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ORAL PRESENTATIONS

SCIENTIFIC SESSION 1 - CLINICAL EVALUATION

O1 Evaluation of pelvic asymmetry and lower limb functional shortening in a cohort of children re-examined after a ten-year observation
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Scoliosis 2014, 9(Suppl 1):O1

Background: The study is a cohort study of children for the occurrence of pelvic asymmetry and functional lower limb shortening.

Aim: The aim of the study was to assess changes in the prevalence of pelvic symmetry and lower limb functional length in children and adolescents after a 10 year observation.

Material and methods: A group of 100 children and adolescents, aged 4-16 years, including 58 girls and 42 boys, were examined initially in 1997 and then re-examined 10 years later. Clinical examination was performed by the same observer (first author), using the same methodology. The exam consisted of: (1) clinical assessment of pelvic symmetry, (2) functional lower limb discrepancy assessment based on Rippstein pluriometer measurement of iliac spines position. Squared Chi test was used for comparison.

Results: The age at follow-up ranged from 14 to 26 years. Clinical pelvic asymmetry was identified in 23.8% and 71.4% of boys during the first and second exam, respectively and in 22.4% and 46.5% of girls, respectively. In boys, the functional lower limb discrepancy was found in 9.7% and 18.6% during the first and the second examination, respectively, with prevalence in respect to the left leg shortening 2.4% and the right leg 37.8%, respectively, difference significant. In girls, in the first study, the functional shortening of the lower limb was found more frequently in the left leg 25.4% compared to 8.5% in the right. In the second study, the functional shortening of the lower limb was found in 18.7% in 28.9% for the right one.

Conclusions: 1. The second examination revealed a significant increase in occurrence of pelvic asymmetry.

2. After 10 years the functional shortening of one of the lower limbs increased in both sexes.

3. In the first study, a functional shortening of the left lower extremity predominated in the girls, while in the second study it was the right lower extremity and was identified in the boys.
Conclusion: The combination of surface topography and stereophotogrammetry is applicable to assess and quantify the individual movements of left and right innominate bones in the sagittal plane separately. For a better understanding of inter individual differences in responding induced leg length inequality and to improve the clinical practicability further studies are recommended.

References

O3
Modification of the postural pattern of the trunk by means of a set of shoe lifts
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Scoliosis 2014, 9(Suppl 1):O3

Background: After the medical evaluation of a spinal disease, the indication of a shoe lift (SL) is prescribed in case of a recognized improvement of some specific outcome.

Aim: The purpose of this study is to measure sagittal and coronal imbalance of the trunk and modification of the hump magnitude, in standing position, in response to the use of a SL (for this study a series of SLs).

Design: Observational study.

Methods: We evaluated 35 consecutive female patients visited in ISICO Institute for spine diseases (scoliosis or hyperkyphosis). With the patient in a standing position, we carried out a set of tests performed with a three-dimensional rastereography (DIERS Formetric) with different SLs (5mm, 10mm, 15mm.) placed alternatively under both feet. We assessed the variations of these different postural outcomes: modification of the hump, sagittal and coronal imbalance of the trunk.

Results: The statistical analysis of the seven acquisitions shows that:
- In the coronal plane, the average variation of the inclination of the line between C7 and the center of the sacrum is 1.8mm ± 0.32.
- In the sagittal plane the average variation of the inclination of the line between C7 and the center of the sacrum is 1.2 ± 0.44.
- In the horizontal plane the average variation of the main hump is statistically significantly different (reduction of average 3.1° ± 1.7) when the SL is placed under the opposite foot (left hump – right foot).

Conclusion: A previous study focused on the observation of postural changes of the trunk in response to the use of a series of SLs demonstrated that the trunk does not change the specific postural characteristics. This study that completes that previous evaluation, shows that the use of SLs alternatively placed under both feet does not show a statistical significant difference of the typical postural pattern of the trunk in coronal and sagittal plane. In the horizontal plane the use of a SL can reduce the hump magnitude.

References

O4
Investigation to analyse the correlation between ‘human plumbline distance’, ‘forometric plumbline distance’ and ‘inclinometry’ in a clinical setting: a pilot correlational study
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Scoliosis 2014, 9(Suppl 1):O4

Background: Sagittal plane measures are an important aspect of evaluation of patients with both Adolescent Idiopathic Scoliosis (AIS) and Hyperkyphosis. It is currently advised that the sagittal profile of AIS patients is measured clinically using Plumbline Distance (PD), yet competence of its use in clinical practice has not been regularly evaluated [3].

Aims: To determine the correlation between Human PD (HPD), Formetric PD (FPD) and Inclinometry measured clinically.

Design: Pilot correlational study.

Methods: 27 consecutive female AIS patients aged 11-18 were measured prior to commencement of ScolioGold physiotherapy treatment with HPD, FPD and Inclinometry with measures repeated on completion of treatment. All measures were taken by one therapist (JM). FPD data considered was Cervical Apex (CA), Vertebral Prominence (VP), Lordotic Apex (LA) and Dimple Middle (DM). Correlation was studied between singular measures of HPD vs. FPD, between predicted Kyphosis (C7+L3 vs VP+LA) and between both HPD and FPD vs. Inclinometry (C7+L3 or VP+LA vs Angle A+B).

Results: An initial analysis for normality (‘Shapiro-Wilk’) and ‘Skew and Kurtosis’) showed normal distributions in all variables except VP as measured by FPD and S1 as measured by HPD. Thus Pearson’s correlation was used in all cases except C7 vs. VP and S1 vs DM which utilised Spearman’s Correlation.

A strong positive correlation was shown between measures of HPD and FPD (Cervical vs. CA [r=0.574], C7 vs. VP [r=0.542], L3 vs. LA [r=0.683], S1 vs. DM [r=0.570]). A very strong correlation was demonstrated between kyphosis predictors in HPD and FPD (C7+L3 vs. VP+LA [r=0.782]). Similarly, Inclinometry showed a strong correlation with kyphosis predictors in both HPD and FPD (A+B vs. C7+L3 [r=0.563] or VP+LA [r=0.628]).

Investigative analysis of data demonstrated pre-treatment Inclinometry Kyphosis (A+B) as 24 degrees (SD 7.96) and FPD (VP+LA) as 50.77mm (SD 19.04).

Conclusion: This study has justified the use of HPD or Inclinometry in the absence of FPD in clinical settings to evaluate sagittal profiles in female patients with AIS for this small patient group. Future studies should be done to evaluate clinical correlation between radiographic kyphosis and HPD or Inclinometry, as well as considering the potential effect of inter-rater error.

References

O5
Rasterstereography: a reliable tool in scoliosis measurement – a critical review of literature
Narasimman Swaminiathan, Arun Mathew Cyriac, Michelle E Lobo
Father Muller Medical College, Mangalore, India
Scoliosis 2014, 9(Suppl 1):O5

Scientific Session 2 - Imaging and Surface Topography

Investigation to analyse the correlation between ‘human plumbline distance’, ‘forometric plumbline distance’ and ‘inclinometry’ in a clinical setting: a pilot correlational study

O4

O3

O5

Rasterstereography: a reliable tool in scoliosis measurement – a critical review of literature

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Scoliosis 2014, 9(Suppl 1):O5

Measurement of the structural deformity of the spine is always a challenge for the clinician, since it is important to make clinical decision. When repeated exposure to the X ray has to be reduced in the routine practice, rehabilitation professionals are looking for a tool to be used in daily practice. Rasterstereography is one such method used from the early of 1980s attracted the attention of clinician in the western world. Recently it has been introduced to the developing countries like India. In this context it is important to analyse the available evidence pertaining to rasterstereography.
Aim: The aim of this paper is to review the available published papers and critically analyse the results in terms of reliability, validity and clinical use of this tool.

Method: A structured literature review was done in PubMed, Ovid, Embase and CINHAL data base using raster stereorgraphy, scoliosis and spine measurement as key words. Boolean logic was used to combine and restrict the results. The articles were restricted to English language. All the articles were appraised by the authors independently by using a predetermined review sheet, which consisted of details including population studied, number subjects, study method, statistical analysis used, results and critical view of the authors.

Results: 20 articles were identified after the search, of which 7 studies used rasterstereorgraphy in scoliosis population. There are studies which compared the rastereography with gold standard radio graphic measurement. Results of the high quality studies explored the utility of this tool in the evaluation of the scoliosis. This paper will discuss the advantages and challenges of using this tool in daily clinical practice.

Conclusion: This critical review identifies the advantages of rastereography in scoliosis assessment and the future direction in using this novel tool in the diagnosis and the management of scoliosis.

**O6**

Validity of a quantitative tool of trunk asymmetry based on digital photographs in patients with idiopathic scoliosis

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Scoliosis 2014, 9(Suppl 1):O6

**Background:** Some measures of trunk deformity obtained in digital photography may be useful in the assessment of trunk deformity. The relationships between these measures and radiographic indexes have not been fully analyzed.

**Aim:** To assess the reliability and validity of a clinical assessment tool of the trunk deformity based on photographs as compared to radiological measurements.

**Study design:** Cross-sectional study. Concordant validity between postural indexes obtained from digital photographs and radiographs.

**Methods:** Front and back digital photographs of patients with idiopathic scoliosis (Cobb>25º) were obtained. Shoulder, armpit and waist angles, in addition to trunk asymmetry indexes, were calculated on front and back photographs with Surgimap software. On AP radiographs Coronal Cobb angles and radiological shoulder imbalance using CRIA angle (Angle between horizontal line and a line drawn from the right and left intersection points of clavicle and rib cage) were calculated. Intra-class correlation coefficient was used to assess intra and inter-rater reliability. The Pearson correlation coefficients (r) were used to estimate concurrent validity between both methods.

**Results:** 80 patients (68 females) mean age 20.3 years (12-40 years) were included. Mean Cobb Maximum (CobbMax) was 45.0º (25.1º-77.2º). All measures had a good to excellent intra and inter-rater reliability both in front and back photographs. Waist height angle and CobbMax angle, both in front and back photographs, were significantly correlated (r=0.42 back/ r=0.29 front view). There was no significant correlation between proximal thoracic curve magnitude and any of the shoulder measures. The correlation between shoulder and armpit heights and radiographic clavicle tilt were -0.44 and -0.41 respectively on frontal view. There was a correlation between trapeziun angle ratio and clavicle tilt in both views (r=0.43 back/ r=0.32 front view). No other statistically significant correlations between both methods were found.

**Conclusions:** Digital photography measurement of waist height is useful to assess trunk deformity in idiopathic scoliosis due to a good correlation with Cobb. Shoulder asymmetry indexes like shoulder height angle can be clinical measures of shoulder imbalance. Trunk asymmetry indexes are not correlated with radiological measures.

**O7**

Correlation of lateral deviation and rotation of the spine in static and dynamic surface topography

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Scoliosis 2014, 9(Suppl 1):O7

**Background:** The use of SST (Spine and Surface Topography) can significantly reduce the amount of harmful radiation in scoliosis treatment and follow-up. So far the SST examination procedure was only possible in a standing/ upright position of the patient. Newer developments also allow dynamic measurements of the spine in motion. Dynamic SST is a step forward in functional analysis of the spine.

**Aim:** Purpose of this study is to investigate the correlation between static and a dynamic SST in scoliosis scanning by 2 selected parameters: spinal deviation and vertebra rotation. The focus of this study is the analysis of range of motion (maxima) in dynamic compared to static measurement results. What does the analysis tell us?

**Design:** 18 patients were measured with both static and dynamic SST. The age of the patients was between 25 und 70 years. There are two patients of each age decade. The patients were measured in static 3D (habitual standing position) and with 4D motion (walking on the treadmill/ 3.5km/h). From these two exams per patient the focus was on the two main parameters: analysis of lateral deviation and rotation of the spine and of individual vertebrae.

**Methods:** SST uses surface topography imaging for 3D back scanning and techniques creating 3D models of the spine without exposing patients to any ionizing radiation. The spine reconstruction model has been used successfully for more than 20 years in evaluation and treatment of patients with spinal deformities such as scoliosis, lordosis and kyphosis. Dynamic spine analysis is using similar algorithms as used in static measurement.

**Results:** We found a significant correlation between the lateral deviation and rotation of the spine in both measurement groups. Those results suggest that static spinal deformities found in a habitual standing position are reflected in a normal walking motion. To a certain degree the dynamic results mirror the static results, tendencies in the maxima in range of motion seems to be an indicator of the severity.

**Conclusion:** Lateral deviation and vertebra rotation in static correlates with dynamic/ functional measurements. For the first time dynamically the range of motion and rotation was quantified and compared to static SST. It will be possible to calculate ranges of plausible motion of the spine from a set of static and dynamic examinations. The combination of static and dynamic SST can probably predict the progression or stability of a spine, but a bigger population will be necessary for verifying this.

**O8**

Correlation analysis between digital photography measurement of trunk deformity and self-image perception in patients with idiopathic scoliosis

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Scoliosis 2014, 9(Suppl 1):O8

**Introduction:** Trunk deformity in idiopathic scoliosis has been fully analyzed using different surface metrics but all of them are expensive and cannot be widely used. Recently it has been suggested that some measures of trunk deformity obtained in digital photography can be useful in the assessment of trunk deformity. Some asymmetry measures have been proposed but the relationship between these measures and patients’ self-image perception has not been established.

**Aim:** To assess the validity of a clinical assessment tool of the trunk deformity based on photographs as compared to self-assessed appearance questionnaires.

**Study design:** Cross-sectional study. Concurrent validity between postural indexes obtained from digital photographs and self-assessed appearance questionnaires.

**Methods:** Front and back digital photographs of patients with idiopathic scoliosis (Cobb angle >25º) were obtained. Shoulder, armpit and waist angles in addition to trunk asymmetry indexes were calculated on front and
back photographs with Surgimap software. All patients completed SRS-22, SAQ and TAPS questionnaires. The Spearman’s rank correlation coefficient (r) was used to estimate concurrent validity between both methods.

Results: 80 consecutive patients (68 females), mean age 20.3 years old (range 12 to 40 years) were included. Mean Cobb angle was 45.9° (range 25.1° to 77.2°).

A moderate but significant correlation was found between waist height angle and TAPS (r=0.34) and SAQ appearance subscale (r=0.35). SRS22 image subscale did not correlate with any photographic measure. Shoulder height angle and trapezium angle ratio correlated significantly with SRS22 Pain (r=0.34) and SRS22 subtotal (r=0.23). Any other correlation between body image perception instruments and other photography measurements was found.

Conclusion: Waist height angle measured with digital photography is moderately correlated with perceived trunk appearance. Trunk asymmetry is poorly correlated with self-assessed appearance whereas shoulder asymmetry is correlated with pain and quality of life.

09
The comparison and validity and reliability study of bilateral innominat vertical length measurements using innovative digital radiographic imaging software in assessing scoliotic leg length discrepancy
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Scoliosis 2014, 9(Suppl 1):S9

Background information: The role of leg length discrepancy (LLD) has been implicated in certain types of scoliosis [1]. Scoliotic LLD has been suggested as a result of rotation of the innominate bones [2]. However, the role of innominat vertical lengths (IVLs) as a predisposing factor for scoliosis is not clear. The reliability of radiographic measurements may reveal whether IVL can be used as a factor for clinical assessment.

Purpose: Clinical investigation of quantifying bilateral IVLs and to assess the intra- and inter-observer variability using digital radiographic techniques.

Methods: Twenty x-ray films from scoliotic patients with LLD were chosen based on convenience, without predilection for gender and age. Images were examined by 7 trained observers to compare bilateral IVLs and to estimate the variability, as well as intra- and inter-observer variations. Each image was measured 3 times at a minimum interval of 1 week. All radiographs were calibrated by the software to allow for accurate length measurements. Student’s t-test was used to compare bilateral IVLs and to estimate the variability, as well as intra- and inter-observer variations. Each image was measured 3 times at a minimum interval of 1 week. All radiographs were calibrated by the software to allow for accurate length measurements.

Results: Overall mean right IVL was 192.6 ± 6.94mm, and left IVL was 190.4 ± 6.95mm. Although there was a discrepancy between bilateral IVLs, there was no statistical significance (P>0.05). Interobserver ICC was 0.954 and intraobserver ICC was 0.974.

Conclusion: Scoliosis patients with LLD might show asymmetrical IVLs; however, this discrepancy has no statistical significance; therefore, IVL is not a strong clinical indicator in assessing scoliotic LLD. On the other hand, the computer-assisted measurements are clinically advantageous and appropriate to assess scoliosis parameters. Digital measurement among different observers showed excellent reliability for the majority of IVL parameters, making it a useful method for the analysis of pathology on radiographs in scoliosis patients.

References

O10
The ability of surface topography postural measurements to detect cobb progression in adolescents with idiopathic scoliosis (AIS) and a main thoracic curve: full torso scans compared to back only parameters
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Scoliosis 2014, 9(Suppl 1):S10

Background: External deformity due to scoliosis can be quantified by surface topography (ST) from full-torso and back-only scans. Determining the ability of ST parameters to detect which curves remain stable is necessary to determine if ST can help reduce radiation exposure in monitoring scoliosis progression.

Objective: The study goal was to compare the ability of full-torso and back-only ST parameters to detect which curves do not progress by >5 (Cobb degrees) in AIS with a main thoracic curve.

Design: Prospective cohort.

Methods: We assessed 42 adolescents (n=32F, age 13±2;17±2yrs) with AIS with a main thoracic curve, braced (n=22) or under observation (n=20), using a full-torso ST scan at baseline and 12±3months later. Subjects were scanned standing in a positioning frame using four laser scanners. One evaluator marked 11 landmarks. Thirty full-torso and 16 back-only parameters were extracted in Matlab by digitizing landmarks on anonymized scans presented randomly. The absolute value of the difference between visits was quantified for ST changes because surface improvement and deterioration can occur with worsening curvatures. The area under the receiver operator characteristic curves (AUC) was used to compare the accuracy in determining which curves did not progress.2 An AUC of 1 represents a perfect and > 0.5 a worthless parameter.

Results: The baseline Cobb angle was 24±12 and the mean 1-yr change was 1.6±8.6 (range -10;34degrees). The largest curve worsened by >5 degrees for 13 patients. Two full-torso ST parameters had statistically significant ability to predict which curve remained stable. The AUC of the absolute change in the “10th to 90th percentile range3 of the angle between the principal axis of inertia of torso cross-sections and the frontal plane” 1 was 0.70 (95%CI 0.52;0.88). The absolute change in the “transverse plane angle between the anterior superior iliac spines and the sternum” 2 was 0.73 (95%CI 0.58;0.88). No back-only parameters demonstrated a significant ability to predict stable curves.

Conclusion: In patients with main thoracic curves, only full-torso ST parameters had significant ability to detect stable curves during a 1 year follow-up. Future work will determine if a prediction rule using ST parameters can be developed to detect stable curves and reduce radiation exposure.

References

O11
Comparing the fatigability of paraspinal muscles between sides and curve levels while performing a modified side plank in patients with adolescent idiopathic scoliosis
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Scoliosis 2014, 9(Suppl 1):S11

SCIENTIFIC SESSION 3 - BASIC SCIENCE
Background: While many studies have been performed on the effects of exercise on Adolescent Idiopathic Scoliosis (AIS), little research has been done into the underlying muscle physiology. Studies have suggested a fibre type imbalance, however, the implications of this difference as reflected through fatiguability have not been studied. The slope of the median frequency of the surface electromyographic (EMG) signal is a useful tool in determining the fatiguability of muscles.

Aim: To compare the fatiguability of paraspinal muscles between levels and sides in patients with AIS.

Design: Cross-sectional study.

Methods: Subjects with AIS were recruited from our specialized scoliosis clinic. Subjects performed 3 modified side planks on both left and right sides. Bipolar sEMG electrodes were placed on either side of the spine at the upper end vertebrae(UAV), apex, and lower end vertebrae(LEV). Raw EMG muscle activity was recorded. The slope of the median frequency of the EMG power spectrum was extracted using Matlab. A repeated measures side-by-level ANOVA was performed to detect differences in the average of the closest 2 out 3 fatigue trials between sides and levels. A paired t-test was performed to determine if there were differences in trial duration between left and right planks.

Results: Thirteen subjects were recruited (10 females) with a mean age of 13.6±1.6 years and a mean BMI of 19.76±3.8kg/m². Mean Cobb angle was 25.0±13.0 degrees. No significant interaction or main effects were found in fatigue measurements between sides and levels. Mean slope of median frequency over sides and levels was 0.023±0.103 for left plank and 0.108±0.21 for right plank. There were no significant differences between left (55.46sec±19.39) and right (58.31sec±19.61) plank mean durations.

Conclusions: The side plank did not create enough fatigue in paraspinal muscles when using sEMG to measure the slope of the median frequency to detect differences between levels and sides. Future work will address the study objectives using the Sorensen test to generate more paraspinal fatigue.

References:

O13 Muscle shortening in structural versus non-structural spine deformities

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Background: Restriction of muscle flexibility is observed in lower limbs of both healthy adolescents and those diagnosed with spine deformity. Children sedentary lifestyle is suspected to be the reason. The resulting inhibition of antagonistic muscle group and disturbance of synergistic/stabilizing groups can potentially involve global muscular balance. The aim of the study was to assess lower limb muscle shortening in children with spine disorders.

Methods: 412 children, aged 10 to 16 years, mean = 12.6 ±1.8 were examined. The subjects were categorized into four groups: Group A – idiopathic scoliosis of 10 to 25 Cobb degrees, n=113, Group B – idiopathic scoliosis of more than 25 Cobb degrees, n=110, Group C – Scheuermann juvenile kyphosis, n=31, Group D – healthy control children age matched, n=118. One observer (first author) performed exam of all children using classical clinical tests to diagnose shortening over the following muscles: gastrocnemius, soleus, hamstrings, rectus femorius, adductor longus, adductor magnus, tensor fasciae latae and piriformis.

Results: All children presented muscle shortening in lower limbs, most often in gastrocnemius, hamstrings and adductors (84.1% to 94.3% for all groups). Differences in muscle shortening prevalence were observed between the scoliosis groups and the Scheuermann group, p<0.001, paired t-test. No correlation was found between scoliosis angle and muscle shortening, Spearman 0.16, p>0.07. Piriformis revealed least shortening (22.6% to 24.5% of all subjects).

Conclusions: 1. Children without structural spine deformities presented limitation in all tested muscles.
2. Younger an adolescent, more often the muscles tested were short.
4. Longitudinal data on lower limbs muscle shortening in adolescence is needed.

O14 Is it worthwhile to measure bone quality in patients with adolescent idiopathic scoliosis?

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Scoliosis 2014, 9(Suppl 1):O14

Background: The application of quantitative ultrasound measurement in the studies of AIS is still sparse.

Aim: The aims of this study were to compare bone quality (speed-of-sound, SOS and z-scores) between female adolescent idiopathic scoliosis (AIS) patients and controls using quantitative ultrasound examination, and further
to analyze the relationship between bone strength and maturation, severity and type of scoliosis in AIS patients measured by the same technique along the long axis of the distal radius.

Design: Case series.

Methods: 88 female AIS patients and 58 healthy female controls from 10 to 16 years of age were included. Quantitative ultrasound measurements were performed at the left distal end of the radius, and the standard method to estimate speed of sound was recorded. Z-score was then calculated. Comparisons were made between the values of SOS and z-score values in patients and age-matched controls.

Results: The SOS values of 88 female AIS patients were significantly lower than age-matched adolescent controls (P<0.01). However, there was no statistical correlations between bone density and types of scoliosis, as well as family history (p>0.05). The SOS values among different severity groups of curvature were found to be significant, particularly between 10 to 20 degrees and 20 to 40 degree groups, but there was no significant correlation between SOS and Cobb angles. Statistically significant correlations were also found between pre- and post-menarche status.

There was significant difference in the SOS values in different Risser stages (p <0.05), and more skeletally immature patients were more osteopenic.

Conclusions: Comparing to non-scoliotic controls, female AIS patients have generally lower bone quality measuring by quantitative ultrasound. Slower maturation may be one of the factors that affect the bone quality in these patients. Different types of scoliosis and family history have no effect on the bone quality in these patients. Although there were significant differences between SOS values and Cobb angles, this may be due to slower bone maturation than the severity of the AIS curve. It is recommended that quantitative ultrasound measurement should be undertaken in AIS patients.

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O16

Flat feet, prone feet, posture and dependency between them in first grade children

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Scoliosis 2014, 9(Suppl 1):O16

Background: Posture is simply the position our bodies adopt in response to the effects of gravity. It is the way we hold ourselves, in sitting, standing or even lying down. Correct posture gives not only a smart appearance but also helps to prevent injury and illness of the spine. The children's ankle-foot complex pass through various stages of development. The presence of abnormalities in them would be a logical prerequisite for the development of abnormalities in other parts of the children's body.

Aim: To establish frequency of flat feet, prone feet and posture and dependency between them in first grade children. The outcome of this assessment will be used to determine the choice of exercises that may improve the deficits discovered during the assessment.

Methods: 31 girls and 27 boys mean age 7 years old were studied in October and November 2012. For the purposes of that study we used: posture assessment, ankle-foot complex assessment, pedobarograph to evaluate the transverse and longitudinal arch of the foot. The plantar pressure distribution was recorded using I-Step foot scanner in erect standing position for 30 second on the foot scanning plate. The result analyzed using the Bravais-Pearson's correlation coefficient (R).

Results: Abnormal posture were observed in 79% of children, while 12% of assess children have no deviation in ankle-foot complex. There is no significant correlation between sex and pronation (R =0.13), age and posture abnormality (R =0.08), age and pronation (R =0.14), age and flat feet (R =0.24). There is no direct correlation between flat feet and posture abnormality, as in our study there is only one such case. There is a strong correlation between pronation and postural deviations (R =0.86).

Conclusion: The pronation in ankle-foot complex is the leading factor for the variation in the children’s posture and it should be monitored and treated during children’s development. To determine the proper treatment is important to invent and use the precision assessments that separate the two deformities (pronation and low arch – flat feet).

The equipment was supported by Hodileko.bg.

O17

Proposition of functional examination according vojta’s concept in children with scoliosis

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Scoliosis 2014, 9(Suppl 1):O17

Background: The father of Vojta’s concept was a Czech neurologist prof. Vaclav Vojta. The beginnings of the theory go back to the 70s of the twentieth century. First Vojta’s patients were children with cerebral palsy. It is currently applied to patients of all ages suffering from neuromuscular system disorders. We also noticed positive results of this therapy during the treatment of children with scoliosis.

Aim: The study is aimed at presenting examples of the functional examination of children over the age of 6 suffering from scoliosis following Vojta's method.

Design: Case series.
Method: Apart from the basic clinical examination before the therapy (and radiological results: Cobb angle, Risset test), each patient undergoes a thorough functional examination. This includes the assessment of supporting-extensory mechanisms in the standing position, all four positions and the supine position. Additionally, the examination involves the Brighton hypermobility score (to determine the degree of joint laxity) and the mobility of temporomandibular joints. In case of detecting supporting-extensory mechanism disorders, the recommended starting position for the exercises, according to Vojta’s concept, may be crawling or the first position upon activating of the relevant movement trigger zones. Depending on the type of scoliosis the starting positions are subject to individual modifications.

Results: On the basis of observations involving children with scoliosis and the analysis of the proposed examination scheme before and after the therapy it was concluded that the quality of supporting-extensory mechanisms, which are crucial to correct body posture, balance and coordination, has improved.

Conclusions: The proposed functional examination according Vojta’s concept can be useful in the clinical assessment of children with scoliosis both before and after the therapy. Further research needs to be conducted, based on the proposed functional examination, to confirm the efficiency of the method according to the evidence-based medicine principles.

References

O18
Rib index, an objective measure to document changes of the rib hump deformity in a risser 4 progressive ais patient treated with the Schroth method
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Scoliosis 2014, 9(Suppl 1):O18

Background: The goals of Scoliosis Specific Schroth Physiotherapy (SSSPT) are to restore muscle balance, reshape the rib cage and reduce the rib hump to improve the esthetic of the patient, to increase the breathing areas and vital capacity, to reduce the Cobb angles, and to avoid spinal fusion surgery. Measuring the Cobb angles on P-A radiographs, assessing the sagittal profile on lateral radiographs, and calculating the Rib Index (RI), extracted from the Double Rib Contour Sign (DRCS) on lateral radiographs as one of the indicators of the rotational component of scoliosis, are three objective measurements Schroth physiotherapists can use to document the progression of this 3D condition. Traditionally, physicians have relied primarily on the Cobb angle when monitoring the progression and improvement of scoliosis. It is also important, however, to assess and document the rib cage rotation and rib hump size as reflected by the RI.

Methods: A 13-year-old female was diagnosed with AIS in December 2011 and has been exclusively treated with SSSPT since September 2012. No bracing was used. The Cobb angle and RI from T6-T11 were measured on radiographs from December 2011 to October 2013. RI is the ratio of distances, d1/d2 (d1, the distance between the most extended point of the corresponding vertebra on lateral scoliosis film; d2, the distance from the least projected rib contour to the posterior margin of the same vertebra). The mean RI was calculated.

Results: At diagnosis, the mean RI was 1.658 and the Cobb angle was 45°. In August 2012, the mean RI and Cobb angle increased to 2.352 and 56°, respectively, indicating an increase in rib hump deformity and progression of scoliosis. In November 2012, after 12 weeks of SSSPT treatments, the mean RI and Cobb angle started to decrease to 2.16 and 52°. In October 2013, after a total of twelve 2-3hr clinic visits and 12 months of a daily 1.5-2hr Schroth HEP, the mean RI decreased to 1.665 and the Cobb angle to 42°. These mean RI and Cobb angle measurements show progression from 2011-2012 and improvement from 2012-2013 as a result of daily SSSPT.

Conclusion: The RI can be used as an additional objective measure to show rib hump improvement with SSSPT.

References

O19
Aetiology of idiopathic scoliosis: the “scotch type” effect or the abnormal initial local anterior-lateral conjunction between the dura mater spinals and the periosteum of spinal canal of concave side. New evidence
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Scoliosis 2014, 9(Suppl 1):O19

Background information: Early we described a local internal lateral fixation (LILF) of a dura mater spinals to the wall of the vertebral channel as the main reason of the serious idiopathic scoliosis. There are a postmortal investigations of the serious scoliosis with a LILF of duramater. Early it was considered by other author that this a secondary phenomenon as a consequence of the vertebras edges pressure in the vertebral channel towards the dura mater.[Movshovich L,1964 [1].]

Purpose: First , to prove that the LILF is not the secondary phenomenon, on the contrary , the LILF of dura mater like a hooked bowstring causes a serious idiopathic scoliosis.

Second, to find a trace on MRI of flat tension of dura mater in consequence of conjunction between the Dura mater and the Periosteum of spinal canal of concave side.

Method: Now we analyzed the evolution of the vertebral foramen forms on 10 postmortal cases of the serious idiopathic scoliosis and 30 MRI-tests of the initial little idiopathic scoliosis with ‘bad scenario” or the intramacularyst.

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

Results: We found trace of flat tension of dura mater in consequence of conjunction between the Dura mater and the Periosteum of spinal canal of concave side.

We find that the starting scoliosis have LILF of dura mater in several cases. These are serious scoliosis in future.

Conclusions and discussion: The MRI test for a LILF of the dura mater can help to make a forecast of future development scoliosis. We can make the early scoliosis treatment by separation of the LILF of the dura mater like Edville Gerhardt Abbott (1913) [2] by overcorrection brace. Now it is called the Abbott-Cheneau brace.

References

O20
Simplified technique for DaVinci view spine presentation
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Scoliosis 2014, 9(Suppl 1):O20

Background: DaVinci presentation is a physician friendly picture of scoliotic spine seen from the cephalad side in the horizontal plane. This presentation is complementary to the standard view of the spine in two planes: frontal (anterior-posterior) and sagittal (lateral). DaVinci presentation can be obtained by using a few techniques which allow for three-dimensional reconstructions: CT, MRI, EDS. DaVinci-presentation is useful in analyzing the spinal deformation in 3D space, in horizontal plane: the deviation of each
vertebrae in relation to the sagittal plane, CLS (center sacral line) or C7PL (C7 plumbline); localization of PMC (plane of maximum curvature) in relation to the sagittal and coronal plane.

**Aim:** Create the simple way to draw the DaVinci-presentation on the basis of X-rays (AP, lat) without the necessity of using the sophisticated software.

**Design:** Draw the DaVinci-presentation of scoliosis manually. Validate the drawing method.

**Material:** X-rays and CT scans of three patients with scoliosis. The magnitude of the main curve, assessed by the Cobb’s angle, amounted to: 71, 87, 88 degrees respectively, 82 on average.

**Methods:** To create the DaVinci-presentation the central points of vertebrae were determined. The method used to define the vertebrae’s central points and to draw the DaVinci-presentation was validated. In the first validation’s step the virtual model of spine was created. This model was subjected to mathematical analysis. In the second validation’s step, the accuracy of assessed position of 42 vertebrae’s centers was verified by examining the CT-scans of analyzed curves.

**Results:** DaVinci presentations of analysed scolioses were drawn. The localisation of central points of vertebrae were close to their real position.

**Conclusion:** Simplified way to draw a DaVinci presentation on the basis of regular AP and lateral X-rays is possible.

**References**

### SCIENTIFIC SESSION 4 - BRACING I

#### O21

**Previously treated versus untreated scoliosis: are results different?**

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**Scoliosis 2014, 9(Suppl 1):O21**

**Background:** Every day we see patients coming after some kind of brace treatment for adolescent idiopathic scoliosis (AIS). Literature is made mainly by studies about untreated patients, so we don’t know what to expect when we start such a treatment.

**Aim:** The aim of the present study was to compare the results of previously treated scoliosis compared to untreated ones.

**Design:** Prospective observational controlled cohort study nested in a prospective database started in March 2003.

**Methods:** Inclusion criteria: patients that started a brace treatment at their first clinical evaluation at our institute between 2003 and 2009 for AIS, 12-15 years old, Risser 0-3.

Patients were divided in two groups, one of patients already treated with a brace (BRACE Group), and one never treated before (UNTREATED Group).

**Outcome measure:** The threshold of 5° Cobb to define worsened, improved and stabilized curves was considered, average Cobb angle, ATR, TRACE (for aesthetic evaluation) Statistical analyses: Mean and SD were used for descriptive statistics of clinical and radiographic changes. Relative Risk of failure (RR), 95% Confidence Interval (CI), Student’s t, Kruskal Wallis, and chi square test were applied.

**Results:** 268 patients were included (226 females), age 13.3 (±1). BRACE Group: 108 (96 females), age 13.2 (±1), Cobb Angle 34±12°, ATR 9.6±0.4, TRACE 5.7. UNTREATED Group: 160 (130 females), age 13.2 (±1), Cobb Angle 33±11° ATR 10.3±0.2, TRACE 5. No differences among groups at first visit but for ATR (p<0.05). 49.38% of patients improved in UNTREATED, 43.13 stable, 7.50 worsened vs 35.19, 52.78 and 12.04 for BRACE (p=0.06). The Cobb angle was 28.9 vs 30.1 (p=0.06). The RR of failure for BRACE was 1.6 (IC95%:0.86-2.35). No differences among groups for TRACE and ATR. Drop out had results similar to the completers (NS).

**Conclusions:** Average clinical and radiological parameters improved in both groups. In the UNTREATED group results were slightly better even not significant, probably for the low statistical power. This study demonstrate that with a good treatment it’ possible to achieve good clinical results even in already treated patients.

**Reference**

#### O22

**Outcomes of brace treatment for adolescent idiopathic scoliosis with curve magnitude of 41 to 50 degrees**

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**Scoliosis 2014, 9(Suppl 1):O22**

**Background:** Effectiveness of brace treatment for adolescent idiopathic scoliosis (AIS) patients with curve magnitude of 20 to 40 degrees was demonstrated by BRAIST study in 2013. However, its effectiveness for the curve over 40 degrees was under controversy.

**Aim:** To investigate outcomes of brace treatment for AIS patients with curve magnitude of 41 to 50 degrees.

**Design:** Case series from prospectively constructed data base.

**Methods:** AIS patients with age over 10 years, Risser sign of 0 to II, within one year postmenarche, Cobb angle of 41 to 50 degrees before treatment and underwent no prior treatment were included in the study. At the final follow-up after the patients reached skeletal maturity, the rate of the patients whose curve was stabilized by the treatment (the curve had not progressed in more than 6 degrees), whose curve exceeded 45 degrees and who underwent surgery were investigated.

**Results:** A total of 12 female patients was included in the analysis. The average age was 12.3 years (11-15) and the average Cobb angle was 45.0 degrees (41 to 50) before treatment. Risser sign was 0 in three, I in five, and II in four patients. There were eight thoracic, two thoracolumbar, and two double major curves. Initial correction rate by the brace was 35.3%. After an average follow-up period of 36 months, the average Cobb angle changed to 50.3 degrees. The curve of six patients (50%) was stabilized by the treatment. The curve of nine patients (75%) exceeded 45 degrees and three patients (25%) underwent surgery.

**Discussion:** For the curve magnitude of 25 to 40 degrees, the rate of the patients whose curve was stabilized by the brace treatment was 79% in our institution. Comparing with these results, the stabilization rate (50%) of the present study for the curve of 41 to 50 degrees was relatively low. However, the progression rate of such magnitude curve in the natural history was reported to be 70-90%.

**Conclusions:** Fifty per cent of the curves of 41 to 50 degrees was stabilized by the brace treatment, which had some effectiveness even for the curve of such magnitude.

#### O23

**Conservative treatment in adolescent idiopathic scoliosis with curves over 45°: is the measurement in Cobb degrees the only parameter to be considered?**

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**Scoliosis 2014, 9(Suppl 1):O23**

**Background:** The recent literature showed positive results in bracing patients with idiopathic scoliosis above 45° that refused surgery. However, no one has investigated whether other parameters are able to affect the results.

**Aim:** The aim of this study was to evaluate the effectiveness of the brace in idiopathic scoliosis with curves above 45° and to assess whether the magnitude of the curve in Cobb degrees is the only parameter for the indication to surgical or conservative treatment.

**Design:** This is a prospective study based on ongoing database including 1,238 patients with idiopathic scoliosis.
Methods: The study including idiopathic scoliosis with 45° or more, Risser 0-4, who had utterly deny any surgical intervention. Fulfill the inclusion criteria 160 patients. Of these, 104 patients have definite outcome, 28 abandoned treatment and 26 are currently under treatment. The minimum duration of follow-up was 24 months. X-rays was used to obtain Cobb degrees and position of the apical vertebra (Perdriolle's method). Three outcomes were distinguished in agreement with SRS criteria: curve correction, curve stabilization and curve progression. We have divided the sample in subgroup according to Risser (0-2; 3-4), to rotation (<20; >25) and to type of Curve. The Kruskal Wallis and Spearman Rank Correlation tests have been used as statistical tests.

Results: The results from our study showed that the 104 patients with a definite outcome Cobb mean value was 47 ± 5.37° SD at beginning and 34.18 ±8.45° SD at follow-up. Perdriolle was 20.2 ± 5.49° SD at beginning and 16.76 ± 7.04° at follow-up. Curve correction was accomplished in 81 patients (77.8%), whereas a curve stabilization was obtained in 15 patients (14.4%); 9 patients (8.6%) have a curve progression and 16 (15.4%) where recommended for surgery. The subgroups with rotation <20 showed a correction/stabilization in 98.1% and surgery referral in 1.8% while in subgroups with rotation >25 a correction/stabilization was achieved in 69.4% but surgery referral in 60.8%. The subgroups with risser 0-2 showed a correction/stabilization in 92.6% and surgery referral in 10.3% while in subgroups with risser 3-4 a correction/stabilization was achieved in 91.6% but surgery referral in 25%.

Conclusion: Results allow to say that an adequate conservative treatment must be absolutely considered in the treatment of scoliotic curves in patients who refuse surgery, in particular if the rotation is lower than 20 and Risser is between 0-2, the results will be better.

O24

Gait analysis in adolescent idiopathic scoliosis walking with Boston brace

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Scoliosis 2014, 9(Suppl 1):O24

Background: Adolescent idiopathic scoliosis (AIS) can affect spine mobility and gait mechanisms. In some of the related science research it is showed that the kinematic differences in the spine, pelvis and lower limb may contribute to the causation and progression of idiopathic scoliosis. Various treatment methods have been used for scoliosis, however using brace is a commonly used method in this regard. Nowadays little is known about the effects of bracing on gait biomechanics in scoliotic patients. The aim of this investigation was to identify the immediate effects of bracing on improvement of asymmetries in lower limb kinematics and pelvic and back movements during level walking in scoliotic subject.

Method: Twenty subjects (10 healthy subjects and 10 AIS with thoracolumbar/lumbar curve) were recruited in this study. Gait analysis was assessed using a three-dimensional motion analysis and a Kistler force plate. Scoliotic patients were assessed with and without Boston brace. Spatiotemporal gait parameters and kinematic parameters of the thorax, pelvis, hip, knee and ankle joints were the parameters used in this study.

Result: Bracing had no significant effect on body segment excursion of ankle, knee and hip joints; however pelvis and hip motions were significantly reduced in all AIS patients.

Conclusion: The use of orthosis seems to improve the symmetry of motion of right and left sides in hip and pelvic. However it reduces the motions of these joint in scoliotic subjects.

O26

To brace or not? The answer is “it depends”. Preliminary results from BrAIST

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Scoliosis 2014, 9(Suppl 1):O26

Background: Recent research suggests current indications for bracing in AIS result in significant over-treatment. Many patients are actually at low risk for significant progression. Others present at higher risk will benefit little from bracing.

Aim: This study developed a simple, yet accurate, model of the risk of significant curve progression in AIS and the risk reduction associated with bracing.

Methods: Data from 238 BrAIST subjects were used (91 observed, 147 braced). All met current indications for bracing (Cobb 20-40°, Risser <3) and were followed until reaching a Cobb angle of >50° or failure (c statistic=0.841). Increasing Cobb angle was more predictive of failure than Risser grade, even with age in the model. The most predictive 3-variable model was chosen.

Results: The overall failure rate was 31% after bracing and 52% after observation. Age, gender, Risser, Sanders’ digital maturity stage (DMS), curve type and Cobb angle were all associated with outcome. DMS stages were more predictive of failure than Risser grade, even with age in the model. The best-fitting model included the DMS (1-2, 3, or 4+), Cobb angle, and treatment (p<0.0001, c statistic=0.841). Increasing Cobb angle was associated with increased risk of failure across all DMS’s; bracing significantly decreased the risk. In DMS 1-2, the risk of failure ranged from 73% (Cobb 20°) to 93% (Cobb 39°). Bracing reduced the risk to 50% and 84%, respectively. Risk was lower in DMS 3 patients, ranging from 36% (Cobb 20°) to 76% (Cobb 40°), reducing to 19% to 52% with bracing. The lowest risk of failure was noted at DMS 4+, ranging from 9% (Cobb 20°) to 31% (Cobb 39°), reducing to 3% to 15% with bracing.
Conclusion: DMS stages in combination with Cobb angle at presentation accurately predict the natural history of AIS during the high-risk period. Bracing significantly altered the natural history. This model provides a simple, yet predictive model of the risk of curve progression and the decrease in risk due to bracing. These results can be used by clinicians and families to make evidence-based decisions concerning bracing for AIS, with the family choosing observation or bracing based on their own risk-benefit considerations.

AWARD SESSION

O27
In favour of the definition "adolescents with idiopathic scoliosis": juvenile and adolescent idiopathic scoliosis braced after ten years of age, do not show different end results
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Scoliosis 2014, 9(Suppl 1):O27

Background: The most important factor discriminating juvenile (JIS) from adolescent idiopathic scoliosis (AIS) is the risk of deformity progression. Brace treatment can change natural history, even when risk of progression is high.

Aim: The aim of this study was to compare the end of growth results of JIS subjects, treated after 10 years of age, with final results of AIS.

Design: Prospective observational controlled cohort study nested in a prospective database started in March 2003.

Methods: Setting: outpatient tertiary referral clinic specialized in conservative treatment of spinal deformities.

Participants: Inclusion criteria: idiopathic scoliosis; European Risser 0-2; ≥ 45° Cobb; age 10 years or more at start of treatment. Exclusion criteria were for both groups: secondary scoliosis and pathologies known to be able to cause possible causes of scoliosis, neurological, previous treatment for scoliosis (brace or surgery).

Groups: 29 patients (26 females, 32.24±6.34 Cobb) met the inclusion criteria for JIS, (JIS treated in adolescence), according to an x-ray before age 10. AIS group included 45 adolescents (37 females, 32.60±6.14° Cobb) with a diagnostic x-ray made after the threshold of age 10. In both groups results at the end of growth were analysed; the threshold of 5° Cobb to define worsened, improved and stabilized curves was considered. Statistical analyses: Mean and SD were used for descriptive statistics of clinical and radiographic changes. Relative Risk of progression (RR), 95% Confidence Interval (CI) of radiographic changes have been calculated.

Results: We did not find any Cobb angle significant differences among groups at baseline and at the end of treatment. In the AIS group the percentage of worsened was 10.3% versus 6.67% in the AIS group.

The RR of progression of AIS was 1.35 (IC95% 0.57-3.17) versus AIS, and it wasn’t statistically significant (p=0.5338).

Conclusion: Brace efficacy can neutralize the risk of progression. So the broad suggestion offered by these results is that there are no significant differences in the final results of AIS and JIS, treated with total respect of the SRS and SOSORT criteria, in adolescence. It is possible that JIS starting the treatment later, could be less aggressive than scoliosis that compel earlier treatment.

O28
Correlation between compliance and results of brace treatment in juvenile and adolescent idiopathic scoliosis
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Scoliosis 2014, 9(Suppl 1):O28

Background: In the last years the literature suggest that the efficacy of bracing to reduce the curve progression and the surgery is good in compliant patients. Some of the studies applied a sensor other standardised form. Therefore the lack evidence of the effectiveness of bracing may partly be explained by poor compliance.

Aim: The aim of the present study was to prospectively evaluate the association between compliance of brace wear and progression of the scoliotic curve including the surgical rate in patients with idiopathic adolescent and juvenile scoliosis treated with PASB, Lyon brace and Milwaukee.

Design: Prospective study from 1424 patients treated for idiopathic scoliosis between 1995 and 2013.

Methods: Fill the inclusion criteria (age between 4-12 years, full-time prescription) 683 patients. Of these, 505 patients. We concluded that the risk for curve progression and surgery is good in patients with idiopathic adolescent and juvenile scoliosis treated with PASB, Lyon brace and Milwaukee.

The RR of progression of AJIS was 1.35 (IC95% 0.57-3.17) versus AIS, and the percentage of worsened was 10.3% versus 6.67% in the AIS group.

O29
Mild angle early onset idiopathic scoliosis avoid surgery under fits physiotherapy
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Scoliosis 2014, 9(Suppl 1):O29

Background: Physiotherapy for stabilization of idiopathic scoliosis angle in growing children remains controversial. Specially, little data on effectiveness of physiotherapy in children with Early Onset Idiopathic Scoliosis (EOIS) was published.

Aim: The aim was to check results of FITS physiotherapy in a group of children with EOIS.

Methods: The charts of the patients archived in a prospectively collected database were retrospectively reviewed. The inclusion criteria were: diagnosis of Early Onset Idiopathic Scoliosis based on spine radiography, age below 10 years, both girls and boys, Cobb angle between 11° and 30°, Risser zero, FITS therapy, no other treatment (nighttime bracing etc.), follow-up minimum 2 years from the initiation of the treatment. The criterion for curve progression was Cobb angle increase of 6° or more at any follow-up radiograph. The criterion for curve stabilization was the Cobb angle within the range ± 5° comparing to the initial radiograph. The criterion for curve correction was Cobb angle decrease of 6° or more at the final follow-up radiograph.

Results: There were 41 children with Early Onset Idiopathic Scoliosis, 36 girls and 5 boys, mean age 7.7 ±1.3 years (range 4 to 9 years) who started FITS therapy. The curve pattern was single thoracic (5 children), single thoracolumbar (22 children) or double thoracic/thoracolumbar (14 children), totally 55 structural curvatures. The minimum follow-up was 2 years after initiation of the FITS treatment, maximum was 16 years, mean 4.8 years). At follow-up the mean age was 12.5 ±3.4 years. Out of 41 children, 10 passed pubertal growth spurt at the final follow-up while 31 were still immature and continued FITS therapy. Out of 41 children, 27 improved, 13 were stable.
and one progressed. Out of 55 structural curves, 32 improved, 22 were stable and one progressed. For the 55 structural curves, the Cobb angle significantly decreased from 180° ± 5.4° at first assessment to 125° ± 6.3° at last evaluation, p<0.0001, paired t-test. The Angle of Trunk Rotation decreased significantly from 4.7° ± 2.9° to 3.2° ± 2.5° at last evaluation, p<0.0001, paired t-test.

Conclusion: FITS physiotherapy was effective in preventing curve progression in children with Early Onset Idiopathic Scoliosis. Final post-pubertal follow-up data are needed.

Acknowledgements: Many thanks to Prof. T. Kotwicki for help in construction and development of the study.

**SCIENTIFIC SESSION 5 - BRACING II**

**O30**

Dynamic elastomeric fabric orthoses in neuropathic scoliosis management: an audit of the frequency and characteristics of use

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Scoliosis 2014, 9(Suppl 1):O30

Background: Scoliosis is a common consequence of neuromuscular diseases with an incidence of 25% in cerebral palsy (CP) [1] and 75-90% in non-ambulant Duchenne muscular dystrophy [2]. Evidence from case studies demonstrates that dynamic elastomeric fabric orthoses (DEFOs) may provide an effective alternative to rigid bracing [3], which often causes discomfort and hence is associated with non-compliance.

Aim: We aimed to describe the routine management of paediatric neuropathic scoliosis, more specifically orthotic management; and explore the progression of scoliosis with DEFO use.

Design: Retrospective audit.

Method: The physiotherapy notes of children with neurological conditions were audited in five Healthcare Trusts across England. A standardized data collection form was used to gather diagnostic and demographic information and scoliosis characteristics and management.

Results: 180 notes were audited (85 male; mean age 9 years [SD 4y 7mo]). Diagnoses included cerebral palsy (44%), neuromuscular dystrophy (3%), spinal pathology (2%), developmental delay (23%) and others (28%), including Rett syndrome and epilepsy.

Scoliosis (Cobb angle >10 degrees) was confirmed in 77 children of whom 45% had been prescribed a DEFO. This was replaced by a rigid orthoses for 4 children; another 4 stopped using the DEFO or any other form of orthoses. DEFO management was far less likely in those with severe scoliosis. Of those with radiographic medical records enabling their scoliosis to be categorized according to severity, 28/42 (72%) with mild scoliosis, 5/8 (63%) with moderate scoliosis and 1/8 (13%) with severe scoliosis used a DEFO. A developing scoliosis was seen in 43 children of whom 51% used a DEFO. No scoliosis was observed in 77 children, all of whom wore a DEFO as a preventative measure. In children wearing a DEFO, in whom the Cobb angle was monitored over time, there was a deterioration of >10° in only 1/8.

Conclusions: DEFO use varied across region and was used in a variety of neuromuscular conditions. It was used more commonly in the management of less severe scoliosis and as a preventative measure. Where serial monitoring was performed, Cobb angle progression was only minimal in those using a DEFO.

References

**O31**

Evaluation of the Rigo classification system for brace design

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Scoliosis 2014, 9(Suppl 1):O31

Background: We were using for the design of scoliosis braces, the King classification system combined with the Cheneau brace concepts as well as the Lehnert's 3-4 curves pattern. This was very frustrating either with the correction results or the body balance. We were completely confused and the design of a brace was empirical, based on the expert’s skill.

Aim: The aim was to evaluate the Rigo classification system for the brace design.

Design: From July 2011 we have started to fabricate the RSB braces for 243 exclusively AIS patients (220 females and 23 males, average age 13,5, with thoracic Cobb angle average 35 degrees and lumbar 29 degrees), based on the Rigo Classification system. The therapy was completed by Schroth and SEAS exercises and the suggested wearing time was 21 hours per day.

Methods: The inter-observer reliability of the classification was testing, in every case individually by an orthopaedic surgeon with CPO degree and a Physiotherapist (Schroth and SEAS certified). The total of the cases for the purpose of this paper was checked again by the same team. The patients were visited every 3 months, checking posture and Cobb angle with Formetric 4D, as well the adequacy of the brace. The patients have had also an in brace x-Ray, about three months after bracing.

Results: From the 243 patients we had 13 patients A1, 9 A2, 41 A3, 66 B1, 28 B2, 20 C1, 26 C2, 22 E1 and 18 E2, according the Rigo classification. The in brace x-rays have shown a correction from 2/3 to 1/3 of the initial Cobb angle, depending on the skeletal maturity, as well as the compliance of the patient. All the patients out of the brace had a better balance and aesthetics (Scapular symmetry, waist triangles, humps and pelvic displacement), almost from the first visit after 3 months.

Conclusion: The Rigo classification system was verified to be excellent for RSB brace, which gave us the best results ever taken. We don't know if it will be the same excellent for other brace types, such as Boston, Sforzesco etc.

Reference

**O32**

Results of the initial in-brace correction-effect

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Scoliosis 2014, 9(Suppl 1):O32

Background: Brace treatment for scoliosis is effective. The short term in-brace correction of the Cobb angle is associated with end results and success of bracing. Irrespective of the factors which determine the correction the measurement of the Cobb angle is a possibility to evaluate the brace quality.

We have investigated the braces from one orthotist over a fixed period of time and have described the connection between age, initial Cobb angle and the achieved correction effect.

Methods: Study design: retrospective. Population: n713 patients diagnosed as having juvenile and adolescent idiopathic scoliosis. We differentiated between 1085 curvatures and assessed the changes. Required was a complete ap-ay-ray film without brace not older than 6 months prior to the start of the brace treatment and the second x-ray film 2 month after the brace fitting.

The correction effect was described by the difference between the Cobb angle of the 2 x-ray films and expressed as a percentage. Groups were matched regarding Cobb angle and age.

Results: Median reported correction effect for all 1085 curvatures was 65.4%.

Patients with Cobb < 25° the mean correction was 68.91%, Cobb 26° to 40° mean correction 38.9%, Cobb > 41° correction 28.42%.

Age groups: < 10yr mean effect 87.56%, N. 57.
Cobb < 25° 95.97%, Cobb 26° to 40° 63.12%, Cobb > 40° 34.72%. 10-12yr mean effect 58.83%, N. 100. Cobb < 25° 74.95%, Cobb 26° to 40° 41.79%, Cobb > 40° 31.67%. 13-14yr mean effect 50.2%, N. 238. Cobb < 25° 67.23%, Cobb 26° to 40° 38.91%, Cobb > 40° 28.69%. > 14yr mean effect 42.17%, N. 318. Cobb >25° 57.47%, Cobb 26° to 40° 36.58%, Cobb > 40° 27.78%.

Conclusions: The achieved corrections show what we have already expected that younger and less matured patients have the best results. As maturity and the Cobb angle increase the correction effect was reduced by the more structural components of the curvatures. However the mean correction effect of 65.4% seems to be encouraging. For us the results make clear that to start with bracing early even with Cobb angles below 25° seems to be a sufficient decision within the conservative scoliosis treatment.

O33 Initial experience with the providence nighttime bracing in adolescent idiopathic scoliosis Inge Beuschau1, Lena Qusth1, Ané Simony2
1ÖRTOS, Odense, Denmark; 2Sector for Spine Surgery and Research, Middelfart Hospital, Denmark Scoliosis 2014, 9(Suppl 1):O33

Background: Nearly six years ago the primary conservative treatment of adolescent idiopathic scoliosis (AIS) in the southern part of Denmark, went from full time bracing and hospitalization to nighttime bracing and an in- and outpatient treatment.

Aim: To evaluate the effectiveness of nighttime bracing in AIS.

Methods: Inclusion criteria were patients diagnosed with AIS and skeletal immaturity. With an apex of the primary curve from TH7 and below and with a Cobb angle between 20-45 degrees. The patients were asked to wear the brace at least 7-8 hours pr. night.

No other previous treatments were accepted and a follow up at least 6 months out of brace. The brace treatment was continued until two years post menarche or for male at the expected adult height. Cross-measured x-rays were used to compare the primary Cobb angle, the in-brace correction and the outcome Cobb angel. A decreased outcome Cobb angle as well as the overcorrection of the curve measured in brace was recorded as zero.

The brace treatment was considered failed if progression > 5 degrees occurred and if surgery were performed.

Results: A total of 55 patients, 8 male and 47 female, with a mean age at 14 years (11-16.5) and the mean primary Cobb at 31 degrees (20-41) were included in this study. There were 27 primary thoracic curves, 16 thoracolumbar, 11 lumbar and 1 double curve.

The mean time of treatment was 18 month (5-59). The average in-brace correction was 81% (24-100%), with a mean in-brace Cobb of 6,1 degrees (0-26). After ended treatment the mean Cobb angle was 28 degrees (7-50), an average of no progression. The end results were 11 failures (6-15 degrees); equal 20 % and out of these 11 patients, 3 had surgery performed (5%).

Conclusion: The results show a good curve control and an acceptable 20 % failure rate, which is equal to other studies. The Providence brace is an excellent alternative to standard conservative treatment. Larger studies are needed to establish the relationship between in-brace correction and curve progression during the treatment.

References

O34 First results of the Maastricht brace in the treatment of adolescent idiopathic scoliosis Dirk Schrander1, Joris Hemus, Helma Voets, Mark van den Boogaart, Paul Willems, Lodewijk van Rhijn Maastricht Universitair Medisch Centrum, Maastricht, the Netherlands Scoliosis 2014, 9(Suppl 1):O34

Background: The Maastricht brace (M-brace) was developed to improve compliance and associated efficacy of brace treatment in adolescent idiopathic scoliosis (AIS). Initial pressure measurements in the M-brace revealed a higher corrective pressure as compared to the Boston brace, and a better patient reported quality of life, as measured with the SRS 22 and Brace questionnaire. We present the first results of the efficacy in terms of curve correction of the M-brace in AIS.

Aim: The aim of this study was to evaluate the in-brace curve correction of the Maastricht brace and to determine the effect of increased wearing comfort on treatment efficacy.

Design: Retrospective cohort study.

Methods: A total of 46 patients (mean age of 13 years) with mild to moderate AIS, who have been treated with the M-brace since January 2011, were included. The correction effectiveness of the brace was evaluated by comparing the primary and secondary curves on bending x-rays with those on standard postero-anterior full spine radiographs with and without M-brace. The degree of correction in the M-brace was then expressed as a percentage of the correction as achieved in the bending radiographs. As a control group four patients were also fitted a Boston brace, in order to compare the in-brace correction between the braces.

Results: There were 38 patients with a primary thoracic curve, and 8 patients with a primary lumbar curve. The average primary curve angle measured in Cobb degrees was 34.7° ± 11.3°. The average primary curve angle in bending x-rays was 15.5° ± 8.3°. In the M-brace the primary curve was 25.4° ± 10.1° (p<0.01). This is an in-brace correction of 48%. The control group had an in-brace correction of 49.7% in the Boston brace versus 45.1% in the M-brace (p=0.21).

Conclusions: These preliminary results demonstrate an adequate in-brace correction of the M-brace, which is comparable to corrections found in current literature and similar to the in-brace correction of the Boston brace in the control group. Given the relationship between compliance and wearing comfort, the M-brace is, without compromising treatment efficacy, a promising new brace treatment for adolescent idiopathic scoliosis.

O35 Prospective 100 first results of immediate scoliosis correction with the new lyon brace: ARTbrace Jean Claude de Mauroy1*, Sophie Pourret2
1Clinique du Parc, Lyon, France; 2Lecante, Lyon, France Scoliosis 2014, 9(Suppl 1):O35

Background: The immediate reducibility of the Cobb angle in brace is the fundamental parameter of success of non-surgical orthopedic treatment of scoliosis.

Aim: The objective of this work is to present the first results of the new Lyon brace (Asymmetrical Rigid Torsion brace) with immediate realization of the brace without plaster cast.

Design: The new Lyon brace is constructed with two asymmetrical lateral polycarbonate pieces connected posteriorly at the midline by a vertical incurved bar. The brace reproduce a twisted column in the opposite direction of scoliosis. The shape is obtained by superposition of three segmental electronic moldings which will be superimposed by a new software: OrtenShape.

Results: The results of a prospective series of the first 100 consecutive patients were studied using EOS X-ray and compared with results obtained by other braces.

Radiologically, in the frontal plane, the immediate in brace reduction is on average (0.72) (0.63 +– 0.19 for thoracic curves & 0.76 +– 0.26 for lumbar curves. These results can be classified:
- Depending on the type of curvature: thoracolumbar (0.96),
lumbar (0.71), double major (0.67), lumbar (0.67), thoracic (0.64).
- According to the criteria of the SRS (40 cases): thoracic curves (0.66), lumbar (0.83).
  - According to the initial angulation:
    20-29° = (0.80).
    30-39° = (0.65).
    > 40° = (0.45).
  In 51 cases with initial kyphosis <30°, improving the flat back is 9.25° from 19° to 28.25°.
  Clinically, the push-up effect is 1.64 cm.
  After at least 1 month of continuous wearing, for thoracic rib hump improvement is (0.50) and for lumbar (0.85).
  The improvement is 40% compared to the old plaster cast and Lyon brace and 60% compared to the Chêneau-Münster brace.
  All radiological and clinical parameters improved significantly.

**Conclusion:** The new Lyon brace (ARTbrace) allows a better immediate in-brace reduction than the old Lyon brace without need for a preliminary plaster cast.

### SCIENTIFIC SESSION 6 - BRACING III AND sagittal BALANCE

**O36**

**Focused molding using adhesive pads in Mehta casting for early-onset scoliosis**

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**Scoliosis 2014, 9(Suppl 1):036**

**Background:** Early-onset scoliosis is often effectively managed by serial casting. Properly localizing the apex of the molds with the cast in place is challenging. The authors explored the effectiveness of a novel technique: incorporation of adhesive pads placed over the major curve apex before Mehta casting.

**Aim:** To determine the effect of adhesive pads placed over the apex of scoliosis curves on curve correction 1) after the first cast and 2) after final cast.

**Study design:** Case series.

**Method:** The 27 patients who received body casts (2000 through 2013) were divided into 2 groups, those without and with apical adhesive pads (5 to 6 layers of pads placed over the major curve's apex during casting): non-pad (NP) group (n = 12) and pad (P) group (n = 15), respectively. Groups were compared for percentage of Cobb angle change from the first cast and curve correction to a Cobb angle of less than 25° with Student t and chi-square tests (significance, p value less than .05).

**Results:** The mean percentage of major first-cast curve correction was 39% ± 18% and 56% ± 17% in the NP and P groups, respectively. Of the 26 patients out of cast, 11 (42%) had a Cobb angle of less than 25°: 3 (25%) and 8 (57%) in the NP and P groups, respectively. The mean differences between the 2 groups in percentage of major curve correction and this Cobb angle correction were significant: p = 0.023 and 0.005, respectively.

**Conclusion:** Adhesive pads placed over major curve(s) during Mehta casting were effective in increasing the amount of major curve correction from the first cast for idiopathic early-onset scoliosis, and in decreasing curves to less than 25° at final follow up.

**Level of evidence:** Level III; Retrospective comparative study.

**O37**

**The second dimension of the Sforzesco brace correction: analysis of the sagittal shape of the spine**

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**Scoliosis 2014, 9(Suppl 1):037**

**Background:** Scoliosis is a three dimensional deformity, and brace correction should be 3D too. The key role of sagittal and pelvic balance in spinal deformity is very well known, but the effect of brace on sagittal plane remain unknown. The aim of this study is to analyse and compare the sagittal and coronal parameters in a sample of patients treated with Sforzesco Brace.

**Method:** Design: observational prospective study on consecutive patients. Participants: the first 12 female (age 13.07±2.05) patients, with idiopathic scoliosis (41.58±14.52° Cobb), in Sforzesco brace treatment, who had orthogonal synchronous AP and LL low dose EOS x-rays examination, before treatment start (PRE), with brace (IN) and after four months of treatment at immediate brace take-off (OUT).

**Outcome measures:** Sagittal and coronal parameters as automatically calculated by the EOS system.

**Statistical analysis:** ANOVA for comparisons and Pearson’s coefficient for correlations judged good between 0.5 and 0.8 and high above 0.8.

**Results:** Scoliosis worst curves improved statistically IN (12.5°±4.98) and OUT (8.8°±3.47) versus PRE.

**P> 40° = (0.45).**

- According to the criteria of the SRS (40 cases):
  - Thoracic curves (0.71).
  - Lumbar (0.67).

**Conclusion:** Greater attention is needed in the sagittal plane correction made by brace. The Sforzesco brace is able to preserve the sagittal balance of the spine and pelvis, while improving the very well known correlations among sagittal and pelvic parameters. Good braces must preserve and model as much as possible the sagittal balance of the spine and pelvis, without losing the good correction of the scoliosis deformity. Interestingly, the supposed anatomical (invariant) parameter pelvic incidence showed to change into the brace (IN) versus either PRE and OUT: possible explanations include a sacro-iliac joint movement, even if more data are needed to understand this result.

**O38**

**Scoliosis and sagittal balance in Parkinson’s Disease: analysis of correlations**

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**Scoliosis 2014, 9(Suppl 1):038**

**Background information:** The knowledge concerning scoliosis in Parkinson’s Disease (PD) and its correlations with sagittal balance (SB) is sparse.

**Purpose:** The aim of this study was to describe the prevalence of scoliosis in PD patients and the existing correlations with SB in relation to the spinopelvic morphology.

**Methods:** 64 consecutive PD patients were included: 53 males, 11 females; 69.5±8.1 years; 5.6±4.1 years of disease (YOD); Hoehn Yahr (H&Y) 2.4±1.1; UPDRS-M 16.1±12.5. The clinical assessment included HY and UPDRS-M score, Pain NRS 0-10 and trunk rotation in bending (ATR). Lumbar lordosis (LL), thoracic kyphosis (TK), scoliosis curves (SC), spinoacral angle (SSA),
Spinopelvic parameters, sagittal balance and compensatory mechanics in younger and older adults with scoliosis

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Scoliosis 2014, 9(Suppl 1):O40

Background: Sagittal balance is an important factor in postural alignment that has been linked to back pain, dysfunction and quality of life. It is reportedly even more important than coronal curve values. The Scoliosis Research Society (SRS) has recently proposed sagittal balance threshold values for evaluating sagittal vertical axis (SVA) and lumbo pelvic compensations as defined by pelvic incidence–lumbar lordosis (Pl-LL) (±50mm and ±10°, respectively).

Aim: To evaluate SVA and PI-LL with the current gold standard (low dose EOS x-ray scans) in younger and older patients with scoliosis.

Design: Retrospective cohort study of 27 consecutive adult patients (45 ±19 years) with scoliosis (coronal Cobb >10°) who underwent EOS scanning were separated into a younger (<45 years, n=14) and older (≥45 years, n=13) group.

Methods: Fisher’s exact tests were used to evaluate differences in the prevalence of SVA and PI-LL threshold deformities in patients younger and older than 45 years old.

Results: 38% of the older group and 0% of the younger group exceeded the SVA threshold of +50mm (p=0.02). No difference between the younger and older group for the prevalence of PI-LL mismatch compensation was found (36% vs. 62% p = 0.25). However, 100% of the younger mismatch subgroup was below -10 degrees and 67% of the older mismatch subgroup exceeded 10 degrees (p = 0.02).

Conclusions: This study demonstrates that patients use compensations to maintain upright sagittal balance. Older patients more frequently exhibit uncompensated positive sagittal balance beyond the 50mm SVA threshold. Whilst there were no differences between the age groups with respect to the proportion of patients who cross the PI-LL threshold, younger patients may compensate by anterior pelvic tilt and lumbar hyperlordosis whereas older patients may compensate by posterior pelvic tilt and lumbar hyplordosis.

Prospective studies are needed to examine the aetiology, pathogenesis and pathomechanisms of compensations and if further compensatory changes occur as patients age.

Physiotherapists who see patients many years before they attend surgical assessments may be able to play an important role in determining, predicting compensations, utilising the information for treatment, monitoring and even preventing the ramifications of sagittal balance failure.
Results: Radiographic spinopelvic angles appeared normal, but many patients presented variations from normality. In particular, pelvic tilt increased (21.2±12.1°) and sacral slope decreased (33.8±10.9°); spinosacral (108.8±20.2°) and spinopelvic angles (150.3±17.1°) were reduced compared to healthy people. Five patients (16.1%) were presenting a camptocoric behavior while walking: 21 patients (67.7%) had an anterior decompensation (average PAKA 32.6±27.7mm) while 10 patients (32.3%) had a posterior one (average distance PS1 24.5±9.4mm); 8 patients (25.8%) had a scoliosis above 20° (Cobb angle=30.8±14.4°), while 11 (35.4%) presented a mild form between 11° and 20° (Cobb angle=11.2±2.1°). Even if the average value of radiographic parameters appeared normal (Table 2), 3 patients (9.6%) had a LL below 20°, and 3 (9.6%) a lumbar kyphosis; 12 (38.7%) presented a TK above 55°.

Conclusions: Sagittal balance evaluation provides new valuable insights for biomechanical understanding of PD patients. Specific spinal parameters (spinosacral, spinopelvic and spinal tilt angles), and their clinical correlation, as well as pelvic parameters like pelvic tilt and sacral slope, appear particularly interesting for their clinical implications in terms of spinal deformities correction in PD population.

**SCIENTIFIC SESSION 7 - SCREENING AND ETIOPATHOGENESIS**

**O42**

**The BrAiST study and the implications for scoliosis screening: our duty for raising awareness and advocacy**

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**Scoliosis 2014, 9(Suppl 1):O42**

**Background:** A recently published NIH-funded study named “Bracing in Adolescent Idiopathic Scoliosis Trial” (BrAiST) affirmed the efficacy of bracing for moderate adolescent idiopathic scoliosis (AIS) and reduced surgical recommendations in braced patients. The implications of this study are numerous. BrAiST affirms the value of bracing, but also confirms the importance of early time and points to the need to assess compliance with compulsory utilization of brace monitors. Additionally, one of the key implications of the study relates to early detection, possibly heralding a new era for scoliosis screening policy adoption.

**Aim:** To engage and enlist the feedback and potential advocacy, on behalf AIS patients, of all persons involved in relevant state agencies, scientific organizations and health care professions.

**Methods:** After a short presentation of BrAiST results, its implications will be highlighted on a) brace treatment, b) the importance of compliance, c) the value of screening programs. Subsequently the current concepts and recommendations on screening will be analyzed.

**Design:** Other (Advocacy/Awareness raising report).

**Results:** This established bracing effectiveness, reducing the number of patients who progress to surgery, resulting in cost savings and great benefit for scoliotics, also calls for raising awareness and advocacy of all the involved related professionals. Awareness will be increased by familiarizing people with the a) history and geography of screening policies, b) current evidence about screening, c) impact of screening on frequency of surgical treatment and its negative discontinuation effects on patients, d) the analysis of evolving aim of screening, e) the encouragement for policy statement publications from professional organizations and governmental agencies regarding scoliosis screening, f) by legislating national program and g) by presentations in pertinent scientific meetings. The advocacy will be benefited by a) providing guidelines on setting up these programs, b) recommendations for improvement of a screening program and c) popularizing its additional benefits on its contribution to clinical research on IS etiology.

**Conclusions:** Due to the fact that the implementation of screening programs is inextricably bonded to non-operative IS treatment, it is believed that this reported ‘BrAiST’ trial will have further impact on IS management swinging the pendulum.

**O43**

**Scoliosis epidemiology is not the same all over the world: a study from a scoliosis school screening in the island of Chongming, China**

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**Scoliosis 2014, 9(Suppl 1):O43**

**Background:** Genetic factors in China could be different than in other places and reflect in prevalence differences.

**Aim:** The aim of the present study was to examine some scoliotic parameters, such as patients’ age, gender ratio, curve magnitude, curve type, and curve side, in Chongming Island with few population exchanges with remaining China differed from that of the published date through a scoliosis school screening program.

**Design:** Cross-sectional study.

**Methods:** A total of 6824 children (3477 boys and 3347 girls) aged from 6 to 17 years old recruited from 352 classes of primary schools, and junior and senior high schools were screened for scoliosis. 442 children showed physical signs of potential scoliosis (Angle of Trunk Rotation at Adam’s forward bending test of five degrees or more) and were referred for posteroanterior radiographic evaluation. Radiographic evaluation included the Cobb angle, curve type, and curve side of scoliosis. The differences in the prevalence rate, the distribution of curve parameters and the variables of age and gender were analyzed by SPSS.

**Results:** The prevalence rate of scoliosis (> 10 degrees or more) was 2.52% (172 of 6824 schoolchildren). There was a positive but very weak correlation between scoliosis and age. The prevalence rate was significantly higher in girls than in boys (girls vs. boys: 3.11% vs. 1.96%, ratio 1.51). Most of the curves were minor (from 10 to 19 degrees). The right curve was the most common type in the thoracic region (60.3% of all thoracic curves), while it was left in thoracolumbar (75.5%) and lumbar regions (64.7%).

**Conclusions:** The prevalence of scoliosis in the Island of Chongming was 2.52%. The percentage of curve magnitude and type were comparable, while gender, curve side and the correlation between scoliosis and age in the Island of Chongming differed from that in other countries. According to these results, epidemiological regional variability, possibly with genetic basis, can be considered.

**O44**

**A line of zebrafish with development of abnormal spinal curvatures**

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**Scoliosis 2014, 9(Suppl 1):O44**

**Background:** The lack of a good animal model system has hindered studying the etiology of idiopathic scoliosis. Recently, it has become clear that several fish species appear to exhibit spinal curvatures.

**Aims:** To determine if the affected tissue in a line of zebrafish with spinal deformities resembles the pathology observed in pediatric populations with scoliosis.

**Design:** This case series study was approved by IACUC.

**Methods:** Potential founder fish with spinal curvatures were outcrossed with a wild type zebrafish line (AB) and the resulting siblings (F1 generation) crossed and the offspring (F2 generation) examined for signs of spinal...
Background: A recent study showed that lumbar epidural steroid injections increased osteoporotic spine fracture risk.

Aim: We further evaluated associations between steroid injections and osteoporotic fracture risk by analyzing the Medicare database and including large joint and transformaminal steroid injections; as well as osteoporotic hip and wrist fractures. A systemic effect would increase risk in all fracture locations regardless of injection site. A local effect would result in a disproportionate increased risk of spine fractures when steroids were injected into the spine.

Design: Epidemiological study using national administrative data.

Methods: Patients who had a steroid injection into the epidural space (ESI), transformaminal space (TSI) or large joint (LJSI) were identified. Patients younger than 65 and those diagnosed with a prior osteoporotic fracture were excluded. Patients were followed continuously until fracture, withdrawal from Medicare or death. Kaplan-Meier survival and Cox regression analysis were performed to determine adjusted fracture risk (Adjusted Hazard Ratio (HR)) for each type of injection, accounting for patient characteristics such as age, sex, Charlson Comorbidity Index (CCMI), Cushing’s syndrome or long term steroid use.

Results: Osteoporotic spine fracture risk after ESI, TSI or LJSI was influenced by age, race, sex and CCMI. The risk decreases with each additional ESI (HR=0.98), TSI (HR=0.99) or LJSI (HR=0.96). Long term steroid use increased spine fracture risk in ESI (HR=1.86) and LJSI patients (HR=1.41). Osteoporotic hip fracture risk was influenced by age, race, sex, CCMI, Cushing’s disease, LJSI (HR=0.95) and TSI (HR=0.95), but not ESI. Osteoporotic wrist fracture risk was influenced by age, race, sex, CCMI, LJSI (HR=0.91), but not by ESI or TSI.

Conclusions: Analysis of patients in the Medicare database showed that ESI, TSI or LJSI decreased osteoporotic spine fracture risk; but this may not be clinically relevant. Successive ESIs did not influence osteoporotic hip or wrist fracture risk, while LJSIs reduced the risk. Prolonged steroid exposure increases spine fracture risk in ESI and LJSI patients. Acute exposure to exogenous steroids via the epidural space, transformaminal space or large joints does not seem to increase the risk of an osteoporotic fracture of the spine, hip or wrist.

ORAL POSTER SESSION 2

O47

The development of a decision making pathway for the physiotherapy treatment of adult scoliosis

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Scoliosis 2014, 9(Suppl 1):O47

Background: The treatment of adults with pain from scoliosis is a complex and difficult task. The variety of structural pathologies with an adolescent de-novo degenerative conditions, include stenosis, joint subluxation, and disc degeneration. Mechanical pain is often associated with mal-alignment and deviations from the physiological neutral spine posture/structure. The Side Shift approach has been used at the RNCH to treat Adolescent Scoliosis and Adults in pain. In order to optimize the management of adult scoliosis a decision making pathway was developed. The purpose of the pathway was to inform the clinicians, guide the management and protect the adult patients. Ultimately it was hoped that it would improve patient outcomes.

Aim: To develop and pilot a decision making pathway which would be robust, measurable, easy to follow and effective.

Method: Initially a Brain storming session was used to develop the key pathways to assessment and treatment.

Adult patients were given open questions on the goals and expectations of treatment. Patients were shown the pathway and asked for comments. The pathways was taught to the Hospital department and integrated to the Care pathway file for the treatment of scoliosis.

Results: A descriptive has been developed and will be presented. Early interim results of outcome and experience to use will be presented.

Conclusions: A pathway provides a structural decision making process which can aid the correct application of treatment techniques to a condition. This needs to be developed initially by discussion and consensus. Robust and varied analysis is needed to prove its effectiveness and worth, to improving the patient experience.
Scoliosis is a 3D deformity of the spine combined with pathological structural changes. Scoliosis tends to progress through growth. BSPTS method based on Schroth principles is a specific physiotherapeutic treatment method for scoliosis. It considers the 3d changes of the spine, the geometrical and axial torsion of the hole spine, thorax and pelvis. Using specific exercise to achieve better muscle balance and corrected posture in order to prevent progression, improve esthetic and function. Aims: To present the efficacy of the BSPTS method based on Schroth principles treating progressive moderate AIS in 2 case studies using objective measures. 

**Case 1:** Starting point- age 17.5 years, Risser=2+, Rt thoracolumbar L3-T7 52° cobb, Trace 10/11, scolometer 16' rt hump, plumb line 2.5 cm rt from center of sacrum. 
End point- age 19, Risser = 4, Rt thoracolumbar L3-T7 35° cobb, Trace 6/11, scolometer 12' rt hump, plumb line 1 cm rt from center of sacrum. 

**Case 2:** Starting point- age 14.5 years, Risser=1, Rt T5 33° cobb, Trace 9/11, scolometer 17° rt hump, plumb line 2 cm rt from center of sacrum. 
End point- age 15.9, Risser = 3 Rt T3 30° cobb, Trace 5/11, scolometer 9° rt hump, plumb line 1 cm rt from center of sacrum. 

**Conclusions:** In spite of the late diagnosed moderate AIS the combined treatment of specific intensive physiotherapy and RSC brace achieved improved Cobb angel, better esthetic and the operation was avoided. 

**Implications:** Early detection could improve the results in all parameters, school screening or other systematic method for early detection is highly recommended. 

Scoliosis specific stabilization exercises are those that are aimed at stabilizing spinal curvatures. 

**Background:** Scoliosis specific stabilization exercises are those that are aimed at stabilizing spinal curvatures. 

**Aim:** The aim of this paper is to assess the efficacy of using corrective exercise on progressive, degenerative curves in an adult population. 

**Methods:** A 64 y/o, postmenopausal female was seen in the clinic for 10 one hour visits, spaced over 5 months. This patient was significantly concerned regarding the twenty degree progression of her curve over 3 years. Family history is significant for severe spinal stenosis. The patient was educated in safe back mechanics, as well as specific scoliosis stabilization exercises according to Schroth and SEAS. She demonstrated satisfactory quality of exercise. The patient had exercise compliance daily of twenty minutes. 

**Results:** The patient was seen for annual follow up for the following objective measures: scolometer angle of trunk rotation, DIERS formetric postural measures, and radiological assessment. We found decreased scolometer angle of trunk rotation from 8 to 4 degrees, decreased Cobb angle from 35 to 25 degrees, as well as DIERS formetric changes including–improved coronal balance, increased trunk height, increased lumbar lordosis, and decreased surface rotation. 

**Conclusion:** The results indicate that employing scoliosis specific stabilization exercises may be an effective tool to halt progressive degenerative curves in adult females. 

**Consent:** Written informed consent was obtained from the patient for publication of this Case report. A copy of the written consent is available for review by the Editor of this journal. 

**Competing interests:** Spinal Dynamics of Wisconsin has no financial relationship with DIERS. 

**References**


**O49**

**Effects of scoliosis specific exercise on a 64 y/o woman with degenerative scoliosis**

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Scoliosis 2014; 9(Suppl 1):O49 

**Background:** Scoliosis specific stabilization exercises are those that are aimed at stabilizing spinal curvatures. 

**Aim:** The aim of this paper is to assess the efficacy of using corrective exercise on progressive, degenerative curves in an adult population. 

**Methods:** A 64 y/o, postmenopausal female was seen in the clinic for 10 one hour visits, spaced over 5 months. This patient was significantly concerned regarding the twenty degree progression of her curve over 3 years. Family history is significant for severe spinal stenosis. The patient was educated in safe back mechanics, as well as specific scoliosis stabilization exercises according to Schroth and SEAS. She demonstrated satisfactory quality of exercise. The patient had exercise compliance daily of twenty minutes. 

**Results:** The patient was seen for annual follow up for the following objective measures: scolometer angle of trunk rotation, DIERS formetric postural measures, and radiological assessment. We found decreased scolometer angle of trunk rotation from 8 to 4 degrees, decreased Cobb angle from 35 to 25 degrees, as well as DIERS formetric changes including–improved coronal balance, increased trunk height, increased lumbar lordosis, and decreased surface rotation. 

**Conclusion:** The results indicate that employing scoliosis specific stabilization exercises may be an effective tool to halt progressive degenerative curves in adult females. 

**Consent:** Written informed consent was obtained from the patient for publication of this Case report. A copy of the written consent is available for review by the Editor of this journal. 

**Competing interests:** Spinal Dynamics of Wisconsin has no financial relationship with DIERS. 

**References**


**O50**

**Analysis of pelvic motion during gait with bivalve brace**

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Scoliosis 2014; 9(Suppl 1):O50 

**Background:** In the literature many articles explain that it is essential to have a femoral brace to restricted pelvic motion during gait. However, two principles to restrict the movement of the trunk in a brace: contention (hydraulic structure of the trunk) and the balance of power (three points system). But we are unable to know how much. 

**Aim:** The aim of this study is pelvis moves into the thoraco lumbar brace during gait, compared to a gait without the brace. 

**Materials and methods:** 2 asymptomatic adults, with similar physical feature. 

They wear a thoracolumbar bivalve brace, made with the same protocol (using CAD CAM) for reproducibility. We design the braces according to the principles of the brace immobilization: 

- a good grip on the waist and overall tightening. 
- supports on the abdomen, thorax and lumbar. 

We use the gait analysis system Vicon®. To use this system, we make holes in the brace at the location of the markers. Each person walks 6-8 trials in the gait analysis system with and without the brace. 

**Results:** The kinematic curves of the pelvic motion compared to the laboratory standard show that there is a significant decrease in the movement of the pelvis. With the brace, the range of motion is negligible. 

**Conclusion:** This preliminary experimentation allowed us to see that we could use the gait analysis system to evaluate the efficiency of brace. In a second step we have to consider a study on the patients who wear their braces on a longer time. So we will be able to objectify the efficiency of immobilization of the pelvis in a brace.
**Statistical analysis:** Firstly descriptive statistics will be used to calculate mean scores and standard deviations for a given question and a domain. The second level will be comparative concerning reliability and validity.

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**OS2**

GMFCS and spino-pelvi-femoral complex in ambulating or walking cerebral palsy children. retrospective study

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Scoliosis 2014, 9(Suppl 1):OS2

**Introduction:** We have performed a radiological evaluation of static data of spine-pelvis-femur complex in walking children with cerebral palsy (CP). The data are discussed about GMFCS and after about radiological data in asymptomatic subjects.

**Materials and methods:** The CP population is comprised of 119 children and the asymptomatic population of 652 children.

**Results:** There is no significant difference concerning the form parameter (pelvic incidence=PIL, on the other hand there is a significant difference on position parameters (pelvic tilt=PT and sacral slope=SS)). There is a correlation between GMFCS and PI (p=0.013) and between GMFCS and PT (p=0.021).

**Discussion:** The PC population is not structurally different than the asymptomatic population. It will be the growth, in pathologic context, which disturb parameters. A lumbar lordosis which is not correlated with PI have to be consider like a result of the disease (postural troubles, neuro-motor disorders related with growth,...) and require a specific and early evaluation and treatment.

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**OS3**

Scoliose et partage - ARTBRACE

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Scoliosis 2014, 9(Suppl 1):OS3

"Scoliose et Partage" is a French association of scoliosis patients. It was created in 2005 to help people suffering from scoliosis and their families. We are not a medical association.

We also want to better know and recognize scoliosis, a disease too often trivialized. We are also trying to raise awareness of the importance of early detection through a booklet created by the association and approved by the Ministry of Health.

We also collaborate when it is possible with the medical community and to this purpose we supported the doctor de Mauroy during the implementation of the ARTBRACE. For this, we analyzed psychological evaluation questionnaires (brace questionnaire) sent to young patients to see how they support and live with their new brace.

The evaluation period provides a time wearing day and night. This questionnaire includes 34 items divided into 8 groups:

1. General health perception: the majority the young people questioned are aware of the risk of development of her scoliosis.
2. Physical behavior: many of them felt tired walking and had difficulty running. Sometimes it was a little harder to eat, sleep, and some breathing difficulties.
3. Emotional behavior: the ARTBRACE seems to have very little influence on the moral and character of young people.
4. Self-esteem and aesthetics: most teens do not like their physical appearance with brace.
5. Vitality: they are generally more tired with the corset.
6. School activity: the brace does not seem to be a gene for school.
7. Body pain: we note very little pain so drugs are rarely taken.
8. Social behavior: Teenagers majority have a social life quite normal with their brace even if they sometimes had some apprehensions before.

We can conclude that the ARTBRACE is often well tolerated in all fields by young people and allow them to have a normal life.

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**OS4**

Shortening effect on spinal canal and clinical results by conversion of kyphosis into lordosis by Pedicle Subtraction Osteotomy (PSO) at the thoracolumbar junction in spinal deformities

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Scoliosis 2014, 9(Suppl 1):OS4

**Background context:** PSO can restore sagittal balance in kyphosis and scoliosis. Effect on central cord-root system seems unknown.

**Purpose:** To measure shortening of canal in PSO as side effect and describe macroscopic and MRI changes in the cord.

**Study design:** Radiographic study of the canal-shortening and lordosating effect as feature of a wedge or PSO the TL- spine. A case series with emphasis on radiographic alterations of the canal and clinical results.

**Material:** Out of a group of 21 consecutive patients (mean age 42.7 yr (13-69)) who had a fusion inclusive a PSO for kyphotic deformities, clinical and radiological parameters were taken preoperatively and at follow-up (minimal 12 months). Complications are described.

**Outcome measures:** Radiograms were measured pre- and postoperatively. Shortening at the frontal side of the canal in the osteotomised vertebra and between top Th10 to bottom L2 was measured as was the ventral side of the column Th10-L2. Correction of sagittal curve Th10-L2 was measured. Preoperative SF36 and VAS for pain and fatigue were compared with follow-up.

**Methods:** 21 adults with a kyphotic deformity were operated and followed for 12 to 29 months.

**Results:** The height of Th10-L2 at the ventral and at the posterior part of the bodies shows a mean shortening at the ventral side of 2.3mm and 7.6mm at the canal side of the bodies, the osteotomised vertebra taking 98% of the latter value. Correction of sagittal profile of Th10-L2 changed from a mean +18° to a mean -9°; SF-36 improves by a mean of 33.6 (SD 17.1) to 49.7 (SD 27.4): p<0.01. VAS for pain improved from 9 (SD 2.6) to 5.5 (SD 2.8) (p<0.01). Two voluntary MRIs at follow up are adjuvant in explanation of results.

**Discussion and conclusion:** In lordosating TL by PSO a true shortening effect on the canal is measured. The series shows the appreciation in some parameters by patients and the actual shortening of the spinal canal at the crucial thoracolumbar area by performing a PSO in fixed kyphotic deformities. Indication and mimicking effects surgery vs. TLI bracing will be discussed.

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**OS5**

Universal brace simulation platform

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**Background:** According to reports of the German Public Health Department, up to 80% of the children suffer from postural weakness. Most of them develop during the adolescent growth severe spine diseases like scoliosis. In case of slight postural deformity, patients are able to influence actively the posture of the spine by physiotherapy and training of stance and behaviour [1]. In advanced cases the patient cannot actively correct the stance and requires passive supportive measures [2], e.g. braces. Unfortunately the quality of braces and brace therapy results are varying very much due to not standardized procedures and different level of qualification of orthopaedic technicians.

**Aim:** The correction principle of brace therapy is based on the reversal of the curvature, extension and de-rotation. The patient’s spine gets strained mechanically by different points of pressure. The most important step in brace treatment is the correct adaption to the patient body. At present mostly an individual plaster cast of the partially-corrected patient is made
as basis for brace adaption. It is the aim of the study to develop a universal platform for simulation of brace construction.

**Design:** Initial studies in 2009 by Helmut Diers and Asklepios Clinic Bad Abbach show that it should be possible to use the three-dimensional setting of the FED-compression-system [3] as a simulation platform for simulation of the construction of braces. In addition a radiation free 3D Spine and Surface Topography system will be an integrated part of the technical design.

**Methods:** Based on existing experience and the construction and function of a FED system it will be possible to visualize immediately the effect of the correction forces on the spine curvature so that, if necessary, new force transmission points can be chosen. In this way the efficiency of the brace treatment can be monitored, changes are easily possible and results will be improved. To visualize the brace effect, a spine measurement system is integrated the spine curvatures and enables the optimization of the brace-referred adaption parameters.

**Results:** It is expected that the research results will improve the patient-individual brace-care. Using the existing FED therapeutic device for scoliosis treatment and integration of surface topography, it will be possible to develop a simulation platform for visualizing the forces in brace treatment. In this way the medical benefit will be considerably improved as well as the quality and economic efficiency of brace production.

**Acknowledgments:** This presentation is part of the BMWi project, IGF: 4802ZR, "KITS"

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**056**

The new Lyon brace (ARTBrace). New concepts of scoliosis correction

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Scoliosis 2014, 9(Suppl 1):C36

**Design:** The ARTBrace is a new Asymmetric, Rigid polycarbonate, Torsion brace constructed with two asymmetrical lateral polycarbonate pieces connected posteriorly at the midline by a vertical incured bar. Both anterior and lower closures are rigid, the upper third is Velcro. The aim is to build this brace in a simple custom way.

**Method:** The first concept is the mathematical model of circled helicoid. In the torso column, the generating circle is perpendicular to the axis. To obtain a torso column in the opposite side of scoliosis, the superposition of three electronic instantaneous full 3D moldings are necessary:
- First molding in self active axial elongation for pelvis and shoulders.
- Second molding in lumbar shift and physiological lordosis for the lumbar spine.
- Third molding in thoracic shift and physiological kyphosis for the thoracic spine.

The 3 moldings are superposed with specific software OrtenShape. The second concept is the wrench and bolt principle. No more pressure and expansion, no more push and pull, scoliosis is untwisted by the brace. The third principle according to Panjabi is the coupled motion behavior of the spine. When the spine is in a flexed or extended position (non-neutral) sidebending to one side will be accompanied by rotation to the same side correcting scoliosis rotation. Molding is 2D but correction is 3D. These new concepts can avoid the plaster cast or major modifications of the mold like the Chêneau brace.

**Results:** No more plaster cast, no more hospitalization, the life of the brace is greater than that of the plaster.

**Efficiency:** the brace is adjustable in the frontal plane, an additional correction by internal pad is easy (like Sforzesco).

**Aesthetics:** the brace is transparent, almost invisible under clothing.

**Hygiene:** a daily 15-minute shower is possible.

**Lightness:** No more 5-7 kg plaster cast.

**Originality:** This is the first untwisting brace of the whole spine in three planes of space.

**Simplicity:** anyone can make a frontal bending with lordosis or kyphosis, no major correction of the positive mold, a single setting, the protocol is identical to that of plaster cast.

**Tolerance:** Polycarbonate is biologically well tolerated.

**Universality:** It is possible to correct Hyperkyphosis like hypokyphosis.

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**057**

Surface topography scan as a source for orthotic brace design.

**Technique and case presentation**

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Scoliosis 2014, 9(Suppl 1):C57

Accurate adjustment and individualized brace design may warrant the optimal brace manufacturing that fit the patient’s body surface. Computerized methods may improve bracing treatment.

**Material and methods:** Computer Aided Design and Manufacturing in bracing is based on the introduction of appropriate data to the computer using anthropometry. The best data can be delivered by precise 3D surface topography supplemented with X-ray and other necessary radiographic modalities. The surface topography scanning used for this study is based on structured light projection. Scanning the surface of the patient’s body is carried out using the multi-directional laboratory scanning system, located at the Baby Jesus Clinical Hospital. The scanning system consists of four uni-directional systems. Each system is calibrated in a common coordinate system and a PC computing unit. Each unit includes a digital camera, multimedia projector and independent PC operating for the projection and recording of images (raster images and binary sinusoidal modulation of brightness). Raster images are recorded by the camera and processed by the scanner’s software. It allows extracting the 3D shape of the patient’s image of the torso surface. The total time of image acquisition is approximately 1.5 seconds. It can be further modified by the orthotist. The positive, foam torso model can be manufactured upon approval and acceptance.

The measurement data are obtained in the form of a point cloud further converted into a 3D model in STL format for further manufacture the orthosis. Point cloud accuracy is as high as less than 0.5 mm. The methodology is described based on the real AIS case.

**Results and conclusion:** The case of 12 years old AIS female patient was documented while elaboration the 3D scan and manufacturing of the brace based on STL file derived from 3D point cloud. Presented approach shows the implementation of the 3D surface topography scanning and its opportunity to transform it easy into a brace design suitable for TLSO brace manufacturing. Good fit and function today remains an important issue in brace manufacturing. We believe that 3D 360 degrees surface scan may significantly improve the accuracy of individual brace production.

**Consent:** Written informed consent was obtained from the parents/legal guardian of the patient for publication of this Case report. A copy of the written consent is available for review by the Editor of this journal.

**Acknowledgements:** This study is supported by the project NR13-0109-10/2010 funded by the National Centre for Research and Development.

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**058**

Evaluation the immediate effects of bracing on kinetic parameters in adolescent idiopathic scoliosis patients

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Scoliosis 2014, 9(Suppl 1):C38

**Background:** Idiopathic scoliosis induces change in coordination between body segments, spinal anatomy, left-right trunk symmetry and gait pattern. Various treatment methods have been used for scoliosis which includes: physical therapy, occupational therapy, osteopathic therapy, casting, bracing and surgery. However, using brace is a commonly used method in this regard. Although, the influence of brace to reduce the scoliosis curve has been investigated in lots of research studies, there is not enough research regarding the influence of brace on performance of scoliotic subjects while walking and standing. Therefore, the purpose of this study was to evaluate the immediate effect of brace on stability performance of scoliotic subjects
and the symmetry of the ground reaction force applied on the right and left feet while walking.

**Method:** Then girls aged between 8 and 12 years were recruited in this study. The gait analysis was assessed using a three-dimensional motion analysis and a force plate (Kistler) in two conditions, with and without Boston brace. Moreover their stability was evaluated by use of force plate. The difference of kinetic and stability parameters between two conditions (with and without Boston brace) was checked by use of paired T-test.

**Results:** For scoliotic patients, comparison of in-brace and out-brace situations revealed a significant decrease in postural sway in brace associated with increase of patient stability. But very short-term bracing in AIS has no significant effect on the symmetry of force applied on right and left limbs during walking (p-value < 0.05).

**Conclusion:** Bracing aligned the vertebral column and improved the abilities of the subject to stand and walk.

1. **O59** Is the minimal invasive anterior rotation spondylodesis a real alternative to corset-treatment?

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Scoliosis 2014, 9(Suppl 1):O59

**Introduction:** In light cases of scoliosis it is general consensus to apply therapy regimes consisting of physiotherapy and corset wearing. In border cases, between 40 and 50° curvature, opinions vary considerably. The corset supporters often target solely one dimension, specifically the lateral curvature. This is the case where the alternative surgical treatment is possible. In recent times precisely the ventral derotation spondylodesis (VDS) has been developed into a minimal invasive, reduced strain and extremely low risk procedure.

**Materials and methods:** Since 2008 we have the results from 71 VDS. In 40 of these there is a following observation period of two years or more. Measured were not only the pre- and postoperative curvature angle, but also the lateral profiling and balance of the spinal column. Noted were blood loss, surgery duration, complications and stationary duration of stay.

**Results:** Preoperative Cobb-angle ø 54° (40-95°), postoperative ø 9° (0-36°). Correction loss <3°, blood loss ø 450ml, ø surgery duration 230 minutes. There was in each case always an improvement of the side profile, particularly as a VDS is to be considered only in case of lordotic deformities. Complications observed was a rod breakage with no pain and no consequences. Otherwise no other complications were observed, especially no neurological ones and no post thoracotome syndrome, no postoperative disturbance of the lung function.

**Conclusion:** The ventral derotation spondylodesis is still a very good treatment method for light single curve scoliosis. Because of the improved surgical but also anaesthesiological possibilities over the years, not only the risk of an operation but also the length of the stationary hospital stay are reduced. The costs are considerably below the ones of a lengthy and possibly also unsuccessful conservative treatment with physiotherapy and corset. One should also consider the psychosocial aspects due to stigmatization caused by a long lasting corset therapy. In this regard, a reasonable risk-benefit consideration should be done. All considered, it appears that even if a residual surgical risk can never be rationalized, in cases of scoliosis in the border area between 40 and 50° precedence should be given to a VDS.

2. **O60** Perceived level of knowledge and skills about clinical management of adolescent idiopathic scoliosis among undergraduate chiropractic students and clinical faculty at a Canadian chiropractic program: cross-sectional study

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Scoliosis 2014, 9(Suppl 1):O60

**Background:** The prevalence of adolescent idiopathic scoliosis (AIS) ranges from 0.93 to 5.2%. Among these individuals, 22% will consult primary care providers for back pain, including chiropractors. Undergraduate chiropractic curriculum include training on the management of AIS. Recent studies however suggest such training may be sub-optimal to ensure sufficient clinical competency. To address this, a four session training educational workshop was provided to a group of chiropractic interns and clinical faculty members at l’Université du Québec à Trois-Rivières (UQTR).

**Aim:** To determine the current level of knowledge and skills about AIS management among junior, senior interns and the clinical faculty members at the Outpatient clinic at UQTR.

**Design and methods:** A cross-sectional online survey was administered to 112 interns and clinical faculty members at UQTR outpatient clinic to assess self-reported levels of knowledge and skills about AIS. The survey questionnaire was pilot tested prior to distribution. Three groups of respondents (juniors, seniors interns and clinicians) completed 15 closed-ended questions on AIS clinical presentation, risks factors and management. Responses were compared between groups using the Fisher’s exact test.

**Results:** A response rate of 43% (n=48/112) was obtained from 14 juniors and 19 seniors interns and 15 clinical faculty members. Among the three groups, 93% of clinicians considered having moderate to high level of knowledge on AIS, compared with 73% senior interns and 21% junior interns (p=0.0001). The proportion of interns and clinicians exposed to an educational training intervention significantly differed between groups (p=0.0201) with fewer juniors interns 57% and clinicians 73% attending than seniors interns 95%. The level of awareness on the existence of practice guidelines on the management of AIS varied similarly across groups (p=0.0138), with less awareness among junior interns 29% and clinicians 50% than senior interns 79%.

**Conclusion:** Study results suggest a persistent knowledge gap among interns and clinical faculty members for the management of AIS in a chiropractic teaching institution. Guideline dissemination and implementation strategies are needed to fulfill these gaps to improve patient care in this setting.

3. **O61** Does 3D back contour changes following spinal fusion in children with idiopathic scoliosis?

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Scoliosis 2014, 9(Suppl 1):O61

**Background:** Oftentimes, patients find trunk asymmetry, including thoracic rib hump, shoulder level difference, more troubling than a significant Cobb angle, as topographical deformity can be readily visualized. Evaluating improvement in these back contour parameters lends to additional criteria by which to assess post-surgical improvement. Quantec raster stereography is recognized as an accurate and reliable tool for monitoring three-dimensional back contour in patients with idiopathic scoliosis before and after surgery.

**Aims:** To investigate the 3D back contour changes in adolescent idiopathic scoliotic deformity from surgical intervention using Quantec imaging.

**Design:** In this prospective controlled study, 35 patients undergoing anterior and/or posterior spinal fusion were evaluated pre and post-operatively by Quantec Spinal Imaging System and radiography.

**Methods:** Mean age of patients 14.5 years, with mean follow-up duration 1.7 years. A reliable Quantec protocol was established previously in the literature, consisting of twelve parameters. Pre and post-operative parameters were analyzed by paired t-test evaluating the effects of spinal fusion on scoliosis contour.

**Results:** Significant improvement was seen in thoracic Cobb angle from 52.9 to 19.6 degrees (p=0.0001) and thoracolumbar from 54.7 to 21.3 degrees (p=0.0001). This correlated with Quantec thoracic Q-angle improvement from 34.8 to 10.6 (p=0.0001), and thoracolumbar Q-angle from 36.3 to 12.4 (p=0.00001). Thoracic rotation improved from 8.6 to -5.6 (p=0.042). Suzuki rib hump sum decreased from 15.7 to 11.5 (p=0.016), and trunk asymmetry decreased from 40.6 to 24.1 (p<0.0001). Left/right percent surface area also improved.

**Conclusions:** This study builds upon previous evidence that spinal fusion produces measurable improvements in lateral curvature, trunk rotation, and topography deformity.
062
The level of stress and body self image perception in adolescents with idiopathic scoliosis
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Scoliosis 2014, 9(Suppl 1):O62

Background: The level of stress and body self image perception in girls suffering from adolescent idiopathic scoliosis (AIS) is the object of interest of the professionals. The clinical assessment, designing of the treatment, are based on subjective reports of the adolescents, their families and on objective examinations of the spine. The aim of the study is to determinate the level of stress and the self image of adolescents with idiopathic scoliosis. The clinical examination (p<0.001).

Aim: Evaluation of the stress level in adolescents with AIS and their self imaging perception.

Methods: The following were used in the evaluation: Bad Sowenbheim Stress Questionnaire (Brace and Deformity), Trunk Appearance Perception Scale (TAPS), and Knee – Feet Perception Scale (KFPS). The BSSQ Brace estimates the stress scoliosis patients have whilst wearing brace, the BSSQ Deformity estimates the stress involved with body deformation. Minimal points number equals 0 (the greatest stress), maximal equals 24 (the least stress). The TAPS evaluates subjective impression of trunk deformity from 3 viewpoints: looking toward the front, back, and with the patient bending over. Minimal points number equals 1 (the biggest deformity), maximal equals 5 (the least deformity). KFPS estimates subjective impression of knee joints and feet position. Minimal points number equals 1 (the biggest deformity), maximal equals 3 (the least deformity). Additionally results of TAPS and KFPS were compared with clinical examination.

Results: Cobb angle was 31.0 ± 8.1 degrees. The BSSQ Brace and Deformity median was 13, the TAPS median of the total score was 4, the KFPS median of the total score was 3. There were significant differences between Cobb angle and TAPS (AIS) and Cobb angle and TAPS clinical examination (p<0.001).

Conclusions: Conservative treatment does not severely impact on the level of stress and the self image of adolescents with idiopathic scoliosis.

References

063
A short – time effect of one-session application of Proprioceptive Neuromuscular Facilitation (PNF) bilateral leg pattern used with contract relax technique and asymmetrical breathing in girls with Adolescent Idiopathic Scoliosis (AIS)

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Scoliosis 2014, 9(Suppl 1):O63

Background: Physiotherapy is a part of conservative scoliosis treatment [1]. Different theories, methods and exercises were proposed and used to date, but only a few of them was proved and recognized as effective. PNF is one of methods in physiotherapy used in orthopedic and neurological diseases [2]. PNF philosophy, three- dimensional patterns, techniques, breathing and movement stimulation can be useful in AIS therapy. Recent author’s studies established limited range of trunk and pelvis rotation (TPR) in AIS girls with double curve scoliosis [3].

Aim: The aim of the study was to estimate a short time effect of one-session application of PNF bilateral leg patterns used with Contract - Relax technique and asymmetrical breathing on the angle of trunk rotation (ATR) and TPR in AIS girls.

Design: Case series.

Methods: 25 girls (12,2) with double curve scoliosis participated in the study. The right thoracic curve (28,1) and the left lumbar curve (24,6) at the spine radiography were including criteria. The clinical assessment, performed before and after therapy, comprised the Angle of Trunk Rotation (ATR) and an original test - Trunk/Pelvis/Hip Angle test (TPHA) created to evaluate TPR. PNF bilateral leg pattern, applied in the supine position with the thorax stabilization, combined with Contract Relax technique and asymmetrical breathing, was used to improve range of rotation into the direction of limitation. To determine statistical differences paired t-test/sign test/signed range test and two samples t-test/Mann-Whitney (Wilcoxon) were used.

Results: Significant difference between right and left TPR was observed before treatment in AIS girls (p<0.001). There was no significant difference ATR values were significant lower after therapy - ATR Th (p<0.001), ATR L (p<0.001).

Conclusions: PNF bilateral leg pattern used with Contract Relax technique and asymmetrical breathing influence ATR and TPR in AIS girls. There is necessary to continue study in numerous AIS group with different types of spine deformation.

References

SCIENTIFIC SESSION 8 - PHYSIOTHERAPY

064
Current knowledge of scoliosis in physical therapy students trained in the United States
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Scoliosis 2014, 9(Suppl 1):O64

Background: Previous research suggests that the average knowledge of idiopathic scoliosis among physical therapy students in Poland may be unsatisfactory with respect to SOSORT guidelines, which provide the most up-to-date conservative treatment options. A similar study is warranted for students enrolled in physical therapy schools in the United States.

Aim: The purpose of this study is to determine basic knowledge of idiopathic scoliosis in physical therapy students trained in the United States.

Design: Exploratory research / Questionnaire.

Methods: A 10-question survey, which included knowledge of 2011 SOSORT Guidelines, was developed for this study. The sample selected for this study included 130 randomly selected physical therapy schools offering the Doctor of Physical Therapy degree in the United States. Physical therapy program directors receiving the research study invitation were asked to forward the anonymous online survey link (Qualtrics Survey Research Suite, Provo, UT) to students meeting the inclusion criteria. The details of the number of students who actually received the study invitation are unknown. The survey link closed after 4-weeks of data collection.

Results: One hundred ninety-two students (192) initiated the survey. A total of 182 students completed consent and met inclusion criteria for the study. Four respondents did not complete all answers to the questionnaire and were not included in final analysis. Therefore, data reflects responses from 178 physical therapy students across the United States. Only 15 students (8%) answered 70% of the survey questions correctly.

Conclusions: Results from this study indicate that physical therapy students within the United States are not trained in knowledge related to the 2011 SOSORT Guidelines.
O65 Physiotherapeutic treatment of scoliosis in Austria and in international comparison
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Scoliosis 2014, 9(Suppl 1):O65

Background: In December 2011 a new working-group “SCOLIOSIS” was founded as part of the professional association of physiotherapists in Austria (Physio Austria) to foster the work with patients suffering from scoliosis.

Aim: In a first step this working-group aimed for an in-depth view on the current provision of physiotherapeutic care for patients, who suffer from scoliosis and to establish a national and international network of people who put their main emphasis on the treatment of scoliosis. Furthermore the collected data should help to answer necessary questions of health insurance companies or other interested parties with regard to the provision of physiotherapeutic care of patients with scoliosis.

Design: Cross-sectional study.

A questionnaire with 14 (quantitative and qualitative) questions was compiled. The questionnaire included questions on patient characteristics, training requirements of physiotherapists, cooperation among different professions or the need of treatment opportunities (i.e. rehabilitation centres, holiday camps).

Methods: Data for this cross-sectional study was collected only from physiotherapists. All physiotherapists were members of Physio Austria 2012 and/or members of SOSORT 2012. The questionnaires were sent by email.

Results: Both groups, Austrians (n=752) and SOSORT members (n=52) put emphasis on high quality treatments. SOSORT members treat their patients with various Scoliosis concepts. In Austria physiotherapists prefer Schroth-therapy. In both groups physiotherapists see a need (n=342) for rehabilitation centers for scoliosis with intensive treatment as an in-patient as well as an out-patient. There is no significant difference in international comparison regarding the wish to work in an interdisciplinary team with orthopaedists, orthopaedic technicians and other physiotherapists whose main emphasis of their work is scoliosis.

Conclusions: Apart from correcting inconvenient everyday postures, physiotherapists all over the world understand therapeutic exercises to be the key to a positive development of juvenile spines. Hence, individual correcting exercises on high standard are particularly important for them.

References

O66 The development of a classification system for the treatment of scoliosis by the side shift
Tony Betts
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Scoliosis 2014, 9(Suppl 1):O66

Background: The Side Shift approach to correction of scoliosis curves has been used by therapist at the RNOHT for over 30 years. The Side Shift approach was developed by Mrs Min Mehta, and has been Modified using consensus based evidence of SOSORT. Clinical observations had indicated that not all patients could actively (Auto) correct to beyond the trunk midline, a key principle of Side Shift.

At the RNOHT a classification system based upon the ability of an individual to auto-correct the spine during a Side Shift movement has been developed to aid the appropriate application of the shift exercises and allow future comparative analysis.

Aim: To develop a Clinical Classification System for the Physical Therapy treatment of scoliosis, which is reliable, valid and universally accepted.

Methods: 58 Consecutive patients who have AIS were tested, by two clinicians (a Physiotherapist and a Orthotist), in 2013. The clinicians were blinded to the classification of each other. The results were tested for reliability. Three types of Side-Shift were developed. Type 1: flexible, Type 2: stiff, and Type 3: rigid. Data was collected for comparison on hypermobility, Cobb angles, and ATR scores.

Results: Agreement was measured using the Kappa statistic (κ).

Intra-rater reliability: The kappa value for agreement between the raters measures on occasion one and occasion two showed substantial agreement, κ = 0.77, 95% CI (0.61 - 0.91), P < 0.01. There was good intra-rater reliability.

Inter-rater reliability: The kappa value for agreement between the two raters measures showed substantial agreement, κ = 0.7623, 95% CI (0.504 - 1.000), P < 0.01. There was also good inter-rater reliability.

There was a moderate negative correlation between the Cobb angles and Hyperlaxity scores, r = -0.3847, p = 0.01.

Type 1 Side Shift accounted for 73% subject with an average Hypermobility score of 6/9.

Conclusion: The results suggest that the Side Shift classification is a reliable scale of descriptive mobility and ability to Auto-correct.

References

O67 The direct impact of derotation techniques (omt-kaltborn-eyjenth) on the trunk morphology and the possibility of the autocorrection in girls with AIS – pilot studies
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Background: Conservative treatment of idiopathic scoliosis is a difficult and complex therapeutic process, which not always is finished successfully. It seems that manual therapy may be used as an element in the preparatory phase for active 3D specific exercises. A systematic review of the literature (which is rather poor) performed by Romano and Neglini show, that manual therapy is not support in the treatment of the idiopathic scoliosis.

Aim: The aim of this study was to assess the direct impact of derotation techniques (Orthopedic Manual Therapy-Kaltborn-Evjenth) on the trunk morphology and on the possibility of the autocorrection in active exercises in girls with adolescent idiopathic scoliosis.

Design: Prospective, randomized and double blind studies.

Methods: 16 girls (15±2y) with AIS (DM – mean Cobb Th=26±7° and L=23±6°). The trunk morphology was examined in two standing positions – habitual and corrected in front of mirror (surface topography) – position of pelvis in three planes and clinic examination - kyphosis and lordosis by pluimeter) in the morning before and after 10 minutes mobilizations. Active and passive derotational mobilization techniques were used only in the area of lumbar curvature. Derotational mobilization techniques were implemented in according with the concept of OMT Kaltborn-Evjenth in a sitting position. Nonparametric tests were used for statistical analysis.

Results: Increasing the possibility of the autocorrection of patient’s trunk in visually biofeedback was observed after once performed mobilization technique. Significant differences among the level of the autocorrection of waist were observed. Statistically significant changes were reported only for two parameters (symmetrical level (p<0.04) and depth (p<0.03) of waist).

Conclusions: The derotational mobilization techniques by Orthopedic Manual Therapy - Kaltborn-Evjenth may be useful in a preparatory phase of the specific active exercises. The topic needs the further investigation.

References
Effect of intensive exercise on quality of life and back proprioceptive sensibility in girls with double curve idiopathic scoliosis

**Background:** Functioning of the proprioceptive system is essential for proper motor control and trajectory planning reflexes, regulation of muscle tension and coordination of muscle activity. Proprioception based biofeedback is used in scoliosis physiotherapy.

**Aim:** To assess back skin deep perception in a group of scoliotic girls before and after a 5-day FITS therapy.

**Materials and method:** 58 girls, aged 10-16 years (mean 13.6 ±1.4) with double curve idiopathic scoliosis were examined. Control group consisting of 40 healthy girls. 12 points were selected at the patient’s back at the scapulae, thorax and waist areas, and a paper sheet with schematic representation of the back was given to each patient. The researcher touched the patient’s back while the patient herself, pointed out the point where the researcher touched the back. Examination was performed twice: immediately before and after a 5-day FITS therapy.

**Results:** In the control group as many as 91.4% girls pointed unerringly to areas located bilaterally near scapulae. Most mistakes occurred when showing the points around waist line on the concave side (34.5% of subjects). In control group most mistakes were made in pointing to places located round the waist line (in 45 to 50% subjects). The size of primary and secondary scoliosis had no influence on the number of errors (p>0.44). In scoliotic girls undergoing a 5-day FITS therapy, no significant differences were observed (p>0.34).

**Conclusions:**

- Healthy children scored on average 1.5 point lower than the children with scoliosis.
- No relationship was found between the curvature angle and the accuracy of the task.
- Techniques which stimulate the points with worse proprioception seems worth considering in individual scoliosis therapy.

**O69**

The effects of a four-week intensive scoliosis-specific exercise programme on patient-reported quality of life in adult subjects with idiopathic scoliosis: a >3 years follow-up study

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**Background:** Health-related quality of life (QoL) is often reduced in adults with scoliosis [1]; therefore it is essential for any treatment they receive to address this. The Scoliosis Research Society-30 (SRS-30) questionnaire is a widely used [2], specific instrument to measure clinical outcomes in patients with scoliosis [3].

**Aim:** The aim of this observational case series is to investigate previous results on whether a four-week intensive scoliosis-specific exercise programme improves patient-reported QoL in subjects with idiopathic scoliosis, by using a much larger number of participants, longer follow-up and only including adult patients.

**Design/methods:** The data set was composed of 731 adult patients (578 females and 153 males) with idiopathic scoliosis and a mean age of 33 years (range 18-64 years, SD 14.68) who were treated with a four-week intensive course of scoliosis-specific physiotherapy (the ScolioGold method) between 2006 and 2013. All patients were asked to rate their QoL on their first day of treatment, at the end of their four-week course and at any subsequent check-up appointments they attended, using a modified version of the SRS-30 questionnaire (replacing ‘surgery’ with ‘treatment’). Each subset, which was analysed from the original data set, was determined by having data pre-treatment and at the relevant time point.

**Results:** In the cohort analysed before and after treatment (n=512), mean total SRS-30 score increased from 3.23 (SD 0.58) to 3.69 (SD 0.44). Increases in QoL compared to pre-treatment results were found to be statistically significant (p <0.05 using a pairwise t-test, corrected for multiple comparisons) at all time points investigated (post-treatment, 1 year, 3 years, >3 years). This was reflected in all subscales, with the exception of function.

**Conclusion:** These results show the positive effect of intensive exercise methods, such as ScolioGold, on adult patients’ QoL and add to the evidence for scoliosis-specific physiotherapy. However, future research is required to establish the effects of treatment on those adults who elect not to return for check-up appointments, including those who may, or may not, have discontinued treatment.

**References**


**O70**

The effect of a 1-year-long intensive Schroth therapy in patients with adolescent idiopathic scoliosis over 45 Cobb degrees who refused surgery in an outpatient clinic in Hungary, a case series

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**Background:** In curves more than 45 Cobb degrees fusion is considered as basically the only possible treatment although studies about intensive Schroth intervention show that it may be effective in slowing curve progression of patients with Adolescent Idiopathic Scoliosis (AIS).

**Aim:** The main purpose of this study was to evaluate the effect of an intensive, 1-year-long and individualized Schroth intervention on curve progression in patients with AIS more than 45 Cobb degrees focused on the efficiency in terms of Cobb angle, axial trunk rotation (ATR) and objective body image.

**Design:** Prospective case series design.

**Methods:** In this case series we included 7 female patients with AIS at the age of 13 with primary thoracic curve, wearing TLSO brace 23 hours/day, Risser: 2-3. The mean Cobb angle at the start of treatment was 47.3° ±2.4°, while the mean ATR with Scoliometer was 14.3° ±3.4°. Patients received Schroth intervention for 12 months in an outpatient clinic. Schroth therapy was individual and personalized, 45 minutes weekly for each patient, combined with minimum 60 minutes of daily home Schroth exercises 5 times per week. Outcomes were recorded at baseline, 6 and 12 months. Patients are currently in treatment.

**Results:** The Cobb angle improved 9.8° in 4 patients, worsened 7° in 1 patient, remained the same 2.5° in 2 patients. The ATR measurements improved 5.3° in 4 patients, remained the same in 3 patients. Objective body images gave a positive feedback to all patients.

**Conclusion:** In conclusion the results of this study confirm the effectiveness of an intensive 1-year-long, individual Schroth intervention for patients with AIS in curves more than 45°. At high risk of progression personalized Schroth intervention appears to be more effective in reducing the progression of scoliosis with additional bracing.

**References**

071
End growth results of exercise treatment to avoid bracing in adolescents with idiopathic scoliosis: a prospective cohort controlled study
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Scoliosis 2014, 9(Suppl 1):O71

Background: Doubts on the efficacy of exercise treatment for adolescents with Idiopathic Scoliosis (IS) still exists.

Aim: To verify the effectiveness of exercises in everyday clinics.

Design: Prospective observational controlled cohort study nested in a prospective database started in March 2003.

Methods: Setting: outpatient tertiary referral clinics.

Participants: consecutive patients from start of the database to 31/12/2010.

Inclusion criteria: IS; Risser 0-2; 11° to 20° Cobb; age 10 years or more; first evaluation. Exclusion criteria: consultations only; immediate prescription of a brace.

Groups: Physiotherapeutic Specific Scoliosis Exercises - SEAS school (PSSE: at least 45 min/week; 3 cognitive-behavioral sessions/year); Controls (CON: less than 15 min/week); Usual Physiotherapy (UP: other institutes/protocol).

End-Of-Treatment (EOT): medical prescription, bracing, Risser 3.

Failures: bracing for scoliosis; EOT above 30°.

Statistical analysis: intent-to-treat (ITT: drop-outs included as failures) and efficacy (EA: only EOT patients). Relative Risk of failure (RR), 95% Confidence Interval (CI), and clinical and radiographic changes have been calculated.

Results: Out of 327 patients, 34 (10%) were excluded due to bracing at first evaluation. We included 293 adolescents: 145 PSSE, 95 UP, 53 CON, with no differences at baseline. Physicians prescribed bracing (failure) without differences among groups.

Failures and drop-outs were 84 (28.7%) and 47 (16.0%) respectively: 21.4% and 18.0% in PSSE; 33.7% and 95.9% in UP; 39.6% and 20.8% in CON.

Efficacy analysis (RR): CON vs PSSE 1.90 (IC 1.48-2.33); UP vs PSSE 1.42 (1.01-1.82); CON vs UP: not significant.

Intent-to-treat (RR): CON vs PSSE 1.51 (1.21-1.80); CON vs UP 1.40 (1.08-1.72); UP vs PSSE: not significant.

At the end of exercises, aesthetics (TRACE) improved statistically in PSSE (1.6 points out of 12) and UP (1.5), not in CON; only PSSE improvement was statistically better than CON.

Conclusion: Patients performing UP or nothing (CON), compared to those treated with PSSE (SEAS), increase the risk of failure (bracing and/or 30° at EOT) 1.9 and 1.4 times respectively (EA).

072
Degree of suitability of information (DSI) for children with idiopathic scoliosis and their parents
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Scoliosis 2014, 9(Suppl 1):O72

Background: As their parents and children increasingly use Internet websites to obtain information about Adolescent Idiopathic Scoliosis (AIS), a growing need to evaluate the content quality of websites is emerging. Betanny-Saltikov et al. and MacCulloch et al. have suggested some suitable requirements that websites on scoliosis should include. From these suggestions, we have created an instrument to quantify this suitability.

Aim: To validate a specific instrument to assess the suitability of information for children with Idiopathic Scoliosis and their parents in English and Spanish websites.

Design: Cross-sectional study. Validation of the psychometric properties of the instrument.

Methods: The DSI evaluates the degree the website oriented to parents and patients needs. The tool consists of 9 item with dichotomic answer (No=0 point, Yes=1); the range comes from 0 (worst quality) to 9 (best quality). It assesses the comprehension of the language used (item 1); different information for parents and children (2,3,4 items); the mentioning of different treatments (item 5) and quality of life themes (item 6); the availability of help service (item 7), graphic design (item 8) and web accessibility (item 9). To identify potential websites about scoliosis, the word "Scoliosis" in Spanish was used in five popular search engines (Google, Yahoo, Bing, Lycos, Ask). After excluding duplicates and videos, we obtained a list of 25 webs. Each web was evaluated separately by three observers. To evaluate the quality of medical information, DISCERN tool was used in addition to DSI.

Internal consistency was calculated. Intraclass correlation coefficient (ICC) was calculated to determine the intraobserver reliability of DSI. To assess convergent validity, correlation between DISCERN and DSI was calculated.

Results: DSI mean was 4.3 (SD=1.8) and DISCERN mean was 38 (SD=4.3). For internal consistency, Cronbach’s α=0.6. ICC was 0.66. For convergent validity, r=0.7 (p<0.001).

Conclusions: Although the internal consistency was not high and ICC value was moderate, DSI has good convergent validity. The questionnaire needs to be revised to maximize its psychometric properties (Content and Factorial Analysis). However it could be considered a new tool, short, specific to evaluate AIS websites and patient oriented.

073
Kidscreen-27 in assessment quality of life adolescents with idiopathic scoliosis
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Scoliosis 2014, 9(Suppl 1):O73

Background: There are a few quality of life (QoL) questionnaires dedicated for patients with adolescent idiopathic scoliosis (AIS): Brace Questionnaire (BrQ), SRS-22, Scoliosis Quality of Life Index (SQUI) and SF-36. Kidscreen-27 generic health related QoL measures for children and adolescents.

Aim: The aim was to evaluate the quality of life of adolescents with idiopathic scoliosis in comparison with corresponding healthy adolescents. In each case the responses were also gained from the parents/ care-givers.

Design: Cross-sectional study. It involved 82 adolescents, ages ranging between 11.0 and 16.0 years, all with IS with Cobb angle between 20-45 degrees. Adolescents were wearing the Chêneau orthosis, (more than 3 months for at least 12h per day). The control group consisted of 82 healthy adolescents, (11.0-16.0 years) and their parents/care-givers.

Methods: Kidscreen-27 consists of five Rasch scaled dimensions: Physical Well-Being (5 items), Psychological Well-Being (7 items), Autonomy & Parents (7 items), Peers & Social Support (4 items), and School Environment (4by items). Answers are pointed from 0 to 4. The higher the score the better the QoL. In the evaluation Kidscreen-27 questionnaire was used for AIS and healthy adolescents. Kidscreen-27 for parents/ care-givers was used additionally. Answering the Kidscreen-27 require 10-15 minutes.

Results: The age of examined group with AIS was 13.5 ± 1.6 years. Cobb angle was 31.0 ± 8.1 degrees. The age of control group was 13.6 ± 1.7 years. In dimension, Peers & Social Support, AIS and their parents/care-givers achieved lower results (10.65 ± 3.13 AIS and 9.1±3.59 parents/care-givers) than in other dimensions. There were significant differences between AIS and their parents/care-givers in dimensions of Physical Well-Being (p=0.023) and Peers & Social Support (p<0.001). Analyze of Autonomy & Parents dimension showed significant difference between AIS and control group and their parents/care-givers (p=0.032 AIS and p=0.014 control group).

Conclusions: Patients with AIS showed better autonomy and relations with parents/care-givers. Parents/care-givers of patients with AIS also presented good autonomy and relations with children.

References
Body image in idiopathic scoliosis: a comparison study of psychometric properties between four patient-reported outcome instruments

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Scoliosis 2014, 9(Suppl 1):O74

Background: Four patient-reported outcome (PRO) instruments are used to assess body image in idiopathic scoliosis (IS): Quality of Life Profile for Spinal Deformities (QLPSD), SRS-22 Self Image scale, Spinal Appearance Questionnaire (SAQ), and Trunk Appearance Perception Scale (TAPS).

Purpose: To compare the psychometric properties of these four assessment instruments.

Methods: Design: This is a cross-sectional study. Inclusion criteria were patients with IS, 10 to 40 years old, Cobb angle ≥25°, without previous surgical treatment. Methods: 80 patients (mean age 20.3 years) were included. The four instruments in a Spanish version were administered. In addition, full-spine x-ray was obtained. Sample was stratified into two groups according to Cobb angle (less and more than 45°). Psychometric properties studied included internal consistency, convergent (correlation between self-image scales and Cobb angle) and divergent validity (correlations with Health Related Quality of Life domains: function, pain, mental health, measured through SRS-22).

Results: All the PRO instruments presented high internal consistency (QLPSD Body Image, α=0.80; SRS-22 Image, α=0.78; SAQ, α=0.89; TAPS, α=0.87). Pictorial scales showed higher correlations with Cobb angle (SAQ Appearance r=0.61 and TAPS r=0.62) than textual scales (QLPSD-bi r=0.36; SRS-22 Self-Image r=0.41). The four image scales showed significant correlations with other HRQL SRS22 dimensions (from r=-2 to 0.7).

Conclusions: All four instruments have good psychometric properties. To evaluate patients with IS is advisable to add pictorial image perception scales to HRQL assessment instruments.

Body image in brace treated and untreated patients: preliminary results from BrAIST

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Scoliosis 2014, 9(Suppl 1):O76

Background: There is no consensus regarding the effect of brace treatment on body image in adolescents with adolescent idiopathic scoliosis (AIS).

Purpose: The aim of this study is to compare self-body image, ideal-body image, and self-ideal body image discrepancy, between brace treated and untreated subjects over time.

Methods: Data from 178 BrAIST subjects that chose treatment were used. Subjects that switched treatment during the study were not included in the analyses. Body image constructs, based on cognitive-behavioral perspectives (1), were used to measure the following: how adolescents 1) think they look (self-body image), 2) want to look (ideal-body image), and 3) the difference between these constructs (self-ideal body image discrepancy). The Spinal Appearance Questionnaire (SAQ) (2) measures these constructs and scores were compared with largest curve size, BMI, and quality-of-life measures. Wilcoxon ranked sum tests were conducted to test differences in self-body image means, ideal-body image means, and self-ideal body image discrepancy means between the treated and untreated groups at baseline and at 6, 12, 18, and 24 month follow-up visits.

Results: At baseline, there were no differences between subjects in the brace group (n=118) and in the observation group (n=60) regarding age, BMI, largest Cobb angle, and quality-of-life. There were no differences at baseline or at any follow-up visit between brace treated and untreated subjects regarding self-body image, ideal-body image, and self-ideal body image. Results from within group analyses found no significant differences within treated or within untreated subjects between baseline body image scores and 24 month body image scores. In addition, there were no significant differences between body image baseline scores and 24 month scores within subjects having < 6° degree increase or within subjects having a ≥ 6° increase in largest Cobb angle.

Conclusions: This study does not support findings from previous research indicating that wearing a brace has a negative impact on body image. At baseline and follow-up visits, this study found no difference in body image between brace treated and untreated adolescents. In addition, this study found that body image was not impacted after 24 months of brace treatment.
SRS-22 (2.3) and current treatment was started involving all patients with idiopathic scoliosis attending a rehabilitation clinic, 10 years of age or older at the time of consultation. The data have been retrospectively analyzed and are presented in several studies. This is the study II.

**Purpose:** The aim of this study was to determine whether patients showed differences in their HRQL depending on the type of treatment.

**Methods:** N 240; mean age 19.3 y ± 10.3 (10-60); mean Cobb thoracic 33.7º ± 13.8; lumbar or thoracolumbar 29.7 ± 12.7. At the time of consultation patients were or had been untreated or treated (exercises exclusively, Chêneau brace + Scoliosis Physiotherapy Exercises, other braces, surgery). Statistics: SPSS.

**Results:** Untreated patients: N 76; Mean Cobb Thoracic 19º; Lumbar/TL 17.5º; Means SRS-22 Pain 21.07; SRS-22 MH 19.64; SRS-22 SI 18.66; SRS-22 F 22.38; SRS-22 Sub Total 81.83. Treated with Exercises exclusively: N 36; Thoracic 24.6º; Lumbar/TL 22.4º; Pain 21.19; MH 20.11; SI 18.94; F 21.75; Sub Total 82.03. Treated with Chêneau-SPE: N 56; Thoracic 29º; Lumbar/TL 22.2º; Pain 22.75; MH 20.20; SI 19.55; F 22.71; Sub Total 85.25. Treated with other braces: N 69; Thoracic 34º; Lumbar/TL 24º; Pain 22.07; MH 20.06; SI 18.25; F 22.65; Sub Total 83.03.

No significant differences between the untreated group, exercises and other braces. Chêneau+SPE showed better scores in Pain and Function, with bigger curves, in comparison with untreated and treated only with exercises and in SI, with lower curves, in comparison with those treated with other braces.

**Discussion and conclusions:** This type of study does not allow to draw final conclusions but it shows that HRQL seems to be similar in untreated (with milder curves) and treated patients (with bigger curves), all attending a rehabilitation clinic for medical advice or for control, suggesting some positive treatment impact.

**O78**

**Body image and brace wear adherence: preliminary results from brAIST**

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Scoliosis 2014, 9(Suppl 1):O78

**Background:** There is no consensus regarding the relationship between body image and brace wear adherence in adolescents with adolescent idiopathic scoliosis (AIS).

**Aim:** The aim of this study is to explore body image and brace wear adherence.

**Methods:** This study used data from 171 brAIST subjects that were in the randomized and preference brace treatment groups at baseline and did not switch to observation at any time during the study. Brace wear adherence categories were based on dose-response range efficacy findings in the brAIST study. The three groups were: least adherent (0-6), middle adherent (6.1-12.8) and most adherent (≥ 12.9), using brace monitor data measuring hours/day in brace. The Spinal Appearance Questionnaire (SAQ)(1) was used to measure body image scores and scores were compared with largest Cobb angle, BMI, and quality-of-life measures. Wilcoxon ranked sum tests were conducted to test body image differences between the least adherent and the most adherent brace wear groups at baseline and at the 6, 12, 18, and 24 month follow-up visits.

**Results:** There were no differences between subjects in the least adherent group and the most adherent group at baseline (n=36 and 95, respectively) or at any follow-up visits regarding BMI, largest Cobb angle, quality-of-life, and body image.

**Conclusions:** Findings from this study do not support previous research indicating that wearing a brace may have a negative impact on body image, which could ultimately lead to poor brace wear adherence. In fact, this study found no difference in body image between the least adherent and the most adherent brace wear groups at any follow-up visit up to 2 years. Further analysis is being conducted to assess relationships between body image, quality-of-life, and demographic and clinical variables within brace wear adherence groups.

**O79**

**A cognitive behavioral approach allows improving brace wearing compliance: an observational controlled retrospective study with thermobrace**

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**Background:** Results of brace treatment of Idiopathic Scoliosis are related to brace compliance: an observational controlled retrospective study with thermobrace.

**Aim:** To verify if Cognitive Behavioural Approach (CBA) dispensed during Physiotherapeutic Scoliosis Specific Exercises (PSSE) sessions increases brace wearing.

**Design:** Retrospective controlled cohort study nested into a clinical database.

**Methods:** Setting. Outpatient tertiary referral clinic. Population. Out of 778 patients, 246 fulfilled the inclusion criteria: Idiopathic Scoliosis; first brace prescription; regular use of Thermobrace heat sensor; two evaluations after braking; age ≥ 6; European Risser 0-3. Evaluations. T0 (start of bracing), T1 (4 months), T2 (10 months). Measurements. Brace wearing compliance (BWC) T0 to T1 (T0-T1) and T1 to T2 (T1-T2). Treatment. CBA adjunctive sessions dispensed during PSSE (CBA-PSSE), after the standard CBA provided to all patients including: at prescription, 20’ by Medical Doctor (MD) and 30-45’ by Physiotherapist; at brace check, 10-15’ by MD and Orthopaedic Technician; at T1, 10-15’ by MD.

Groups. According to CBA-PSSE in T0-T1 period: CBA1 (143 patients) 2 sessions; Poor-Adherence (PA1, 52) 1 session; Control (CON1, 51) 0 sessions. Similarly, according to CBA-PSSE in T1-T2 period: CBA2 (97), PA2 (78), CON2 (71). Combinations among the 6 groups in the two periods were checked. Statistics: ANOVA for group comparisons.

**Results:** Patients were 13.03±1.11 years old. Brace hours prescription: 21.93±1.77 (T0-T1), 21.03±1.79 (T1-T2). BWC: 91.06±1.263% (T0-T1), 91.64±14.3% (T1-T2). We found no differences among groups in brace prescription and BWC in T0-T1 and in T1-T2.

CBA1 had more brace prescription than CON1 (P<0.001); CBA1 and CON1 improved BWC more than PA1 (P<0.005); CBA2 and CON2 improved BWC more than PA2; patients who were both in CBA1 and in CBA2, had more hours of brace prescription than PA2 and CON2, and improved brace compliance more than PA2 (P<0.05). Overall, BWC differences among groups reached a maximum of 7%.

**Conclusion:** CBA improves BWC, specifically, patients with high BCA-PSSE in both observed periods (CBA1+cBA2) had both the highest brace hours prescription and the highest BWC. Poor adherence to CBA-PSSE matched with poor brace wearing adherence.

**O80**

**Health, function, quality of life and self-esteem in AIS: preliminary results from brAIST**

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Scoliosis 2014, 9(Suppl 1):O80

**Background:** Conflicting reports have been published concerning the effect of adolescent idiopathic scoliosis (AIS) and its treatment on patient physical and psychosocial function and overall quality of life.

**Aim:** The aim of this study is to compare the physical and psychosocial function and quality of life over time in treated and untreated patients and in comparison to school-based populations.

**Methods:** brAIST, a multi-center, partially randomized prospective study, enrolled 383 subjects with AIS and followed them until skeletal maturity (treatment success) or until the curve exceeded 50 degrees (treatment failure). Patients were braced or observed based on randomization or on their own preference. They completed the Child Health Questionnaire (CHQ) (1) and the Pediatric Quality of Life (PQLQ) (2) prior to treatment and then every six
months. Baseline and final follow-up scores were ranked and compared using analysis of variance techniques. Scores were also compared to published norms. (2, 3).

Results: Baseline, final scores and final outcome were available for 237 subjects. 61% were braced. The success rate was 49% in the untreated group compared to 72% in the braced group. There were no statistically significant differences between the braced and untreated groups on any of the subscales at baseline. At final follow-up, there is some evidence that patients who were braced yet had treatment failure ranked lower than braced patients with a successful outcome, on the self-esteem (p<0.07), behavior (p<0.07), physical functioning (p<0.09) and role functioning (p<0.05) CHQ subscales. This difference was also found in QOL scores (p<0.04). Overall, subject QOL and CHQ scores were not different than those published for school-based populations.

Conclusions: Patients in this study scored similar to those in a school-based population, indicating little effect of the diagnosis of AIS on their physical and psychosocial function or overall quality of life. However, there were differences within the study cohort. Developing a curve of 50 degrees or greater was possibly associated with lower-ranked self-esteem, behavior, physical and role functioning and overall QOL. These findings suggest that patients who wear a brace require not only orthopaedic support, but also psychosocial support, especially in the face of significant curve progression.

O81
Health related quality of life in untreated and treated patients with AIS. Study I: back pain, curve magnitude and trunk appearance
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Scoliosis 2014, 9(Suppl 1):O81

Background: Pain or fears about future pain is one of the main reasons for medical consultation. Patients and families use to believe that Cobb angle and back pain are linearly related. The relationship between scoliosis magnitude, HRQL and Self Perception of Trunk Deformity is not clear. To better understand this, a prospective data collection including age, main thoracic and lumbar or thoracolumbar Cobb angle, Trunk Asymmetry Perception Scale TAPS, SRS-22 and current treatment was started involving all patients with idiopathic scoliosis attending a rehabilitation clinic, 10 years of age or older at the time of consultation. The data have been retrospectively analyzed and are presented in several studies. This is the study I.

Purpose: The aim of this study was to analyze the relationship between back pain (SRS-22 Pain), curve magnitude and TAPS.

Methods: N=240; mean age 19.3 y + 10.3 (10-62), mean Cobb thorac 33.7° + 13.8, lumbar or thoracolumbar 29.7 + 12.7. At the time of consultation patients were untreated or treated (exercises, RSC brace + Scoliosis Physiotherapy Exercises, other braces, surgery). The sub-population of untreated patients was also analyzed, N=76, mean age 19.6 y + 11.6, mean Cobb thoracic 28.2° + 14.8, lumbar 25.2° + 14.7. SPSS was used for statistics.

Results: In the whole sample there was no correlation between SRS-22 Pain and the Cobb angle of the main thoracic curve; a significant but weak correlation was found between SRS-22 Pain and Cobb Lumbar (r= -0.22 p< .005), TAPS (r= -36 p<.001) and age (r= -49 p<.001). In the sub-population of non-treated patients, SRS-22 Pain correlated with Cobb Thoracic (r= -0.35 p= .01), TAPS (r= -43 p<001) and age (r= -.62 p>0.01), but not with Cobb lumbar.

Discussion and conclusions: Back pain is multi-factorial. Age and subjective perception of trunk deformity show both a stronger linear relationship with back pain than the Cobb angle. The weak linear relationship existing between back pain and thoracic Cobb angle in untreated patients disappear in the whole sample (untreated and treated patients) and the opposite for the Lumbar Cobb. Interpretation is complex tought out study I.

O82
The assessment of the sexual functioning in women with idiopathic scoliosis- preliminary study
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Scoliosis 2014, 9(Suppl 1):O82

Background: Sexuality is conditioned by the integrated action of biological, psychological and socio-cultural factors. Inhibition or distortion of this function, as well as disharmony with other spheres of human personality is causing the sexual dysfunction. Idiopathic scoliosis (IS) manifested many deformities in the trunk often occurs in periods of change in the development of the child psyche and personality. Disorders affecting the physical realm, especially the appearance of the body impact on perception of their differences, lack of acceptance and reduce self-esteem. All this may lead to the functioning disorders of the many areas of life, including sexuality.

The aim of the study was to determine the occurrence frequency of sexual dysfunctions in women with IS and to find a correlation with scoliotic deformation.

Design: Prospective, randomized and double blind studies.

Methods: In a study participated 36 women aged 18-24 years (mean 20.7 ±1.9) with IS. Sexual functioning of respondents was evaluated using a standardized questionnaire Female Sexual Functional Index (FSFI). The survey questions related to sexual activity in the previous four weeks, including her 6 domains: desire, arousal, lubrication, orgasm, satisfaction and pain. The value of the total score below 26 points indicates the presence of dysfunction in the sexual sphere. On the basis of the current X-ray, the values of Cobb and AVR were determined.

Results: Average results of FSFI score including the individual domains were as follows: desire: 3.72, arousal: 3.49, lubrication:4.03, orgasm:3.43, sexual satisfaction:4.01, pain associated sexual intercourse:3.43. Among the respondents, 34.28% of women received total score indicating the presence of sexual dysfunction clinical significantly symptoms. The average value of points obtained in the group was 22.1±2.46. There was no correlation between FSFI test result and the Cobb and AVR primary curvature values (p> 0.05).

Conclusions: 1. Based on this evaluation it can be concluded that women with IS have problems with sexual functioning, for the most experience orgasm and pain during sexual intercourse.
2. It is necessary further research and to extend their scope to search for factors influencing on the disorders occurrence and to determine their relationship with the scoliosis occurrence.

POSTER PRESENTATIONS

P1
Educational therapy of adolescent idiopathic scoliosis treated by brace
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Scoliosis 2014, 9(Suppl 1):P1

Introduction: Adolescent idiopathic scoliosis treated by brace with PET. The Patient Educational Therapy (PET) according to the “ARS” in 2013.

Inclusion: Adolescents between 12 and 15 years old with a tolerance for younger children who are still in adolescent problematic. Evolutional scoliosis diagnosis and orthopedic treatment indication.

Objectives: Improve compliance.

Improve understanding about scoliosis and its progress. Preserve quality of life.

Course.

Educational diagnosis during the week of brace adaptation. PET program is shape by 5 workshops on 1 day: expression group between adolescents, around the brace, experience about daily life with the brace, physical activity with brace, expression group between parents.
Discussion: The PET objectives engage the adolescent, his parents, his physiotherapist and his physician on the conservative treatment of scoliosis and allow each of them to acquire adaptability capacities and self-care capacities. Evaluation questionnaires completed by the adolescent and his parents are in analysis.

P2 Cost effectiveness of lumbar epidural steroid injections
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Scoliosis 2014, 9(Suppl 1)P2

Background: Economic value is an important component of healthcare policy decision making. The primary currency for comparing the value of competing healthcare interventions is the Cost per Quality Adjusted Life Year (QALY) gained.

Aim: To determine cost/QALY gained for lumbar epidural steroid injections (LESI).

Design: Longitudinal cohort.

Methods: Patients who had an LESI between June 2012 and July 2013 and had EQ-5D scores available before and after LESIs were identified. Costs were calculated based on the Medicare Fee Schedule multiplied by the number of LESIs done between the two clinic visits. QALYs were calculated using the EQ-5D.

Results: There were 257 patients (157 females, 100 males), mean age 60.0 years (21 to 88 years). Cost per LESI was $608, with most patients receiving 3 LESIs over one year (range 1 to 6). The mean QALY gained was -0.006. One hundred twenty-two patients (47%) had a gain in QALY (mean= 0.083) at a cost of $16,503 per QALY gained, 103 had a loss in QALY (mean = -0.112) and 32 had no gain in QALY. Ten of the 122 patients who improved, and 19 of the 135 patients that did not improve had medical comorbidities that precluded surgery. Of the 112 patients who improved without medical comorbidities, 31 (28%) subsequently had surgery. Of the 116 patients who did not improve and had no medical comorbidities, 45 (39%) subsequently had surgery. This proportion is statistically significantly different at p=0.05. Although the patients who had surgery even after improvement with LESI had a lower mean QALY gain (0.067) compared to those that did not have surgery (0.089), this was not statistically significant (p=0.260).

Conclusions: This study indicates that at LESI may not be a cost-effective intervention in patients with low back pain. For the 122 patients who improved, cost per QALY gained was acceptable at $16,503. However for the 135 patients with no gain or a loss in QALY, the economics are unreportable with a cost per QALY gained being theoretically infinite. Further studies are needed in order to identify specific patient populations that will benefit from LESI, as the economic viability of LESI requires improved patient selection.

P3 The seas approach reduced Cobb angle, and the thera-band exercise improved scapula winging in a double major curve type of Adolescent Idiopathic Scoliosis (AIS) – a case report
Chiko Itoshara, Yosuke Shiraishi
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Scoliosis 2014, 9(Suppl 1)P3

Background: In Japan, bracing is the only treatment which is considered as an effective conservative treatment for AIS. Therefore, therapeutic exercise for scoliosis does not pervade as a clinical approach for AIS. Only a few orthopaedists and therapists adopt Side Shift and Pelvic Hitch exercise. In general, clinical evidence regarding the effectiveness of specific exercise for preventing progression of curves is not recognized. In this case, Cobb angle progressed 9 degrees post bracing.

Purpose: To report:
1. ASC (active self correction) of SEAS is effective in reducing Cobb angle of the patient after skeletal mature.
2. Thera-band Shiraishi exercise is effective in improving scapula winging.
3. We want to spread that specific exercise is effective to AIS.

Methods: We followed a 14 year-old girl diagnosed in 2006 with AIS, 28 degrees in the thoracic and 28 degrees in the lumbar. Started Boston brace immediately, with everyday exercise including Thera-band exercise for scapula winging and AKA (arthrokinematic approach). She finished bracing, at the age of 18, Cobb angle remained 31 degrees. After 6 months, her curve progressed again, then we offered a night brace, ASC (active self correction) of SEAS and Mitsui-thermal therapy.

Conclusion & discussion: In this case, a Cobb angle increased from 28 degrees to 31 degrees in the thoracic vertebrae during 14 to 18 years old. However, after 6 month from bracing off, thoracic curve increased from 31 to 37 degrees. When she was 21 years old, SEAS approach was applied and 3 months later, Cobb angle decreased from 37 to 30 degrees. SEAS approach was effective to Cobb angle improvement. In addition, we think that the thera-band exercise makes cosmetic improvement on scapula winging, and Mitsui-thermotherapy build-up strength of the spinal muscles.

Consent: Written informed consent was obtained from the parents/legal guardian of the patient for publication of this Case report. A copy of the written consent is available for review by the Editor of this journal.

P4 Effects of orthopaedic treatments upon 3D radiologic morphologies and equilibrated postures in adolescent idiopathic scoliosis
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Scoliosis 2014, 9(Suppl 1)P4

Introduction: In case of scoliosis, spinal deformations are measured upon frontal radiographs. However, these deformations are developed in 3D space. Recent studies have been proposed to access to 3D features of spine and pelvis in upstanding patients.

Material and method: Geometric structures of spinal curves of scoliotic patients have been identified. They show plane regions where spinal curves are purely flexed. These regions are linked together by zones of connection, where abduction and axial rotation components, are concentrated. Spine and pelvis of each patient radiographed in upstanding may be synthesized by two rows of indices: one row describing the morphology, the second one illustrating the postural stability. The present study is dedicated to effects upon 3D back morphology and postural stability of orthopaedic treatments exerted to a same patient.

Results: Orthopaedic treatments may significantly change the patient back morphology. The series presents effects of orthopaedic treatments when results of the 3D analysis of morphology and postural stability in initial situation were unknown for the technical operator in charge of cast or brace design. Technique and preliminary results are presently analyzed by clinical people: rehabilitation doctors and physiotherapists.

P5 Effects of specific physiotherapeutic exercises in a patient with a severe neuromuscular scoliosis with rigid spine syndrome: a case report
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Scoliosis 2014, 9(Suppl 1)P5

Background: Non-idiopathic Scoliosis account for approximately 20% of scoliosis population and some cases need surgery. Exercises are important for the rehabilitation following fusion.

Design: Case report.

Aim: To show the improvements in the positive sagittal balance and flat back condition in a patient with a severe neuromuscular scoliosis (NMS) with Rigid Spine Syndrome (RSS) treated with specific physiotherapeutic exercises.

Methods: A 16-year-old male patient diagnosed with severe NMS with RSS underwent to a posterior spinal fusion from T5 to L1 at 10 years-old. Surgery reduced the Cobb’s angle at the main thoracic, lumbar and the cervical curvature to half. Nonetheless, post-surgery complications appeared: the cervical curvature increased, positive sagittal balance appeared, hyperextension of the neck and head, flat back and kyphosis
posture was developed. On October 2013 the patient started a program with specific exercises for scoliosis 2-3 times a week, based on rotational breathing principles from the Schroth method, Pilate's exercises and physical therapy lumbo-pelvic stabilization exercises following the standard features of scoliosis rehabilitation schools.

Results: Radiographies and documented pictures were taken at the beginning and at the sixth week of treatment. A comparison of these images shows an improvement in the flat back condition where the lumbar lordosis angle increased and positive sagittal balance was normalized. Currently, the patient is able to maintain this new posture by his own, however, he usually tends to fall into the misalignments postural vicious.

Conclusions: Short term results were observed in a difficult case of scoliosis using a convergent approach of different treatment techniques. Although Cobb’s angle remains, changes are evident at lateral radiography and documented pictures. Specific exercises could be an effective way to maintain or reduce the progression of the positive sagittal balance, improve the flat back condition and quality of life.

References

P6
Effects of scoliosis specific conservative management of an adolescent female with is with high risk of progression
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Scoliosis 2014, 9(Suppl 1):P6

Background: Daily scoliosis specific exercises have been used in European clinics since the first half of the century for stabilizing scoliotic curves in adolescents. Over the past decade, physiotherapists in the US have begun to use these strategies as well.

Aim: The aim of this study is to provide a case study of a patient with progressive AIS, and her current outcomes in a US clinic.

Methods: A 12 y/o female diagnosed with AIS presented to the clinic, with recent history of 6 degree progression (over 3 month) in thoracic and lumbar curves to be 21 degrees right thoracic and 27 degrees left lumbar, Risser 0, premenarchal, at initiation of treatment. Risk of progression, as calculated using Lonsdorf equation, was greater than 90%. In addition, she had a ScoliScore of 188, indicating a high risk for progression to a severe curve. (3) She was prescribed a Boston brace to be worn 14 hours per day. She was then trained in scoliosis specific exercises according to SEAS and Schroth, and was compliant with a 20 minute home exercise program, five times per week.

Results: Over the course of 16 months of treatment and observation, this patient was 1.5 years post menarchal, Risser 0, and has increased in height by 3.25 inches. She patient had experienced a reduction in lordosis from 24 to 33 degrees, and stable rotation as measured by Nash Moe grade 1.

Conclusion: The results show that scoliosis specific stabilization exercises can be successful at halting progression over a 16 month period of time in an adolescent with IS with high risk of progression.

Consent: Written informed consent was obtained from the patient’s legal guardian of the patient for publication of this Case report. A copy of the written consent is available for review by the Editor of this journal.

P7
Case study reflecting principles and treatment techniques of postural restoration
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Scoliosis 2014, 9(Suppl 1):P7

The etiology of scoliosis has eluded definition. Relative Anterior Spinal Overgrowth (RASO) is generally accepted as an initiating phenomenon but predisposing factors to RASO are not understood. A revolutionary new approach to physical therapy known as Postural Restoration (PR) which, in the US, has been especially successful in sports performance enhancement, offers a perspective on human bio-mechanics which may help clarify predisposition to scoliosis. Additionally, PR treatment techniques offer powerful tools to balance asymmetrical function. The case study demonstrates the effectiveness of early intervention. Clinically, PR has also proven successful in rehabilitation for older adolescents and for adults. PR is the first approach to appreciate the significance of fundamental asymmetry in the human body as a positive factor, facilitating movement via a universal right side dominant movement pattern. This pattern represents one half of the gait cycle; its opposite pattern, on the left, is less used and less strong.

Right side dominance manifests in a tri-planar system. PR recognizes the essential role respiratory function plays in the bio-mechanical organization of the body. Breathing discord effects changes in diaphragm form and function causing it to lose respiratory effectiveness and to assume a more structural role, which then reinforces lordosis. As a result, shear forces on dorsal vertebral growth plates result in RASO as described by the Heueter-Volkmam principle.

RASO obstructs normal thoracic flexion. Compensatory strategies to achieve flexion, which follow dominant right side patterning will demonstrate a thoracic dextro-scoliiosis, with or without a compensating lumbar levo-scoliiosis.

PR rehabilitation begins with sagittal plane balancing. Activities follow which balance frontal plane asymmetries by inhibition of dominant muscle chains and facilitation of the non-dominant pattern. Transverse plane activity is integrated once sagittal and frontal plane relative balance has been achieved. Programs usually begin in non-weight bearing positions and progress to upright, then to alternating reciprocal movement. ADL activities are modified. All exercises rely on respiratory coordination.

This case study follows a 9 year old, hypermobile girl, diagnosed by x-ray with a right thoracolumbar curvature of 27 degrees, who was able to eliminate her curvature, by x-ray, over a three month period with PR.

Consent: Written informed consent was obtained from the parents/legal guardian of the patient for publication of this Case report. A copy of the written consent is available for review by the Editor of this journal.

P8
ESR1 and ESR2 genotypes and the age at menarche in idiopathic scoliosis
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Scoliosis 2014, 9(Suppl 1):P8

Background: Environmental and genetic factors have influence on the age at menarche (AAM). Disturbance of the AAM in patients with idiopathic scoliosis (IS) were postulated [1]. Estrogen receptor genes 1 and 2 (ESR1, ESR2) single nucleotide polymorphisms (SNP) in IS were suggested to have some association with predisposition to IS [2]. ESR SNPs were reported to have association with AAM in healthily females [3].

Aim: The purpose of the study was to investigate associations of the ESR1 and ESR2 SNPs with AAM in IS patients.

Material: 227 Caucasian females from Central Europe (Poland) with idiopathic scoliosis were included into this trial. The AAM in months was established in each case. Four SNPs were investigated with use of the
restriction enzymes: in ESR1 rs9340799 and rs2234693 with XbaI and PvuII enzymes, in ESR2 rs4986938 and rs1256049 with AluI and RasI enzymes respectively. The statistical calculation was done with ANOVA, t-Student, or Kruskal-Wallis tests. P value 0.05 was considered as significant. The mean and SD values are presented in months.

Results: All genotypes followed Hardy-Weinberg Equilibrium. The mean AAM for all patients was 154.7±14.3.
Genotypes distribution, mean and SD AAM values were:
XbaI - AA (N=76, 153.8±13.1), AG (N=113, 155.6±16.3) GG (N=38, 154.2±13.0) p=0.7613;
PvuII - CC (N=51, 154.0±14.0), CT (N=117, 154.9±15.8), TT (N=59, 155.2±13.2) p=0.9129;
Alul - AA (N=27 153.4±14.6), AG (N=99, 155.4±14.4), GG (N=101, 154.5±15.3) p=0.8008;
RasI - AG (N=23, 150.4±15.2), GG (N=204, 155.2±14.6) p=0.1392.

Conclusions: In idiopathic scoliosis patients investigated ESR1 and ESR2 gene SNPs showed no association with age at menarche onset.

References:
2. Grivas TB, Vasilidi E, Mouzakis V, Mihas C, Koufopoulou G: Association between adolescent idiopathic scoliosis prevalence and age at menarche in different geographic latitudes. Isfahan, Iran: Orthopedic Surgery Department, School of Medicine, Isfahan University of Medical sciences, Isfahan, Iran Scoliosis 2014, 9(Suppl 1):P9

Background: Scoliosis is one of the musculoskeletal disorders which influence the performance of the subjects during standing and walking. There is not enough information regarding the influence of orthosis on the gait and stability functions of scoliotic subjects, therefore the aim of this study is to find the effects of the orthosis on the mentioned parameters.

Case description: A 12 year old scoliotic subject was recruited in this study. They walked and stood with and without Milwaukee orthosis. Motions of the joint and the forces applied on the leg were collected by use of motion analysis system and a Kistler faceplate. The length of erector spine, external oblique and internal oblique abdominalis tendons

Discussion: The orthosis aligned the vertebral column and improved the abilities of the subject to stand and walk. As the length of vertebral column muscles increased follow the use of the orthosis it can be concluded that it influenced the curve correction.

P10 Treatment of the so-called idiopathic scoliosis by physiotherapy - incorrect or correct – examples of both group of children

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Scoliosis 2014, 9(Suppl 1):P10

Introduction: The biomechanical aetiology of so-called idiopathic scoliosis is described in years 1995 − 2007 (T. Karski) and presented since 2002 in many Congresses and Symposia.

Material: In 2012 the whole material gathered 1950 cases. Patients were 2 to 60 years old.

Discussion: A new principle of correction applicable to the proximal structural curve in thoracic double major and triple structural curves is presented in a single case report. Further research is necessary before to make any conclusion.

Consent: Written informed consent was obtained from the parents/legal guardian of the patient for publication of this Case report. A copy of the written consent is available for review by the Editor of this journal.

P11 Case report: AID, a new principle of correction to treat proximal structural curve with a brace

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Scoliosis 2014, 9(Suppl 1):P11

Background: There is no wide accepted principle to brace primary thoracic double major and triple structural curve patterns. Axial elongation from a super-structure or three-point system with a neck semi-ring are some of the previously proposed principles.

Aim: The purpose of this case report is to present a new principle of correction based on axial compression on the convex ribs of the proximal curve.

Case report: A 14 year old was diagnosed with AIS at 10 years of age. In a first X-ray from February 2010 it was noted a right thoracic curve measuring 7º Cobb, combined with a left lumbar measuring 7º Cobb. Progressive thoracic region was not measurable. One year later, February 2011 the Cobb angles progressed to 18º and 33º respectively, and progression was confirmed on September 2011 with a Cobb angle of 24º in the main thoracic and 26º in the lumbar curve. She was treated with a Boston brace showing poor in-brace correction, with 17º lumbar, 22º main thoracic and 19º proximal curves. In a new X-ray out of brace on May 2012 the angles were 19º, 18º and 21º. With her second Boston brace the values were 19º, 18º and 25º respectively. On December 2012 and with no new reference out-brace the brace was changed to a classical Chêneau type brace, with no in-brace X-ray, mainly due to the over-exposure. Menarche on April 2013. New X-ray on June showed a progression to 21º, 25º and 31º respectively. Due to the bad evolution of the proximal curve we designed a removable superstructure with a combined mechanism: compression on the convex proximal curve and three-point system. After using partial time this super-structure and confirming an acceptable in-brace correction of the proximal curve, her 21º lumbar, 22º main thoracic and 19º proximal curves. In the main thoracic and 26º in the lumbar curve. She was treated with a Boston brace showing poor in-brace correction, with 17º lumbar, 22º main thoracic and 19º proximal curves. In a new X-ray out of brace on May 2012 the angles were 19º, 18º and 21º. With her second Boston brace the values were 19º, 18º and 25º respectively. On December 2012 and with no new reference out-brace the brace was changed to a classical Chêneau type brace, with no in-brace X-ray, mainly due to the over-exposure. Menarche on April 2013. New X-ray on June showed a progression to 21º, 25º and 31º respectively. Due to the bad evolution of the proximal curve we designed a removable superstructure with a combined mechanism: compression on the convex proximal curve and three-point system. After using partial time this super-structure and confirming an acceptable in-brace correction of the proximal curve, her last X-ray on January 2014 showed a stable curve 21º, 27º and 30º respectively, at Risser 3. 

Discussion: A new principle of correction applicable to the proximal structural curve in thoracic double major and triple structural curves is presented in a single case report. Further research is necessary before to make any conclusion.

Consent: Written informed consent was obtained from the parents/legal guardian of the patient for publication of this Case report. A copy of the written consent is available for review by the Editor of this journal.
P12

The possibilities of using elastic therapeutic (Kinesio) tape in patients with scoliosis
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Scoliosis 2014, 9(Suppl 1)P12

Elastic Therapeutic (Kinesio Tape) has rapidly become a recognised therapeutic modality in many musculoskeletal and neurological disorders. This tape, applied with a certain amount of stretch to its own paper backing is known under many names making research into it a challenging task. Its recoil properties make it a very suitable tool to assist in current scoliosis management. The studies of the various elastic therapeutic tape brands have reported positive effects on pain, ROM, balance, strength, function and proprioception. A large amount of anecdotal evidence has been published and warrants further research. It is reasonable to assume that the outcome of the research on the effects of taping on both upper and lower extremities by means of Functional Magnetic Resonance Imaging and Ultrasonic Imaging is transferable to the trunk. Both the research on the physiological movement of the skin of the trunk captured by three-dimensional motion analysis system (Vicon Motion Systems) by T. Fukui and the videos of the skins' anatomy and physiology by Dr. J.C. Guimberteau have resulted in novel ways to use the tape. A number of these tape possibilities will be presented and their function addressed.

The use of elastic therapeutic tape applications to:
- assist patients to hold their corrected posture (Schroth, SEAS exercises).
- help relieve pain in the (elderly) scoliosis patient with postural collapse.
- assist pulmonary function in the both patients with idiopathic Adolescent Scoliosis and neuromuscular scoliosis.

Elastic Therapeutic Tape is a wonderful new extra tool in the management of scoliosis patients.

P13

The evaluation of chosen body posture parameters in children with scoliosis – own materials
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Scoliosis 2014, 9(Suppl 1)P13

Introduction: Treatment of children with scoliosis requires the monitoring and evaluation of posture parameters. The raster stereographic method can be used at any time to observe the therapy progress due to its harmless towards the child.

Material and methods: We evaluated 140 children with idiopathic scoliosis treated by the FED method at the Rehabilitation Centre in Zgorzelec. The children were assessed by the 4D DIERS Formetric III at the beginning and the end of the month of the stay. Some of the patients were evaluated six-months after the FED treatment. One of the parameters selected to assess the therapy outcome is the rotation of the trunk area beginning at the apex deriving from radiography.

Results: Preliminary results in both groups, the group assessed after a month and the group assessed after six-months, reveal a reduction of the rotation parameter by an average of 40.

Conclusions: After a preliminary analysis of the trunk posture in children with idiopathic scoliosis assessed by DIERS Formetric III 4D, the raster stereographic method can be considered a fast, secure way to follow-up the outcome of the FED therapy.

P14

Radiological progress report of curing scoliosis according to the fed method based on own material
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Scoliosis 2014, 9(Suppl 1)P14

Introduction: In the process of treating scoliosis X-ray is one of the objective methods of assessing the progress of therapy. In the assessment of scoliosis picture should cover the entire spine, hip bones with plates and hips, made standing in the AP and lateral projections. On the basis of a well-made images, you can specify the parameters of scoliosis (type of scoliosis, Risser test, the Cobb angle, the angle of rotation of the vertebrae, the index kifo - lordosis, etc.) which allows the selection of the proper physiotherapy and assessment of treatment effects.

Materials and methods: We evaluated a group of 70 children diagnosed with idiopathic scoliosis in age from 7 to 18 years residing in the treatment by the Fed at the Centre for Rehabilitation in Zgorzelec. The children remained in the two monthly turnusach apart semester. During the stay twice a day participated in therapy by the Fed. Analysis and evaluation of X-ray were performed before treatment and at the end of the half-year stage. With images were evaluated Cobb angle, vertebral rotation by raimondi test Risser, type of scoliosis by King-Moe.

Results: The results have been developed in the form of tables and charts, broken down by the scoliosis to 20°, 30°, 40° and above 40°.

Conclusions: Comparison of X-ray images is one of objective assessment in the treatment of scoliosis. The results presented in the study are the evaluation of the effectiveness of the method the Fed.

P15

Analysis of body posture of children with idiopathic scoliosis in the image Diers after the application of kinesiology taping application
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Scoliosis 2014, 9(Suppl 1)P15

Introduction: In the process of treating scoliosis essence of treatment is to maintain normal patterns of attitudes through appropriate antigravity muscle tone. Stimuli proper posture pattern in the period in which the child does not perform exercises gives 24hours a day sensory information. In both Idiopathic Adolescent Scoliosis and adult scoliosis patients this extra stimulus gives 24hours a day sensory information.

Material and method: Evaluated in a group of 40 children diagnosed with idiopathic scoliosis in age from 10 to 15 years residing in the treatment by the Fed at the Centre for Rehabilitation in Zgorzelec. Each child before treatment, the day of admission to the ward had made an assessment method Diers. Then an application of Kinesiology Taping. Used applications ligamentous took the form of V and were used on curves thoracic and lumbar scoliosis. Next, a re-image method Diers assessing mathematical representation of the body surface after the application of Kinesiology Taping.

Results: The results obtained after the application of Kinesiology Taping show that the image of body posture changes, which record the images method Diers.

Conclusions: Kinesiology Taping techniques are useful in the treatment of idiopathic scoliosis. After the tension of the skin and muscles make it easy to maintain the correct posture pattern.
Scientific evidence reveals conjoined etiology in spinal deformation and the need for etiology based treatment. Insight in a trail

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Introduction: Effects of discongruent growth on the spine and central cord morphology gained attention in Orthopedics. If growth is dependent on exogenic factors and neuromuscular tension, therapy must focus on reversal of this. An extensive search on clues in existing literature was done. Goal was to formulate consequences for treatment strategies.

Characteristics of earlier research: No doubt European orthopedic science proved that deformities are load dependent changes. Jansen researched sources of rotational forces in the human body produced by the asymmetric diaphragm. Modern research was mainly morphological in nature based on the AP X-ray.

Opening black box and the holistic concept of Milan Roth: In experiments on the “Nervous Skeleton” and its way of growth Roth offered science on neurovertebral and neuro-osseous growth relations, with tension forces. Recent studies with MRI in idiopathic scoliosis confirm much of this11. If there is increased tension in the CNS, there must be increased contraction in muscles too, if their energy is not used to deform the soft connecting parts (Volkmann Hueter principle) or the bones of the spine (Wolff’s Law).12.

Correction by reversing etiologic factors: Own study on forced lordosis we proved two issues towards durable correction: existence of a thoracolumbar kyphosis in scoliosis, confirmed by Ni in Spine and the possibility to correct double curved scoliosis by applying a symmetrical lordotic (and thus extending)force at the TL joint14. By that the erecting muscles are forced back to the midline. To preserve instantaneous derotation by lordotic forces into real corrective growth faces challenges. By forcing the erecting muscles in normal tracks and create a long lordosis, this position was seen highly unstable but proved to work. In this we oppose Dickson’s axiom not to facilitate lordosis in a deformed spine. A developed and used lordotic brace applies a complete controlled lordosis. An extra strain on the erector trunci is given through pads giving stability. So normal growth forces of the spine erecting muscles are brought back in their original tracts. TLI braces only prevent flexion, the most prevailing “posture” in modern life of children.

Result: In a first series were published in Scoliosis. Children can assess their own progress in achieving a better clinical posture and function.