective: To determine if non-surgical treatment using the Spinecor brace can effectively reduce adult scoliosis curvature magnitude.

Study design: Twenty-three adults between the ages eighteen and sixty-five years, seeking treatment for adolescent onset idiopathic scoliosis (AIS) were fitted with the Spinecor Orthosis [1] after being exposed to an anterior-posterior (AP) full spine and lateral full spine radiograph, with a minimum of three months between exposures and a maximum of one year. Measurements of the radiographs were performed using a digital inclinometer in order to reduce error and all projections were exposed without the orthosis.

Results: Patients were separated into three groups based on curvature location: Thoracic (T), Thoracolumbar (TL) and Lumbar (L). T-tests were performed using the initial and follow-up Cobb measurements of AP radiographs for each of the three groups. The maximum (T) reduced from 94 degrees to 77 degrees (−12.2%) following a minimum of three months of treatment. The maximum (TL) measurement reduced from 31 degrees to 23 degrees (−13.4%), and the (L) minimum reduced from 17 degrees to 11.1 degrees (−15.3%). The patients in the “Thoracic” group (n = 20) had a mean average change of −5.27 degrees. The “Thoracolumbar” group (n = 3) had a mean average change of −6.0 degrees. The Lumbar group (n = 15) had a mean average change of −4.40 degrees.

Conclusion: These findings suggest the use of a flexible strapping orthosis (Spinecor) is an effective tool in the management of adult scoliosis. Long term studies are necessary to determine the sustainability of these early positive results.

References

S24

The efficacy of a new CAD/CAM Brace in the treatment of idiopathic scoliosis
Jeffrey Kessler and Gez Bowman
4760 Sunset Boulevard, Dept of Orthopedics, Los Angeles Medical Center, Los Angeles, CA 90027, USA
E-mail: jeffrey.i.kessler@kp.org
Scoliosis 2007. 2(Suppl 1):S24

Objective: Traditional scoliosis braces are typically crafted from customized casts or molds made of the patient’s trunk. More recently, computer aided design/computer aided manufacture (CAD/CAM) and other computer technology has been introduced in order to try to eliminate this close physical contact and minimize the variability of orthotists’ skills. The purpose of the present study is to report on the preliminary experience with the Los Angeles brace™, a new CAD/CAM brace.

Study design: This was a retrospective review of forty adolescent idiopathic scoliosis patients who completed treatment with this new CAD/CAM brace. Initial Cobb magnitude of the primary curve averaged thirty degrees (range 25–40 degrees). The distribution of curve patterns included one lumbar, eleven thoracolumbar, eight thoracic, and twenty double major curves. The brace is an asymmetric, underarm thoracolumbar sacral orthosis (TLSO) that uses computer models and algorithm generated predictions in its construction.

Results: In-brace correction averaged fifty-one percent for the primary curves, with corrections of fifty-three and twenty-two percent for girls and boys, respectively. Average followup was twenty months since brace discontinuation. Six patients (fifteen percent) experienced curvature progression at the completion of bracing.

Conclusion: This study suggests that this new CAD/CAM brace is as effective as other types of orthoses in the treatment of scoliosis [1]. In keeping with prior studies, males in this study had poor in-brace corrections [2].

References

S25

Does bracing change the sport habits of patients? A controlled study
Michele Romano and Stefano Negrini
ISICO (Italian Scientific Spine Institute), Via Carlo Crivelli 20, 20122 Milan, Italy
E-mail: stefano.negrini@isico.it

Objective: In our Institute for many years we have asked patients to perform sport activities freely while in treatment,
wearing braces or not, because of the physical and psychological advantages. Our aim was to verify whether patients complied with this approach.

**Study design:** We evaluated 270 patients at the start of treatment, considering how their sport activities habits changed after the first six months of treatment. Different groups considered included (see Table 1):

**Results:** We did not find differences in the number of patients who practiced sport in the different groups. There were slight changes in number of hours of sport per week according to hours and type of bracing, but they were not statistically significant. Patients did not behave differently if they were required to perform sport in-brace or out-brace.

**Conclusion:** It is possible to undergo brace treatment and continue normally practicing sport, if this is explained to patients and parents and if braces are designed in a way to allow it.

### S26

**The development of scoliosis following pinealectomy in two species of chicken with different growth rates**

M Beuerlein, Keith Bagnall, X Wang, J Wilson, James Raso and M Moreau

Department of Surgery, University of Alberta, Edmonton, Alberta, Canada, T6G 2H7

E-mail: kbagnall@med.ualberta.ca

**Objective:** To determine whether differences in growth rate affects the development of scoliosis following pinealectomy in young chickens.

**Study design:** Eighty newly-hatched White leghorn and forty-two newly-hatched Mountain Hubbard chickens were divided equally into control and experimental groups. The experimental chickens underwent pinealectomy. All chickens were observed for five weeks during which time radiographs were taken weekly to assess the development of scoliosis. Weight and spinal length measurements were also gathered.

**Results:** Mountain Hubbard chickens grow much faster than White Leghorn chickens during the initial stages of development. After four weeks, the incidence and severity of scoliosis is not significantly different between the two species. However, prior to the fourth week, the Mountain Hubbard chickens had a significantly higher incidence and severity of scoliosis than the White leghorns.

**Conclusion:** These results indicate a relationship between the percentage growth rate and scoliosis curve development in pinealectomised chickens. This might be a useful factor to consider in the development of successful treatment strategies for scoliosis curve development in humans.

### S27

**Demonstration of vertebral and disc mechanical torsion in adolescent idiopathic scoliosis using three-dimensional magnetic resonance imaging**

Daniel Birchall, David Hughes and Brad Williamson

Consultant and Head of Division, Northern Neurosciences Centre, Newcastle, UK

E-mail: Daniel.Birchall@nuth.nhs.uk

**Objectives:** To demonstrate and measure mechanical torsion in patients with adolescent idiopathic scoliosis using three-dimensional magnetic resonance imaging (MR) imaging.

**Methods:** Ten patients with adolescent idiopathic scoliosis were imaged with three-dimensional MR imaging, and the data post-processed through multiplanar reconstruction to produce images angled through individual endplates. Transverse rotation was measured at each endplate and these measurements used to calculate the amount of vertebral and disc mechanical torsion present. A test object was imaged in order to validate the measurement technique.

**Results:** Mechanical torsion was demonstrated within the vertebral bodies and discs of the imaged subjects, with vertebral mechanical torsion contributing on average forty-five percent of the overall transverse plane deformity.

**Conclusion:** Deformation occurs in the transverse plane within the vertebrae and discs of subjects with idiopathic scoliosis, and a significant proportion of the rotation present in the scoliotic spine occurs as a result of plastic deformation within the vertebrae themselves. We believe that this is the first systematic demonstration of mechanical torsion in idiopathic scoliosis.

### S28

**Evaluation of the effect of vertebral and disc mechanical torsion on the correction achieved by posterior instrumentation in adolescent idiopathic scoliosis**

Daniel Birchall, David Hughes and Brad Williamson

Consultant and Head of Division, Northern Neurosciences Centre, Newcastle, UK

E-mail: Daniel.Birchall@nuth.nhs.uk

**Objectives:** To evaluate the effect of rotational deformation (‘mechanical torsion’) on the short-term and long-term effectiveness of modern posterior spinal instrumentation in treating the three-dimensional deformity of adolescent idiopathic scoliosis.

**Methods:** Ten patients with idiopathic scoliosis were imaged with three-dimensional magnetic resonance imaging pre-operatively and at six weeks and twelve months post-operatively following Isola posterior instrumentation [1]. Changes in the three-dimensional deformity were measured, and the effect of mechanical torsion within the vertebral bodies and discs on the overall changes analysed.

**Results:** Posterior instrumentation causes partial and temporary improvement in disc mechanical torsion but insignificant improvement in vertebral mechanical torsion. Changes in disc torsional deformity correlate with changes in apical rotation, Cobb angle and thoracic hypokyphosis.

**Conclusion:** Mechanical torsion within the vertebral bodies and discs of patients with idiopathic scoliosis presents a...
Wedge deformed vertebrae can be straightened by brace.

Jacques Chêneau, Theodoros B Grivas, Gudrun Engels and Herta Sanitätshaus Fritsch
1 39 rue des Chanterelles, 31650 Saint Orens, France
2 Orthopaedic and Spinal Surgeon, Head of the Orthopaedic Department, “Thriasio” General Hospital, Attica, Greece
3 am Buzenweg 6, D 92245 Kümmersbruck, Germany
4 Kirchenstrasse 6D, 90762 Fürth/Bayern, Germany
E-mail: grivastb@panafonet.gr

Scoliosis 2007, 2(Suppl 1):S29

Objective: It is well documented that congenital scoliosis patients suffering defects of segmentation, like unilaterial unsegmented bars, need early surgical treatment, as the deformity will malignantly progress [1]. Other similar cases having defects of formation such as hemivertebrae (nonincarcerated, semincarcerated, or incarcerated) receive a variety of treatments ranging from observation to brace treatment or surgical intervention [2]. The aim is to highlight the fact that, in selected congenital scoliosis patients, the smaller side of blocks and wedged vertebrae can be expanded due to brace treatment.

Study design: Presentation of the long-term follow-up of two congenital scoliotics with blocks and hemivertebrae, conservatively treated.

Materials and methods: The first patient is a boy (born on 30 October 1985). He was eleven years of age when he initially attended the scoliosis clinic with a L3 incarcerated hemivertebra, with a Cobb angle L2–L4 of 21 degrees. Due to surface and radiological deformity (spinal/radiological deformity)? A study in school-screening referrals, with aetiological implications.

Theodoros B Grivas, Elias Vasiliadis, Olga Savvidou, Spiros Dangas, Georgios Triantafyllopoulos and Marinos Malakasis
Orthopaedic Department, “Thriasio” General Hospital, G. Gennimata Av. 19600, Mogoula, Attica, Greece
E-mail: grivastb@panafonet.gr

Scoliosis 2007, 2(Suppl 1):S30

Objective: A discrepancy between scoliometer readings [1] and Cobb angle is observed in some younger children from school screening to the scoliosis clinic. The aim of this report is to assess the effect of age on the concordance of the surface and the radiological deformity in patients with adolescent idiopathic scoliosis (AIS) and to discuss the aetiological implications of this phenomenon.

Study design: A radiological study was conducted in order to determine the influence of age in the relationship between the deformity of the thorax (rib hump) and the deformity of the spine (Cobb angle) in scoliotics. Eighty-three girls (mean age 13.39 years, range 7–18 years), referred to hospital from a school screening program were assessed. All satisfied the inclusion criterion for referral which was the presence of a thoracic deformity (hump) expressed as Angle of Trunk Rotation (ATR) [1] of greater than or equal to seven degrees. The spinal deformity was assessed radiographically by reading the Cobb angle from the postero–anterior spinal radiographs (SR). The surface/thoracic-rib/hump deformity was quantified, from the lateral SR, assessing the “rib-index” [2]. The data were statistically analysed using SPSS for Windows, v12 http://www.spss.com.

Results: The girls were divided into five groups: 1) straight spines, (n = 15); 2) spinal curvature with Cobb angle <10 degrees (n = 7); 3) thoracic (n = 30); 4) thoracolumbar (n = 10); and 5) lumbar curves 10–20 degrees (n = 21) respectively.

When regressing linearly the dependent variable “Cobb-Thoracic” with the independent (predictor) “rib-index” without the effect of the variable “age” there is no statistical significance (SS) (p < .227) and it is statistically significant when the effect of the (predictor) variable “age”, (p < 0.05) is included. The same was found for the thoracolumbar spine, (p < 0.02), but not for the lumbar spine (p < 0.6).

Conclusion: The thoracic/surface deformity expressed as the rib hump and the spinal/radiological deformity expressed as the Cobb angle, were correlated in AIS patients, and formulas were created to predict Cobb angle from scoliometer readings. Our results show that the above approach is inaccurate as age influences the agreement of these two deformities. In younger children the concordance of the surface and radiological deformity is weak and it becomes stronger by the age. The aetiological implications are that the thoracic cage deformation precedes and then the deformation of the central axis, namely the spine, follows.

References
S31
The biomechanics of conservative treatment of idiopathic scoliosis

Angelo Gabriele Aulisa1, Stefano Negrini2, Marco Galli3, Federico Visci4 and Lorenzo Aulisa5
1Orthopaedic Department, Children’s Hospital Bambino Gesù, Institute of Scientific Research, Via della baldiunia 63 00136 Rome, Italy
2ISICO (Italian Scientific Spine Institute), Milan, Italy
3Department of Orthopaedics, “A. Gemelli” Hospital, Universita Cattolica del Sacro Cuore, Rome, Italy
E-mail: aulisa@libero.it

Scoliosis 2007, 2(Suppl 1):S31

Objective: To evaluate the mechanical action of braces and the biological response to their action.

Study design: Two studies were carried out. The goal of the first was to analyse the actions induced by the brace, in order to modify the pattern of load distribution on the vertebrae included in the curve. The optimization of the actions results in an inversion of the stress concentration through the spinal curve. The second derives from the observation that the biomechanics of orthotic treatment.

Results: The biomechanical analysis demonstrates that the response of the scoliotic spine to the action induced by the brace are determined by two main factors: (1) the residual potential of remodelling of the vertebrae (due to the residual potential of growth); and (2) the capacity of the visco-elastic structures to react properly to the forces. The study defined the G modulus of torque-rigidity in relation to the age of the individual, the level of the intervertebral disks, included in the scoliotic curve, should work within the limits of linear elasticity.

Conclusion: The effectiveness of the corrective action is linked of the vertebral rotation.

S32
Values of thoracic kyphosis in adolescents from the city of Czestochowa (simple method of measurement during clinical examination) – pilot study

Jacek Durmala, Ewa Detko and Katarzyna Krawczyk
Department of Rehabilitation, Medical University of Silesia, Katowice, Poland
E-mail: jdurma@gcm.pl

Scoliosis 2007, 2(Suppl 1):S32

Objective: Knowledge of the normal value of thoracic kyphosis is essential during the assessment of the posture of the body. We measured thoracic kyphosis in 566 adolescents from Czestochowa (city in Poland) aged nine to fourteen years (275 girls and 291 boys).

Study design: The measurement of thoracic kyphosis was performed during clinical analysis of body posture using Plurimeter-V by Rippstein [1]. The measurement was made in standing position and spontaneous relaxed posture. Each value represents mean and standard deviation from at least three replicate measurements.

Results: See Table 1.

Conclusion: The applied method of the measurement is simple and useful in the clinical practice.

Reference

S33
The incidence of dorsal and pelvis asymmetries in school-age children with hip dysplasia in the neonatal-infancy period

Marek Kluszczynski
Rehabilitation Ward, Provincial Specialist Hospital in Czestochowa, Poland
E-mail: marek.klusczynski@mechatronika.edu.pl

Scoliosis 2007, 2(Suppl 1):S33

Objective: The aim was the comparative analysis of the incidence of dorsal and pelvis asymmetries in school-age children with hip dysplasia in the infancy period.

Study design: Fifty children aged from four to fourteen years, diagnosed with hip dysplasia in the infancy period, were included
in the study. Using a Rippstein plurimeter [1], dorsal and pelvis asymmetries were examined. The control group included fifty randomly chosen children aged from twelve to sixteen years.

**Results:** Dorsal asymmetry was found in ninety percent of test group children, including a small asymmetry of 2–4 Bunnell degrees [2] in seventy-eight percent. In the control group, dorsal asymmetry was found in fifty percent of children, including a small asymmetry in forty-six percent. Pelvis asymmetry was found in eighty percent of test group children, predominantly an eight-type deformation with a right-side anterior superior iliac spine (ASIS) lowering in sixty-six percent and a left-side posterior superior iliac spine (PSIS) lowering in forty-six percent of children. In the control group, pelvis asymmetry was found only in forty-two percent of children.

**Conclusion:** A statistically significant, higher incidence of dorsal and pelvis asymmetries is found in children with single-hip dysplasia in their infancy period as against the children who did not experience dysplasia.

**References**

**S34**

**Sitting forward bending position versus standing position for studying the back shape in scoliotic children**

Tomasz Kotwicki¹, Joanna Chowańska¹, Edyta Kinel², Małgorzata Lorkowska¹, Wanda Stryla² and Andrzej Szulc¹

¹Department of Pediatric Orthopedics and Traumatology, University of Medical Sciences of Poznan; ul. 28 Czerwca 1956 roku nr 135; 61-545 Poznan, Poland
²Department of Rehabilitation, University of Medical Sciences of Poznan; ul. 28 Czerwca 1956 roku nr 135; 61-545 Poznan, Poland

E-mail: kotwicki@amp.edu.pl

**Objective:** Potential benefits of sitting position for scoliosis exam include stable posture and level pelvis. The hypothesis was that surface topography as well as scoliometer evaluation can be performed in sitting forward bending position and that the parameters describing deformity in the frontal and axial plane can be provided.

**Study design:** Cross sectional study of 113 girls with idiopathic scoliosis, aged 14.0 ± 2.1 years (range 10 to 18), mean height 160.0 ± 9.4 cm (range 121 to 184), mean weight 48.6 ± 9.2 kg (range 22 to 75) who underwent rater stereography exam of the back in standing position and in sitting forward bending position. The Cobb angle of the main curve was 41.2 ± 16.7 degrees (range 10 to 95), Risser sign value from 0 to 5, median = 2.

**Methods:** Spine length (C7-S1), Hump Sum and posterior trunk symmetry index (POTSI) were measured [1]. Bunnell scoliometer [2] was used to measure angle of trunk rotation (ATR) in standing position at three levels of the spine and the Sum of Rotation was compared with the Hump Sum. Additionally 49 girls, having scoliosis of 10 to 70 degrees of Cobb angle, were examined for ATR both in standing forward bending (Adams’ test) and in sitting forward bending position.

**Results:** Spine length was 41.5 ± 3.5 cm (29.8–49.9 cm) in standing and 46.5 ± 3.5 cm (35.0–53.4 cm) in sitting forward bending position (mean difference 5.0 ± 2.7 cm, p < 0.05, Mann Whitney U test) proving that flexion of the trunk was achieved. The Hump Sum value was 21.3 ± 7.7 degrees in sitting and 19.0 ± 6.6 degrees in standing position (p < 0.01). The correlation coefficient for Hump Sum vs Sum of Rotation was 0.71 for the sitting and 0.49 for the standing position (p < 0.05). POTSI was 23.3 ± 13.8 in sitting and 28.9 ± 17.5 in standing position (p < 0.001). The ATR was not distinct between standing and sitting forward bending position (p > 0.05).

**Conclusion:** Back asymmetries in children can be measured successfully in sitting forward bending position. This position provides a more stable posture and eliminates the impact of lower limb discrepancy, and therefore may be considered a recommended position for scoliosis exam using scoliometer or surface topography.

**References**

**S35**

**Comparison of three non-invasive devices to assess the sagittal spinal configuration in an heterogeneous population of scoliotic and non-scoliotic subjects**

Manuel Rigo and M Villagrasa

E. Salvà Spinal Deformities Rehabilitation Institute.
Via Augusta 185, 08021 Barcelona, Spain
E-mail: lolo_rigo@hotmail.com

**Objective:** To compare three non-invasive devices (SpineScan®, Myrin® inclinometer, Saunders® goniometer) to assess the sagittal postural curvatures of the spine (thoracic kyphosis, lumbar lordosis and pelvis inclination) in an heterogeneous population formed by scoliotic and non-scoliotic subjects. The Formetric® system has provided the reference angles.

**Study design:** Prospective observational. Fifty three consecutive subjects (nineteen males, thirty-four females, age 16.3 years, thirteen healthy controls/forty scoliosis patients) were measured with the Formetric and the three compared devices in a same session. All measurements by the same observer.

**Results:** Mean kyphotic angles measured with the SpineScan (43.8 degrees), the Myrin (34.9 degrees) and Saunders (35.8 degrees) were significantly lower compared with the Formetric (50 degrees). Mean lordotic angles measured with Myrin (32.5 degrees) and Saunders (32.8) were significantly lower compared with Formetric (39.4 degrees). Myrin pelvis inclination (19.4 degrees) was not different compared to the Formetric (20.3 degrees) but both were lower than Saunders (29.8 degrees). Myrin angles were similar to those already published. Both Myrin and Saunders showed a strong correlation with Formetric but not the SpineScan.
**Conclusion:** Myrin and Saunders devices can be used in substitution of the Formetric to partially assess the sagittal profile in scoliotic and non-scoliotic subjects with less cost. SpineScan needs further verifications and possibly requires a longer training time.

**S36**

Is there a relationship between the results of unterberger test and convexity of scoliosis major curve?

Michele Romano and Fabio Zaina
ISICO (Italian Scientific Spine Institute), Via Carlo Crivelli 20, 20122 Milan, Italy
E-mail: michele.romano@isico.it

Scoliosis 2007, 2(Suppl 1):S36

**Objective:** The Unterberger stepping test is normally used to identify vestibular dysfunction and not to detect central disorders of balance. However we found a statistically significant difference in a sample of thirty scoliotic patients compared with a healthy control group. Our aim was to study if there is a relationship between direction of rotation during the test performance and convexity of scoliosis major curve.

**Study design:** Fifty-nine patients with adolescent idiopathic scoliosis (range: 14–55 degrees Cobb) performed an Unterberger test (fifty steps on place with closed eyes) before physical therapy session. Patients were divided into two groups: single curves, twenty-nine subjects with eleven left or right thoracic curves and thirty patients with double curves.

**Results:** There was a statistically significant concordance between the side of the curve and patient displacement after test performance in the single curves group when compared with the double curves, even if not all patients performed in the same way. There was not a statistically significant difference among left and right curve behaviours.

**Conclusion:** These results could be explained both with neuromotorial changes primary or secondary to the pathology, and biomechanical ones due to vertebral displacements.

**S37**

A retrospective study of thirty-six cases of vestibular hypofunction in adolescents with idiopathic scoliosis

Marc Lamantia, Gary Deutchman, Joe Indelacato and Marianna Raykhman
The Scoliosis Care Foundation, 1085 Park Ave, Suite 1E, New York, NY 10128, USA
E-mail: info@scoliosiscare.org

Scoliosis 2007, 2(Suppl 1):S37

**Objective:** The objective of this study is to determine the incidence of vestibular hypofunction in patients with adolescent idiopathic scoliosis (AIS).

**Study design:** Thirty six cases of patients with AIS, between the ages of eight and fifteen years received a full spine anterior-posterior (AP) radiograph and binaural bithermal caloric testing using air irrigation at 47 degrees C and 25 degrees C. Measurements and evaluation were performed using Micro-medical Spectrum software http://www.micromedical.com.

**Results:** Findings included a 15.4 percent (n = 6) occurrence of complete unilateral vestibulopathy and 50 percent (n = 18) occurrence of significant (>25%) unilateral weakness. Sixty-six percent of patients categorized with right thoracic curvatures (n = 15) revealed an ipsilateral vestibular weakness. All patients with left lumbar curvatures (n = 4) demonstrated an ipsilateral left vestibular weakness. Conversely, those with double major curvatures (n = 11) exhibited a more heterogeneous distribution. A correlation of one was noted between subjects in the right thoracolumbar group and right vestibular weakness (n = 4). The mean percentage vestibular weakness (n = 36) for all groups was 35.53.

**Conclusion:** A significant vestibular weakness was observed in patients with AIS when compared to a normal population. The direction of the curvature is related to the side of vestibular weakness. None of the thirty-six patients complained of vestibular based symptoms. This suggests a higher cortical neglect syndrome of the vestibulocortical areas in the right parietal cortex. Further studies including functional magnetic resonance imaging and other functional testing of the vestibular cortex is warranted.

**S38**

Radiculopathy in degenerative lumbar scoliosis: treatment with selective nerve root steroid injections

Avraam Ploumis 1,2, Ensor E Transfeldt1, Thomas J Gilbert3, Amir A Mehboob1, Manuel R Pinto1, Jill W Wroblewski1 and Francis Denis1
1Twin Cities Spine Center, Minneapolis, Minnesota, USA
225 Mitropoleos St., Thessaloniki 54624, Greece
3Center for Diagnostic Imaging, Saint Louis Park, Minnesota, USA
E-mail: ploumis@med.auth.gr

Scoliosis 2007, 2(Suppl 1):S38

**Objective:** To define the origin of radiculopathy of patients with degenerative lumbar scoliosis and to assess the correlation between percentage of radiculating pain relief with selective nerve root injections and lateral canal dimensions.

**Methods:** Ninety-three consecutive patients (average age sixty-eight years) with degenerative de novo scoliosis (74% lumbar, 26% thoracolumbar; average curve 24 degrees) were retrospectively studied in terms of presenting symptomatology. For those patients with ipsilateral radicular symptoms, plain radiographs and MRI at presentation were reviewed. Radiographic measurements included major and lumbosacral curve Cobb angle. Computerized measurements of MRI included minimum subarticular height and foramens cross-sectional area of the nerve root that was injected. The patient’s reported response from the nerve root injections was rated poor, good and excellent (<50%, 50–70%, >70% of relief). Correlation between MRI measurements and response from the steroid injections were done with the Pearson’s test.

**Results:** Eighty-one percent of the patients presented with back pain, 61% with radicular symptoms, 15% with imbalance and 40% with neurogenic claudication. Based on the results from the selective nerve root injections and from the fifty patients with radicular symptoms, 36% had nerve root symptoms coming from the major curve, 60% from the lumbosacral hemicurve and 4% from both. The affected nerve roots were more frequently the L4 (26%) and L5 nerve roots. Seventy-five percent of the patients had radiculating pain with selective nerve root injections and from the fifty patients with neurogenic claudication. Based on the results from the selective nerve root injections and from the fifty patients with radicular symptoms, 36% had nerve root symptoms coming from the major curve, 60% from the lumbosacral hemicurve and 4% from both. The affected nerve roots were more frequently the L4 (26%) and L5 nerve roots. Seventy-five percent of the patients had radiculating pain with selective nerve root injections and from the fifty patients with neurogenic claudication. Based on the results from the selective nerve root injections and from the fifty patients with radicular symptoms, 36% had nerve root symptoms coming from the major curve, 60% from the lumbosacral hemicurve and 4% from both. The affected nerve roots were more frequently the L4 (26%) and L5 nerve roots. Seventy-five percent of the patients had radiculating pain with selective nerve root injections and from the fifty patients with neurogenic claudication. Based on the results from the selective nerve root injections and from the fifty patients with radicular symptoms, 36% had nerve root symptoms coming from the major curve, 60% from the lumbosacral hemicurve and 4% from both. The affected nerve roots were more frequently the L4 (26%) and L5 nerve roots. Seventy-five percent of the patients had radiculating pain with selective nerve root injections and from the fifty patients with neurogenic claudication.
Conclusion: In degenerative scoliotic curves, radicular symptoms come mainly from the concavity of the lumbosacral hemicurve. There is no evidence that the rate of relief from selective nerve root injections correlates with the degree of stenosis noted in the MRI.

S39
Seven criteria to treat Scheuermann’s Disease
Biagio Iemolo
Azienda Ospedaliera Gravina – Caltagirone, via Gulfi n.20; Pedalino c.a.p. 97010, Italy
E-mail: biagioiemolo@tiscali.it
Scoliosis 2007, 2(Suppl 1):S39

Objective: In our spine center, we observe adolescents who present clinical cases of bony spinal dystrophy during growth, without typical clinical and especially the radiological features of Scheuermann’s disease. Such borderline cases (‘pre-Scheuermann’s?) [1], which cannot be easily classified, need prompt careful and appropriate answers in terms of therapy. We find that existing classifications of Scheuermann’s disease are restricting and do not include various types of spinal irregularity and clinical abnormalities of our patients [1]. Our purpose is to present seven criteria to define easily all forms of Scheuermann’s disease.

Study design: Four clinical criteria and three radiological criteria are proposed for immediate evaluation of deformity. The clinical criteria are: age, level (classic or atypical), pain, spinal rigidity. The three radiological criteria are: degrees (Cobb), vertebral irregularity, wedging.

Results: We scored the points of each criterion to define the categories of kyphosis and quantify the magnitude of the spinal deformity. These criteria are used easily to recognize all the categories of patients and to describe indications for treatment.

Conclusion: The point of our work is quite practical. Seven categories of patients and to describe indications for treatment. Results maintained stable at follow-up (96 ± 2.73 months).

References

S40
Is correction of the deformity sufficient for complete recovery from idiopathic scoliosis?
Angelo Gabriele Aulisa1, Stefano Negrini2, Marco Galli3, Andrea De Matthaeis3 and Lorenzo Aulisa3
1Orthopaedic Department, Children’s Hospital Bambino Gesù, Institute of Scientific Research, Via della baldusina 63 00136 Rome, Italy
2ISICO (Italian Scientific Spine Institute), Milan, Italy
3Department of Orthopaedics, “A. Gemelli” Hospital, Universita Cattolica del Sacro Cuore, Rome, Italy
E-mail: aulisa@libero.it
Scoliosis 2007, 2(Suppl 1):S40

Objective: Aim of the study is to show that all patients that reached the complete correction of the parameter of scoliotic deformity (Cobb and Pedriolle degree) by means of orthotic treatment maintained the correction even after the early end of treatment (before the end of growth).

Study design: The study was carried out on 300 patients who underwent orthotic treatment by means of Progressive Action Short Brace (P.A.S.B.). Sixteen patients (14 females and 2 males) were selected on the basis of the following criteria:
• Complete correction of Cobb and Pedriolle degrees
• End of treatment before the skeletal maturity
Nine cases presented a thoracolumbar scoliosis and seven cases presented a lumbar curve.

At the beginning of treatment mean age was 12 ± 1.67 years and mean Cobb angle was 28 ± 5.7 degrees. Treatment lasted 25.88 ± 1.99 months.

Results: In all cases the complete correction of Cobb that Pedriolle parameters was maintained after the weaning from the brace. Results maintained stable at follow-up (96 ± 2.73 months).

Conclusion: Evolution of the scoliosis is the result of the interaction between biological and mechanical factors. The biomechanical studies of the elastic characteristics of the healthy spine and the deformed one confirm the assumption, but do not solve the question of their respective role in the pathogenesis of the deformity. Clinical analysis has confirmed that the mechanical component assumes a prominent role compared to the biological factors in the pathogenesis of the evolution of the curve [1, 2].

References

S41
Twelve DNA markers accurately assess risk of progression in adolescent idiopathic scoliosis
JT Braun
Department of Orthopaedics and Rehabilitation, University of Vermont, Burlington, VT, USA
E-mail: john.braun@earthlink.net
Scoliosis 2007, 2(Suppl 1):S41

Objective: Optimization of AIS management necessitates early and accurate identification of progressive deformities. As standard radiographic evaluation relies on variables that change over time, these methods are often inaccurate in assessing risk of progression. Most data suggest that adolescent idiopathic scoliosis (AIS) has a polygenic inheritance. The exact gene(s) involved, however, have not been identified. Using our unique genealogy resources and a large patient population from across the United States, we hope to discover the molecular basis of AIS. As an interim result in our efforts to understand the genetic basis of AIS, we report on twelve DNA markers potentially useful in accurately predicting curve progression.

Methods: DNA samples from 675 skeletally mature AIS subjects were collected from spine centers across the U.S. Radiographic data at initial presentation during adolescence and at skeletal maturity allowed identification of surgical curves (progression beyond 40 degrees Cobb). Genotypes were obtained for twelve DNA markers identified as having diagnostic utility in AIS. Genotype weighting factors were established in an independent discovery sample set.
Clinical risk scores were estimated using the subject’s first radiographic evaluation for AIS. Using an additive model, summed risk scores were used to classify subjects as either LOW or HIGH risk for progression to a surgical curve.

Results: Of 675 subjects with AIS, 454 progressed to a surgical curve (>40 degrees), with 187 and 34, respectively, maintaining mild (<25 degrees) and moderate (25–40 degrees) curves. Using the additive model, 181/187 (97%) of subjects with mild curves were correctly classified as LOW risk and 416/454 (92%) as HIGH risk for progression to a surgical curve (p < 0.00001).

Conclusion: The twelve DNA markers discovered in this study will greatly improve our ability to assess risk of progression. For HIGH risk patients this will likely result in earlier bracing or fusionless scoliosis surgery. For LOW risk patients this will allow elimination of years of unnecessary observation. When compared to standard radiographic methods, the twelve DNA markers identified in this study provide a superior assessment of risk of progression in AIS. Additional research will likely refine this marker panel and further improve our ability to accurately predict AIS progression.

S42 Cost analysis of a school-screening program
Theodoros B Grivas, Elias Vasiliadis, Christina Maziotou, Michail Betsios, Spiros Psarakis and Dimitrios Segos Orthopaedic Department, “Thriasio” General Hospital, G. Gennimata Av. 19600, Magoula, Attica, Greece E-mail: grivastb@panafonet.gr

Scoliosis 2007, 2(Suppl 1):S42

Objective: To appraise the cost of running a school screening program in a general hospital.

Study design: A financial analysis was conducted for the estimation of the cost of our school-screening program, taking into consideration all the relevant factors, which may affect it. During the period of 1-1-2000 to 14-5-2006, 6470 pupils aged 6–18 years old were screened at schools for spinal deformities. The examiners were properly trained Health Visitors and occasionally Orthopaedic and General Medicine residents and Physiotherapists. The number of examiners who were involved in the program and their working hours, their salary on hourly basis, the expenditures required for transfer of the team and the average cost of the program for each child was calculated.

Results: During the examined period 20 examiners were involved in the program. The total number of working hours was 602. The salary per hour for the trainee doctors was 6.80€, for the Health Visitors 6.70€ and for the Physiotherapists 5.50€ in current prices. The examiners’ transportation expenditures were calculated to be 32€ per year. The average cost for the examination of each child for the above studied period was calculated to be 2.24€.

Conclusion: The cost of our school-screening program is low. The present study provides a strong cost-effectiveness evidence for the continuation of the program when looking from a financial point of view. An instrumented spinal fusion for right thoracic deformity costs 1.500 – 1.700€ per level. Therefore one operation can approximately cover the total cost of our program, up to now. School screening can provide the researcher with valuable information about trunk asymmetries and epidemiological data of idiopathic scoliosis, which may contribute in further understanding of spinal deformities, at a low cost.

S43 School based scoliosis screening: an analysis of socio-demographics, compliance, efficacy and a proposed role for physical therapists in a state mandated program
Arsenio Paez1,2, Denise Lotufo1 and Mary Ann Wilmarth1
1Northeastern University, Bouve Institute of Health Professions, School for Professional and Continuing Studies, Boston, MA, USA
263 Reynolds Drive, Fairfield, CT 06824, USA
E-mail: artiep@aol.com

Scoliosis 2007, 2(Suppl 1):S43

Objective: School scoliosis screening programs are mandated across the United States, but their efficacy remains controversial [1, 2, 3]. This study investigates data from the Massachusetts program, examining its efficacy and follow up attained after a positive screen.

Study design: This retrospective cohort study analyzes data for 272,337 students in grades 5–9 from 1989 to 2005 in Massachusetts. Regression and data analyses determined the incidence of scoliosis over the life of the program, its predictive value, specificity and the rate of follow up attained after screening.

Results: The incidence of scoliosis was 0.55%, or 1489 students from 1989 to 2005. The program’s positive predictive value was low, at 50%, or 1 confirmed diagnosis per 200 students screened. Children in lower socioeconomic strata were more likely to be identified for possible scoliosis than other students. Girls were identified and diagnosed with scoliosis increasingly over time. Compared to other programs, fewer students per thousand were positively screened for scoliosis in MA, though follow up evaluation was incomplete for 72% of those students.

Conclusion: Sociodemographic factors may influence the identification of students at risk. Methodological issues significantly influence the program’s efficacy and ability to meet its goals, including bringing those identified to follow up care.

References

S44 Repeatability of different methods to collect in everyday clinics the sagittal profile of patients with adolescent idiopathic scoliosis
Fabio Zaina1, Stefano Negrini1, Michele Romano1 and Angelo Aulisa2
1ISICO (Italian Scientific Spine Institute), Via Carlo Crivelli 20, 20122 Milan, Italy
2Rome, Italy
E-mail: stefano.negrini@isico.it

Scoliosis 2007, 2(Suppl 1):S44

Objective: Assessing the repeatability of different methods to collect in everyday clinics the sagittal profile of patients with adolescent idiopathic scoliosis to identify the best one to be used.
Study design: We performed two studies. In the first one, in a medical setting, 61 patients were consecutively evaluated by two examiners (inter-observers), while one performed a second time the evaluation after 5 minutes (intra-observer); the evaluations included: sagittal and frontal distances from the plumbline of C7, sagittal distance of T12 and L3, D’Osualdo’s Arcometer measurement. In the second study, in a physiotherapist setting, the sagittal distances (cervical, C7, thoracic, lumbar, sacral) have been evaluated consecutively using two different tools to identify verticality: a plumbline or a laser. Repeatability has been evaluated according to Bland and Altman, to identify the limits of variation clinically significant.

Results of the first study: See Table 1.

Results of the second study: We verified that the usage of the laser in a physiotherapist setting reduced the errors due to positioning of the plumbline and movements of the hands during measurement of multiple data.

Conclusion: These results give the limits during measurements in a clinical setting of parameter that are routinely collected by some clinicians. 1 cm. is the minimum change to be considered clinically significant between two examinations for C7, while this is 1.5 for T12 and L3, but only when measurements are taken always by the same treating physician.

S45
The 3-DEMO (3-Dimensional Easy Morphological) classification of scoliosis
Stefano Negrini and Alberto Negrini
ISICO (Italian Scientific Spine Institute), Via Carlo Crivelli 20, 20122 Milan, Italy
E-mail: stefano.negrini@isico.it

Scoliosis 2007. 2(Suppl 1):S45

Objective: To present a new, simple and clinically oriented three-dimensional morphological (3-DEMO) classification of scoliosis.

Table 1 (abstract S45) Results of the first study.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Intra-observer</th>
<th>Inter-observer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sagittal distance of C7 from the plumbline (cm.)</td>
<td>0.9</td>
<td>1.7</td>
</tr>
<tr>
<td>Sagittal distance of D12 from the plumbline (cm.)</td>
<td>1.3</td>
<td>1.9</td>
</tr>
<tr>
<td>Sagittal distance of L3 from the plumbline (cm.)</td>
<td>1.2</td>
<td>2.2</td>
</tr>
<tr>
<td>D’Osualdo Arcometer (calculated ° Cobb)</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>ATR (°)</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Height of the hump (mm.)</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>Frontal distance of C7 from the plumbline (cm.)</td>
<td>1.1</td>
<td></td>
</tr>
</tbody>
</table>

S46
Repeatability of the Aesthetic Index for adolescent idiopathic scoliosis
Fabio Zaina, Stefano Negrini, Marco Monticone, Chiara Paroli and Angelo Aulisa
ISICO (Italian Scientific Spine Institute), Via Carlo Crivelli 20, 20122 Milan, Italy
E-mail: stefano.negrini@isico.it

Scoliosis 2007. 2(Suppl 1):S46

Objective: To evaluate the intra- and inter-rater repeatability of the Aesthetic Index (AI) and its sub-scores.

Study design: Since many years in our Institute we have used a clinical tool to evaluate the aesthetics of the trunks posteriorly. This is based on a three point scale for asymmetry (0 absent, 1 slight, 2 important) of the shoulders, scapulae and flanks; the sum of these sub-scores gives the AI. One hundred sixty anterior photographs of the trunk of adolescent idiopathic scoliosis patients were scored two times independently by three observers. We used the Kappa statistics [1]: 0–0.2 poor, 0.2–0.4 fair, 0.4–0.6 moderate, 0.6–0.8 good, 0.8–1.0 very good. The 95% level of agreement was used to identify the minimum clinically significant change to be considered between two different clinical examinations.

Results: See Table 1.
Table 1 (abstract S47) Results.

<table>
<thead>
<tr>
<th></th>
<th>Intra-raters Kappa statistics</th>
<th>Inter-raters Kappa statistics</th>
<th>Percent of agreement</th>
<th>95% level of agreement (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRACE1</td>
<td>0.16–0.24</td>
<td>0.09–0.14</td>
<td>28.8–36.3</td>
<td>2/11 (99.4–96.9%)</td>
</tr>
<tr>
<td>Shoulders</td>
<td>0.29–0.43</td>
<td>0.16–0.25</td>
<td>51.3–70.6</td>
<td>1/3 (96.9–100%)</td>
</tr>
<tr>
<td>Scapulae</td>
<td>0.43–0.58</td>
<td>0.41–0.50</td>
<td>76.9–79.4</td>
<td>1/2 (99.4–100%)</td>
</tr>
<tr>
<td>Hemithorax</td>
<td>0.22–0.41</td>
<td>0.12–0.20</td>
<td>58.8–63.1</td>
<td>1/2 (98.1–99.4%)</td>
</tr>
<tr>
<td>Flanks</td>
<td>0.40–0.48</td>
<td>0.07–0.11</td>
<td>55.0–68.0</td>
<td>1/4 (95.6–99.4%)</td>
</tr>
<tr>
<td>TRACE2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulders</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scapulae</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemithorax</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flanks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Repeatability index for TRACE2: intra-rater 47–49%, inter-rater 47–50%.

**Conclusion**: The intra-raters agreement is between moderate and good for single sub-scores, and fair for the AI, as it happens for the inter-raters agreement. The AI and its sub-scores can be used in the everyday clinical practice, but a change of 2 points for sub-scores, and 3 for AI is required to reach clinical significance, and this gives to the AI a low sensitivity.

**Reference**

---

**POSTER PRESENTATIONS**

**P1**

**Reliability of the Bad Sobernheim Stress Questionnaire (BSSQbrace)**

Christine Botens-Helmus, Rolf Klein, Carola Stephan and Hans-Rudolf Weiss

Asklepios Katharina Sroat Spinal Deformities Rehabilitation Centre, Korczakstrasse 2; D-55566 Bad Sobernheim, Germany

**E-mail**: hr.weiss@asklepios.com

**Scoliosis** 2007, 2(Suppl 1):P1

**Objective**: A new instrument to assess stress experienced by scoliosis patients while wearing their brace has been developed. The aim of this study was to test the reliability of this new instrument.

**Study design**: Eight questions are provided. A maximum score of 24 can be achieved (from 0 for most stress to 24 for least stress). The subdivision of the score values was: 0–8 (strong stress), 9–16 (medium stress) and 17–24 (little stress).

**Methods**: Eighty-five patients were invited to take part in this study and to complete the BSSQbrace questionnaire once at the first presentation and a second after a further three days. Sixty-two patients, with an average age of 14.5 years and an average Cobb angle of 40 degrees, returned their fully completed questionnaires.

**Results**: The average stress value was 12.5 at the first measurement and 12.4 at the second measurement. The maximum score was 23; the minimum score was 2. There was a correlation of 0.88 (Intraclass Correlation Coefficient) between the values of the two measurements. Cronbach alpha was 0.97.

**Conclusion**: The BSSQbrace questionnaire is reliable with good internal consistency and reproducibility. It can be used to measure the impairment a patient feels while wearing a brace.

**P2**

**Reversal of curvature magnitude in response to physical methods: a 15-year followup in an adult female diagnosed with moderately severe scoliosis at age eleven years**

William J Brooks1,2, Elizabeth A Krupinski3 and Martha C Hawes4

1Restorative Care Foundation, Kansas City, MO 64152, USA
2Department of Osteopathic Principles and Practice, College of Osteopathic Medicine, Nova Southeasten University, Ft. Lauderdale, FL 33328, USA
3Department of Radiology, Arizona Health Sciences Center, University of Arizona, Tucson AZ 85721, USA
4Department of Plant Sciences, University of Arizona, Tucson, AZ 85721, USA

**E-mail**: wjbdo@wjbrooksdo.com

---

**Reference**
Scoliosis 2007, 2(Suppl 1):P2

Objective: To document improvement in curvature magnitude in moderately severe pediatric onset scoliosis, in an adult, without surgery.

Study design: An adult case report was monitored from age thirty-eight years through fifty-four years of age. Repeated measures analysis of variance (ANOVA) was used to evaluate change in magnitude of Cobb angle, based on values obtained by three independent readers, using full spine radiographs taken at four-year intervals.

Methods: A multimodal physical therapy approach included deep tissue massage and osteopathic manipulation, in combination with a daily home exercise program.

Results: Stable, progressive improvement in Cobb angle occurred over a fifteen-year period in response to physical methods. The improved curvature occurred in correlation with progressive improvement of chest wall morphology and excursion.

Conclusion: The forty percent (thoracic curve) and fifty percent (lumbar curve) reduction in curvature magnitude compares favorably with results from surgical intervention [1].

Reference

Scoliosis 2007, 2(Suppl 1):P3

The effect of physical therapy on computerized dynamic posturography of an adolescent with idiopathic scoliosis: a case study
Karen A Correia1 and James Megna2
1Kare Therapeutics, 732 Smithtown Bypass, Suite 102A, Smithtown, NY 11787, USA
2Southside Hospital, Bayshore, NY, USA
E-mail: KJMCORR@optonline.net

Scoliosis 2007, 2(Suppl 1):P4

An artist’s inquiry into scoliosis: an adult case report
Laura Ferguson
New York, NY, USA
E-mail: laura@lauraferguson.net

Scoliosis 2007, 2(Suppl 1):P5

Patient-specific exercise programs in the conservative management of the so-called idiopathic scoliosis
T Kariski
Department of Pediatric Orthopedics and Rehabilitation of Skubiszewski Medical University of Lublin; University Pediatric Hospital, Chodzki St. 2, 20-093 Lublin, Poland
E-mail: tkariski@dsk.lublin.pl

Scoliosis 2007, 2(Suppl 1):P6

Yoga therapy for scoliosis: an adult case approach
Elise B Miller
Palo Alto, California, USA
E-mail: ebm@yogaforscoliosis.com

Scoliosis 2007, 2(Suppl 1):P7

Objective: To document improvement in the curvature of adolescent idiopathic scoliosis without surgery.

Study design: Idiopathic scoliosis was diagnosed at age eight years. A T5–T12 spinal fusion with cadaver bone graft, without instrumentation, was performed at age thirteen years (John Cobb, Hospital for Special Surgery, New York, NY, U.S.A.). The Cobb angle of the post surgical curve measured eight-five degrees. By age thirty-two years restrictive lung disease, arthritis and spinal stenosis, were diagnosed. The symptoms worsened progressively.

Methods: An exercise program incorporating Alexander Technique, Yoga, Pilates, and neuromuscular training was designed to (1) strengthen and stabilize muscles around hypermobile joints, and (2) improve proprioceptive awareness to allow postural adjustments to improve spinal alignment and symmetry. In collaboration with orthopedists and radiologists, images including a three-dimensional spiral computed tomography scan of the subject’s skeleton were made for the purpose of drawing.

Results: Symptom stabilization occurred as the patient gained a more graceful and coherent sense of her body, as well as improved look and function. A series of artworks revealing the three-dimensional spatial dynamic of the scoliotic spine were produced http://www.lauraferguson.net/.

Conclusion: Health related quality of life can be improved using movement practices based on these concepts.

P5

P6
Study design: An adult case report was monitored from age twenty-three until fifty-eight years of age. Idiopathic scoliosis (right thoracic with a Cobb angle of forty-nine degrees, with compensatory left lumbar curve) was diagnosed at age sixteen years, with referral to an orthopedic surgeon who recommended spinal fusion surgery. A second opinion from Dr. Harris, orthopedic surgeon at Children’s Hospital, advised against immediate surgery and instead recommended swimming, general stretching and Physical Therapy. The patient became an avid swimmer and later joined the swim team in college. She then joined the Peace Corps in Brazil where she became more sedentary and began to experience pain with her scoliosis.

Methods: At age twenty-three years, she began yoga therapy with BKS Iyengar and continued to study with him over a thirty-five year period. A multimodal physical therapy/yoga therapy approach included deep tissue massage and chiropractic adjustments.

Results: Stable progressive improvement in magnitude of Cobb angle from forty-nine degrees to thirty-one degrees. Also the improved curvature occurred in correlation with progressive improvement in posture, appearance, and morphology.

Conclusion: The reduction in curvature and high quality of life as a result compares favorably with results from surgical intervention [1].

Reference

P7
Yoga and somatic therapy for the treatment of adolescent idiopathic scoliosis: adult case report
Marcia Monroe
Private practice, 161 West 15th #3A; New York, NY 10011, USA
E-mail: marciamnro@aol.com
Scoliosis 2007, 2(Suppl 1):P7

Objective: To describe the use of iyengar Yoga therapy and movement reeducation techniques in the management of a forty-six-year-old woman with idiopathic scoliosis.

Study design: Case report of a subject diagnosed with idiopathic scoliosis and recommended for spinal fusion during her early adolescent years.

Methods: The subject instead chose to work with conservative therapy sessions during a one year period. These approaches included somatic movement reeducation techniques, primarily Body Mind Centering, Feldenkrais, and iyengar Yoga.

Results: The subject has been studying and teaching on a daily basis iyengar Yoga classes reinforced with notions of movement reeducation. The Yoga regimen has helped the patient to stabilize weak muscles, enhance the range of respiration, postural tone, as well as strengthen and lengthen the spine through specific postures used as traction. The integration of concepts of movement reeducation based on bio mechanics and motor development has helped the improvement of proprioception, sensibility, and awareness of functional movement.

Conclusion: The addition of iyengar Yoga therapy regimen with the integration of movement reeducation based on Body Mind Centering and Feldenkrais techniques can be very useful to help the well being and function of victims of scoliosis regardless of age.

P8
Exercised-based methods to treat adult scoliosis: adult case report
Marjorie T Nieh
Rensselaer, NY 12144, USA
E-mail: niehmarm@yahoo.com
Scoliosis 2007, 2(Suppl 1):P8

Objective: Severe scoliosis (Cobb angle >50 degrees) in adult populations is associated with increased pain, reduced vital capacity, and mean progression of ten degrees per decade [1, 2]. Few nonsurgical approaches to prevent progression and maintain health related quality of life (HRQL) have been documented [3].

Study design: This study is a self-described case report of a sixty-five-year-old female with severe scoliosis (Cobb angle 60–65 degrees), who was diagnosed at age 28 years, and was not treated surgically. A multimodal approach using low-impact and high-impact exercises offered through the YMCA, yoga and Taekwon Do Centers was used. These included aerobics, step aerobics, boot camps, pilates, yoga, nia, body conditioning, kickboxing and martial arts.

Results: Flexibility and mobility have been maintained, and subjectively the deformity is not obvious to observers. Back pain severity has been reduced, but a lumbar support belt is still needed to perform house chores such as vacuuming and gardening. Heavy lifting is avoided.

Conclusion: Self-chosen and non-prescribed exercises were used to maintain function in a patient at high risk for reduced HRQL.

References

P9
Retrospective review of a single case of surgically treated adolescent idiopathic scoliosis over a forty-year period
Joseph P O’Brien
National Scoliosis Foundation, 5 Cabot Place, Stoughton, MA 02072, USA
E-mail: jpopbrien@scoliosis.org
Scoliosis 2007, 2(Suppl 1):P9

Objective: To document the results of surgically treated adolescent idiopathic scoliosis (AIS) over a forty-year period.

Study design: Retrospective adult case report from initial arthrodesis for AIS at age sixteen years, through fifty-six years.

Methods: Treatment records for one male patient over a forty-year period were obtained and summarized.

Results: Initial improvement in Cobb angles occurred in response to a two-stage non-instrumented T4-L2 arthrodesis (T4-L2), requiring 243 days inpatient treatment and 120 days of outpatient care. The cost exceeded $100,000 (1966 dollars). At age 28, lumbar curve progression, fractured arthrodesis, and pain resolved with posterior fusion extension and Harrington...
P10
Non invasive evaluation of SpineCor brace correction from surface topography
Nancy Shawfaty1, Farida Cheriet1,2, Christine Coillard1,2, Souad Rhalmi1, Hubert Labelle1,2 and Charles Hilaire Rivard1,2
1 Research Center, Hôpital Sainte-Justine, 3175 Côte-Sainte-Catherine, Montréal, Québec, Canada, H3T 1C5
2 Department of Orthopedic Surgery, Université de Montréal, PO Box 6128, Station Centre-ville, Montréal, Québec, Canada, H3C 3J7
3 Department of Computer Engineering, École Polytechnique, PO Box 6079, Station Centre-ville, Montréal, Québec, Canada, H3C 3A7

Scoliosis 2007, 2(Suppl 1):P10

Objective: Surface topography is used as a non invasive acquisition of the external trunk geometry of adolescent idiopathic scoliosis (AIS). The aim of this study is to investigate a surface evaluation approach to evaluate the three-dimensional correction by inferring the in-brace trunk surface of patients undergoing SpineCor brace treatment [1].

Study design: Inspeck 3D digitizers were used to acquire the external without-brace and with-brace trunk of fifteen patients. On both acquisitions, anatomical landmarks were identified. Using landmark based elastic registration, the in-brace surface is obtained by transforming the without-brace trunk into the with-brace trunk. To quantify the external trunk correction, indices of torso asymmetry are extracted from the without-brace and the in-brace surface. The external correction is then correlated to thoracic and vertebral rotations determined from three-dimensional reconstruction of the spine and rib cage from multiple X-ray images.

Results: Preliminary results have demonstrated that clinical indices measured on the in-brace trunk successfully quantify the three-dimensional correction induced by the SpineCor brace on the trunk surface.

Conclusion: The proposed approach is a first step in establishing reliable non invasive and radiation free follow up for brace treatment while providing a quantitative three-dimensional measure of the external correction.

Reference

P11
Pilot study to validate a scoliosis-specific instrument that measures quality of life and treatment effect
Katie Sherman
7027 North Seneca Avenue, Glendale, WI 53217, USA
E-mail: QualityInsights@sbcglobal.net

Scoliosis 2007, 2(Suppl 1):P11

Objective: To develop a reliable, valid instrument to measure the quality of life of scoliosis patients and treatment effect for scoliosis.

Study design: The instrument’s questions were derived from SF-36 and Brace Questionnaire subscales, and common complaints of adolescents with scoliosis. Questions ask about a patient’s social, mental, and physical functioning, roles (in school, family, etc.), pain, general health, and the value placed on treatment. Surveys will be completed by patients at Spinal Dynamics of Wisconsin. The data will be analyzed using item-convergent validity, floor and ceiling effects, internal consistency, and clinical external validity.

Results and conclusion: Upon successful completion of this study, a reliable and valid instrument will have been developed, and the minimum necessary sample size will have been determined for future use.

P12
Analysis and simulation of progressive adolescent scoliosis by biomechanical growth modulation
Ian AF Stokes
Department of Orthopaedics and Rehabilitation, University of Vermont, 434 Stafford Hall, Burlington, Vermont 05405-008, USA
E-mail: Ian.Stokes@uvm.edu

Scoliosis 2007, 2(Suppl 1):P12

Objective: Scoliosis is thought to progress during growth because angular deformity produces asymmetrical spinal loading, generating asymmetrical growth, etc. in a ‘vicious cycle’ [1]. The aim of this study was to test quantitatively whether calculated loading asymmetry of a spine with scoliosis, together with measured bone growth sensitivity to altered compression can explain the observed rate of progression during adolescent growth.

Study design: Estimated level-specific spinal loading asymmetry, together with the relationship expressing growth sensitivity to load were included in an analysis that was used to estimate the resulting asymmetrical vertebral growth, and its contribution to the progression of a scoliosis curvature. The initial geometry represented a lumbar scoliosis of 26˚ Cobb, averaged and scaled from measurements of fifteen patients’ radiographs. Asymmetrical loading of spine was calculated, assuming physiologically plausible muscle activation strategies. Growth sensitivity to stress was obtained from published values derived from animal studies of vertebral and tibial growth plates, expressed in a linear formulation of growth as a function of stress. Human adolescent spinal growth velocity was obtained from published values based on stereo-radiographs of a population with scoliosis.

Results: Mechanically modulated growth of the spine having an initial 26˚ Cobb scoliosis was predicted to progress for the majority of eleven analyzed loading conditions (effort magnitude and direction). The averaged final lumbar spinal curve magnitude was 34˚ Cobb at age 16 years when the efforts producing the spinal loading were at 50% of maximum effort, and it was 42˚ Cobb when the efforts were at 75% of maximum.
Discussion: An analysis that included analytically determined spinal load asymmetry and empirically determined growth sensitivity to load predicted that a substantial component of scoliosis progression during growth is biomechanically mediated. The rationale for conservative management of scoliosis during skeletal growth assumes a biomechanical mode of deformity progression (Hueter-Volkmann principle). The present study provides a quantitative basis for this previously qualitative hypothesis. The findings suggest that an important difference between progressive and non-progressive scoliosis might lie in the differing muscle activation strategies adopted by individuals, leading to the possibility of improved prognosis and conservative or less invasive interventions.

Acknowledgements
Supported by NIH R01 AR 44119 and NIH R01 AR 46543.

Reference

P13
Katharina Schroth Method for treatment of post-polio scoliosis in an adult
Beatriz Torres
Palo Alto, CA 94306, USA
E-mail: btorres3380@sbcglobal.net

Scoliosis 2007, 2(Suppl 1):P13

Objective: To describe improved health related quality of life in a sixty-five-year-old female with post polio left thoracic scoliosis (Cobb angle eighty-five degrees), in response to treatment under the guidance of Christa Lehnert-Schroth physiotherapist, Manuel Rigo MD and Hans-Rudolf Weiss MD.

Study design: Adult case report. At age twelve years, the patient wore a Milwaukee Brace for two years. At age nineteen years, spinal fusion surgery was performed T10–T12. Onset of debilitating pain occurred following menopause.

Methods: Unsuccessful efforts to relieve pain included treatment from several orthopedic surgeons, physical therapists, osteopaths, chiropractors, and the use of yoga, Alexanders, and myofascial release. The Three Dimensional Therapy for Scoliosis by the Katharina Schroth method, includes correcting improper movements with therapeutic exercises, orthopedic breathing and re-education of the neuromuscular system [1, 2].

Results: After four weeks the patient was able to recognize abnormal movements that were contributing to early retirement and disability.

Conclusion: Through the daily practice of this therapeutic method the patient has become pain free and her fears of increased disability have been reduced.

References