ROLE OF LOCAL STREPTOMYCIN IN PREVENTION OF SURGICAL SITE INFECTION IN TB SPINE
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Surgical site infection (SSI) continues to be one of the most common post-operative complication in most spine surgeries. Patients with tuberculosis (TB) of spine are more at risk of developing this dreaded complication due to a number of reasons. This adds to significant morbidity and economic burden on patients adversely affecting the mental status and quality of life of patients. The aim of this study was to investigate the role of local streptomycin in preventing SSI in patients undergoing surgical management of spinal TB. 56 patients who underwent surgical management for radiologically proven TB spine divided in two groups were included in the study. Group A included 30 patients with no local streptomycin administered intraoperatively while Group B included 26 patients operated in the later part of study with the use of local streptomycin intraoperatively. The two groups were compared with each other and the outcome criteria analysed were SSI rate, length of hospital stay, duration of post-operative antibiotics and need for debridement. Length of hospital stay and duration of post-operative antibiotics was significantly higher in group A when compared with group B. SSI rate and need for debridement were higher in group A but the difference was not statistically significant. Poor nutritional status, low immunity, poor patient compliance to anti-tubercular therapy and intraoperative spillage of tubercular debris, pus and necrotic material make these patients prone to secondary infections and SSIs. Intra-operative administration of local streptomycin powder may play an important role in reducing secondary infections and SSI’s.

<table>
<thead>
<tr>
<th></th>
<th>GROUP A</th>
<th>GROUP B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>35.8±18.7(17-56)</td>
<td>28.7±11.7(18-66)</td>
</tr>
<tr>
<td>Sex</td>
<td>M : 11</td>
<td>M : 8</td>
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<tr>
<td></td>
<td>F : 19</td>
<td>F : 18</td>
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<td>Level of spine involved</td>
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<td>Cervicodorsal : 2</td>
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<tr>
<td></td>
<td>Dorsal : 12</td>
<td>Dorsal : 9</td>
</tr>
<tr>
<td></td>
<td>Dorsolumbar : 8</td>
<td>Dorsolumbar : 8</td>
</tr>
<tr>
<td>Lumbar</td>
<td>8</td>
<td>7</td>
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<tr>
<td>Mean fusion levels</td>
<td>4.11±1.6</td>
<td>3.97±0.98</td>
</tr>
<tr>
<td>SSI incidence</td>
<td>13.34%</td>
<td>3.84%</td>
</tr>
<tr>
<td>Duration of hospital stay</td>
<td>37.4±1.9</td>
<td>28.1±2.2</td>
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<tr>
<td></td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
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<tr>
<td>Length of post-op antibiotic</td>
<td>8.1±1.6</td>
<td>6.2±2.1</td>
</tr>
<tr>
<td></td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Need for debridement</td>
<td>10%</td>
<td>3.84%</td>
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Disclosures:
author 1: none; author 2: none; author 3: none
THE EPIDEMIOLOGY OF VERTEBRAL OSTEOMYELITIS REQUIRING SURGICAL INTERVENTION IN THE UNITED STATES FROM 1998 TO 2013

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Introduction: Cases of vertebral osteomyelitis (VO) that are refractory to conservative treatment are treated surgically to debride infected segments, decompress and ultimately stabilize affected vertebral segments. There is limited data on the epidemiology of surgical management in VO in the US, and no study to date has evaluated the impact of patient characteristics on surgical outcomes on a large scale.

Purpose: To assess the characteristics of patients with VO who underwent surgical intervention

Methods: From the Nationwide Inpatient Sample (NIS) database an estimated 228,044 patients were admitted for VO in the US between 1998 and 2013. Of these, 44,401 underwent surgical intervention. Data were extracted on patient demographics, comorbidities, inpatient mortality, length-of-stay (LOS), and inflation-adjusted hospitalization charges. Sub-analysis included comparisons of LOS, hospital charges, & mortality rate between operative & non-operative VO cases.

Results: Incidence of surgical intervention for VO patients increased from 0.6 per 100,000 admission in 1998 to 1.1 in 2013, and is estimated to reach to 1.4 in 2020 (R = 0.9). Majority of patients were white, male, had a mean age of 56 years, and 38% carried Medicare insurance. 22.6% of patients has at least 1 complication during the immediate perioperative time. The comorbidities that significantly increased inpatient mortality were congestive heart failure (CHF) (OR: 6.1), liver disease (OR: 2.9), & renal disease (OR: 1.9). The most common postoperative complications were anemia (6.7%), sepsis (5.6%), superficial infections (4.1%), instrumentation complications (2.8%), pulmonary insufficiency (1.6%), deep venous thrombosis (1.2%), & hematoma (1.1%). The most commonly performed procedures were 2-3 level fusion/instrumentation of lumbar spine, cervical spine, and 4-8 level fusion of thoracic spine. Factors that significantly increased LOS were thoracolumbar fusion (OR: 19.9), combined anterior/posterior fusions (OR: 7.5), vertebral resection (OR: 4.4), and fusion of >9 levels (OR: 3.7). Comorbidities that significantly increased LOS were CHF (OR: 8.3), renal disease (OR 8.3), hepatitis C (OR: 6.1), & history of drug abuse (OR: 3.2). Most common comorbidities that significantly increased total hospital costs were renal disease (OR: 7.4), liver disease (OR:2.2), CHF (OR: 2.1), psychological illness (OR: 1.6). Mean inflation adjusted total hospital costs increased from $20,355 per patient in 2001 to $39,991 in 2013.

Conclusion: VO is an understudied condition with a steady increase in its incidence in the US. It appears that the rate and the need for invasive procedures to salvage this condition is also increasing. We identified certain patient demographics and comorbidities to be associated with higher complications, mortality rate and overall costs. VO is associated with lengthy and expensive hospital stays resulting in a significant burden to patients and the healthcare system.

Disclosures:
INSTRUMENTED VS NON INSTRUMENTED ANTERIOR DECOMPRESSION IN TB SPINE: LONG TERM OUTCOME ANALYSIS
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Introduction: Treatment of tuberculosis of spine has modalities ranging from medical to surgical in form of pus drainage to decompression with instrumentation. Goals of surgery include radical debridement of the infective focus. When surgery causes spinal instability, the question arises whether the risk of recurrent infection outweighs the benefits of spinal instrumentation and stabilization. Instrumentation helps in preventing progression of kyphosis and helps in maintaining the achieved correction. With the time treatment of tuberculosis of spine changed from preventing mortality to preventing and treating morbidity and deformity. Method: Retrospective study, 93 patients, divided in two groups Group1: decompression without instrumentation 50 patients, Group2 decompression with instrumentation 43 patients. Average age was 40.80 years ranging from 14 to 72. Groups were age matched (mean 39.48 vs. 42.34), average number of vertebrae involved (2.6 vs. 2.13), severity of deformity (26.080 vs. 27.230) and type of auto grafts used. Most common region of spinal vertebrae involved was thoracic (D7-D8) in all the groups. Student T test is used. Average follow up was 30 months [18 to 42].

Result: In group 1, Postoperative local kyphosis correction was 9.80 [mean] and late loss of correction at last follow up was 9.10 [mean]. Local kyphosis correction at immediate postoperative period in group 2 was 18.120 [mean] and late loss of correction at last follow up has been 1.210. Late loss of correction in instrumented group was lesser [p value: <0.05] which is statistically significant. Correction of kyphosis at latest follow up is significantly more in group 2 as compare to group 1 (p <0.05). There is significant correction of kyphosis in group 2 as compare to group 1 (p <0.05). In group 1 we achieved 2.6% correction of kyphosis as compared to preoperative angle. In group 2 this correction was 62.76%. Concern to neurological recovery there is no significant difference between group 1 and group 2. There were no episodes of wound infection, development of new discharging sinuses and recurrence of the disease at the same or any other level in the spine in either of the 2 groups. Conclusion Progressive kyphotic deformity can lead to late onset of paraplegia and cardiopulmonary compromised state. Instrumentation will prevent kyphosis progression and its adverse effect.

Disclosures: author 1: not indicated; author 2: none; author 3: none; author 4: none
DEVELOPMENT OF AN EPIGENETIC IVD TEST FOR THE DIAGNOSIS AND PROGNOSIS OF ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS)


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Introduction

Adolescent idiopathic scoliosis (AIS) is a three-dimensional deformity of the spine in which the etiology is yet unknown. There is no clear explanation on how the disease will progress; and X-rays, considered as the gold standard for disease monitoring, has not prognostic value. The role of genetic factors involved in AIS is widely accepted but epigenetics may also contribute to AIS progression. In this context, miRNAs, epigenetic signaling molecules that contribute to bone morphogenesis and osteoclastogenesis can become new and useful biomarkers for the AIS diagnosis and prognosis.

Purpose of the study

We propose the development of an In vitro Diagnostic (IVD) test based on the detection of miRNAs signature as diagnostic/prognostic biomarkers of AIS.

Materials and Methods

The original project granted by EuroSpine was performed in the Hospital Universitario y Politécnico La Fe* (Valencia, Spain). Using NGS technology, we analyzed miRNAs isolated both from the plasma of AIS patients (aged 12 to 18 years) with a Cobb angle >10° (n = 17) and age matched healthy subjects (n = 10). To validate the miRNAs signature, we conducted RT-qPCR assays in 30 patients and 13 healthy adolescent subjects (validation cohort).

To develop the ScoliPro® prototype, we designed specific primers and Taqman probes for AIS-associated miRNAs measurement by RT-qPCR. Analytical sensitivity and specificity have been evaluated using synthetic miRNAs.

ScoliPro® IVD test is currently being evaluated in 50 AIS patients (kit validation cohort) recruited at Hospital La Fe (Valencia). Anthropometric variables, Cobb angle, Risser and miRNAs expression levels are being measured over 18 months in order to evaluate the ScoliPro® diagnostic/prognostic ability.

Results:

Circulating miRNAs from AIS patients showed differential expression patterns compared to controls. A specific biomarker signature composed by 4 miRNAs (miR-122, miR-27a, miR-223, and miR-1306) was identified. Moreover, a bioinformatics algorithm for early diagnosis and disease stratification was developed.

miRNA signature was protected by European Patent and EpiDisease S.L. obtained the technology license the development and commercialization of the test.

ScoliPro® kit has been manufactured with good analytical sensitivity and specificity. The technical file and the Clinical Evaluation Report to obtain the CE Mark are currently being prepared.

Conclusion

The involvement of miR-27a, miR-122, miR-223, and miR-1306 in the modulation of the genetic background of AIS patients provide a new tool to evaluate the progression and the phenotypic variability of AIS. Based on this miRNA signature we developed ScoliPro® test.

We are interested in performing a large-scale clinical trial in several hospitals across Europe to validate the potential prognostic value of our test in other countries.

Disclosures:

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CORRELATIONS OF PELVIC INCIDENCE-BASED RELATIVE RADIOGRAPHIC PARAMETERS TO LOWER EXTREMITY COMPENSATIONS

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Comprehensive Spine Center, Acibadem Maslak Hospital, Istanbul, Turkey; Acibadem Mehmet Ali Aydinlar University School of Medicine, Istanbul, Turkey; Department of Orthopedics and Traumatology, Acibadem Mehmet Ali Aydinlar University School of Medicine, Istanbul, Turkey; Department of Biostatistics, Ankara University Faculty of Medicine, Ankara, Turkey; Spine Surgery Unit, Hospital Universitario La Paz, Madrid, Spain; Spine Surgery Unit, Bordeaux University Hospital, Bordeaux, France; Spine Center Division, Department of Orthopedics and Neurosurgery, Schulthess Klinik, Zurich, Switzerland; Ankara ARTES Spine Center, Ankara, Turkey; Spine Surgery Unit, Hospital Vall d’Hebron, Barcelona, Spain; Vall D’Hebron Institute of Research, Barcelona, Spain

BACKGROUND: As a response to positive sagittal malalignment, the human body progressively recruits compensatory mechanisms in the spine and/or non-spinal segments (i.e lower extremities) in an effort to maintain the gravity line and a horizontal gaze. Whole-body radiographic assessment is hence suggested for quantifying lower extremity compensation. Yet, such imaging modalities are not widely available. Relation of Relative Pelvic Version (RPV), Relative Lumbar Lordosis (RLL) and Relative Spinopelvic Alignment (RSA) to previously defined lower extremity compensation angles were investigated.

PURPOSE: The aim of the study was to assess the correlation between relative radiographic parameters of the GAP Score with the lower extremity compensation angles.

MATERIAL-METHODS: Inclusion: Having radiographs that include at least mid-femur or mid-tibia; ≥4-level fusion. Pre and postoperative RPV (measured minus ideal sacral slope), RLL (measured minus ideal lumbar lordosis), RSA (measured minus ideal global tilt), femoral obliquity angle (FOA), knee flexion angle (KFA) and global sagittal angle (GSA) were measured. Preoperatively, relation of relative radiographic parameters to lower extremity compensation angles was assessed by Kruskal-Wallis tests. Correlations of changes in RPV, RLL and RSA, from preoperative to postoperative radiographs, to changes in FOA, KFA and GSA were assessed by Spearman's correlations.

RESULTS: 193 patients (knee available in 144) (156F, 37M, 58±17 years) with a mean f-up of 36 (24-67) months were included. Preoperatively, FOA, KFA and GSA were significantly different in categories of RPV, RLL and RSA (for all comparisons, p<0.01). Changes in RPV, RLL and RSA were significantly correlated to changes in FOA, KFA and GSA (rho range, 0.351-0.767) (for all comparisons, p<0.001).

CONCLUSIONS: PI-Based relative radiographic parameters significantly correlate to measurements reflecting lower extremity compensation. Preoperative to postoperative changes in PI-Based relative radiographic parameters of RPV, RLL and RSA, reflect into changes in measurements quantifying lower extremity compensations such as FOA, KFA and GSA. This information may be useful when whole-body imaging is not available. Setting surgical goals in the sagittal plane on the basis of the parameters reflected by the GAP score may result in spontaneous
resolution of lower extremity compensations.

Disclosures:
RELIABILITY AND VALIDITY OF SELF-REPORTED DISABILITY QUESTIONNAIRES IN LOW BACK PAIN POPULATION: A SYSTEMATIC REVIEW

Riaz Mohammed, Hainan Yu, Sarah Batley, Pierre Côté, Anne Taylor-Vaisey, Nadège Lemeunier
IFEC, UOIT-CMCC Centre for Disability Prevention and Rehabilitation, Toulouse, France

Background: Low back pain is a common health problem in the general population. It is the leading cause of disability in the world. Self-reported questionnaires are reported by the patient and do not require a physical examination by the practitioner. Pain and disability are the most commonly measured domains of these questionnaires. Systematic reviews looking at the reliability and validity of self-reported pain questionnaires in LBP patients are limited despite their widespread use in clinical practice.

Objective: The purpose of this systematic review was to determine both the reliability and validity of self-reported questionnaires used in the assessment of disability in adults with LBP aged 18 years or older.

Method: We systematically searched five databases from 2000 to 2018. We screened and critically appraised eligible studies using QAREL and QUADAS-2 instruments for reliability and validity studies, and AMSTAR-2 for systematic reviews. Low risk of bias articles were included.

Results: 10917 articles were captured and four were low risk of bias. Four questionnaires were studied: Functional Rating Index (FRI), Oswestry Disability Index (ODI), StrarT Back Screening Tool (SBT), and Absenteeism Screening Questionnaire (ASQ). The test re-test reliability is ICC=0.63 for FRI and 0.78 for ODI. Validity was reported in four phase II studies according to Sackett and Haynes. FRI is correlated with ODI and has the area under the curve as 0.93 using 8.4 as cut-off in measuring four-week changes. There is statistically significant difference in ODI scores between patients with or without sick-leave or treatment. SBT is associated with ODI and numerical pain scale. ASQ has sensitivity 92% and specificity 89% using 40% and 70% of total score as a cut-off, respectively.

Conclusions: There is limited evidence to support the clinical utility of disability questionnaires. More high quality studies (phase III validity studies) are needed.

Disclosures:
author 1: none; author 2: none; author 3: not indicated; author 4: none; author 5: none; author 6: employee: UOIT-CMCC Centre for Disability Prevention and Rehabilitation, Faculty of Health Sciences | University of Ontario Institute of Technology (UOIT), Canadian Memorial Chiropractic College; author 7: employee: IFEC
GREATER DISABILITY ASSOCIATED WITH PATIENTS’ UNREALISTIC EXPECTATIONS OF LUMBAR SURGERY COMPARED TO SURGEONS’ EXPECTATIONS

Carol A. Mancuso, Roland Duculan, Frank P Cammisa, Andrew A Sama, Alexander P. Hughes, Darren R Lebl, Federico P. Girardi
Department of Orthopedic Surgery, Hospital for Special Surgery, New York, NY, USA

Background: Agreement between patients and surgeons regarding expectations of lumbar surgery is a preop goal. Knowing what characteristics contribute to differences in expectations, particularly unrealistically high expectations, would help direct preop communication.

Purpose: To compare agreement within the patient-surgeon pair regarding expectations of surgery

Sample: 402 lumbar surgery patient-surgeon pairs

Outcome: HSS Lumbar Spine Surgery Expectations Survey

Methods: Patients of 5 spine surgeons completed the ODI and the valid 20-item Expectations Survey preop. The Survey asks how much improvement is expected for each item with response options of complete to no improvement; a total and four domain scores (personal activities, daily function, psychological well-being, and skeletal function) are generated (range 0-100, higher is greater expectations). Surgeons independently completed an identical Survey preop rating expected improvement for each item for each patient, yielding similar 0-100 total and domain scores. Agreement within the patient-surgeon pair was measured with the intraclass correlation coefficient (ICC) (range 0 (agreement no better than chance) to 1 (perfect agreement)). Differences between patients’ and surgeons’ scores were then assessed in multivariable models.

Results: Mean age was 55, 55% were men, and mean ODI was 53 (range 4-84). The mean total Survey score was 73±19 for patients, 57±16 for surgeons (p<.0001), and the ICC was .32 (ie fair agreement). 86% of patients had higher scores (ie greater expectations) than their surgeons. Greater expectations were not due to expecting more items, but rather to patients more often expecting complete improvement (eg for ≥15 items 34% vs 2%, p<.0001) whereas surgeons more often expected a lot/moderate improvement. The mean difference between patients’ and surgeons’ scores was 16.5. In multivariable analysis with this difference as the dependent variable, worse ODI score was the variable most closely associated with patients’ greater expectations (OR 2.5, CI 1.7-3.7, p<.0001). For domains scores, although ICC values varied (.67 personal activities, .09 daily function, .49 psychosocial well-being, .55 skeletal function), in multivariable analyses worse ODI score consistently was the variable most associated with patients’ greater expectations (p<.005 for each model).

Conclusions: There was fair agreement between patients and surgeons regarding expectations with patients having greater expectations, especially if they were more disabled. Although it seems logical that patients with the most disability would have the most to expect, the essential issue is whether such high expectations (ie complete improvement) are realistic; according to surgeons, a lot/moderate improvement is more appropriate. Thus preoperative discussions should not be centered on what items to expect, but instead should emphasize how much improvement to expect for each item.

Disclosures:
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Dissatisfaction after lumbar surgery associated with clinical variables and not patients’ and surgeons’ expectations

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Background: Results of lumbar surgery often are described with patient-reported global assessments (e.g., satisfaction) which are associated with expectations of surgery. Knowing what clinical variables are related to dissatisfaction could impact preop discussions with patients and decisions to operate.

Purpose: To determine which patient and surgeon variables were related to dissatisfaction 2 years postop

Sample: 401 lumbar surgery patient-surgeon pairs

Outcome: Global satisfaction

Methods: Preop patients completed valid clinical/psychosocial measures including the Expectations Survey rating amount of improvement expected for symptoms, function, and mental well-being (score 0-100, higher is greater expectations). Surgeons completed an identical Survey rating expected improvement for each item for each patient. A Surgical Invasiveness Index (SII) value was calculated from OR records (max 10 points/vertebral level); higher is greater complexity. Two years postop patients rated global outcome including satisfaction (very satisfied, satisfied, neither, dissatisfied, very dissatisfied) and how would they feel if their current symptoms were permanent (delighted, pleased, mostly satisfied, mixed, mostly dissatisfied, unhappy, terrible). At follow-up patients also reported any subsequent spine-related re-hospitalization. A patient-reported poor outcome was defined as any response of terrible, unhappy, or dissatisfied, and was the dependent variable in multivariable analyses with clinical variables/Expectations scores as independent variables.

Results: Mean age was 55, 55% were men, median SII value was 5 (range 1-50); mean follow-up was 2.1 years. 55 patients (14%) reported a poor outcome, 346 (86%) did not report a poor outcome. There were no differences between groups for most demographic/clinical variables or for Expectations scores (73 vs 73 by patient-report; 54 vs 57 by surgeon-report). Patients with poor outcome more often had prior spine surgery (p=.004), more depressive symptoms (p=.07), worse ODI (p=.09), more complex surgery (p=.06), and subsequent re-hospitalization (27% vs 9%, p<.0001). In multivariable analysis including only variables known preop, poor outcome was associated with more depressive symptoms (OR 1.1, CI 1.0-1.1, p=.02), prior surgery (OR 2.7, CI 1.4-5.0, p=.002), and more complex surgery (OR 1.1, CI 1.0-1.1, p=.02). When re-hospitalization was added to the model, all variables remained associated and re-hospitalization became the most impactful (OR 3.3, CI 1.6-6.8, p=.002).

Conclusions: It was fitting that patients’ and surgeons’ expectations did not predict poor outcomes otherwise surgery would not have occurred. Prior surgery, depressive symptoms and complex surgery affected patients’ assessment of outcome. Patient-reported poor outcome, however, was most strongly associated with spine-related re-hospitalization, emphasizing that averting or predicting additional spine care is a compelling challenge.

Disclosures:
author 1: grants/research support: US Agency for Healthcare Research and Quality; author 2: none; author 3: grants/research support: Spinal Kinetics, Inc.; Ivy Healthcare Capital Partners, LLC; ISPH II, LLC; NuVasive, Inc.; Mallinckrodt Pharmaceuticals; Centinel Spine, Inc. (fka Raymedica, LLC); Beatrice & Samuel A. Seaver Foundation; 4WEB Medical; Woven Orthopedic Technologies; Depuy Synthes;
DIFFERENCES BETWEEN POSTOPERATIVE NARCOTIC PRESCRIPTIONS IN OUTPATIENT LUMBAR SPINE SURGERY BETWEEN THE UNITED STATES AND FRANCE
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Introduction: The United States is currently undergoing a major opioid crisis that has recently started to decrease its population's life expectancy due to over-mortality of its young citizens by drug overdose. Among the listed causes, physician narcotic prescriptions for both acute and chronic medical conditions are often pointed out as the main culprit for this crisis. Purpose: We investigated the differences between discharge prescriptions following outpatient lumbar spine surgery between a French and a U.S spine surgery department.

Patient Sample: 100 age and sex-matched patients: 50 patients in the American center, 50 in the French center.

Outcome Measures: Amount of narcotics in MED (Morphine Equivalent Dose) in the discharge prescription. Number of postoperative visits to the emergency room for inadequate pain control.

Methods: Demographics, comorbidities, operative data, current prescriptions and discharge prescriptions were compared between the two groups. Narcotic consumption was converted in milligrams of morphine equivalent dose (mg MED).

Results: 25 American patients (50%) consumed narcotics preoperatively versus 4 French patients (8%). Only 22% of Americans were opioid naïve. Postoperatively, all French patients had a narcotic-free prescription while all American patients were prescribed a significant amount of narcotics (617.04mg ± 345.16mg MED). One American patient returned to the emergency department for inadequate pain control while none of the French did. French patients were never prescribed steroids but had systematic non-steroid inflammatory drugs while 41.4% of American patients were prescribed postoperative steroid tapers following a postoperative telephone call.

Conclusions: For identical surgeries, All American patients were prescribed postoperative narcotics while none of the French were. Cultural beliefs from both patients, physicians and the industry probably represent the most significant barrier against the implementation of a narcotic-free culture in our practice. Reducing narcotic prescriptions in our practice is not only feasible but also highly desirable.

Disclosures:
CERVICAL BONE MINERAL DENSITY MEASURED BY QCT IN PATIENTS UNDERGOING ANTERIOR CERVICAL SPINE SURGERY
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BACKGROUND/INTRODUCTION:
Surgery to the anterior column of the cervical spine is commonly performed for a variety of spinal pathologies. Clinically, the association between bone mineral density (BMD) and surgical instrumentation performance is well recognized. Although several studies quantified the BMD of the human lumbar spine, comprehensive BMD data for the cervical spine is limited. The few available studies mainly included young and healthy patient samples, which are contrary to the typical cervical fusion patient. Currently no large scale study provides detailed BMD information of the cervical and first thoracic vertebrae in patients undergoing anterior cervical spine surgery.

PURPOSE OF THE STUDY:
The objective of this study was to determine the BMD of the cervical and the first thoracic vertebrae in patients undergoing anterior cervical discectomy and fusion (ACDF).

MATERIALS AND METHODS:
Patients that underwent ACDF from 2015 to 2018 at a single, academic institution were included in this study. Subjects with previous cervical instrumentation or missing/incomplete preoperative cervical spine CT imaging were excluded. Asynchronous quantitative computed tomography (QCT) measurements of the lateral masses of C1 and the C2-T1 vertebral bodies were performed. For this purpose, an elliptical region of interest (ROI) that consisted exclusively of trabecular bone was selected. Any apparent sclerotic levels that might affect trabecular QCT measurements were excluded from the final analysis. Pairwise comparison of BMD was performed and correlations between the various cervical levels were evaluated. The statistical significance level was set at p<0.05.

RESULTS:
194 patients (men, 62.9%) met inclusion criteria. The patient population was 91.2% Caucasian with a mean age of 55.9 years and mean BMI of 28.2 kg/m2. The trabecular BMD was highest in the mid-cervical spine (C4) and decreased in the caudal direction (C1 = 253.3 mg/cm3, C2 = 276.6 mg/cm3, C3 = 272.2 mg/cm3, C4 = 283.5 mg/cm3, C5 = 265.1 mg/cm3, C6 = 235.3 mg/cm3, C7 = 216.8 mg/cm3, T1 = 184.4 mg/cm3) (Figure 1). The BMD of C7 and T1 was significantly less than those of all other levels. Nonetheless, significant correlations in BMD among all measured levels were observed, with a Pearson’s correlation coefficient ranging from 0.507 to 0.885.

CONCLUSIONS:
To the authors’ knowledge this is currently the largest study assessing cervical BMD by QCT. The patient sample consisted of patients undergoing ACDF, which clearly adds to the clinical relevance of the findings. Knowledge of BMD variation in the cervical spine might be useful to surgeons utilizing anterior cervical spine plate and screw systems. Due to the significant variation in cervical BMD, procedures involving instrumentation at caudal levels might possibly benefit from a modification in instrumentation or surgical technique to achieve results similar to more cephalad levels.
Disclosures:
USE OF HOUNSFIELD UNITS OF S1 BODY TO DIAGNOSE OSTEOPOROSIS IN PATIENTS WITH LUMBAR DEGENERATIVE DISEASES

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Object: To evaluate the performance of using Hounsfield unit (HU) of S1 body to diagnose osteoporosis in patients with lumbar degenerative diseases.

Methods: A total of 316 patients aged ≥ 50 years requiring surgery for lumbar degenerative diseases were reviewed. The bone mineral density (BMD) of S1 body and L1 was measured in HU with preoperative lumbar computed tomography (CT). Circular regions of interest (ROI) were placed on middle-axial and middle-sagittal images of S1 body. Dual energy x-ray absorptiometry (DXA) and the criterion of L1 ≤ 110HU were used to diagnose osteoporosis. The area under the receiver operator characteristic curve (AUC) was calculated to assess the performance of using HU of S1 body to diagnose osteoporosis.

Results: The inter-observer and intra-observer reliability of measuring HU of S1 body was excellent with ICCs over 0.8 (p<0.001). The correlation between HU of S1 body and average T-score of L1-4 was significant with Pearson correlation coefficients ≥ 0.60 (p<0.001). The AUCs of using HU of S1 body to diagnose osteoporosis were 0.86 and 0.88 for axial HU and sagittal HU, respectively (p<0.001). The HU thresholds with balanced sensitivity and specificity for diagnosing osteoporosis were ≤ 202HU for axial HU (sensitivity:76%; specificity: 76%) and ≤ 185HU for sagittal HU (sensitivity:80%; specificity: 80%).

Conclusions: Both sagittal and axial HU of S1 body are useful tools for assessing BMD and diagnosing osteoporosis. Measuring HU of S1 body preoperatively from routine lumbar CT may help with surgical planning for patients with lumbar degenerative diseases.

Disclosures:
author 1: none; author 2: none
EOS, O-ARM AND STANDARD SPINE RADIOGRAPHS; WHAT IS THE CUMULATIVE RADIATION EXPOSURE DURING CURRENT SCOLIOSIS MANAGEMENT?

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Background/Introduction

During the course of assessment and treatment for AIS, patients are subjected to repeated radiological exposure. Only a few studies have evaluated the total absorbed radiation dose from standard radiography and EOS during follow-up for scoliosis. To the best of our knowledge, this is the first study to evaluate and compare total radiation dose exposure from all modalities for a cohort of AIS patients.

Purpose of the study

The primary aim of this study was to determine the radiation exposure of AIS patients during scoliosis management. Moreover, this study aimed to compare follow-up algorithms among international spine centers.

Materials and methods

A retrospective review on radiation exposure of patients treated for AIS. Inclusions: patients followed for AIS from 2013-2016 without neuromuscular diseases. The O-arm cone-beam CT scanner was used for 3D navigation in all surgically managed patients, low dose protocols were used (70kVp, 80mAs). A survey asking for information on radiological algorithms and imaging frequencies was sent to a number of international spine centers for comparison with in-house algorithm.

Results

61 patients were included, 19 were treated conservatively (M/F: 6/13) and 42 surgically (M/F: 11/31). Median follow up time for the conservative group was 8 (range 0-51) months and 37 (range 13-163) months for the surgical group. Median number of X-rays/EOS were; 2 (range 0-20)/2 (range 0-17) for the conservative group and 15 (range 2-57)/11 (range 0-26) for the surgery group. Patients undergoing surgery received a median cumulative radiation dose of 10.31mSv (range 3.79-20.43) vs. a median dose of 1.09mSv (range 0.22-7.17) for those treated conservatively. Approximately 25% (39.04/161.82mSv) of total intraoperative radiation dose for all patients was a result of O-arm 2D fluoroscopy. A mean of 11 levels of the spine were fused during correction surgeries. Median Cobb angle at the beginning/end of follow up were 19°(range 10°-50°)/ 23° (range 12°-65°) for the conservative group and 44° (range 10°-80°)/ 15° (range 4°-30°) for the surgery group. Median Cobb angle before the surgery was 52° (range 36°-82°). The results of the questionnaire showed great variety of radiological follow-up algorithms among 8 spine centers without adherence to any of the published consensus statements.

Conclusion

Surgically treated patients were, as anticipated, exposed to more, radiation dose than those treated conservatively, almost 10-fold more, owing mainly to intraoperative 3D scans and a larger numbers of radiological follow-up examinations. The use of cone-beam CT-based 3D navigation elevates patient safety during deformity surgery. However, patients are potentially exposed to a significant amount of radiation depending on protocol and use of 2D fluoroscopy. Further awareness of ways to reduce radiation dose and optimize radiological protocols is warranted in order to decrease radiation-induced malignancy.
A NOVEL AND REPRODUCIBLE CLASSIFICATION OF THE VERTEBRAL ARTERY IN THE SUBAXIAL CERVICAL SPINE

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Department of Orthopaedic Surgery, Hospital for Special Surgery, New York City, NY, USA

Background: An injury of the vertebral artery (VA) is one of the most catastrophic complications in the setting of cervical spine surgery. Anatomic variations of the VA can increase the risk of iatrogenic lacerations.

Objective: To propose a novel and reproducible classification system that describes the position of the VA based on a two-dimensional map on computed tomography angiographs (CTA).

Methods: This cross-sectional retrospective study reviewed 248 consecutive CTAs of the cervical spine at a single academic institution between 2007 and 2018. The classification consists of a number that characterizes the location of the VA from the medio-lateral (ML) aspect of the vertebral body and a letter that describes the VA location from the anterior-posterior (AP) aspect. The reliability and reproducibility was assessed by two independent raters on 200 vertebral arteries.

Results: The inter- and intra-rater reliability values showed the classification’s reproducibility. The inter-rater reliability weighted $\kappa$-value for the ML aspect was 0.93 (95% CI: 0.93-0.93). The unweighted $\kappa$-value was 0.93 (95% CI: 0.86-1.00) for at-risk” positions (ML grade $\geq$ 1), and 0.87 (95% CI: 0.75-1.00) for high-risk” positions (ML grade $\geq$ 2). The weighted $\kappa$-value for the intra-rater reliability was 0.94 (95% CI: 0.95-0.95). The unweighted $\kappa$-values for the intra-rater reliability were 0.95 (95% CI: 0.91-0.99) for at-risk” positions, and 0.87 (95% CI: 0.78-0.96) for high-risk” positions.

Conclusion: The proposed classification is reliable, reproducible, and independent of individual anatomic size variations. The use of this novel grading system could improve the understanding and interdisciplinary communication about vertebral artery anomalies.
A NOVEL PREOPERATIVE TRAJECTORY EVALUATION METHOD FOR L5-S1 TRANSFORAMINAL PERCUTANEOUS ENDOSCOPIC LUMBAR DISCECTOMY BY MRI OR CT

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Introduction: L5-S1 transforaminal PELD is a demanding procedure due to structures like iliac crest, L5 transverse process, hypertrophic L5-S1 facet joint, and sacral ala. There has been no definite preoperative evaluation method to evaluate the surgical validity of L5-S1 transforaminal PELD. Authors report a new preoperative trajectory evaluation method for L5-S1 transforaminal PELD using magnetic resonance imaging (MRI) or computed tomography (CT) examinations.

Methods: Twelve patients who were diagnosed L5-S1 disc herniation were preoperatively evaluated with this new method. Skin marker is attached to patient’s back as a tentative skin entry point which was determined by usual preoperative MRI or CT. A new tilted axial and coronal MRI or CT scan is performed according to axis of L5S1 transforaminal working channel. These images will show good relationship between working channel and iliac crest. With this tilted MRI/CT, surgeon can decide exact skin entry point.

Results: Six patients were decided to undergo a transforaminal PELD and results were successful. The other six patients were considered to be unsuitable for transforaminal PELD because of the probable blockade by iliac crest.

Conclusion: A new preoperative trajectory evaluation method for L5S1 transforaminal PELD is simple technique to determine whether iliac crest blocks working channel pathway. The tilted MRI or CT can provide precise evaluation for L5S1 transforaminal PELD trajectory and may achieve good outcome.

Disclosures:
author 1: none; author 2: not indicated
EXAMINING HOW SELF-PERCEIVED PARTICIPATION TO SOCIETY AND AUTONOMY DIFFERS AMONG ADULTS WITH SPINAL DEFORMITY RECEIVING SURGICAL OR NON-SURGICAL MANAGEMENT

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Background/ introduction
Clinical decision making in ASD care is complex. The World Health Organization (WHO) calls for an assessment of patients with chronic disorders as ASD using the International Classification of Function, Disability and Health (ICF). Therefore this study introduces Self-perceived participation to society and autonomy (SSP) as a tool to quantify disability to support clinical decision-making in ASD care.

SSP can be quantified using the Impact on Participation and Autonomy Questionnaire (IPA); constituting 5 domains: autonomy indoors, family role, autonomy outdoors, social relations, work and education.

ASD patients with more SSP limitations are more likely receiving surgery as a result of decision-making based on radiographic parameters and Health-related Quality of Life measures, compared to ASD patients with less limitations. IPA might be a supporting tool during the ASD clinical decision-making process.

Purpose of the study
Adult Patients with Spinal Deformity experiencing more limitations in their self-perceived participation to society and autonomy are more likely receiving surgery compared to ASD patients with less limitations.

Materials and Methods
Following informed consent, 56 ASD patients were recruited at the outpatient clinic and grouped depending on the type of ASD care required (group 1-non-surgical care; group 2-planned for surgery) in this cross-sectional cohort study. Demographics, Scoliosis Research Society-22r score (SRS-22r) and IPA were recorded for every patient (table 1).

Non-parametric tests were used to statistically compare both groups. Area Under the Receiver Operating Characteristic (AUC-ROC)-analysis was used to determine the discriminative power of IPA to detect ASD patients that are more likely to receive surgical ASD care. Cutoff values for IPA were chosen by selecting the score which maximizes sensitivity and specificity. Using this cutoff value the total IPA scores were dichotomized in a positive (above cut-off value=worser SPP) and negative way (below cutoff value=less limited SPP), to allow calculating the odds ratio (OR) to be offered surgical care within the same patient cohort in case of IPA scores below the defined cutoff.

Results
The SPP, quantified by IPA and the SRS-22r is worse in ASD patients scheduled for surgical ASD care compared to non-surgical patients (p<0.001). IPA has moderate power to discriminate between both groups (AUC-IPA=0.81) with a cut off value for the total score of IPA equal to 38. Patients with a total IPA> 38 are more likely (OR=7.5±2.14) receiving surgical ASD care than ASD patients with a total IPA ≤ 38.

Conclusion
ASD patients with limited SPP (IPA score > 38), are more often scheduled for ASD surgery. Quantitative assessment of the level of participation to society and autonomy in ASD patients can
enhance clinical decision making in future ASD care, in line with the WHO’s ICF model.

<table>
<thead>
<tr>
<th>Gender (F/M)</th>
<th>Group 1 (n=36)</th>
<th>Group 2 (n=20)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>60.91</td>
<td>57.24</td>
<td>0.64</td>
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<tr>
<td>BMI</td>
<td>24.47</td>
<td>25.58</td>
<td>0.55</td>
</tr>
<tr>
<td>SRS-22r</td>
<td>3.38</td>
<td>2.49</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total IPA</td>
<td>27.94</td>
<td>54.80</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Autonomy indoors</td>
<td>0.46</td>
<td>1.19</td>
<td>0.001</td>
</tr>
<tr>
<td>Family role</td>
<td>1.18</td>
<td>2.23</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Autonomy outdoors</td>
<td>1.25</td>
<td>2.32</td>
<td>0.001</td>
</tr>
<tr>
<td>Social relationships</td>
<td>0.74</td>
<td>1.44</td>
<td>0.008</td>
</tr>
<tr>
<td>Work and education</td>
<td>1.42</td>
<td>2.88</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Table 1. Demographics, SRS-22r and IPA scores (significance level p<0.005).

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