SEPTEMBER/OCTOBER 2007
VOLUME 7, NUMBER 5S

ELSEVIER

SUPPLEMENT TO

THE SPINE JOURNAL

A Multidisciplinary Journal of Spinal Disorders

Proceedings of the 22nd Annual Meeting of the North American Spine Society

Austin, Texas
October 23–27, 2007

OFFICIAL JOURNAL OF THE
NORTH AMERICAN SPINE SOCIETY

The Spine Journal is indexed in *Index Medicus*

ISSN 1529-9430

of HRQL include: SRS-22 and SF-12. Spearman's Rank Order Correlation was used to determine relationships between individual radiographic parameters and HRQL. Patients were then grouped into dichotomous deformity patterns including: High(III-V)/Low grade (I-II) by Meyerding Grade, kyphotic or lordotic at L5-S1, and high (>30 degrees) and low (<30 degrees) pelvic tilt. Dichotomous variables were analyzed using Student's t-test.

RESULTS: 37 adults (age 18-68) with spondylolisthesis had complete radiographic and clinical data. There is a moderate correlation between C7 sagittal balance and appearance (r=0.7), and activity (r=0.6) on the SRS-22 instrument. All other radiographic parameters had a low independent correlation with HRQL. Grouping patients by lordotic or kyphotic slip angle at L5-S1, adults with a neutral or kyphotic angle at L5-S1 had significantly more pain (p=0.01), functional limitations (p=0.02), and mental health compromise (p=0.01) than patients with a lordotic slip angle. Adults with a high pelvic tilt had significantly worse scores for appearance (0.05), pain (p=0.00), function (p=0.02), and physical component summary (0.05). Adults with a high grade olisthesis (III,IV) had more limitations in physical role (p=0.04) and mental health (p=0.02) that those with a low grade olisthesis.

CONCLUSIONS: Surgical strategies for the management of high-grade spondylolisthesis remain variable. Reduction of high-grade spondylolisthesis may restore lumbosacral and lumbopelvic alignment to the range of normal. The value of deformity reduction on improving outcomes has not been demonstrated. This study demonstrates that global sagittal balance is the only individual radiographic parameter with a moderate correlation with health status. Grouping patients into deformity patterns, segmental kyphosis at L5-S1, olisthesis greater that grade III, and pelvic tilt less than 30 degrees are significantly associated with a measurable compromise of health status. This data may support the role of deformity reduction in the management of spondylolisthesis in the adult.

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

doi: 10.1016/j.spinee.2007.07.093

Thursday, October 25, 2007
4:15–5:03 PM
Concurrent Session 2: Diagnostics

78. Reference Data for Interpreting Interspinous Process Widening in Flexion/Extension X-rays Of The Cervical Spine

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BACKGROUND CONTEXT: Lateral flexion and extension radiographs of the cervical spine are commonly used to evaluate injuries or disease that may not be apparent on static unstressed films. Computer assisted imaging techniques are now commonly used in the analysis of cervical motion, and reference data for interpreting intervertebral rotations and translations have been published. However, there are currently no clinically validated criteria for assessing interspinous process widening in flexion-extension studies of the cervical spine.

PURPOSE: The purpose of this study is to document normal interspinous widening, in a cohort of asymptomatic adults, using previously validated tracking software.

STUDY DESIGN/SETTING: Prospective cervical flexion and extension radiographs were taken, the images tracked, and interspinous widening calculated for each cervical level.

PATIENT SAMPLE: 156 skeletally mature subjects were recruited to participate in the study. Patients were not recruited if they reported prior neck pain which necessitated a visit to a physician.

OUTCOME MEASURES: Cervical interspinous widening was defined by the distance between spinous process tips in full flexion minus their distance in full extension, divided by the width of the superior endplate of the C4 vertebra.

METHODS: Each full flexion and extension was captured with an all digital fluoroscopic imaging system (KIMAX, Medical Metrics, Inc, Houston, TX). The tracking and stabilization software (QMA, Medical Metrics) allows the specified vertebrae to be superimposed in flexion and extension. It thus permits easy visualization of motion between vertebrae. The software was then able to report the distance between spinous process tips in flexion and extension. This technique has been validated to measure intervertebral rotational motion with errors less then 0.5 deg and intervertebral translational motion with errors less then 0.5 mm.

RESULTS: Of the 156 asymptomatic subject entered into the study, 7 had images that could not be tracked, and not all levels could be analyzed due to problems visualizing the anatomy. The remaining 149 subjects provided 865 cervical levels for analysis. The mean, stdev, and the lower and upper limits of the 95% confidence interval for each cervical level are provided in Table #1. The lower cervical spine contributed the most to motion. A comparison of the motion at any given level to it's adjacent levels shows maximally 50% more motion then its neighbor (Figure #1).

CONCLUSIONS: This data supports the general rule that interspinous widening by greater then 50% of the adjacent levels represents an abnormal finding and should raise clinical concern for disease or injury.

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

Level	Mean	StdDev	N	LL 95% CI	UL 95% CI
C1C2	29.71	16.83	140	-3.27	62.70
C2C3	34.18	13.45	149	7.82	60.54
C3C4	54.50	18.01	148	19.19	89.81
C4C5	62.27	20.57	146	21.96	102.59
C5C6	60.06	26.41	145	8.30	111.81
C6C7	53.72	27.43	137	-0.04	107.47

Table 1. Summary of Data

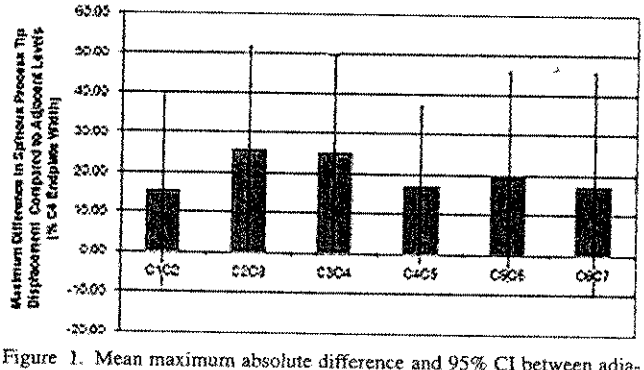

Figure 1. Mean maximum absolute difference and 95% CI between adjacent levels in spinous process tip displacement.

doi: 10.1016/j.spinee.2007.07.095

79. The Effect of Lumbar Flexion and Extension on the Central Canal with Dynamic MRI

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BACKGROUND CONTEXT: Lumbar central canal stenosis is defined as the reduction in the diameter of the spinal central canal, which causes

neurogenic claudication and radicular leg pain. Previous myelography and in vitro study of cadaveric specimens showed that extension of the spine caused protrusion of the intervertebral disc, bulging of the ligamenta flava and spondylolisthesis, resulting in a narrowing of the canal. However, few noninvasive studies exist to show these results. Dynamic MRI studies can show with high precision the amount of change of the diameter of the spinal canal with flexion and extension of the spine.

PURPOSE: The purpose of this study was to define the diameter changes of the spinal canal at each level of the lumbar spine with dynamic MRI studies, to document the amount of change, and to see how progressive degeneration of the disc at the functional spinal unit will affect these values.

STUDY DESIGN/SETTING: This was a retrospective study on patients who presented with low back pain and were examed by dynamic MRI to determine the effect of lumbar flexion and extension on spinal canal.

PATIENT SAMPLE: Lumbar MR images for 461 patients, including 192 male and 169 female, (15–85 years of age), with lower back pain, were obtained.

OUTCOME MEASURES: All radiological data on MRI was recorded on computer based measurement from MRI taken by flexion, neutral and extension.

METHODS: All patients were examed in sitting flexion 40 degree, upright, and extension 10 degree within a 0.5 T dynamic MRI scanner. Quantitative measurements of canal diameter in the saggital midline in disc level were obtained for each position. Degeneration was graded according to the signal of the discs in T2 weighted images. Change ratios of the canal diameter from neutral position to flexion or extension were calculated to reflect the extent of change relative to the grade of degeneration.

RESULTS: Statistically significant differences in canal diameter were obtained between neutral and flexion position and between neutral and extension position for L2-3 to L5-S1 levels. Results showed that flexion increased the canal diameter and extension decreased the canal diameter. Change ratio of L4-5 was greatest in both flexion and extension. In flexion, the change ratio positively correlated with the degree of degeneration in L2-3 to L5-S1. In extension, the change ratio negatively correlated with the degree of degeneration in L3-4 only.

CONCLUSIONS: Dynamic MRI can demonstrate spinal canal diameter change in lumbar flexion and extension and also show the amount of change in the cross-sectional area with the highest accuracy. The spinal canal is widest in flexion and narrowest in extension. The relief of spinal stenosis in flexion is greater when the degree of degeneration is more severe. Furthermore, the less amount of degeneration, the greater the change in extension of the canal diameter. This study is the first to fully define the amount of diameter change of the spinal canal with flexion and extension of the spine, quantify the change at each level, and demonstrate how these values change with the increasing amount of degenerative grade of the disc at the functional motion segment.

FDA DEVICE/DRUG STATUS: Dynamic MRI: Approved for this indication.

doi: 10.1016/j.spinee.2007.07.096

80. Positional MRI: A Valuable Tool in the Assessment of Cervical Disc Bulge

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BACKGROUND CONTEXT: Positional MRI (pMRI) has recently been proposed as an alternative to conventional MRI techniques. pMRI offers the advantage of assessing cervical spine pathology in the neutral, flexion, and extension positions. pMRI also allows examination of the cervical spine in a more physiologic, weight-bearing position as compared to traditional supine MRI imaging. A recent review of the literature demonstrated no studies to-date that have investigated the amount of cervical disc bulge in the neutral, flexion, and extension positions.

PURPOSE: The purpose of this study was to determine if adding flexion and extension MRI data to traditional neutral views would be beneficial in the evaluation of cervical disc bulges.

STUDY DESIGN/SETTING: Patients with radicular cervical spine signs and symptoms underwent pMRI in neutral, flexion, and extension. The images were analyzed using novel computer measurement technology to objectively quantify the amount of disc bulge.

PATIENT SAMPLE: One hundred sixty-three patients with radicular cervical spine symptoms were included in the study. This represented 978 cervical discs in total. There were 69 males and 94 females. The mean age was 44.1 years (range 19–93).

OUTCOME MEASURES: Disc bulge was measured as the amount of extension of the disc beyond the intervertebral space. Discs with less than 2.0 mm disc bulge in the neutral position were selected and compared with their respective flexion and extension data.

METHODS: Disc bulge was measured using MRI Analyzer™ Version 3 (Truemetric Corporation: Bellflower, CA) anatomic software to objectively quantify the amount of disc bulge in millimeters. The statistical significance was calculated using the chi-square test.

RESULTS: The mean disc bulge was 1.96 mm in neutral, 1.86 mm in flexion, and 1.93 mm in extension (n=978 discs). For discs with less than 2.0 mm disc bulge in neutral (n=539 discs), the results were as follows: 18.18% 2.0 mm bulge in flexion and 23.75% 2.0 mm bulge in extension (p=0.025). In addition, 2.41% 3.0 mm bulge in flexion and 3.34% 3.0 mm bulge in extension (p=0.36). Using 2.0 mm of disc bulge as a cut-off value, the false negative ratio for the neutral position alone compared to flexion and extension was 25.08%.

CONCLUSIONS: A significant increase in the degree of cervical disc bulge was found by examining flexion and extension views as compared to neutral views alone. This study also suggests that extension MRI views yield a higher detection rate of missed cervical disc bulges than flexion views. Flexion and extension MRI views provide valuable, added information when assessing patients for cervical disc bulge. This data suggests that positional MRI might be especially beneficial in patients with symptomatic radiculopathy and unimpressive static MRI studies.

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

doi: 10.1016/j.spinee.2007.07.097

81. FAD versus Provocative Discography: Comparative Results and Postoperative Clinical Outcomes

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BACKGROUND CONTEXT: To address problems with the diagnosis of discogenic low back pain, we have designed a new test, the Functional Anaesthetic Discogram. This test involves the performance of a standard provocative discogram, followed by the placement of a catheter into the putative disc(s) found to be concordantly painful on injection. The patient then assumes a position that would ordinarily cause him or her pain. Anaesthetic is then delivered into the disc, and pain relief in that position is recorded.

PURPOSE: We performed this study to determine the results of the Functional Anaesthetic Discogram in 31 patients with chronic low back pain, and to compare these with the results of standard provocative discography in this group of patients.

STUDY DESIGN/SETTING: This study was an IRB- approved, prospective clinical trial of a novel technique performed in a university practice.

PATIENT SAMPLE: 41 patients (21F, 20M) with chronic low back pain referred on for surgical consultation.

OUTCOME MEASURES: Pre-study VAS, Oswestry, and DRAM scales were recorded; during the test, VAS scales, pain concordancy, and pressurization data were recorded. Post-operative VAS and Oswestry scores along

nonsmokers. There was a strong trend toward lower fusion rates at six months for multilevel vs. single-level patients (64.5% versus 84.0%), but this difference did not quite reach statistical significance (P=0.0623).
CONCLUSIONS: In this study, the only statistically significant factor correlating with nonunion following ACDF with allograft and cervical plating was age. Although there was a strong trend toward lower fusion rates for multilevel cases at six months postoperatively, this difference did not reach statistical significance. Smoking did not appear to be a significant risk factor for nonunion.
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

doi: 10.1016/j.spinee.2007.07.130

110. Prospective Study of Serum Metal Ion Levels in Patients with Stainless Steel Metal-on-metal Cervical Disc Replacements

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BACKGROUND CONTEXT: Total disc replacement is a recent alternative treatment for degenerative disc disease. Corrosion of metallic wear particles can lead to increased metal ion release in the body.
PURPOSE: We measured the serum chromium (Cr) and nickel (Ni) levels in patients who were implanted with stainless steel metal-on-metal cervical disc replacement devicess.
STUDY DESIGN/SETTING: Prospective study of serum levels in patients implanted with the PRESTIGE™ Cervical Disc.
PATIENT SAMPLE: In this prospective study, 25 patients with degenerative disc disease were treated with disc replacement using an artificial cervical disc containing a metal-on-metal, 316L stainless steel (ASTM F138; 18% Cr, 14% Ni) ball-in-trough articulation.
OUTCOME MEASURES: Serum was assayed for Cr and Ni using a high-resolution inductively-coupled plasma-mass spectrometry (Element, Finnigan MAT, Bremen, Germany). The detection limits were 0.015 ng/mL for Cr and 0.17 ng/mL for Ni. Values below the detection limits were assigned a value of half the detection limit. Longitudinal statistical comparisons were made using the Friedman test.
METHODS: Serum samples were collected preoperatively (n=25 patients) and at three (n=25) and at six (n=17) months postoperatively.
RESULTS: The median Cr levels were 0.074 ng/mL at pre-op, 0.11 ng/mL at three months and 0.12 ng/mL at six months. The difference was statistically significant ($p<0.01$) between serum Cr levels at both three and six-month time periods compared with pre-op levels. The median Ni levels were 0.085, 0.18, and 0.21 ng/mL at pre-op, three months, and six months, respectively. The difference was statistically significant ($p=0.035$) only between six-month and pre-op levels. Generally, the values for Ni were quite low with many samples having levels below the detection limit. It is interesting to note that the median serum Cr values were an order of magnitude lower than values seen in a group of cobalt-alloy (ASTM F75; 30% Cr) metal-on-metal hip surface replacements and total hip replacements at comparable time intervals [1]. Additionally, the serum Ni and Cr levels were an order of magnitude lower than those reported for posterior spinal arthrodesis with stainless steel instrumentation at comparable time intervals [2].
CONCLUSIONS: Short-term metal levels were an order of magnitude lower than those observed at similar time points in stainless steel posterior spinal instrumentation and cobalt-alloy metal-on-metal hips.
FDA DEVICE/DRUG STATUS: PRESTIGE™ Cervical Disc: Investigational/ Not approved.

doi: 10.1016/j.spinee.2007.07.131

111. Kinematic Analysis of Relationship Between the Grade of Disc Degeneration and the Motion Unit in Cervical Spine

Masashi Miyazaki, MD[1], Soon Woo Hong, MD[1], Seung Hwan Yoon, MD[1], Jun Zou, MD[1], Benjamin Tow, MD[1], Ahmet Alanay, MD[1], J.J. Abitbol, MD, FACS[1], Jeffrey C. Wang, MD[1]; [1]University of California, Los Angeles, Los Angeles, CA, USA

BACKGROUND CONTEXT: Many people suffer from cervical degenerative disease. The degree of degeneration of cervical spine has not been compared with the extent of cervical spine mobility. The effect of degeneration of the disc on the overall motion of the functional spinal unit is also not defined. Dynamic Motion MRI studies can demonstrate the mobility of each motion segment and define where the motion of the spine occurs, and it can relate it to the grade of degeneration.
PURPOSE: To define the relationship between the grade of disc degeneration and the motion unit in cervical spine and to elucidate how the role of each cervical spine unit for flexion-extension motion changes with degeneration with dynamic MRI.
STUDY DESIGN/SETTING: Prospective patients with neck pain were enrolled and obtained a dynamic flexion/extension MRI of the cervical spine.
PATIENT SAMPLE: 168 patients were permitted to enroll our study with symptomatic neck pain with/ without radiculopathy or myelopathy.
OUTCOME MEASURES: All radiological data on MRI was recorded on computer based measurement from MRI taken by flexion, neutral and extension.
METHODS: MRI analyzer in true MRI which included 76 point marked in each image were undergone automatically all measurements and calculations with regard to translational motion and angular variation on each segment. According to grading system on the basis of the literature, two observers analyzing MRIs graded 5 (grade I to V) in each of intervertebral disc on the T2-weighted sagittal images.
RESULTS: On the each cervical unit, compare to more normal discs with Grade I and II mild degeneration, translational motion and angular variation increased for segments with discs with higher degenerative grades (Grade III and IV). However, the authors observed that the translational motion and angular variation of the segments decreased significantly in severe Grade V degeneration. For the Grade I and II segments, C4/5 and C5/6 units contributed the majority of the total angular mobility of the spine. For Grade III and IV degeneration, the segments of C3/4 and C6/7 units increased as well as C4/5 and C5/6 units. In Grade V, the roles of C4/5 and C5/6 units for total angular mobility decreased.
CONCLUSIONS: Following degeneration, the changes of translational motion and angular variation were observed. Namely, the authors demonstrated the changes that occur with progressive degeneration. The angular motion and translation moves from normal disc (Grade I and II) to a more unstable phase (Grade III and IV) to a more ankylosed stage with more stability (Grade V). We also demonstrate the contribution of different levels to overall motion that occurs with degeneration.
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

doi: 10.1016/j.spinee.2007.07.132

112. Does Bilateral Foraminotomy Eliminate C5 Palsy after Open-door Cervical Laminoplasty?

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BACKGROUND CONTEXT: C5 palsy is a well-recognized complication known to occur after cervical laminoplasty. Incidence of C5 palsy after laminoplasty without concomitant nerve root decompression has been reported to be between 5 to 17%. While bilateral C4-5 foraminotomy performed at the time of laminoplasty has been proposed to prevent such complication, there is little data published to validate its success among North American patients.

PURPOSE: The purpose of this study was to compare the safety and accuaracy of pedicle screw placement in the thoracic spine using the free-hand anatomic technique with and without the knowledge of pre-op CT scan parameters.
STUDY DESIGN/SETTING: This study is a retrospective, randomized radiographic review of 22 patients.
PATIENT SAMPLE: 22 patients undergoing spinal deformity surgery were randomized into two groups. The average age was 14.6 years (10–18 years). All of the patients had idiopathic scoliosis, except one who had Schuermann's Kyphosis.
OUTCOME MEASURES: Post-operative CT scans were obtained and used to assess pedicle screw placement. Pedicle screw cortical perforation was evaluated and described as projecting medially into the lateral recess, anteriorly or antero-laterally without evidence of soft tissue impingement, and into the costovertebral junction.
METHODS: 22 patients undergoing spine deformity surgery were randomized into two groups. Group A patients either did not undergo pre-operative CT scan or the operative surgeon was blinded to CT. Group B patients had pre-op CT scans, the parameters of which the surgeon was made aware. Post-operative CT scans were obtained in all of these patients and used to evaluate screw placement.
RESULTS: The average age was 14.6 years (10–18 years). All of the patients had idiopathic scoliosis, except one in Group B who had Schuermann's Kyphosis. The average Cobb angle was 50.3 (40–77 degrees). A total of 369 pedicle screws were placed. In group A, 18 screws (12.5%) were malpositioned out of a total of 168 placed. In group B, 31 (15.4%) were malpositioned out of 201 screws placed. Evaluation of preoperative CT scan did not significantly effect the percentage of screws that had some breaching of the cortex. The vast majority of breaches were in the costovertebral junction.
CONCLUSIONS: In experienced hands, there is not a significant difference in the incidence of pedicle screw malpositioning based on the ability to perform preoperative evaluations of CT scan-based pedicle parameters. With rigorous free hand anatomic technique, safe placement of pedicle screws is possible and can be done safely without the reliance on routine preoperative CT. This can decrease a patient's total radiation exposure over the course of treatment of their spinal deformity.
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

doi: 10.1016/j.spinee.2007.07.169

144. Ability of Magnetic Resonance Imaging to Detect Facet Arthrosis in the Cervical Spine

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BACKGROUND CONTEXT: While preoperative MRIs are considered to be standard of care prior to most cervical arthrodeses, CTs are usually not felt to be necessary. However, in the pre-operative work-up for an arthroplasty, most protocols require a CT to determine if facet arthrosis, a contraindication to arthroplasty, is present. As MRIs have improved in image quality, it has become possible to detect facet arthrosis in many cases.
PURPOSE: To determine if facet arthrosis can be detected reliably enough by MRI to obviate the need for a CT.
STUDY DESIGN/SETTING: Clinical radiographic study.
PATIENT SAMPLE: 23 pre-operative patients.
OUTCOME MEASURES: Computed tomography scans were considered to be definitive for facet arthrosis and graded 0=normal; 1=cysts &/or sclerosis; 2=hypertrophy; 3=ankylosis. Since grades 1–3 are contraindicated in arthroplasty, the MRI was simply read as normal or abnormal for facet arthrosis.
METHODS: Three spine surgeons evaluated CTs and MRIs from 23 patients, obtained within 30 days of each other, on three separate occasions. All CT scans were obtained from the same state-of-the-art scanners, MRIs were from the same 1.5T machines. A total of 594 facets, were evaluated.
RESULTS: 256 facets were normal on CT and of these, 163 (63.7%) were also interpreted to be normal on MRIs, indicating moderate concordance (©,§=0.52). However, this still meant that the MRI was read as having facet arthrosis in 93/256 cases (36.3%), where there was none. When facet arthrosis was present on CT, it was misread as being normal on MR 21.6% of the time. MRI inter/intra-reliability demonstrate poor to slight agreement (©,§=0.19–0.41).
CONCLUSIONS: We found that MRIs were unable to accurately determine the presence of facet arthrosis in a substantial percentage of cases. Over 36% of normal facets were read as being abnormal and over 21% of abnormal facets were read as being normal. Despite the added radiation and expense, CT remains the gold standard for diagnosing facet arthrosis and is required pre-operatively for cervical arthroplasty.
FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

doi: 10.1016/j.spinee.2007.07.170

145. Missed Spondylolisthesis in Static MRIs but Found in Dynamic MRIs in the Patients with Low Back Pain

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BACKGROUND CONTEXT: Spondylolisthesis is known as one of results of instability. And the measurement has been established by using simple X-rays. But, X-rays should be taken several times for positional change and they make the patient exposed to much radiation hazard. Comparing X-ray, dynamic MRI can make exact sagittal images replacing true lateral view of X-rays during positional change. But, to date any quantitative report has not been done for detecting spondylolisthesis in flexion and extension MRIs while neutral MRIs show normal.
PURPOSE: To evaluate how many the dynamic MRI can detect the missed spondylolistheis in static MRI.
STUDY DESIGN/SETTING: Our radiological study was processing on prospective, randomized methods in the patients who complained low back pain with/ without radiating pain.
PATIENT SAMPLE: 510 patients who permitted to enroll our study in low back pain with/ without radiculopathy.
OUTCOME MEASURES: All radiological data on MRI was recorded on computer based measurement from MRI taken by flexion, neutral and extension.
METHODS: 510 patients (186 females, 324 males, mean age 42.2 years, range 16–85 years) had taken dynamic MRIs for the study. Images were gotten from the positions of flexion 40 degrees, upright, and extension 10 degrees. MRI Analyzer in true MRI which included 67 points marked in each image has undergone automatically all measurement and calculation with regard to translation from L1-2 to L5-S1 by Meyerding's method. We decided a normal slip limit as the slip under 3 mm anteriorly and posteriorly at first, and then under 4 mm secondly. The number in which the neutral MRI showed normal but flexion or extension MRI showed over 3 mm or 4 mm, that is, missed spondylolithesis was counted. Statistical analysis was performed using Chi-square test with significance set at $p<0.05$.
RESULTS: In the case when spondylolisthesis meant more than 3mm translation, the total count and percent of missed spondylolisthesis is

41 and 18.1% in flexion. For each level in flexion, L3-4 level was most commonly missed as 38.7% and L4-5 level was 35.1%, L2-3 level 30.8%, and L5-S1 level 4%. In extension view, the total count and percent was 18 and 8.9% which was smaller than in flexion (p=0.005). And for each level in extension, L2-3 level was 25%, L3-4 level 20.8%, L4-5 level 14%, and L5-S1 level 3.2%. When spondylolisthesis was decided as more than 4 mm translation, total count and percent of missed spondylolisthesis was 18 and 12.3% in flexion but it was not different statistically from the result of more than 3 mm translation (p=0.148). For each level in flexion, L3-4 level was most commonly missed as 53.8% and L2-3 level was 33.3%, L4-5 level 17.9%, and L5-S1 level 3.5%. In extension view, the total count and percent was 6 and 5% which was smaller than in flexion (p=0.042). And For each level in extension, L2-3 level was 33.3%, L3-4 level 25%, L4-5 level 4.2% and L5-S1 level 2.4%.

CONCLUSIONS: In the patients with back pain, missed spondylolisthesis in neutral MRIs but found in flexion MRIs is 18.1% for all the levels in the condition that spondylolisthesis is considered as more than 3 mm translation. And it is larger than in extension MRIs because flexion movement makes more anterior translation. The rate of newly found spondylolisthesis in flexion or extension MRIs with 3 mm criteria is not quite different from 4 mm criteria.

FDA DEVICE/DRUG STATUS: This abstract does not discuss or include any applicable devices or drugs.

doi: 10.1016/j.spinee.2007.07.171

Friday, October 26, 2007
4:16–5:16 PM
Special Interest Poster Presentation 3: Lumbar - Non-fusion

146. Indirect Decompression (X-Stop) versus Conventional Decompressive Surgery for Lumbar Spinal Claudication – A Prospective Randomized Trial

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BACKGROUND CONTEXT: Although generally successful, decompressive surgery for lumbar spinal claudication has its complications and requires hospitalization and rehabilitation. Zucherman et al have demonstrated X-Stop patients to fare better than patients given conservative treatment in an RCT.

PURPOSE: To compare the outcomes in terms of function, quality of life and re-operations after indirect decompression versus conventional decompression for LSC.

STUDY DESIGN/SETTING: Prospective randomized study including patients with central spinal stenosis according to MRI or CT, refractory to conservative treatment and accepting participation in an RCT. Outcome at 6, 12 and 24 months.

PATIENT SAMPLE: 50 patients in each group using randomization by envelope. 54 males and 46 females, mean age 70 (45–89) years. Surgical treatment at three spine centres in Sweden.

OUTCOME MEASURES: Function and satisfaction according to the Zürich Spinal Stenosis Questionnaire, quality of life according to SF-36 and incidence of repeat operations as well as complications. Pain on the VAS scale.

METHODS: After completing preoperative data and in absence of exclusion criteria, patient randomized to either X-Stop treatment under local anaesthesia or decompressive surgery in general anaesthesia on 1 or 2 levels.

RESULTS: Follow-up: Inclusion according to criteria is complete. Two cases of spinous process fractures have been noted in the X-Stop group and 11 cases were re-operated in the X-Stop group and 3 cases in the decompressive group. Follow-up to date demonstrate the patients at 6 and 24 months having similar outcome as regards the SF-36 and the ZSQ and both groups are significantly improved compared with baseline.

CONCLUSIONS: Preliminary figures demonstrate that, when successful, X-Stop decompressive surgery may give similar results as decompressive surgery in terms of function and quality of life. An increased rate of secondary surgery is obvious and will be analyzed regarding cause when the follow-up is complete.

FDA DEVICE/DRUG STATUS: X-Stop: Approved for this indication.

doi: 10.1016/j.spinee.2007.07.173

147. Intervertebral Disc Transplantation: A New Dimension in the Treatment of Degenerative Spine Disease

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BACKGROUND CONTEXT: Spinal fusion is a well recognized treatment for the degenerated disc disease. However one complication is accelerated adjacent segment degeneration. Artificial disc replacements have been developed but results are variable. The authors have previously reported success using intervertebral disc autografts, fresh allografts, and fresh frozen allografts as a non-fusion strategy in a primate model.

PURPOSE: To review the process of development of the concept of intervertebral disc allograft transplantation from primate experiments to a pilot human trial. To determine the feasibility and long term clinical results of this innovative treatment option in the human.

STUDY DESIGN/SETTING: A prospective, non-blinded study of outcomes in patients who received a fresh-frozen allogenic intervertebral disc transplantation in the cervical spine.

PATIENT SAMPLE: Five patients, 4 males and 1 female, average age 47 years.

OUTCOME MEASURES: JOA scores and VAS scores were used to evaluate neuro-function. Serial MRI, static and dynamic radiographs were used to monitor the status of the grafts.

METHODS: All patients with cervical disc herniation underwent anterior disc excision and transplantation of a fresh-frozen endplate-disc-endplate composite disc allograft obtained from healthy donors. No internal fixation or perioperative immunosuppressant was used. The mean follow up period was 5 years and 3 months.

RESULTS: The average operating time was 1.8 hours and blood loss was 62 mls. At a minimum follow up of 5 years, all patients had improvement of the preoperative myelopathic or radiculopathic symptoms. Good union between the recipient bone and the graft endplates were seen after two months with no graft migration or subsidence. No serological suggestion of immuno-reaction was found. There was reduction of the disc height at the early postoperative period and mild degenerative changes at the final follow up.

However, all except one of the transplanted discs showed preservation of mobility without olisthesis in the flexion-extension radiographs at the final follow up. One patient needed an additional posterior foraminotomy for recurrent radiculopathy. This segment eventually resulted in auto-fusion. MRI at the final follow up showed preservation of hydration in at least 2 of the discs.

CONCLUSIONS: The mobility and stability of the spinal segment were preserved. Fresh-frozen allogenic intervertebral disc transplantation has been successfully performed in a pilot human series without immunologic