THE 75 DEGREES THRESHOLD IN CEREBRAL PALSY WITH SCOLIOSIS IN ONLY POSTERIOR SURGERY WITH PEDICLE SCREWS UNTIL WHEN WE CAN JUST OBSERVE SCOLIOSIS PROGRESSION IN CP PATIENTS WITH GMFCS IV AND V?

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Background: Parents and caregivers have hesitated to do spinal fusion just at 50 degrees as surgical indication because they are afraid of a lot of serious complications and medical morbidity. They guess that „Is the surgery necessary at this time around?“ Thus spinal fusion in patients with CP who have global involvement poses an „ethical dilemma“. Purpose of the study: We aimed at „threshold point“ to (1) evaluate „effectiveness“ which the relationship is between preoperative Cobb’s angle and the Cobb’s angle correction rate after the surgery? (2) evaluate „efficiency“ which is the relationship between preoperative Cobb’s angle and the operation time, and peri-operative transfusion? (3) analyze „risk factors“ which affect the general medical health, and complications.

Material and Methods: We evaluated total 94 patients with spastic quadriplegia CP (GMFCS IV:V=28:66) with more than 50 degrees. All patients were taken surgery with pedicle screws (T3~pelvis) through only posterior approach by one surgeon. Demographic variables for retrospective research included age, sex, perioperative BMI, albumin, Hb, total lymphocyte count (TLC), pO2, ASA score, preoperative Cobb’s, and kyphosis angle. For „effectiveness“, postoperative Cobb’s angle and correction rate were measured. Operation time and peri-operative transfusion were measured for „efficiency“ in two groups divided by that angle of effectiveness. Length of stay (LOS) in hospital, ICU stay, minor medical complication, and major complication was recorded for „risk factors“ in those two groups. We divided into two groups (A&B) at robust point to compare „efficiency“ and risk factors by Mann-Whitney test, Spearman correlation analysis, and Chi-square test.

Results: The mean of postoperative angle and correction rate were 17 (9~33°) and 74.1% (57.8~84.6) respectively. The „effectiveness“ of 2 variables showed a continuous decreasing trend until 75° preoperative angles (at this point, rho=0.64,-0.35, p<0.001) (Fig. 1). The „efficiency“ of 2 variables displayed a continuous increasing trend till 75° with a significant difference between 2 groups (A:B=<75°:>75°) (rho=0.32, 0.31, p<0.05, Mann-Whitney p<0.05). And the risk factors of general health showed a significant difference between 2 groups statistically. But, in terms of Spearman test, ICU stay was no difference. The other demographic variables, as well as the risk factors of complications didn’t seem to be statistically different.

Conclusion: In this study, the effectiveness, as well as efficiency of the scoliosis surgery in CP was significantly inferior in patients with preoperative Cobb’s angle>75°. The LOS and ICU stay was significantly longer in patients with Cobb’s angle>75° and showed positive relationship with the
operation time and the amount of perioperative transfusion. It suggests that 75 degrees could be a threshold point which changed the scoliosis operation for surgeons, caregiver, and patients to be more difficult and challengeable.

Disclosures:
EFFECT OF BODY MASS INDEX PERCENTILE ON CLINICAL AND RADIOGRAPHIC OUTCOME AFTER POSTERIOR INSTRUMENTED FUSION FOR ADOLESCENT IDIOPATHIC SCOLIOSIS
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Introduction: Aim of the study was to evaluate the effect of body mass index percentile for age (BMI %) on postoperative and at medium follow-up outcome in adolescent idiopathic scoliosis patients underwent posterior instrumented fusion (PSF). Particularly the two BMI % distribution extremes: <5% and >95% were considered.

Materials and methods: From January 2010 to December 2015 150 patients (68 male -82 female) affected by AIS underwent posterior instrumented fusion. Demographic data were recorded for all patients. Patients were divided in 4 groups considering BMI%: underweight BMI% < 5% (UW), normal weight 5%≤84% (NWL), overweight 85%≤94% (OW), obesity ≥ 95% (OB). For every patients curve type, brace use, operative time, blood loss, hospital stay, complications were registered. Radiographic evaluation consisted of pre-operative long-cassette X-ray and bending test, post-operative long-cassette X-ray and at regular intervals. The Risser grade, the pedicle screw density, the percentage of correction, the thoracic kyphosis and lumbar lordosis were evaluated. Clinical evaluation was performed using pre-operative SRS -22 questionnaire, post-operative and at regular intervals. Descriptive and inferential statistical analysis were conducted to compare all group to NWL with three independent t test. All group showed a normal distribution for BMI and BMI%.

Results: Mean age was 14.8 (10-18). The mean BMI for the entire cohort was 22.1±5 Kg/m²; 20 patients were UW, 64 NWL, 27 OW, and 39 OB. The mean complications index was 1.1%. No complication were registered in the NWL and OW groups; in the UW the complications index was 0.7%, in the OB 1.7% (p<0.004). Intraoperative blood loss were greater in the UW (1000± 500 ml) and OB (1500± 500 ml) p<0.01 versus NWL (650±500 ml) and OW (850±500 ml). The operative time and hospital stay were similar for all groups (p>0.05), as well as for percentage of curve correction and pedicle screw density. The thoracic kyphosis increased for OB (35°±7° post-op versus 43°±7° p=0.03) at 5 years follow-up. The lumbar lordosis showed a decrease at 5 years follow-up in the OB group (46°±8° versus 40±9° p>0.05). The UW and OB showed worse results at SRS-22, especially for pain and self-perception categories p<0.001 compared to NWL and p<0.003 compared to OW.

Conclusions: The collected data showed as UW and OB patients, undergone PSF, despite a comparable radiographic result, are at higher risk for perioperative complications. They also obtain considerable worse clinical results, especially for pain and self-perception, compared to NWL and OW. Counselling should be always done for patients and family and the achievement of normal BMI% should be recommended. OB patients considerably reduce risks and improve outcome even if only become OW.

A CRITICAL THORACIC KYPHOSIS IS REQUIRED TO PREVENT SAGITTAL PLANE DETERIORATION IN SELECTIVE THORACIC FUSIONS IN LENKE I AND II AIS

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Introduction
The quantitative analysis of the sagittal plane in adolescent idiopathic scoliosis (AIS) has only recently gained more attention. It has been reported before that undercorrection of thoracic hypokyphosis may be associated with reduced lumbar lordosis which in turn may have adverse effects on the global sagittal balance. In the present study we were interested in how the amount of thoracic kyphosis influences the sagittal profile and balance in selective thoracic (STF) and thoracolumbar fusions (TLF).

Methods:
Out of 154 patients identified with complete 2y minimal follow up, 86 presented with Lenke type I and II. All patients had AIS correction with a side-loading pedicle screw system with 6mm rod employing a sliding and cantilever technique without special attention to the sagittal plane. Patient factors such as age, Risser grade, lowest and upper instrumented vertebra (LIV/UV), lumbar modifier were recorded. Coronal Cobb and sagittal parameters were measured using Surgimap. Statistical analysis according to distributions and multiple linear and logistic regressions were performed using STATA for Mac v13.

Results
42 pts had STF and 44 TLF. Comparing the sagittal plane in STF vs.TLF, at 2 years there was a difference in the SVA (TLF -4.8±28.7mm vs. STF 13.1±28.4mm, p=0.01). A multiple regression analysis against SVA revealed LIV (p=0.015) and lumbar modifier C (p=0.014) as significant contributors (r-square=0.22, p=0.03). Logistic regression against postoperative change in SVA vs. thoracic kyphosis allowed calculation of a critical thoracic kyphosis of 23º (spec 0.70, sens 0.63), below which a trend to deterioration of sagittal parameters was observed in STF postoperatively (n.s), whereas they remained significantly improved to preop at 2 years if thoracic kyphosis is above 23º (preop vs. 2y: SVA p=0.039, thoracic kyphosis (TK) p=0.006, lumbar lordosis (LL) p=0.036).

Conclusion
It appears that TLF with LIV at L2-L4 is significantly associated with a maintained SVA at 2 years, whereas STF and a lumbar modifier of C were associated with an increased SVA at 2y compared to preoperatively. In TLF sagittal parameters were maintained regardless of the amount of thoracic kyphosis. STF with correction of the thoracic hypokyphosis above 23º resulted in a maintained improvement of all sagittal parameters after 2y.

Disclosures:
author 1: other financial report: Speaker's bureau: Nuvasive, Medtronic, Depuy Synthes; author 2: none; ; author 3: consultant; ; author 4: none
LESS IS MORE: SIGNIFICANT CORONAL CORRECTION OF AIS DEFORMITY PREDICTS THORACIC HYPOKYPHOSIS

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Introduction:
It is suggested that posterior approach with significant coronal plane correction of AIS deformity is associated with hypokyphosis and imbalance in the sagittal plain. Other factors such as the pre-operative coronal curve magnitude, use of hooks, the number of levels fused, pre-operative kyphotic posture, screw density and rod type have all been implicated. Maintaining the normal thoracic kyphosis is important as hypokyphosis is associated with proximal junctional failure and early onset of degenerative changes in the spine.

Our aim in this work was to study the association between the coronal correction successes with the sagittal balance outcome in AIS patients after posterior surgical correction.

Methods:
Retrospective case series of patients with Lenke 1-2 surgically corrected via posterior approach using a standardized surgical technique with a minimum follow up of 2 years. Complete radiographical preoperative and postoperative were measured as well as the operative data including UIV (divided into two Categories - T4 and above or below T5), LIV (divided into two categories - L3 or below and above L3), metal density (% number of instrumented pedicles vs total available) and thoracic flexibility (% MT correction ≥50% and >50% in bending films). We further analyzed the post-surgical coronal outcome (Group I <60% and Group II ≥60%) of our group and studied their association with the post-operative kyphosis in the sagittal plain. Univariate and multivariate logistic regression were performed.

Results:
In total, 95 cases were included in our study (87% females, average age 14), 68 cases had thoracic correction of more than 60% (72%). Most cases had metal density of less than 80% (97.8%) and thoracic flexibility of more than 50% was found in 29 cases (31%). Preoperative hypo-kyphosis (<20°) was found in 24 cases (25.3%). Post-operative thoracic hypokyphosis was 5 times more likely in patients with thoracic correction ≥60% [OR 5.16 (95% CI, 1.79 - 14.91; p=0.002)], after adjusting for confounding variables. This association was not affected by metal density, thoracic flexibility, LIV, UIV, age or sex.

Conclusion:
Our data confirms the 'essential lordosis' hypothesis of Roaf (1966) and Dickson (1992) i.e. that with greater ability to translate the apical vertebra towards the midline there is a commensurate lengthening of the anterior column due to the vertebral wedging. The lack of association with metal density or flexibility etc. suggests that this is an anatomical derivation rather than surgeon related. This also implies that use of Smith-Peterson osteotomies to 'lengthen' the posterior column and restore kyphosis is a flawed concept. Preservation of 'normal' thoracic kyphosis may require less
coronal correction in preference for a balanced spine.

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Disclosures:
WHERE TO STOP DISTALLY IN LENKE MODIFIER C AIS WITH LUMBAR CURVE MORE THAN 60°: L3 OR L4?

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Introduction. The selection of LIV in AIS patients with large lumbar curve remains controversial. Stopping the distal fusion at L3 could save more mobile lumbar spinal segments but may increase the risk of decompensation.

Purpose. The purpose of the study was to evaluate pre-operative radiographic factors that were associated with the selection of either L3 or L4 as LIV in posteriorly treated AIS patients with large lumbar curve (\(>60°\)).

Methods. 84 AIS patients with lumbar curve more than 60° were recruited with a minimum of 2-year follow-up after posterior instrumentation with lumbar curves included in fusion (Lenke type 3C, 5C or 6C). Patients were grouped according to the selection of LIV, either L3 group or L4 group. All radiograph parameters were measured pre- and post-operatively including lumbar Cobb angle, lumbar flexibility and L3 translation and rotation on upright posteroanterior film and supine side-bending film, etc. The SRS-22 score was used to assess clinical outcomes. Radiographic and clinical parameters were compared between the two groups. Multivariate regression analysis was performed to determine the factors most predictive of LIV selection.

Results. There were 24 patients in L3 group and 60 patients in L4 group. The average duration of follow-up was 3.1 years. At last follow-up, no difference was found in the clinical and radiographic parameters between the two groups. Preoperatively, the L3 group had lower L3 translation on AP view (28.6 vs. 35.1, \(p=0.024\)), L3 translation on concave side-bending film (5.5 vs. 13.5, \(p<0.001\)), L3 rotation on convex side-bending film (1.3 vs. 2.0, \(p=0.001\)) and larger lumbar flexibility (65.2% vs. 53.9, \(p=0.022\)). Multivariate regression found that L3 translation on concave side-bending film was the single most important predictor of LIV selection. Specifically, concave bending L3 translation < 10mm was a potential threshold for selecting L3 as LIV.

Conclusion. For AIS patients with lumbar curve larger than 60°, one can reliably stop at L3 if preoperative L3 translation on concave side-bending film was less than 10mm, with the same radiographic and clinical outcomes as fusing to L4.

Keywords: adolescent idiopathic scoliosis; large lumbar curve; LIV selection.
Level of Evidence: 3

Disclosures:
SINGLE ROD INSTRUMENTATION FOR THE POSTERIOR CORRECTION AND FUSION OF NEUROMUSCULAR SCOLIOSIS
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Purpose
The purpose of this study is to assess the safety and efficacy of the technique of unilateral instrumentation of the concave side of scoliosis in patients with neuromuscular disorders (NMD).

Methods
Included in this study, 31 consecutive cases of neuromuscular scoliosis, constant wheelchair users, treated with unilateral pedicle screw instrumentation on the concave side of the scoliosis curvature. There was a minimum 2-year follow-up period.

Results
There were no deaths, no acute infections and no serious neurological complications. The mean age at surgery was 14 years 6 months (range 9 years 3 months-21 years 3 months). Mean preoperative Cobb angle was 74.6° (range 45°-115°) preoperatively, improved to a mean of 29° (range 4.6°-66.8°) immediately postoperatively, and at the last follow-up the mean Cobb angle was 35.7° (range 7.2°-69.4°). The mean pelvic obliquity was 19.4° (range 6°-43°) preoperatively, improved to a mean of 7.4° (range 1.5°-14°) immediately postoperatively and a mean of 8.1° (range 2.2°-16.1°) at the final follow-up. We encountered six cases of implant failure, four of which had broken rods.

Conclusions
Unilateral pedicle screw instrumentation for scoliosis in patients with NMD with multiple comorbidities and minimal functional needs has proved to be a safe and effective alternative to the conventional technique in reducing the operating time, blood loss and length of hospital stay.
COMPARATIVE STUDY OF MINIMALLY INVASIVE PERCUTANEOUS PEDICLE SCREW FIXATION AND OPEN SURGERY IN THE TREATMENT OF THORACOLUMBAR FRACTURES

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Objective: A comparison of minimally invasive percutaneous pedicle screw fixation and open surgery for neurological intact thoracolumbar fracture.

Methods: A retrospective study was conducted in the patients who were thoracolumbar fractures without neurological deficits from January 2016 to December 2016, and the patients consisted of minimally invasive group and open surgery group. The blood loss, radiological parameters and patient-reported outcomes were compared between the two groups.

Results: A total of 180 patients were eligible that consisted of 93 patients in minimally invasive group and 87 in open surgery group, who were followed up for 12-24 months (average, 17.49±3.24 months). Compared with the open surgery group, the intraoperative blood loss was less, the operative time and hospital stay were shorter and visual analogue scale (VAS) in 72h postoperation was less in the minimally invasive group, but the C-arm exposure time was longer and hidden blood loss were more (P<0.05). Compared with preoperation, significant improvements were observed at the last follow-up in the two groups regarding Cobb angle, percentage of anterior height of the fractured vertebral body (P<0.05), but there were no significant differences between the 2 groups at the last follow-up (P>0.05). VAS and ODI were no significant differences between two groups at the last follow-up (P>0.05).

Conclusion: This study found no significant difference in radiological outcomes and long-term patient-reported outcomes between the two groups, the minimally invasive percutaneous pedicle screw fixation has the advantage of shorter operative time, less intraoperative blood loss, short hospital stay. Nevertheless, hidden blood loss should be considered.

(Key words) Thoracic vertebrae; Lumbar vertebrae; Fracture Fixation, Internal; Minimally Invasive Surgical Procedures; Hidden blood loss

INTRAOPERATIVE STIMULATED AND SPONTANEOUS EMG MONITORING FOR IMPROVING THE ACCURACY AND SAFETY OF MINIMALLY INVASIVE PERCUTANEOUS LUMBOSACRAL SCREW PLACEMENT.

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Background:
Because the increase of minimally invasive fusion technics with percutaneous screw placement, intraoperative neurophysiological monitoring become an important topic in spine surgery in order to achieve appropriated accuracy and avoid surgical misplacement complications. In clinical practice the amplitudes vary between the stimulation of the Jamshidi needle, Kirschner wire, and the pedicle screw.

Methods:
A prospective study was performed to evaluate the effectiveness of evoked a electromyography in predicting pedicle screw misplacement and subsequent lumbar radiculopathy, we analyze 61 consecutive patients (268 screws) ; new onset of postoperative radiculopathy and the accuracy of the screw in the Heary tomography scale were recorded. Electrically evoked electromyography threshold for the Jamshidi needle, Kirschner wire and pedicle screws were also recorder.

Results:
The mean age was 54.5 years, 268 screws were implanted under controlled homogeneous conditions (TIVA, BIS 45-55) with 19 pedicle breaches grade II to IV in the Heary tomography scale but without clinical relevance or therapeutic consequence. No revision surgeries were required because pedicle screws position. New onset of radicular pain or neurological deficit was recorder in 8 patients. An average of 4.2 milliamps difference (Range from 2 to 9 ) were recorder between the stimulation of Kirschner needle and definitive screw. Position of 36 needles was changed because of critical intraoperative stimulations results.

Conclusions:
We support the routine use and utility of neuromonitoring techniques for improving the accuracy and safety of pedicle screw implantation. As far as we know this is the first study that evaluate Therapeutic implications of the difference between stimulation of the Jamshidi needle, Kirschner wire and pedicle screws, in the decision to modify the situation of the pedicle needle or proceed to the placement of the screw. We present our intraoperative t-EMG protocol for percutaneous screw placement.

Disclosures:
author 1: none; author 2: none; author 3: none; author 4: not indicated; author 5: consultant: Synthes; author 6: none
DOES L4/5 POSE ADDITIONAL NEUROLOGIC RISK IN LATERAL LUMBAR INTERBODY FUSION?

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Background/ introduction
Lateral lumbar interbody fusion (LLIF) has been increasingly used for the treatment of various lumbar diseases. Using a retroperitoneal transpsoas approach, LLIF circumvents some of the challenges associated with anterior or posterior interbody fusion techniques. However, LLIF has its unique set of complications with approach-related nerve injuries being of major concern. Incidence rates of motor weakness vary significantly throughout the literature. Several risk factors for nerve-related motor weakness have been proposed including performance of the procedure at the L4/5 level.

Purpose
The aim of the current study was to compare the rate of nerve-related motor deficits in patients undergoing single-level LLIF with and without L4/5 involvement.

Materials and Methods
A review of prospectively collected clinical data from a single, academic institution was performed. All patients treated surgically for lumbar spine pathology that underwent single-level LLIF with or without supplemental posterior fixation from 2006 to 2016 at our institution were eligible for inclusion. Patients with missing pre- or postoperative motor exams were excluded. New postoperative motor deficits were defined as a decrease in motor strength in the tibialis anterior or quadriceps femoris muscle at first postoperative visit compared to preoperative baseline. Resolution of motor deficits at last follow-up was defined as return to preoperative baseline or recovery of full motor strength. Regression analysis was performed to examine the association of LLIF at L4/5 and the risk of new motor deficits.

Results
Out of 1290 patients treated with LLIF at our institution, 368 patients (54.6% female) met inclusion criteria. Mean age was 59yrs (range 21-86yrs). 174 patients underwent single-level LLIF including the L4/5 level and 194 patients underwent LLIF without the involvement of L4/5. At the first postoperative visit (6 weeks), 11.5% of patients in the L4/5 group had a new motor deficit compared to 3.6% in the non-L4/5 group (p=0.005). Multivariate analysis demonstrated that operating on L4/5 (OR=3.2) was significantly correlated with a new motor deficit (p=0.022). However, these differences resolved over time. At last follow-up (mean=13.6 month), 1.7% of the patients in the L4/5 group and 0.5% of the patients in the non-L4/5 group had remaining deficits (p=0.348).

Conclusion
To our knowledge this is the first study to compare postoperative motor deficits after single level LLIF in patients with and without involvement of L4/5. Our results are in line with previous studies which report an initial increased risk of new motor deficits for LLIF performed at L4/5. However, the majority of new motor deficits resolved over time and there was no significant difference in motor
deficits between both study groups at last follow-up. Our findings will hopefully act as a basis to improve clinical decision making and counseling of patients undergoing LLIF at L4/5.

Disclosures:
A SYSTEMATIC REVIEW ON THE OUTCOMES OF ENDOSCOPIC DISCECTOMY AND MINIMAL INVASIVE DISCECTOMY COMPARED TO CONVENTIONAL MICRODISCECTOMY

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Purpose: The aim of this study was to compare the safety and efficacy of minimally invasive techniques for the treatment of Lumbar Disc Herniation (LDH) using Percutaneous Endoscopic Discectomy (PED) and Minimal Invasive Discectomy with tubular retractors (MID) versus conventional microdiscectomy (MD) which is considered the "gold standard surgical treatment" for LDH.

Methods The systematic review was conducted using the Preferred Reporting Items for systematic Reviews and MetaAnalysis (PRISMA). Literature search was performed using data from PubMed, Google scholar and Google for studies performed up to December 2017. The quality assessment and clinical relevance criteria used were the Cochrane Musculoskeletal Review Group criteria as utilized for randomised trials. The inclusion criteria were that the studies needed to be randomised controlled trials comparing the patients needed to have discectomy with one of the above methods due to LDH at one lumbar level, follow up of more than 12 months, monitor the Visual Analog Scale (VAS) for the affected leg and back pain, Oswestry Disability Index (ODI) or Roland-Morris Disability Score as outcome scores. Exclusion criteria were studies with less than 12 months of follow up and studies that did not describe accurately the surgical method used.

Results The data of nine randomised controlled trials (RCT) which met the inclusion criteria were analysed with a total number of 1,475 patients included. 4 RCT's compared the results of MID to MD and 5 RCT's compared the results of PED to MD. No statistically significant difference was found in the VAS for back pain when comparing PED and MID to MD (WMD 0.04, P=0.92 and WMD 0.09 P=0.18 respectively) at 1 year follow up. Also no significant difference was found in the ODI for PED and MID compared to MD (P=0.34 and P=0.21 respectively.) PED demonstrated statistically significant lower estimated blood loss when compared to MD (p<0.05)

No significant difference in overall complication and reoperation rate was found between PED and MD and MID compared to MD.

Conclusion Based on this systematic review PED and MID are both as effective and safe as standard MD

Keywords endoscopic discectomy versus microdiscectomy, minimally invasive discectomy versus microdiscectomy, tubular discectomy

Disclosures:
author 1: none; author 2: none; author 3: none