

Free Paper Session VIII: Paediatric Orthopaedics

FP8.1

Changes of Shoulder Balance, Sagittal Alignments and Curve Correction in the Treatment of Lenke I and II Scoliosis Using a Three-dimensional Correction Strategy

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Introduction: Shoulder balance in Lenke I and II adolescent idiopathic scoliosis (AIS) is a complex condition without a reliable strategy to achieve full correction. This paper aimed to analyse the change of shoulder balance, sagittal alignment, and curve correction rate.

Methods: We reviewed patients with AIS who underwent posterior spinal fusion from 2016 to 2017. Preoperative standing, side bend, and postoperative and follow-up Cobb's angles were analysed to determine the relationship between shoulder balance, curve flexibility, and correction rate (CR). The sagittal alignment was analysed in these patients by cervical lordosis (CL; C2-C7), thoracic kyphosis (TK; T1-T12), lumbar lordosis (LL; L1-S1), pelvic incidence (PI), pelvis tilt (PT), sacral slope, and C7 sagittal vertical axis (SVA).

Results: There were 26 patients (20 female and 6 male). The mean length of follow-up was 1.63 years. There were 10 Lenke I and 16 Lenke II cases. The preoperative, side bend, postoperative, and follow-up Cobb's angles of Lenke I (I) and II (II) cases were as follows: proximal thoracic (I: 290°, 190°, 150° CR 47%, 150°; II: 460°, 410°, 250° CR 43%, 280°); main thoracic (I: 580°, 320°, 120° CR 79%, 120°; II: 710°, 480°, 200° CR 72%, 220°); lumbar (I: 320°, 70°, 100° CR 72%, 90°; II: 330°, 90°, 60° CR 82%, 80°); T1 tilt angles (I: 10°, -70°, -60°; II: -30°, -80°, -90°); and clavicular angles (I: 30°, -40°, -30°; II: 20°, -30°, -40°). The sagittal alignment of both Lenke cases are as follows: CL (2.10°, -0.50°, 60°); TK (290°, 290°, 320°); LL (450°, 400°, 510°); PI (420°, 420°, 440°); PT (90°, 130°, 70°); SL (330°, 300°, 360°); and SVA (1.4°, 0.8°, 1.3°).

Conclusion: The shoulder balance changed from left down to left up after operation. The sagittal alignment changes of this group of patients moved towards normal.

FP8.2

Curve Regression Timing with Underarm Bracing for Adolescent Idiopathic Scoliosis: Predictive Factors and Clinical Implications

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FP8.3

Ultrasound for Screening Scoliosis to Reduce Unnecessary Radiation: A Prospective Diagnostic Accuracy Study on 442 Schoolchildren from the Scoliosis Screening Programme in Hong Kong**H Pang,¹ YS Wong,² WCW Chu,³ YP Zheng,⁴ JCY Cheng,² TP Lam²**¹*Department of Orthopaedics and Traumatology, Prince of Wales Hospital, Hong Kong*²*Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong*³*Department of Imaging and Diagnostic Radiology, The Chinese University of Hong Kong, Hong Kong*⁴*Department of Biomedical Engineering, The Hong Kong Polytechnic University, Hong Kong*

Introduction: Schoolchildren in Hong Kong are screened for scoliosis, and those screened positive for suspected scoliosis will receive X-ray assessment. Subjects with Cobb's angle $\geq 20^\circ$ are referred to a specialist. However, there were screen positive cases with Cobb's angle smaller than referral threshold of 20° , who are therefore subjected to unnecessary radiation exposure. Our objective is to determine if ultrasound can identify subjects "not for specialist referral" to reduce unnecessary radiation exposure.

Methods: A total of 442 schoolchildren screened positive for suspected scoliosis in scoliosis screening programme were prospectively recruited. Ultrasound of the spine was performed in addition to whole spine radiography. Three parameters were determined, namely X-ray-based referral status (Cobb's $\geq 20^\circ$ for specialist referral or Cobb's $< 20^\circ$ not for specialist referral, the gold standard), ultrasound-based referral status (based on ultrasound spinous process angle [SPA]) and ATR.

Results: In all, 243 girls and 199 boys (mean age 13.2 ± 1.8 years) were recruited with mean major Cobb's angles of $14.0 \pm 6.6^\circ$ and mean ATR of $5.7 \pm 2.4^\circ$. In total, 78 (17.6%) patients had Cobb's angle $\geq 20^\circ$. Patient-based logistic regression analysis showed the area under receiver operating characteristic curve was 0.735 when only SPA was used, as compared with 0.832 when both SPA and ATR were used. At a probability cut-off of 0.11, the sensitivity and specificity of ultrasound were 92.3% and 51.6% while the positive and negative predictive values were 29.0% and 96.9%, respectively.

Conclusion: Ultrasound is accurate for identifying schoolchildren with Cobb's angle $\geq 20^\circ$ before subjecting to confirmatory radiography. Incorporation of ATR could further enhance the prediction accuracy.

FP8.4

Validation of Paediatric Quality of Life Inventory™ (PedsQL™) Generic Core Scales 4.0 in Chinese Patients with Idiopathic Scoliosis

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Introduction: Health-related quality of life (HRQoL) of patients with idiopathic scoliosis is important, as the disease onset occurs during prepubertal and pubertal growth. Currently there is a lack of generic instrument for these younger patients, and patient-perceived outcome measures have shortcomings. Thus, we aimed to validate the use of the Pediatric Quality of Life Inventory™ (PedsQL™) in local patients with idiopathic scoliosis.

Methods: Paediatric patients with and without idiopathic scoliosis were consecutively recruited at outpatient clinics. Patients were asked to complete PedsQL (8-12 years or 13-18 years, depending on age), the youth version of EuroQoL-5D (EQ-5D-Y), and the refined Scoliosis Research Society-22 (SRS-22r) patient questionnaires. Scores were compared between the patients with and without scoliosis. Sensitivity of PedsQL was explored using EQ-5D-Y dimensions, and its correlation with SRS-22r questionnaire was examined.

Results: A total of 566 patients were recruited, 63.0% of them with scoliosis. The total mean scores of PedsQL were 90.6 ± 9.6 (8-12 years) and 87.7 ± 10.9 (13-18 years) with no floor/ceiling effects (<15%). Significantly higher PedsQL summary and total scores were detected in the patients with scoliosis than in those without scoliosis. Among patients with scoliosis, all PedsQL scores were lower ($p < 0.05$) for those with problems in the five dimensions of EQ-5D-Y. The PedsQL correlated with SRS-22r only for patients with scoliosis.

Conclusion: The PedsQL was sensitive in patients with scoliosis who perceived themselves as having problems in mobility, self-care, doing usual activities, having pain or discomfort, and feeling worried, sad, or unhappy. Together with its minimal floor and ceiling effects and its correlation with SRS-22r, PedsQL was found to be useful in reflecting HRQoL of paediatric patients with idiopathic scoliosis.

FP8.5

Effect of Magnetically Controlled Growing Rods on Three-dimensional Changes in Deformity Correction**PWH Cheung, KMC Cheung, JPY Cheung***Department of Orthopaedics and Traumatology, The University of Hong Kong, Hong Kong*

Introduction: Magnetically controlled growing rods (MCGRs) have been shown to achieve similar coronal plane correction as traditional growing rods. Changes in sagittal and axial planes are factors indicating potential for proximal junctional kyphosis and rotational deformity, but they remain largely unknown. This study aimed to determine the three-dimensional changes in deformity correction with MCGR distractions.

Methods: Patients with early-onset scoliosis who underwent dual MCGRs and minimum 2-year follow-up with images were recruited. Three-dimensional reconstructions of 6-monthly biplanar images were assessed for changes in coronal, sagittal, and axial planes. Changes in growth parameters were scaled to changes in coronal Cobb's angles, rotational, and sagittal profile (T1-12, T4-12, L1-L5, L1-S1) at the proximal thoracic, main thoracic, and lumbar curves. Pelvic parameters (sagittal and lateral pelvic tilt, pelvis rotation) were studied.

Results: Ten patients with early-onset scoliosis were studied with mean age of 8.2 ± 3.0 years at index surgery. Six patients had rod exchange. Mean duration between index surgery and rod exchange was 29.5 ± 11.8 months. Despite consistent gains in body height and arm span, the main changes in coronal and rotational profiles only occurred at initial rod implantation surgery with only small changes at subsequent follow-up examinations. Flattening of sagittal plane occurred at initial surgery with rebound within first 2 years after surgery, without significant changes thereafter. No pelvic parameters changes were observed.

Conclusion: The three-dimensional changes with MCGR are mainly observed with initial rod implantation and no significant changes are observed with distractions. The MCGR is able to prevent deformity progression in the transverse plane.

FP8.6

Accuracy of Ultrasound for Radiation-free Quantitative Assessment of Spinal Curvatures in Patients with Idiopathic Scoliosis: A Systematic Review and Meta-analysis

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Introduction: Despite application of ultrasound for quantitative measurement of spinal curvatures has been reported with various studies, a systematic review for such is lacking. This systematic review aimed to evaluate the reliability and validity of ultrasound, using radiographic measurement as gold standard in idiopathic scoliosis patients, and the use of various anatomical landmarks for measurement of spinal curvatures.

Methods: Medline, Embase, CINAHL, and CENTRAL databases were searched. QUADAS-2 (Quality Assessment of Diagnostic Accuracy Studies 2) quality assessment tool was adopted. Reliability of ultrasound in terms of intra-class correlation coefficient was recorded. Pearson correlation coefficients between ultrasound and radiographic measurements were extracted for meta-analysis. Subgroup analyses based on ultrasound measurement protocols of spinous process (SP), transverse processes (TP), and centre of lamina (COL) were conducted.

Results: Eleven articles reporting 18 correlation analyses on 766 subjects were eligible for meta-analysis. The mean inter-rater reliability of ultrasound measurement was 0.87 ± 0.07 . Pooled correlation for all studies was 0.918 (95% confidence interval=0.868-0.949), exhibiting substantial heterogeneity ($I^2=90.50\%$, $p<0.001$). Subgroup analyses showed that pooled correlations were 0.887 for COL method (comprising 356 subjects); 0.924 for SP method (255 subjects); and 0.941 for TP method (117 subjects); all with notable heterogeneity ($I^2>90\%$, $p<0.001$). The overall risk of bias was rated moderate; yet publication bias was noted.

Conclusions: Our results show that ultrasound is a promising non-invasive method with satisfactory validity and reliability for measuring coronal curvatures using the SP, TP, or COL methods. Further development of three-dimensional ultrasound towards scoliosis assessment will facilitate its translational application for managing scoliosis.

FP8.7

Effects of E-Fit Exercise Intervention on Bone Density, Muscle Functions, and Quality of Life in Girls with Adolescent Idiopathic Scoliosis: A Randomised Controlled Pilot Study**KY Cheuk,¹ RWL Lau,² EMS Tam,² SSC Hui,³ JCY Cheng,¹ TP Lam¹**¹*SH Ho Scoliosis Research Lab, Joint Scoliosis Research Centre of the Chinese University of Hong Kong and Nanjing University, The Chinese University of Hong Kong, Hong Kong*²*Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong*³*Department of Sports Science and Physical Education, The Chinese University of Hong Kong, Hong Kong*

Introduction: Adolescent idiopathic scoliosis (AIS) is associated with lower bone mineral density (BMD) and muscle strength. We aimed to assess exercise intervention on BMD, muscle functions, and quality of life (QoL) in AIS.

Methods: Girls with AIS were randomly assigned to exercise or control group. Exercise group participated in a 6-month home-based E-Fit exercise programme. At baseline and 6 months, BMD using dual-energy X-ray absorptiometry, muscle strength using shoulder/biceps/leg/back-lift and trunk-curl, QoL using Scoliosis Research Society-22 (SRS-22), and patient's view using feedback questionnaire were investigated.

Results: Forty girls (age 11-14 years) completed the study, with 16 in the exercise group and 18 in the control group. Both groups had similar maturity, body size, BMD, and muscle functions at baseline. The exercise group had better improvement (as shown by effect size of Cohen's d) in right femoral neck bone mineral content (0.162); SRS-22 functional (0.252), SRS-22 self-image (0.271) and SRS-22 total scores (0.102); and muscle parameters of biceps (0.460), leg-lift (0.109), and trunk-curl (0.192). However, differences did not reach statistical significance, likely owing to Type II errors. Subjects were positive with the programme for feasibility of domestic application (70%). Some subjects felt the exercise was difficult and time-consuming and that compliance could be enhanced by shortening exercise duration (47% of subjects, 35% of parents) and positive reinforcement with programme compliance (24% of subjects, 29 of parents).

Conclusion: This pilot study strongly indicated potential benefits of exercise on bone health, muscle functions, and QoL for patients with AIS. It provided valuable information for sample size estimation and ways of enhancing patient's compliance which are important for long-awaited definitive studies on exercise intervention for patients with AIS.

Declaration: HMRF-funding (Ref: 14152371).

FP8.8

Responsiveness Property of the Traditional Chinese Version of the 24-Item Early-onset Scoliosis Questionnaires

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Introduction: Early-onset scoliosis (EOS) imposes significant burden on health-related quality of life (HRQoL) of patients and caregivers. The 24-Item Early-onset Scoliosis Questionnaires (EOSQ-24) is a locally validated measurement tool to evaluate the overall impact of EOS on patients' physical, psychological, and socio-economic well-being. We aimed to investigate the responsiveness property of the EOSQ-24 in detecting changes in HRQoL outcomes.

Methods: We recruited caregivers of 100 EOS patients. The EOSQ-24 was completed by the caregiver at baseline and at 6 months after treatment with observation, bracing, or surgery. Paired differences in each domain and subdomain of EOSQ-24 were calculated with paired *t* test. Mean changes in EOSQ-24 scores were analysed using the global rating of change scale (GRS) as an anchor for detecting changes in caregiver-perceived general health over time. Further analysis was made with respect to patient age, Cobb's angle at recruitment, aetiology, ambulatory status, and treatment.

Results: Significant paired differences comparing baseline and follow-up EOSQ-24 scores were observed in the vast majority of subdomains and domains. Significant positive correlations were found in multiple EOSQ subdomains in the group with improved GRS (n=28). For the group with unchanged GRS (n=60), significant improvement was observed in subdomains of general health, pulmonary function, mobility, physical function, daily living, emotion, and financial burden. In the group with worsened GRS (n=7), no significant correlation was shown. There was no significant correlation with age, Cobb's angle, aetiology, ambulatory status, and treatment.

Conclusion: We concluded that EOSQ-24 was responsive in detecting improvement in HRQoL outcomes from caregivers' perspectives.

FP8.9

Changes in Global Sagittal Alignment after Posterior Instrumentation of Right Thoracic Curve in Adolescent Idiopathic Scoliosis with and without Thoracic Hypokyphosis**KH Yeung,¹ GCW Man,² C Vergari,³ W Skalli,³ JCY Cheng,² WCW Chu¹**¹*Department of Imaging and Interventional Radiology, The Chinese University of Hong Kong, Hong Kong*²*Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong*³*Laboratoire de Biomécanique, Institut de Biomecanique Humaine Georges Charpak, France*

Introduction: Patients with adolescent idiopathic scoliosis (AIS) with thoracic curve often present with rotatory deformity and diminution of thoracic kyphosis. However, the change of global sagittal alignment (GSA) during thoracic kyphosis restoration remains uncertain. The aims of this study were to evaluate these changes in AIS with and without thoracic hypokyphosis during surgical correction, in comparison with healthy controls.

Methods: The patients with AIS were subdivided into thoracic hypokyphosis (THK) and normal thoracic kyphosis (NTK). Early-onset scoliosis radiographies were acquired at baseline, immediately after surgery, and at 1-year and 2-year follow-up examination. Multiple GSA parameters and head positions were measured, including ratio of sagittal vertical axis to sacrofemoral distance (SVA/SFD), and angle of odontoid-hip axis (OD-HA) line.

Results: Twenty-four operative AIS girls with right thoracic curvature and 36 female asymptomatic controls (NC) were recruited. There were significant differences on multiple GSA parameters between patients with AIS, with and without THK, and NC. Compared with NC, patients with AIS with THK at baseline had higher SVA/SFD ($p < 0.05$) and OD-HA ($p < 0.05$), indicating that THK had compensated balance with unusual forward leaning posture. Immediately after surgery, SVA/SFD still remained high while OD-HA reversed, suggesting balance remained partially compensated. Both parameters were normalised after 2 years, indicating sagittal balance finally achieved. In contrast, no significant difference was found between NTK and NC. Changes in GSA and mechanism of balance are different in patients with AIS with or without THK.

Conclusion: As the head plays a critical role on balance during immediate and delayed after surgery, OD-HA can be complementary parameter for assessing global balance during follow-up of patients with AIS with THK.

FP8.10

Success in Treating the Contralateral Hip in Cerebral Palsy Patients with Unilateral Hip Subluxation

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Introduction: The role of non-operative treatment in the non-subluxed hip in cerebral palsy patients undergoing surgery for the subluxed hip remains unclear. We investigated the outcome of contralateral hips in patients who received surgery for unilateral hip subluxation.

Methods: We reviewed all cases of patients with cerebral palsy who had hip surgery between 1990 and 2014 in our institute. Hip subluxation was defined as Reimer's Migration Index (RMI) of >30%. We included only patients with unilateral hip subluxation and excluded those with follow-up of <5 years. Failure (defined as latest RMI >40% or requiring subsequent surgery) rate and baseline characteristics were compared between operated and non-operated groups.

Results: Twenty-six patients met our study criteria (mean follow-up, 10 years) with 12 non-operated and 14 operated cases. The failure rate in the non-operated group was 1/12 (8%) versus 1/14 (7%) in the operated group, but this was not statistically significant. The two groups were similar in age, Gross Motor Function Classification System, preoperative RMI and acetabular index. The only difference is the preoperative abduction range – the non-operated group has a better mean abduction (56° vs 37°, p<0.05).

Conclusion: Our study suggests that patients with cerebral palsy with unilateral hip subluxations do not have higher rates of failure in the contralateral, non-operated hip, provided that they have good abduction range (>50° in our study). This suggests that abduction range should be a key factor in considering non-operative treatment on the contralateral hip.

FP8.11

Multiple Skeletal Maturity Indices for Maturity Assessment: Relationship between the Simplified Olecranon, Simplified Digital, and Distal Radius, and Ulna Classifications

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FP8.13**Impaired Lung Function and Relationship to Spinal Deformities in Patients with Adolescent Idiopathic Scoliosis: A Systematic Review and Meta-analysis****H Pang,¹ F Zaina,² JPY Cheung,³ S Negrini,² D Samartzis,⁴ AYL Wong⁵**¹*Department of Orthopaedics and Traumatology, Prince of Wales Hospital, Hong Kong*²*Italian Scientific Spine Institute, Milan, Italy*³*Department of Orthopaedics and Traumatology, The University of Hong Kong, Hong Kong*⁴*Department of Orthopaedics, Rush University Medical Center, United States*⁵*Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hong Kong*

Introduction: Patients with adolescent idiopathic scoliosis (AIS) display certain degree of compromised lung function, but the evidence on its exact relation remains unclear. Our team summarised the associations between various lung function parameters and radiographic features in patients with AIS.

Methods: A systemic search in electronic database for original studies reporting association between lung function and spinal deformity in patients with AIS was performed. Multiple independent reviewers extracted data and evaluated quality of the included studies. Pearson correlation and 95% confidence intervals for associations between various pulmonary and spinal parameters were calculated using random-effects meta-analysis.

Results: Fifteen studies (1907 participants) were included. Several spinal deformity parameters were significantly related to lung functions (eg, % forced vital capacity [FVC], % forced expiratory volume in 1 second [FEV1], % total lung capacity [TLC]) in AIS patients. Patients with impaired lung function demonstrated significantly larger thoracic Cobb's angles and less thoracic kyphosis than healthy controls. Meta-analyses from 10 studies showed that main thoracic Cobb's angles were negatively related to %FVC, %FEV1, %TLC, and %VC. Conversely, thoracic kyphosis angles were positively associated with %FVC, %FEV1, and %TLC.

Conclusion: This is the first systematic review and meta-analysis to summarise the associations between pulmonary function and spinal deformity in patients with AIS. Although it has been reported that patients with severe thoracic Cobb's angle display significant pulmonary impairments, our findings suggest that pulmonary impairment exists even in patients with mild-to-moderate idiopathic scoliosis. Future research should investigate the effectiveness of non-surgical/surgical means in restoring the lung function of these patients after accounting for confounders.

FP8.14**Accuracy of Prediction Methods in Determining the Timing of Epiphysiodesis in Children in Hong Kong****JSH Wong,¹ NLW So,² TWK Liu,³ CCW Kong,³ A Ip,³ W Chow²**¹*Department of Orthopaedics and Traumatology, The University of Hong Kong, Hong Kong*²*Department of Orthopaedics and Traumatology, The Duchess of Kent Children's Hospital at Sandy Bay, Hong Kong*³*The University of Hong Kong, Hong Kong*

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FP8.15

Vertebral Body Tethering: Growth Modulation versus Anterior Scoliosis Correction

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Introduction: Vertebral body tethering (VBT) is a relatively novel technique in the treatment of immature adolescent idiopathic scoliosis (AIS). Firstly, it can allow correction of scoliosis through growth modulation by tethering the spine on the convex side of the curve to allow the concave side unrestricted growth similar to hemiepiphysiodesis concept. Secondly, it functions as anterior scoliosis correction where the tether is able to perform most of the correction immediately where limited growth is expected.

Methods: Patients were included from our database and analysed prospectively for patient demographics and radiological parameters (preoperative and postoperative Cobb's angles [immediate post-op, 3, 6, 12, 24 months, and latest follow-up]), bending Cobb's angles, and fulcrum flexibility rate (FFR). Other results obtained from these measurements included fulcrum bending correction index (FBCI) and correction rate (CR).

Results: In total, 17 patients (16 were female) with 23 curves with a minimum follow-up of 24 (range, 24-60) months were included. Fourteen patients underwent single-stage thoracic VBT for main thoracic curves (Lenke 1) and three patients for double major curves (Lenke 3). Mean age was 13 years; mean Risser stage was 1.76. Preoperative curve magnitude of those 20 curves were 51.0° (range, 32°-83°) correction after surgery 14.8° (range, 0°-35°) on first erect and 14.6° at final follow-up. They were divided into two groups by Risser grade. For Risser 0-2 group (n=11), their mean age was 12.4 years, preoperative Cobb's angle 48.8°, bending Cobb's angle 22.18°, FFR 45.4%, CR at first follow-up 57.8%, CR at final follow-up 61.7%, FBCI at first follow-up 107%, and FBCI at last follow-up 114%. For Risser 3+ group (n=12), their mean age was 14.42 years, preoperative Cobb's angle 54.42°, bending Cobb's angle 29.5°, FFR 54.4%, CR at first follow-up 83.4%, CR at last follow-up 80.2%, FBCI at first follow-up 153%, and FBCI at last follow-up 147%. No major complications were observed.

Conclusion: Vertebral body tethering by growth modulation or anterior scoliosis correction are promising for correction of immature AIS.

FP8.16

Vertebral Body Tethering in Lumbar Curves: A >2-Year Follow-up Study

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Introduction: Posterior fusion of the lumbar spine for scoliosis is often avoided to prevent morbidity and loss of movement. Vertebral body tethering (VBT) in lumbar curves has not previously been described. We describe our experience at a minimum 2-year follow-up.

Methods: Patient demographics including age, sex, and Risser scores were collected. Radiology measurements included preoperative and postoperative Cobb's angles, bending angles, and flexibility percentages. Preoperative and postoperative Cobb's angles were measured immediately post-surgery, and at 3-month, 6-month, 12-month and 24-month intervals. Scoliosis Research Society-30 questionnaire (SRS-30) scores were obtained pre- and post-operatively at same intervals.

Results: Seven female patients were included, with a mean age of 14.09 years. Mean Risser score was 2.7 (range, 2-4). Harrington stable vertebra were 4.57 levels. Among these seven patients, two had single lumbar curves (Lenke 5) with a mean Cobb's angle of 43°, bending angle 3°, and flexibility at 93%. The other five patients had double major curves of which 2 were Lenke 6, 1 was Lenke 3C, and 2 were Lenke 1C. The mean major thoracic (MT) Cobb's angle was 59.4° (range, 39°-87°), mean thoracolumbar/lumbar (TL/L) Cobb's angle was 55.5°, and mean bending film TL/L was 35.2°. Flexibility rate was 36%. Three patients (Lenke 1C, 3C) had two-stage procedures with both MT+TL/L curves tethered and four patients (Lenke 5 and 6) had VBT of only their lumbar curve. Two patients (Lenke 6) had indirect thoracic curve correction with mean preoperative MT Cobb's angle of 40.5° improving to become a mean postoperative MT Cobb's angle of 27.5°. Mean correction rate was 69.1%. The mean SRS-30 scores before surgery were 2.7 and after surgery were 3.80. Mean hospital length of stay was 6.7 days.

Conclusion: Lumbar VBT is a safe and effective option to avoid a long fusion into the lumbar spine. This is the first report of lumbar VBT with a minimum 2-year follow-up for Patient Reported Outcome Measures (ie, SRS-30) and radiographic data.