ORAL PRESENTATION 001

A Newly Described Ligament Between Dural Sac and Ligamentum Flavum at L5 Level: The ATA and its Surgical Importance.

Solaroglu Ihsan¹, Okutan Ozerk¹, Beskonakli Ethem¹
¹Ankara Ataturk Research and Education Hospital, Bilkent, Ankara, Turkey

OBJECTIVES: To describe a new ligament; “ATA”, between dural sac and ligamentum flavum at L5 level and its surgical importance.

SUMMARY OF BACKGROUND DATA: Postoperative cerebrospinal fluid leakage translates into longer hospital stay with significant implications for the patient, the healthcare system, and the society. To avoid injury to dural sac during lumbar surgery, it is crucial to know the anatomy and its variations.

METHODS: The length and the number of ATA were examined in 14 consecutive patients, which underwent L5 laminofl avectomy in our department. The ATA and its anatomical landmarks described first time in the literature. We termed this ligament as ATA; reminding “Attention for Terminal Attachment”.

RESULTS: The presence of ATA has shown in 10 patients (71%). There was double ATA in 4 patients (40%). The mean length of ATA was 7.7 ± 1.8 mm. ATA originates from dural sac at the level of superior border of superior facet of S1 vertebra and projects toward to ligamentum flavum. Histological examination of ATA revealed fibrous connective tissue.

CONCLUSION: In this preliminary study, we described a new ligament; “ATA”, between dural sac and ligamentum flavum at L5 level. ATA is an important structure that creates potential risk for inadvertent dural lacerations during fl avection. Dissecting ATA before fl avection may be an important step in reducing risk of dural sac injury and postoperative CSF leakage, which may result in significant benefits for patients and healthcare organizations.

KEYWORDS: Anatomy, dural sac, lumbar, fl avum, CSF leakage, complication.

ORAL PRESENTATION 002

Thromboprophylaxis in Traumatic and Elective Spinal Surgery: Analysis of Questionnaire Response and Current Practice of Spine Trauma Surgeons

Ploumis Avraam¹, Ponnappan Ravi¹, Sarbello John¹, Vaccaro Alexander²
¹University of Ioannina, ²Rothman Institute, Philadelphia, PA, ³Jefferson Medical College

INTRODUCTION: Although much research has been invested in the prevention of thromboembolic events following surgical procedures, there have been few investigations specific to spinal surgery, especially in the context of trauma. Neurosurgeons and Orthopaedic surgeons from the Spinal Trauma Study Group were surveyed in an attempt to understand current practices in the perioperative administration of thromboprophylaxis in spinal surgery.

METHODS: Forty-seven spine surgeons were provided with a 24-question survey pertaining to deep vein thrombosis (DVT) prophylaxis in spine surgical patients. There was 100% response to the survey, and 46 of the 47 physicians (98%) responded to the case scenarios.

RESULTS: Institutional protocols for DVT prophylaxis existed for 42 (89%) of the respondents; however, only 27 (57%) indicated that these protocols included SCI patients. Preoperatively, no prophylaxis or mechanical prophylactic measures for SCI and non-SCI spinal fracture patients were routinely used by 36 (77%) and 40 (85%) respondents, respectively. Postoperatively, pharmacologic prophylaxis was prescribed by 42 (91%) and 28 (62%) surgeons for SCI and non-SCI spinal fracture patients, respectively. There was a statistically significant tendency to use more intensive prophylactic measures for patients with SCI (x² 10.86, p<0.01) as well as a statistically significant longer duration of proposed thromboprophylaxis (x² 24.62, p<0.001). Postoperative pharmacologic thromboprophylaxis for elective anterior thoracolumbar spine surgery was reported by 23 (51%) of the respondents while only 18 (40%) utilized pharmacological prophylaxis in elective posterior thoracolumbar spine cases. Spine complications from low-molecular weight heparin (LMWH) were reported by 22 (47%) surgeons including fatal pulmonary embolism by 19 (40%) surgeons.

CONCLUSION: A basis for a consensus protocol on thromboprophylaxis in spinal trauma was attempted. No more than mechanical prophylaxis was recommended preoperatively for non-SCI patients or postoperatively for elective cervical spine cases. Chemical prophylaxis was commonly utilized postoperatively in patients with SCI and in patients with elective anterior thoracolumbar surgery.

KEYWORDS: thromboprophylaxis, deep vein thrombosis, spine trauma, survey.
ORAL PRESENTATION 003
Differential Treatment Of Nerve Root Compression Pain Caused By Lumbar Disc Herniation Applying Minimal Invasive Disc Decompression.
Bokov Antrey1, Skorodumov Alexander1, Istrilev Alexey2, Stupak Yuri2.
1Institute of Traumatology and Orthopaedics of Nizhny Novgorod Municipal, 2Hospital 39 Of Nizhny Novgorod.

INTRODUCTION: Nucleoplasty is a minimal invasive intervention to perform disc decompression in cases of nerve root compression caused by disc herniation. It is important to find a rational boundary between nucleoplasty and microsurgery.

MATERIALS AND METHODS: this is a prospective non-randomized cohort study, minimal follow-up: 18 month.

Patients examination: neurological examination, visual analogue scale and Oswestry disability questionnaire, MRI obligatory, RCT – optionally, discography - only before nucleoplasty. Patients have been divided into the following groups:
GROUP 1: Patients with disc protrusion treated with nucleoplasty (n=46), divided into subgroups:
SUBGROUP 1.A. disc protrusion size=<5 mm (n=24).
SUBGROUP 1.B. disc protrusion size 6–9 mm (n=22).
GROUP 2. Patients with disc extrusion treated with nucleoplasty (n=27).
GROUP 3. Patients with disc extrusion or sequester treated with microdiscectomy (n=65).

Clinically significant effect: 50% relief of pain intensity and 40% decrease of ODI.

RESULTS: Decrease of pain intensity and disability had been found in all groups of patients, p<0.0001, SP(statistical power)=99-100%.

Subgroups 1.A and 1.B. had no differences in rates of clinically significant result, p=1,0 SP=5,3. The rate clinically significant results: group 1 - 78,3%, 95% CI(confidence interval) 66-90%, group 2 - 44% (95% CI 25-65%), group 3 – 93% (95% CI 85-98%).

Total annulus disruption increases the rate of unsatisfactory results of nucleoplasty, OR(odds ratio)=4,5; 95%CI 1,57-12,87 (logistic regression model, p=0,0034). Nucleoplasty performed in case of disc extrusion have a significantly higher rate of unsatisfactory results versus microdiscectomy, OR=19,06; 95%CI 2,29-68,73 (logistic regression model, p=0,0001).

CONCLUSION: The restriction of absolute size of disc protrusion does not provide a significant improvement of the results of nucleoplasty. The rational boundary between two types of surgery is integrity of annulus.

KEY WORDS: microdiscectomy, nucleoplasty.

MATERIALS AND METHODS: this is a prospective non-randomized cohort study, minimal follow-up: 18 month.

Patients examination: neurological examination, visual analogue scale and Oswestry disability questionnaire, MRI obligatory, RCT – optionally, discography - only before nucleoplasty. Patients have been divided into the following groups:
GROUP 1: Patients with disc protrusion treated with nucleoplasty (n=46), divided into subgroups:
SUBGROUP 1.A. disc protrusion size=<5 mm (n=24).
SUBGROUP 1.B. disc protrusion size 6–9 mm (n=22).
GROUP 2. Patients with disc extrusion treated with nucleoplasty (n=27).
GROUP 3. Patients with disc extrusion or sequester treated with microdiscectomy (n=65).

Clinically significant effect: 50% relief of pain intensity and 40% decrease of ODI.

RESULTS: Decrease of pain intensity and disability had been found in all groups of patients, p<0.0001, SP(statistical power)=99-100%.

Subgroups 1.A and 1.B. had no differences in rates of clinically significant result, p=1,0 SP=5,3. The rate clinically significant results: group 1 - 78,3%, 95% CI(confidence interval) 66-90%, group 2 - 44% (95% CI 25-65%), group 3 – 93% (95% CI 85-98%).

Total annulus disruption increases the rate of unsatisfactory results of nucleoplasty, OR(odds ratio)=4,5; 95%CI 1,57-12,87 (logistic regression model, p=0,0034). Nucleoplasty performed in case of disc extrusion have a significantly higher rate of unsatisfactory results versus microdiscectomy, OR=19,06; 95%CI 2,29-68,73 (logistic regression model, p=0,0001).

CONCLUSION: The restriction of absolute size of disc protrusion does not provide a significant improvement of the results of nucleoplasty. The rational boundary between two types of surgery is integrity of annulus.

KEY WORDS: microdiscectomy, nucleoplasty.

ORAL PRESENTATION 004
Non-Fusion Method in Thoracolumbar and Lumbar Spinal Fractures
Kim Yong-Min, Cho Byung-ki, Lee Hyung-Joon
Department of Orthopaedic Surgery, Chungbuk National University Hospital

INTRODUCTION: To evaluate the results of posterior stabilization of thoracolumbar fracture using non-fusion method followed by the removal of metal implants within an appropriate period. Changes in the sagittal alignment and the restoration of segmental motion were also investigated.

SUMMARY OF BACKGROUND DATA: Posterior fusion using a transpedicular screw system remains the treatment of choice for the management of thoracolumbar and lumbar fractures. However, fusion methods result in the permanent loss of segmental motion. If both stability and motion could be achieved, functional results would improve considerably.

METHODS: Twenty-three patients under 40 years of age (mean 28.0 years) with thoracolumbar or lumbar spine fractures were managed by this non-fusion method. Implants were removed at a mean 9.7 months after initial fracture fixation and patients were followed up for more than 18 months. Sagittal alignments of metal fixed segments, heights of...
ORAL PRESENTATION 005
Relation of the Development of Adjacent Segment Degeneration after Two Levels Posterolateral Fusion for Degenerative Lumbar Instability with Preoperative Facet Tropism and Sagittal Alignment at full fusion

Abdelfattah Mohamed Fathy Saoud MSc, MD, PhD1, Khaled Mohamed Fathy Saoud MSc,MD,PhD2, Hanaa Abdulkader MSc, MD, PhD3
1Department of Orthopaedic and Spine Surgery, Ain Shams University, Cairo, Egypt, 2Department of Neurosurgery, Ain Shams University, Cairo, Egypt, 3Department of Radiodiagnosis, Ain Shams University, Cairo, Egypt

Abstract
BACKGROUND: After lumbar spinal fusion, adjacent segment degeneration (ASD) is a concern to both patients and surgeons and is a potential cause of further spinal surgery. Although ASD may be considered as a part of the normal aging process and degenerative change, it could be influenced by changes in the stress acting on the adjacent segment after spinal fusion. There are confusing reports in literature on whether ASD development affects the patients’ outcome, in terms of changing his clinical status to the worse or not. No enough studies has correlated the development of ASD especially the symptomatic cases and postoperative sagittal alignment and the presence of preoperative facet tropism.

The authors hypothesized that mal-alignment of the sagittal balance after posterior spinal fusion at least increases (If not causes) the phenomenon of ASD development and progress. Also the authors hypothesized that facet tropism may play a role in the development and/or advancement of ASD.

Patients and Methods: This prospective study was run in Ain Shams University hospitals and hospitals of ministry of health in Cairo from April, 2004 till January, 2008.

We had 53 patients (39 females and 14 males with ratio of 2.8:1). All were operated upon for degenerative indication and were selected according to strict inclusion criteria and all were fully fused by April of 2005. Range of follow up was 30-40 months with mean of 33 months but we considered the 30 months follow up visit as the final follow up.

Patients were categorized into group A with no facet tropism and B with facet tropism of the levels intended for fusion and their adjacent segments. Every group was subcategorized according to sagittal alignment at full fusion (measured using Cobb method) into group 1 with normal lordosis angle of 20-65 degrees and group 2 with hypolordotic alignment and group 3 with hyperlordotic alignment.

Patients were assessed clinically according to modified functional scale of Ghiselli et al and radiographically by AP and lateral plain films and dynamic laterals in the post fusion visits to assess ASD signs in the adjacent segments above and below fusion. The changes were graded according to University of California at Los Angeles Grading Scale for Intervertebral Space Degeneration. MRI was added for patients with symptomatic ASD and was done for all patients at the final follow up.

RESULTS: The results of this work prove that the incidence of asymptomatic ASD at 30 months follow up was only 3.2% and the symptomatic ASD was only 2.4% for the directly adjacent segment above fusion at 30 months follow up for group A1 patients (0.96% per year) and this is far less than the recorded symptomatic ASD in most series that amounts to 3% per year of follow up so it is 7.5% for that length of follow up.

In group A2 with hypolordotic alignment there was 50% incidence of asymptomatic ASD in the directly adjacent segment above fusion and 50% incidence of symptomatic ASD in the directly adjacent segment above so actually all the segments directly above fusion got ASD in this group.

In group A3 all the levels directly below fusion showed ASD (66.7% Asymptomatic and 33.3 symptomatic) and all are in the directly adjacent segment below and that proves that hyperlordosis puts extra-demand on the adjacent segment below fusion.

In group B1 of facet tropism even with the preservation of physiological lordosis we had all levels directly above fusion levels showing ASD at the 30 months follow up (80% asymptomatic and 20% symptomatic) which is significantly different than the same alignment group with no facet tropism in our series (5.2% and 2.4% respectively).

B2 and B3 groups patient population were insufficient for proper result analysis.

CONCLUSION: The results of this work prove that keeping lordotic alignment performing lumbar fusion for degenerative diseases within physiological ranges decreased the incidence of both symptomatic and non symptomatic ASD and that the disturbance of this alignment increased the incidence of symptomatic and non symptomatic ASD in the segments directly above fusion in hypolordotic alignment and in the segment directly below in hyperlordotic alignment and thus keeping physiologic lordosis plays detrimental role in decreasing the incidence of ASD and that this should be taken care of during surgery.

Also the authors concluded that patients with facet tropism are more likely to develop ASD than those with no tropism so those patients should be informed of this possibility and that they are more likely to need treatment that could be surgical for that condition in a while after fusion surgery. More patient population and longer follow up are needed to further solidify the concluded facts.

ORAL PRESENTATION 006
Preservation of Segmental Motion with Anterior Contralateral Cervical Microdiskectomy and Interbody Fat Graft: Prospective Study

Yunus Aydin, Halit Çağusoğlu, Osman Türkmenoğlu, Murat Musluman,
Cengiz Tuncer
Clinic of Neurosurgery, Şişli Etfal Education and Research Hospital, Istanbul, Turkey

INTRODUCTION: The aim of our study is to evaluate the results and effectiveness of this minimal invasive technique with or without interbody fat graft replacement in patients with cervical paramedian disc herniations.

METHODS: This prospective observational study was undertaken for the analysis of 330 patients with cervical paramedian disc herniation who underwent one-or adjacent two-level anterior contralateral microdiscectomy without fusion between 1992 and 2008. Interbody fat graft replacement were performed on 71 of 330 patients (Group 2). The mean follow up time was 10 years (range 1–15 years). Preoperative and postoperative lateral dynamic cervical radiographs were obtained and, the presence of a reduction in the height of interspace and spontaneous osseous union at the discectomy level were investigated. Surgeries were done by the senior author (YA). Clinical outcomes were assessed using the Neck Disability Index and Short Form–36.

RESULTS: Despite fusion procedures were not performed, spontaneous radiological fusion signs were obtained in 12% of group 1 patients. Follow-up radiological studies revealed healing without fusion in group 2 patients. There was no significant change in the overall cervical curvature (C2–T7) angles postoperatively in late follow-up findings (p = 0.77). It represented a statistically significant mean loss of 2.24 of segmental lordosis (p < 0.0001). The NDI scores decreased significantly in both early and late follow-up evaluations and the SF–36 scores demonstrated significant improvement in late follow-up results in two groups. Analysis of clinical outcome showed no statistical differences between two groups (p = 0.77).

CONCLUSION: Anterior contralateral microdiscectomy without fusion achieves better exposure for resection of the offending foraminal or far lateral lesions, ventral osteophytes, or a disc fragment under direct microscopic visualization. Collapse, loss of motion and, instability of the involved disc level can also be avoided via this less invasive technique and interbody fat graft.

KEYWORDS: anterior cervical microdiscectomy, contralateral approach, spinal alignment, fat graft

ORAL PRESENTATION 007
The Impact of Automatic Retractors on the Esophagus During Anterior Cervical Surgery: An Experimental in Vivo Study in a Sheep Model

Halit Çavuşoğlu1, Cengiz Tuncer2, Canan Tanık3, Zihni Mutlu1, Ebruhan Zengin4, Murat Karabağlı5, Yunus Aydıno3
1Clinic of Neurosurgery, Şişli Etfal Education and Research Hospital, 2Clinic of Neurosurgery, Şişli Etfal Education and Research Hospital, 3Clinic of Neurosurgery, Şişli Etfal Education and Research Hospital, 4Pathology Department, Şişli Etfal Education and Research Hospital, 5Veterinary Faculty, Surgery Department, Istanbul University, 6Eskisehir Osmangazi University Neurosurgery Department

INTRODUCTION: Postoperative dysphagia is a well-recognized complication of anterior surgical approach to the cervical spine. However, its incidence and etiology remain unknown. The aim of this study was to investigate the impact of the automatic retractor use on the esophagus and to describe its possible pathological changes that might occur during the cervical spine surgery.

METHODS: Sixteen skeletally mature female sheep underwent single level cervical discectomy via an anterior approach. Continuous retraction was applied with automatic retractor system during surgery. The sheep model was chosen because of its anatomic similarities to human esophagus. The esophageal tract in every animal was examined using contrast radiographic examination. Eight animals were sacrificed three days after the operation (Group 1). Remaining were sacrificed four weeks after the operation (Group 2). The esophagus were then removed for histopathological study by haematoxylin and eosin (H&E) and Masson's trichrome staining. The changes in esophageal innervation were examined with NADPH-diaphorase enzymehistochemical staining.

RESULTS: Among all, only one animal in Group 1 demonstrated postoperative radiographic abnormality. The histopathological study of the esophaguses at the treated level revealed edema between the muscular fibers in the outer longitudinal and inner circular layers of muscularis propria. Vascular congestion, vascular damage, and inflammation were observed in multifocal areas. In Group 2 animals sacrificed after four weeks after the surgery, mild-to-moderate fibrosis were found extending from the outer surface of esophagus to the longitudinal layers of muscularis propria. Enzyme-histochemical staining revealed existence of normal myenteric plexus and ganglion cells, and nitricergic innervation in the all parts of esophagus wall.

CONCLUSIONS: We demonstrated in this study that the direct pressure induced by the medial retractor blade on esophagus wall leads to local injury. Postoperative dysphagia occurring during the anterior cervical spine surgery could be directly caused by the pathological changes in human esophagus similar to what we have observed in sheep undergoing exact same surgical procedure.

ORAL PRESENTATION 008
Results of Spinal Decompression & Stabilization – Personal Experience
Shah Alam, MBBS, FCPS, MS, FRCS Associate Professor
Department of Orthopaedic & spine surgery, NITOR

A total number of 169 patients underwent surgical procedure due to different spinal disorders. Conservative approaches were tried where it was indicated. When there was no improvement with conservative treatment then surgical procedures were adopted.

METHODS: It was a prospective study which was done in both Govt. (NITOR & SSMC) and private hospitals irrespective of age & sex. Total period was from August 2002 to August 2009. Age of the patients ranged between from 8-65 years. In this series male was more dominant than female. In this series main causes were infective, traumatic, degenerative & neoplastic disorders. Pott’s paraplegia 75, pott’s quadriplegia 14, traumatic unstable spinal injuries with neurological deficit 33, degenerative disc disease 18, Spondilolisthesis 14 and neoplastic 15 cases. Decompression and stabilization done in all cases. Strud graft was used in case of corpectomy with. Instrumentations was done as adjuvant to achieve early biological union & prevention of further deformities. In Pott’s disease when conservative treatment failed to improve, decompression and stabilization was done by thoracotomy specially in at thoraco-lumber tuberculosis. Clowards operation done in cervical disc prolapse with spinal canal stenosis. In spondilolisthesis, laminctomy followed by stabilization done by bilateral pedicular screw fixation with or without inter-body bony fusion. In neoplastic cases corpectomy & stabilization done with instrumentation.
RESULTS: Excellent and satisfactory results were achieved in incomplete unstable injuries. No neurological improvement detected in complete injuries. Maximum Pott’s paraplegia regained their neurological function and bowel bladder dysfunction except one who recovered her one limb function full but other limb become spastic. In few patients required physiotherapy after surgery and improved later on. Maximum cases became symptoms free with bony union within expected time.

COMPLICATIONS: In complete spinal injuries no improvements were detected. Breaking of pedicular screws observed in two cases. Mal-position of screws in 5 cases observed in traumatic spinal injuries. Bed sore developed in 3 cases after surgery in traumatic cases.

DISCUSSIONS: Maximum spinal disorder can be treated conservatively. Decompression and stabilization helps both for regaining the neurological deficit and also prevents further deformities. Instrumentation enhances biological union.

CONCLUSION: Proper selection of cases is very important in spinal disorders. In incomplete spinal injuries satisfactory results can be achieved in maximum cases but in complete spinal injuries almost no neurological development were achieved but for early mobilization surgery was helpful. Maximum spinal disorders can be managed conservatively but surgical intervention should be done in earliest possible time when it is indicated.

ORAL PRESENTATION 009
Algorhythm for Use of Percutaneous Short Fixation of Fractures Involving the Thoracolumbar Junction and Lumbar Spine
Alessandro Landi MD, Nicola Marotta MD, Roberto Tarantino MD, Maurizio Domenicucci MD, Roberto Delfini MD
Neurosurgery Department of University of Rome “Sapienza”

PURPOSE: The authors propose an algorhythm for deciding whether to perform open surgery or percutaneous surgery with short fixation in patients with fractures of the thoracolumbar junction and lumbar spine.

MATERIALS & METHODS: Between July 2005 and May 2009, 72 patients underwent surgical stabilization by posterior route for fractures of the thoracolumbar junction and lumbar spine. In 44 of these the lesion involved the thoracolumbar junction, in 28 the lumbar spine (L2 in 6 cases, L3 in 15 cases, L5 in 7 cases). The fractures were assessed morphologically according to Magerl’s classification (52 type A, 12 type B, 8 type C). All patients were analyzed according to the algorhythm proposed, according to which patients must fulfill certain criteria: the fracture must be Magerl type A, it must involve only one level, the McCormack score must be 6 or less, invasion of the spinal canal must be 25% or less according to Hashimoto’s formula, MRI must confirm discoglanditive integrity. Neurologically, the patient must be ASIA E. 25 patients (17 thoracolumbar junction, 8 lumbar spine) fulfilled these criteria and were treated by percutaneous short fixation. The remaining 47 patients underwent open surgery. Of the 25 patients in which the algorhythm was applied, 8 underwent posterolateral fusion with minimally-invasive technique and 17 percutaneous short fixation without PLF.

RESULTS: The average length of the surgical procedure was 80 minutes and the loss of blood 10cc. All patients were dismissed without corset. All patients were submitted to follow-up CT scan 6 months after surgery. Follow-up ranged from 6 months to 2 years. In all cases CT scan confirmed fusion and there were no cases of rupture of the device. None of the patients presented neurological deficits.

CONCLUSIONS: The algorhythm described permits a proper selection of patients with thoracolumbar fractures who can be treated by percutaneous short fixation, thus avoiding the risks connected with failure of the stabilization system.

ORAL PRESENTATION 010
Demographics, Clinical and Radiographic Results of Kyphoplasty. Follow Up From 2 Weeks to 5 Years.
Techy Fernando1, Mohan Vivek1, Paik Charles2, Ryu Robert1, Mekhail Anis1.
1University of Illinois / Advocate Christ Medical Center, 2Washington University - Saint Louis, MO

BACKGROUND CONTEXT: Despite the fact that recent prospective, randomized, placebo controlled studies showed no difference between vertebroplasty and a sham operation, vertebral filling procedures for the treatment of insufficiency fractures continue to be widely used with excellent results in pain control, return to function and minimal complications.

PURPOSE: The goal of our study is to better understand the demographics and outcomes of kyphoplasty in improving pain in insufficiency fractures that are unresponsive to conservative treatment, identify risk factors for recurrence of back pain due to new fractures, discern and understand the timing for symptom improvement after the procedure, and correlate the amount of vertebral height correction with clinical improvement.

STUDY DESIGN/SETTING: Retrospective analysis of 82 patients who underwent kyphoplasty with radiographic analysis pre- and post-operatively, as well as prospective analysis of visual analog (VAS) and postoperative short form 36 scores (SF-36).

PATIENT SAMPLE: Elderly patients, both male and female, with osteoporotic compression fractures of their vertebral bodies. All procedures were performed on an outpatient basis.

OUTCOME MEASURES: Change of vertebral body height after kyphoplasty, incidence of adjacent vertebral fractures, other fractures, improvement in VAS scores, and SF 36.

METHODS: Eighty-two patients underwent kyphoplasty and were followed clinically and radiographically at 2, 4, 9 weeks and 1 year. SF-36 scores were collected 3 to 5 years post-operatively via telephone interviews with available patients. All data was collected only after IRB approval was obtained from our institution. Several variables were then analyzed to better understand the demographics, clinical and radiographic outcomes, risk factors for new fractures and other complications. Data analysis was performed using SPSS (Chicago, IL) student's t-tests.

RESULTS: Maximal improvement in the VAS was seen at 2 weeks in 90% of our patients, and at 9 weeks, 100% reached maximal improvement. Approximately 50% of patients had passed away or were not reachable at 1 year. Fifty percent of our osteoporotic compression fractures happened at the upper lumbar spine. At 1 year follow up, 27% of patients had recurrence of back pain (from which 24 % had a new vertebral fracture and 3% had back pain with no associated new fracture). Fractures at the adjacent level accounted for 50% of the new onset insufficiency vertebral fractures. Female gender was a significant risk factor for recurrent back pain at 1 year. Age, number of levels, and...
location of level did not show statistically significant correlation with recurrent back pain after kyphoplasty at 1 year follow up. Female patients responded better to the kyphoplasty treatment (VAS scores) when compared to males (p=0.0095). Gender was also a statistically significant difference in time to maximum improvement. Females recovered faster overall (p=0.0082). Age, number of levels, and location of levels were not statistically significant with respect to post-operative VAS scores. Older patients had more recurrent fractures (p=0.0172) and their fractures were located at more caudal levels (p=0.004) than younger patients. Lumbar (L2-L5) levels were associated with a higher rate of multi-level compression fractures (p= 0.00013). Finally, the amount of radiographic reduction after Kyphoplasty did not correlate with clinical outcome.

CONCLUSIONS: These results enable us to better understand the demographics and outcomes of kyphoplasty, identify risk factors for recurrence of back pain, and discern the timing for symptom improvement after the procedure. This study also showed no correlation between the amount of vertebral height correction and clinical outcomes.

ORAL PRESENTATION 011
Standard Operation of Cervical Spondylosis Based on the Diagnosis With 3.0T MRI
Hisanobu Koga MD, Oishi Tsuyoshi MD.
Nagasaki Morinoki Neurosurgical Clinic

INTRODUCTION: 3.0T refined MRI reveals the anatomical structures clearly. Operative findings correspond well with MRI findings. We have operated cervical spine lesions according to the MRI findings. We have changed the operative indication and method after introduction of the 3.0T MRI. We show the recent advance of our technique and discuss.

METHODS: 3.0T MRI (Achieva 3.0T Philips, the Netherlands) has been equipped since July 2007 in our institute. Sequences for imaging the spinal cord and the cervical nerve root are Balanced Fast Field Echo (B. FFE), T2 multiple fast field echo (T2*) and T2 turbo spin ech (T2 TSE). Each image can be reconstructed for acquiring the more visible view. The selection of the procedure basically depends on the relation between MRI finding and symptom. Radiculopathy dominant cases were mainly performed with anterior approach with or without fixation. All of posterior procedures were open-door laminoplasty. The cases were classified into three terms to evaluate the advance of the method.

RESULTS: 144 cases of cervical spondylosis including OPLL were operated for 30 months. 110 cases were anterior approach and 34 cases were posterior approach. The total number of disc spaces (DS) for anterior approach was 194. The methods of our anterior procedure were divided into three groups, which are fixation with the cylindrical cage (CC), fixation with the box cage (BC) and foraminotomy(FR). On some cases the free spaces were packed by the bone cement. Each term had next contents in the anterior procedure, 1st term: CC; 24DS, BC; 23DS, FR; 12DS. 2nd term: CC; 2DS, BC; 60DS, FR; 33DS. 3rd term: CC; 0DS, BC; 21DS, FR; 20DS.

CONCLUSION: Operative indication and method could be determined by detailed 3.0T MRI findings. Our protocol has given less invasive and more effective operative benefits.

KEYWORDS: 3.0T MRI Cervical spondylosis Standard operation

ORAL PRESENTATION 012
Cervical Cord Injury in Patients With Ankylosed Spines - Progressive Paraplegia in Two Patients After Posterior Fusion Without Decompression -
Yoshihisa Sugimoto¹, Yasuo Ito², Yasuyuki Shiozaki¹,Tetsuro Mazaki²,
Masato Tanaka¹
¹Okayama University Hospital, JPN, ²Kobe Red Cross Hospital, JPN

INTRODUCTION: Diffuse idiopathic skeletal hyperostosis (DISH) and ossification of the posterior longitudinal ligament (OPLL) are disease processes similar in pathology which can lead to unexpected fractures due to low energy trauma. In reported cases of fracture of the ankylosed spine in patients with DISH or OPLL, increasing lever arm and a grossly unstable fracture occurred. However, the actual surgical intervention for these fractures and spinal cord injuries was not discussed. We describe technical pitfall to treat two cervical cord injuries, including dislocations in patients with ankylosed spine due to DISH or OPLL.

CASE PRESENTATION: We report on two cervical cord injuries, including dislocations in patients with ankylosed spine due to DISH or OPLL. Two patients underwent posterior fusion without decompression; however, postoperative progressive paraplegia still occurred. There were three points in common: these patients had ankylosed spines due to DISH or OPLL; they were elderly and had spinal canal stenosis; and, after undergoing posterior fusion without decompression, their bilateral, lower extremity palsies worsened after surgery. Cervical alignment was slightly different after posterior fusion, and this change concentrated in one segment because adjacent vertebral bodies were ankylosed, and thus, immovable. Additionally, this stress caused infolding of the ligamentus flavum with resultant spinal cord compression.

CONCLUSION: In these cases, we recommend posterior fusion and decompression such as laminoplasty to avoid worsening palsy.

ORAL PRESENTATION 013
Scoliosis and Congenital Heart Disease
Sugimoto Yoshihisa, Tanaka Masato
Okayama University Hospital

INTRODUCTION: The purpose of this study was to determine the association between congenital heart disease (CHD) and scoliosis among Japanese. Patients with congenital heart disease are at an increased risk to develop scoliosis. Chest roentgenograms were reviewed to determine incidence, curve type and onset of scoliosis associated with congenital heart disease. To determine the incidence, curve type, onset and characteristics of scoliosis in patients with congenital heart disease among Japanese. Although the strong association between congenital heart disease and scoliosis is well established, the etiology of scoliosis in patients with congenital heart disease is still unknown.

METHODS: Chest roentgenograms were done in 2530 patients with CHD who underwent cardiac operations to assess for the presence of scoliosis, using the Oxford Cobbmeter (Oxford Metrics) from November 1990 to December 2006. The apex, the side of the curves and curve type of scoliosis were described.

RESULTS: Three hundred and eighty seven (10.2%) of these patients had scoliosis greater than 10°, sixty nine (2.7%) of them had curves greater than 20°, twenty six (1.0%) of them had greater than 30°,
INTRODUCTION: Morbid obesity is characterized by an individual weighing more than 100 pounds over his or her ideal body weight, or having a body mass index (BMI) of 40 or higher. The morbidly obese patient poses many unusual surgical/anatomical challenges during endoscopic laser minimally invasive spine surgery (MISS), and has a greater incidence of spinal surgical complications, up to 36% in spinal surgery, including problems with wound healing, pneumonia, deep vein thrombosis and need for further surgery. Other adverse outcomes and co-morbidities can include diabetes, kidney failure, hypertension, heart disease, liver disease, and nerve compressions. Newly developed GPS (grid positional systems) was designed to simplify and facilitate the endoscopic MISS.

METHODS: 136 morbidly obese surgical patients with 254 symptomatic herniated lumbar discs underwent endoscopic MISS. Average age of 42 (with intractable single and multiple lumbar herniated discs. They were safely treated with outpatient endoscopic laser MISS, guided and facilitate by application and utilization of newly developed GPS. Various endoscopic assisted mini spinal instruments are utilized to perform transforaminal endoscopic lumbar microdiscectomy and foraminoplasty for treatment of spinal stenosis. Holmium YAG laser is applied for laser thermodisckplasty.

RESULTS: Overall result 90% patients with good to excellent results. Fair results 6.4% patients, (with single level problem. Average follow-up, is 46 months. For single level, average satisfaction score is 93%.

CONCLUSION: Endoscopic laser MISS, performed with GPS guidance, for microcompressive lumbar discectomy and stenosis decompression in the morbidly obese surgical patient, is an effective, safe, less traumatic and easier spinal surgery. It avoids the more dangerous alternative of more traumatic open spinal procedures performed with general anesthesia. It reduces risk and complication, and leads to an excellent surgical result, faster recovery and significant economic savings.

KEYWORDS: Obese Endoscopic Lumbar Discectomy

ORAL PRESENTATION 015
Endoscopic Transforaminal Microdecompressive Lumbar Disc Surgery with GPS for Morbid Obese Patient
Chiu John MD,MSc,FRCS(US)
California Spine Institute, Thousand Oaks, California, USA

INTRODUCTION: Degenerated lumbar disc and spinal stenosis are common problems requiring decompressive lumbar surgery. Open spinal discectomy is associated with significant morbidity, long-term convalescence, prolonged general anesthesia and wide dissection of tissues that can cause bleeding, scarring and eventual destabilization of spinal segments. The less traumatic endoscopic minimally invasive lumbar microdecompression procedure is free from these potential complications. Therefore the pursuit of minimally invasive spine surgery (MISS) began.

METHODS: The endoscopic spine surgical procedure, its surgical indications and its operative techniques including tissue modulation technology (i.e. laser and radiofrequency surgical application) are presented. It requires seamless connectivity to perform the surgical procedures, SurgMatix®, a new integrated imagedata based OR control system has been developed and utilized to facilitate this endoscopic MISS and creates organized control instead of organized chaos.

RESULTS: Among a series of 5336 MISS patients (10,255 discs) the surgical result for endoscopic MISS has been extremely gratifying for both the patient and the surgeon. There was no postoperative mortality, and morbidity of less than 1%. The potential risk and potential complications are presented. Endoscopic microdecompression can effectively decompress herniated discs and treat spinal stenosis with foraminoplasty.

CONCLUSION: Endoscopic microdecompression can effectively decompress herniated discs and spinal stenosis with foraminoplasty for treatment of spinal stenosis. It also provides an excellent and effective access or platform for spine arthroplasty, spinal disk replacement, artificial disk, vertebralplasty, spinal fixation/fusion, disc re-growth technology and perhaps genome therapy. Obviously, this minimally invasive, less traumatic, outpatient endoscopic MISS treatment leads to excellent results, faster recovery, and significant economic savings.

KEYWORDS: Endoscopic spine surgery technological
ORAL PRESENTATION 017
Anterior Endoscopic Microdecompressive Cervical Discectomy (AECD) with GPS
Chiu John MD,MSc,FRCS(US)
California Spine Institute, Thousand Oaks, California, USA

INTRODUCTION: To demonstrate outpatient anterior endoscopic microdecompressive cervical discectomy and foraminal decompression (foraminoplasty), by utilizing GPS (grid positional system), can treat herniated cervical discs and cervical foraminal stenosis efficaciously and successfully, by mechanical decompression and application of lower level non-ablative Holmium laser for laser thermodiskoplasty (disc shrinking and tightening effect).

MATERIALS AND METHODS: Since 1995, 2066 patients (3730 Discs), who failed at least 12 weeks of conservative care were treated. Levels were C2 to C7, inclusive. All patients demonstrated unilateral radicular pain of a specific dermatome, single level or multiple levels, confirmed with EMG/NCV, MRI or CT scans demonstrated the herniated cervical disc. The surgical technique of anterior endoscopic microdecompressive cervical discectomy foraminal decompression (foraminoplasty) and laser thermodiskoplasty (non-ablative lower Holmium laser energy for disc shrinkage) are described. The surgical approach guided and facilitated with GPS (grid positional system), is explained.

RESULTS: For single level, 94% had good to excellent symptomatic relief and spinal motion preservation. 6% of patients had some persistent neck and upper extremity residual but diminished pain associated with parasthesia, after surgery. Average time to return to work was ten to fourteen days. At an average followup of 48 months. There were no intraoperative complications. Postoperatively, one patient with transient Horner's syndrome and one transient hoarseness voice were noted.

CONCLUSION: The surgery of anterior endoscopic microdecompressive cervical discectomy and foraminal decompression with mechanical decompression and lower level non-ablative Holmium laser for disc shrinking and tightening effect (laser thermodiskoplasty) with GPS has proven to be safe, less traumatic, easier, and efficacious with significant economic savings. It preserves spinal motion. It is an effective alternative or replacement for conventional open cervical spinal surgery for discectomy, and can decompress foraminal stenosis, in degenerative spine disease.

KEYWORDS: Endoscopic cervical discectomy GPS

ORAL PRESENTATION 018
Thoracic Endoscopic Microdiscectomy with GPS System.
Chiu John MD,MSc,FRCS(US)
California Spine Institute, Thousand Oaks, California, USA

INTRODUCTION: To demonstrate the safety and efficacy of outpatient based endoscopic thoracic discectomy with laser thermodiskoplasty performed for symptomatic thoracic herniated nucleus pulposus.

MATERIAL AND METHODS: Since February 1996, 412 patients' (516 discs) with symptomatic thoracic discs without myelopathy, who failed at least 12 weeks of conservative care, were treated. The technique of percutaneous microdecompressive endoscopic thoracic discectomy (with laser thermodiskoplasty) with GPS (Grid Positioning System) by posterolateral approach is described. The thoracic disc levels were T1 to T12. All patients demonstrated a contained soft thoracic disc herniation on MRI or CT scans. Intraoperative thoracic discogram and pain provocative tests were positive and confirmed the disc involved.

RESULTS: Preliminary postoperative follow-up demonstrates 90% of all patients had good to excellent and 6% fair symptomatic relief. The average time to return to work was ten days for the non-workers' compensation patients. Most of the patients received non-ablative lower laser energy application for thoracic disc shrinkage or tightening.

CONCLUSION: Percutaneous microdecompressive endoscopic thoracic discectomy with GPS (Grid Positioning System) and application of non-ablative lower Holmium laser energy for disc shrinkage (laser thermodiskoplasty) appears to be easy, safe and efficacious. This less traumatic, easier outpatient treatment leads to excellent results, faster recovery, and significant economic savings

KEYWORD: Endoscopic thoracic discectomy GPS

ORAL PRESENTATION 019
Surgical Management of Spinal Cord Hemangioblastomas
Jia Wenqing, Yang Jun, Wang Guihui
Department of neurosurgery, TianTan Hospital, Capital medical University Beijing China 100050

OBJECTIVE: Summary the methods in the spinal hemangioblastomas operation.

METHODS: Retrospective analysis 38 spinal hemangioblastoma microscope surgery patients in last 5 years of TianTan Hospital. McCormick scale were used to evaluate the spinal function before and one week after the operation. All the patients were microsurgical treatment.

RESULTS: Only one subtotal resection , 37 total resection. The Pathology diagnosis are all the hemangioblastomas. One week after the operation McCormick scale show 30 improved, 6 similar, 2 aggravation but recovered in one month. No tumor recurred during a follow-up period of 3–60 months and no dead patient.

CONCLUSION: Spinal cord HbIs are benign highly vascular nature intramedullary tumors that can be cured surgically with microscope.

KEYWORDS: Spinal hemangioblastomas, Surgical Treatment
ORAL PRESENTATION 020
Result of Minimally Invasive Modified Mini - Open Posterior Lumbar Interbody Fusion
Kim Hyecun Sung1, Jeon Ki Hyun MD1, Choi Woo Jin MD1, Kim Kwan Tae MD1, Ju Chang Il MD2, Kim Seok Won MD2, Lee Seung Myung MD2, Shin Ho MD2
1Hurisarang Spine Hospital, Chosun University, 2Department of Neurosurgery, College fo Medicine, Chosun University

INTRODUCTION: In degenerative lumbar disease, conventional posterior lumbar interbody fusion (PLIF) leads to significant muscle injury and related complications. In contrast, minimally invasive lumbar interbody fusion is performed without significant muscle stripping or soft tissue injury.

METHODS: The surgical outcomes were compared between the two groups which underwent surgery due to degenerative lumbar disease between 2004 and 2007. In group A (n=86), conventional PLIF was performed using a microscope with an open transpedicular screw fixation system; and in group B (n=145), modified mini-open (MoMO) PLIF was performed using the newly designed percutaneous transpedicular screw fixation system (Apollon System®). A percutaneous transpedicular screw was inserted in the same skin incision site during MoMO PLIF procedures. In Group A, Group B, respectively, mean follow-up period was 23.7 and 25.3 months, mean age was 56.3 and 59.1 years. Operative level was one level; 73 and 117 cases, two levels; 11 and 22 cases, three levels; 4 and 6 cases. Clinical outcome was assessed using the Low Back Outcome Score. We also compared the operative time, blood loss and the extents of post-operative midline surgical scar.

RESULTS: In group A, Group B, respectively, the mean surgical time was 163.7 and 142.6 minutes, the mean blood loss was 753 and 438 ml and the average LBOS was 56.2 and 63.8. The extents of post-operative midline surgical scars were as follows: 1 level, 6.23 and 3.71 cm cm; 2 levels, 11.28 and 6.27 cm; and 3 levels, 15.26 and 8.35 cm. Clinical outcome was assessed using the Low Back Outcome Score. We also compared the operative time, blood loss and the extents of post-operative midline surgical scar.

CONCLUSIONS: As compared with conventional PLIF; MoMO PLIF can diminish the extents of midline skin incision and muscle retraction. Furthermore, this approach is also effective in easily performing multi-levels. It is therefore useful in reducing operative time and intra-operative blood loss, thus minimizing post-operative back pain.

KEYWORDS: lumbar · fusion · Minimal · Percutaneous

ORAL PRESENTATION 021
Spinal Instability Predicting Score (SIPS) for Following Fractures after Vertebroplasty in Patients with Osteoporotic Vertebral Compression Fractures
Kim Hyecun Sung1, Jeon Ki Hyun MD1, Choi Woo Jin MD1, Kim Kwan Tae MD1, Ju Chang Il MD2, Kim Seok Won MD2, Lee Seung Myung MD2, Shin Ho MD2
1Hurisarang Spine Hospital, Chosun University, 2Department of Neurosurgery, College fo Medicine, Chosun University

INTRODUCTION: Vertebral augmentation procedures have emerged as the standard treatments for osteoporotic vertebral fractures. However, these procedures are associated with following fractures (FFs). The purpose of this study was to evaluate the spinal instability factors related to FFs.

METHODS: 231 patients of Vertebroplasty (VP) with X-ray follow-up > 6 months were enrolled. FFs were classified based on the FFs pattern: 1) no FFs (NFFs), 2) neo-fractures (NFs), 3) HFs and 4) kyphotic compression fractures (KCFs). Each occurrence rate was studied for factors that may induce FFs due to instability; scoring was performed related to the HF’s occurrence rate. By summation of those scores, we obtained SIPS for FFs. After correcting by factors which prevented HFs, the FF risk groups were classified into the following four groups: group A, no risk group; group B, low risk group; group C, moderate risk group; and group D, high risk group.

RESULTS: The FF types were as follows: NFFs, 112 cases (48.28%); HFs, 65 cases (28.02%); NFs, 35 cases (15.09%); and KCFs, 19 cases (8.19%). In the FFs risk group, the possible percentage of HFs according to the corrected SIPS were as follows: { NFs } / { total FFs } = possible percentage of HFs } [ HFs, NFs and KCFs ] – group A: [ 84.06% ] / [ 0% ] [ 0%, 10.14%, 5.80% ], group B: [ 60.61% ] / [ 39.39% ] [ 6.06%, 21.21%, 12.12% ], group C: [ 41.54% ] / [ 58.46% ] [ 24.62%, 16.92%, 16.92% ], and group D: [ 6.24% ] / [ 93.76% ] [ 73.44%, 15.63%, 4.69% ].

CONCLUSIONS: We can calculate predicting scores and can predict FFs using the SIPS. If the SIPS high, the patients have a greater chance for FFs. Therefore, we must give more attention to such patients.

KEYWORDS: Osteoporosis · Fractures · Augmentation · Instability

ORAL PRESENTATION 022
Two Different Patterns of Sacroiliac Joint Unleveling
Jeon Ki Hyun MD1, Choi Woo Jin MD1, Kim Kwan Tae MD1, Ju Chang Il MD2, Kim Seok Won MD2, Lee Seung Myung MD2, Shin Ho MD2
1Hurisarang Spine Hospital, Chosun University, 2Department of Neurosurgery, College fo Medicine, Chosun University

INTRODUCTION: The diagnostic methods for pain which is generated from the sacroiliac joint are lacking in accuracy and the pathophysiology remains unclear. The purpose of this study was to understand the pathophysiology of the sacroiliac joint instability.

METHODS: The current study involved 83 patients between 2005 and 2008. Based on the radiologic findings, patients were assigned to the following two groups: group A, lumbosacral angle (LSA) subsidence pattern (n=54), in which the sacrum subsided into the lumbosacral angulated side; and group B, LSA lifting pattern (n=29), in which the sacrum lifted on the lumbosacral angulated side. Treatments included injection and sacroiliac joint distraction manipulation. Treatment outcomes were measured based on the degree of improvement in accordance with the visual analogue scale (VAS) and LSA on the lumbosacral antero-posterior view.

RESULTS: In group A and group B, respectively, the period during which the symptoms were persistently present was 29.80 and 36.61 months and the mean VAS was 6.93 and 7.67. On radiograph, the LSA abnormality was investigated in 75 patients (90.36%). LSA was group A; 4.03 and group B; 5.88 degrees. At the final follow-up, in group A and group B, respectively, the total frequency of treatment was 5.97 and 8.73 times, LSA was 1.72 and 2.83. The proportion of cases in which VAS was decreased by > 50% at the final follow-up was 83.33% (45 patients) and 68.97% (20 patients). The VAS was 2.81 and 3.07.

CONCLUSIONS: We found two different radiologic patterns of sacroiliac joint unleveling based on radiograph. The period during which the symptoms were persistently present, the intensity of pain and LSA were significantly greater in group B than group A. The
treatment outcomes were excellent in both groups. But they had different patterns of treatment results.

**KEYWORDS:** Sacroiliac joint • Instability • Lumbosacral angle

**ORAL PRESENTATION 023**
Cervical distractor screw technique guiding thoracolumbar pedicle screw insertion is Efficient and Accurate Compared with Anatomic Landmarking, Fluoro-Navigation or Fluoro-merge CT Navigation.

*King Fahad Specialist Hospital*

**INTRODUCTION:** Pedicle screw fixation is a mainstay of thoracolumbar stabilization. Screw insertion using anatomic landmarks and fluoroscopy is common but can be technically challenging and requires exposure to ionizing radiation. Computerized navigation has been reported to improve accuracy, but is expensive and complex. The authors evaluate these three methods and a fourth technique using standard cervical distractor screws to mark the entry point and trajectory.

**OBJECTIVE:** To compare standard cervical distractor screws as pedicle markers with anatomic landmark/fluoroscopy, fluoro-navigation, and fluoro-merge CT navigation.

**METHODS:** Pedicle screws were inserted in an intact cadaveric human spine from T1-L5 using the following four insertion techniques: cervical distractor screws, landmark/fluoroscopy, fluoro navigation and fluoro-merge CT. CT scan and anatomical dissection were then performed to evaluate screw position for site and degree of breach.

**RESULTS:** The cervical distractor screw method had a breach rate of 5.9% versus 29.4%, 32.4%, 20.5% for conventional, Fluoro and Fluoro-navigation respectively (p<0.05). There is also a significant association between degree of medial and distal breach versus the method of screw insertion (p<0.05).

**CONCLUSION:** Cervical distractor screws as pedicle markers offer favourable insertion accuracy and reduction of radiation exposure compared to the other three methods.

**KEY WORD:** Pedicle screw, cervical distractor screw, CT navigation, fluoro-navigation, marker screw

**ORAL PRESENTATION 024**
Upper Limit mJOA Score in Cervical Spondylotic Myelopathic Patients: Semiology and Surgical Outcome

*Sharifi Guive*

**INTRODUCTION:** Anterior cervical disectomy is an effective and safe treatment for nerve root or spinal cord compression caused by disc herniation or spondylolysis.

**METHODS:** Forty three patients with CSM caused by osteophytic ridge or intervertebral disc herniation that underwent anterior disectomy and fusion in loqman hakim hospital from 2002-2006 were prospectively enrolled.

**RESULTS:** The major pathology in our patients was vertebral osteophytes (86%) and soft disc (14%). The mean interval from symptoms onset to hospital presentation was 10.78 ± 7.3 months. In lower limbs, of 31 with pre-operative functional impairment, 25 remained unchanged, 3 improved and 3 worsened, which is not significant, and of 39 patients with preoperative upper limb functional impairments using Cooper's scale, 20 improved, 15 remained unchanged and 4 became worse (p=0.001). Recovery rate of mJOA score was 24.5 ± 17.70 %, for Cooper lower extremity score was 32.2 ± 40.56% and for cooper upper extremity score was 7.8 ± 16.80 %. The Mean gain in mJOA was 0.84 (±0.57).

**CONCLUSION:** The mean mJOA gain in our patients was low because: The mean pre-operative mJOA score of our patients was high (13.4 ± 1.66) and patients were younger than the patients of other studies and we think that the decompression of cervical canal in older patients is more effective. We think that in patients with good condition that myelopathy has not established yet, and they have minor sensory or motor disturbances, perhaps mJOA is not a detailed, perfect, and powerful scale for pre and post operative assessment of patient

**KEYWORDS:** Cervical Spondylotic Myelopathy, Surgical Outcome

**ORAL PRESENTATION 025**
Bilateral Three-Level Lumbar Spondylolysis Directly Repaired by Hook-Screw Technique

*Sharifi Guive*

**INTRODUCTION:** It introduces a very rare case of symptomatic bilateral three-level spondylolysis with only 6 case reports presented in the literature.

**METHODS:** We report a case of bilateral three levels lumbar spondylolysis, directly repaired by use of hook-screw technique. The patient's complaint was low back pain for 2 years that progressively worsened and exacerbated with standing and walking. He also mentioned bilateral sciatalgia, recently. The neurologic examination was normal. Interestingly, we found bilateral lumbar spondylolysis in L3, L4 and L5 levels in imaging studies.

**RESULTS:** After proving that spondylolysis was the source of the patient's low back pain by local anesthetic agent injection, we used a direct technique for correction of spondylolysis by use of a hook-screw device plus decortications of lysis area and iliac crest autograft. We assessed the patient after surgery for evaluation of pain recovery and fusion rate.

**CONCLUSION:** The results were favorable and proved the efficacy of hook-screw technique for treatment of symptomatic multi-level lumbar spondylolysis.

**KEYWORDS:** Hook-screw; Low back pain; Spondylolysis.

**ORAL PRESENTATION 026**
Diagnosis, Treatment and Long – Term Follow – Up of Lumbar Synovial Cysts

*Alessandro Landi, Roberto Tarantino, Nicola Marotta, Andrea Gennaro Ruggeri, Martina Cappelletti, Maurizio Domenicucci, Roberto Delfini Department of Neurological science, division of Neurosurgery University of Rome “ Sapienza”*

**INTRODUCTION:** Spinal synovial cysts are cystic dilatations of the synovial membrane that may appear at any level of the spine, with a prevalence of the lumbar segment, particularly L4-L5. Clinical symptoms vary according to the nerve root compression exerted by
the cyst and the amount of stenosis present. The causes of synovial cyst formation in the spine are still unclear despite the fact that a clear correlation exists with instability, facet degenerative arthropathy and degenerative spondylolisthesis. In the lumbar spine, these conditions may lead to the sudden or progressive onset of lumbar and radicular pain, depending on whether or not there is acute bleeding inside the cyst. Despite the conservative options available, the treatment of choice is complete removal of the cyst. We describe our experience and discuss the clinical and instrumental diagnostic tools, surgical treatment and long-term clinical outcome of this pathology.

**MATERIALS AND METHODS:** From January 1995 to December 2007, 14 patients with lumbar synovial cysts were treated in our institute: 10 were straightforward cysts and 4 were hemorrhagic. Preop diagnostic workup consisted of CT scan, MRI and dynamic X-rays of the lumbar-sacral spine. In all cases, the cyst was surgically removed via hemilaminectomy or hemilaminectomy and partial arthrectomy with preservation of the medial 2/3 of the facet joint: in cases with preoperative instability, posterior fusion was also performed. Postoperatively, all patients underwent control MRI, followed by dynamic X-rays 1 year after operation. Minimum clinical follow-up was 12 months.

**RESULTS:** Immediate clinical improvement was observed and complete removal confirmed by MRI. One year dynamic evaluation in the non-stabilized patients did not show any signs of instability. All patients were asymptomatic and recurrence-free at 1 year follow-up.

**CONCLUSIONS:** Although conservative procedures have been proposed for treatment of lumbar synovial cysts, the gold standard of treatment is still complete surgical resection. Evaluation of lumbar stability by MRI and dynamic X-rays is essential for correct surgical planning and to identify patients who require fusion once the cyst has been removed. In patients without signs of instability, hemilaminectomy or hemilaminectomy and partial arthrectomy with preservation of the medial 2/3 of the facet seems to be an effective option, with a low risk of complications and recurrences.

---

**ORAL PRESENTATION 029**

**Microneurosurgery of Intramedullary Spinal Cord Cavernous Angioma**

Piao Ming-xue, Yang Jun

Department of Neurosurgery, Tiantan Hospital, Capital Medical University, Beijing 100050, China

**OBJECTIVE:** To investigate the therapeutic strategies of spinal cord cavernous angioma. METHODS: Clinical data on 39 patients with intramedullary cavernous angioma were analyzed. The function of patient before operation was worse. The postoperative neurological status was improved in 30 patients. remained unchanged in 5, and aggravated in 4. No deaths occurred.

**CONCLUSIONS:** MRI is one of the most effective way in diagnosis of intramedullarily cavernous angioma. Microsurgery is optimal for patients with symptoms. Pre-operation location and intra-operative electro-physiological monitoring is essential for operation.

**KEYWORDS:** Spinal cord, cavernous angioma, Magnetic resonance imaging, Microsurgery

---

**ORAL PRESENTATION 030**

**Dynamic stabilization with neutralization device**

Koumpouros Nikolaos

S.S. Filippo e Nicola Hospital

The use of rigid stabilization devices grants benefits to patients, but also raises doubts in physicians about the functional syndrome that causes an additional pain in almost 35% of operated patients. Therefore it is necessary to look for a “dynamic solution” in order to reproduce a new vertebral stability similar to physiological condition. The flexible neutralization devices modify favourably both movement and transmission of the vertebral load without causing the arthrosis of the vertebral segment. The dynamic stabilization aims to restore physiological vertebral stability, oppose disc degeneration, preserve adjacent discs and avoid degeneration of facet joints. I present my experience of the available solutions of dynamic stabilization comprehending pedicular screw systems, disc arthroplasty and interspinous devices. Most favourable results have been obtained with flexible neutralization devices and hybrid systems.

---

**ORAL PRESENTATION 031**

**2 - Year Clinical Outcomes in 119 Patients Treated with a Mini - Open, 90° Lateral, Retraperitoneal, Trans - Psoas Approach for Lumbar Spine Discectomy and Fusion**

William Smith MD. 1,2, Madilyne Malone BS. 2, Ginger Christian BS. 2, Sherrie Serrano2, Kyle Malone MS. 2

1University Hospital of Larissa, 2NNI Research Foundation

**INTRODUCTION:** Interbody fusion in the lumbar spine is an established technique for treatment of lower back pain and radicular symptoms. Several surgical options for anterior column reconstruction exist, with outcomes, fusion and success extensively reported in the literature on anterior interbody fusion (ALIF), posterior interbody fusion (PLIF) and transforaminal interbody fusion (TLIF). Outcome and fusion rates for a mini-open, 90° lateral, retroperitoneal, trans-psoas approach for lumbar spine discectomy and fusion (eXtreme Lateral Interbody Fusion (XLIF)), introduced in the literature in 2006, has heretofore been unreported.

**METHODS:** This work reports outcome measures (disability, pain, satisfaction) and fusion status at 24-months for 119 patients treated with XLIF between 2006 and 2008 by a single neurosurgeon. Data was collected prospectively, and compiled retrospectively.

**RESULTS:** Significant decreases in mean disability, overall pain, lower back pain, and radicular pain were realized at all time points postoperatively (all, p<0.001). Narcotic medication decreased significantly from 67.2% preoperative to 34.8% postoperative (p<0.01). Patient-reported satisfaction was 83.2% overall, 87.0% on relief of pain, and 95% of patients would undergo the surgery again if their outcome was known preoperatively. Fusion was verified by x-ray or CT in 87% of patients. XLIF-specific complications included one...
CONCLUSIONS:

The XLIF procedure for interbody fusion, in this series, performed comparably at 24-months postoperative on reported complications, outcomes, satisfaction, and fusion as ALIF; PLIF; and TLIF with shorter mean operative time and less blood loss.

ORAL PRESENTATION 032

A Comparison Of The Surgical Efficacy Of Alif And Xlif L4-5 Fusion Procedures With Posterior Fixation

Malone Kyle1, Smith William2, Thalgott John3, Garber Jason1, Raskin Jeffrey4, Saxena Rajeev5, Malone Madilyne1

1NNI Research Foundation, 2University Hospital of Larissa, 3Center for Diseases and Surgery of the Spine

BACKGROUND CONTEXT: Utilizing a mini-open approach, specifically XLIF, instead of similar open procedures is gaining in prevalence as preference for many surgeons.

PURPOSE: The purpose of this experiment was to directly compare operative variables associated with minimally invasive vs. open procedures. Our hypothesis is that patients who underwent L4-5 interbody fusion with posterior fixation via the XLIF approach will have shorter OR times (ORT) and length of post-operative hospital stay (LOS) as well as less blood loss (EBL) than patients who received the procedure via the ALIF approach.

STUDY DESIGN/ SETTING: Observational

PATIENT SAMPLE: 45 patients underwent ALIF L4-5 with bilaterally posterior fixation by two surgeons, and 50 patients underwent XLIF L4-5 with bilateral posterior fixation by one neurosurgeon.

OUTCOME MEASURES: EBL(cc), OR Time(mins), Length of Hospital Stay(hrs)

METHODS: 95 patients were identified as having undergone isolated L4-5 interbody fusion procedures with posterior fixation. 45 received the procedure via an anterior/posterior approach (ALIF), and 50 via a mini-open lateral/posterior approach (XLIF). No intra-operative complications were reported. ORT, EBL, and LOS were compiled through retrospective chart review and analyzed via a 1-way MANOVA.

RESULTS: The two cohorts were matched in all demographics except the XLIF group had a significantly greater mean age than did the ALIF group (M ALIF Age = 50.2 years, M XLIF Age = 61.6 years; p < .05). The significant multivariate effect of approach (λ = 0.488) was associated with univariate effects on ORT, EBL, and LOS. ORT was significantly longer for the ALIF approach (MALIF = 150.84mins, SEALIF = 4.75mins) than for the XLIF approach (M XLIF = 99.08mins, SEXLIF = 4.50mins) F(3, 91) = 62.573, p = <.001. EBL was significantly greater for the ALIF approach (MALIF = 228cc, SEALIF = 18.55cc) than for the XLIF approach (M XLIF = 64.72cc, SEXLIF = 17.59) F(3, 91) = 64.773, p = <.001. LOS was significantly greater for the ALIF approach (MALIF = 228cc, SEALIF = 18.55cc) than for the XLIF approach (M XLIF = 40.68hrs, SEXLIF = 3.87hrs) F(3, 91) = 28.264, p = <.001.

CONCLUSIONS: The results confirm our hypothesis. Our findings suggest that the mini-open XLIF procedure significantly decreases surgery time, intra-operative blood loss, and length of post-operative hospital stay when compared to the same procedure being pursued via an open approach, despite the XLIF cohort’s greater mean age. This is consistent with the widely held notion that mini-open procedures are less traumatic than open procedures, however the decreased operative time suggests less technical difficulty, which is atypical of minimally invasive procedures, namely endoscopic techniques. Long-term follow-up will be required to determine if the approaches are comparable in patient outcomes.

FDA Device/Drug Status: ALIF L4-5: Approved for this indication.; eXtreme Lateral Interbody Fusion: Approved for this indication.; bilateral posterior pedicle screws: Approved for this indication.

ORAL PRESENTATION 033

Graft Extrusion In AxialIF®

William Smith1, William Blake Rodgers2, Michael Seiff3, Madilyne Fogarty4, Kyle Malone1

1Las Vegas, NV, USA; 2Midwest Spine, 3The Nevada Neurosciences Institute, Las Vegas, NV, USA; 4International Spinal Development and Research Foundation, Las Vegas, NV, USA

BACKGROUND CONTEXT: The minimally invasive AxiaLIF® system for L5-S1 discectomy and fusion works in a presacral corridor to access the L5-S1 disc space from the inferior aspect of the superior sacral segment. Graft insertion after disc removal involves transporting graft through a delivery tube into the empty disc space. The graft aids in distracting the segment to restore disc height and spur bone growth after insertion of the AxiaLIF® Rod. One advantage to the system is that the entire procedure is performed while leaving the annulus and ligamentous structures intact.

PURPOSE: In our series, we observed that in rare AxialIF® cases where annular deficiencies exist, graft extrusion from the disc space is possible and the following two cases outline the complication

STUDY DESIGN/SETTING: observational study

PATIENT SAMPLE: 287 AxialIF® L5-S1 cases performed by one neurosurgeon

OUTCOME MEASURES: Complications, as reported by any significant change in pain, motor ability, sensory perception, reflex, and any adverse event.

METHODS: Chart review

RESULTS: Two patients (2/287; 0.69%) experienced graft extrusion, one of which required revision.

Case 1: A 64 year-old female with a transitional anatomy at L4-5 was scheduled to undergo an L4-5 XLIF® and L5-S1 AxialIF®. During the approach for the L4-5 XLIF®, due to her sacralized lumbar L4-5, a 3-5 corridor for approach could not be accessed. The XLIF® was aborted and the patient underwent a two-level L4-5 AxialIF®. Shortly after surgery the patient developed a deep wound infection in the aborted XLIF® incision site and after cleaning, a CT was taken and revealed that graft material had extruded anteriorly from the L4-5 disc space (Figure 1). The patient was asymptomatic and did not require revision.

Case 2: A 30 year-old female with DDD underwent an L5-S1 AxialIF® procedure with posterior facet screws. The patient readmitted to the hospital four (4) days post-operative complaining of severe stabbing pain and acute neurological deficits in the back and lower extremities. The patient was immediately brought to the OR after CT revealed graft extrusion posteriorly into the intradural space. A four hour operation was performed to remove the dura from the intradural space and at six months, has several continuing deficits.
CONCLUSIONS: This identifies two rare cases with one serious result pertaining to the AxiaLIF® system of interbody fusion. Compromises in the annulus, possibly exacerbated by the inflammatory response of BMP, could lead to graft extrusion as this system uses graft as a disc distracting agent, thus greatly increasing intra-annular pressure. This complication is exceedingly rare as experienced in our series and we are unaware of any other similar cases. Avoidance can largely be achieved by using a recent annulotomy and/or dye extravasation in discography as contraindications for this procedure.

FDA Device/Drug Status: AXIALIF L5-S1: Approved for this indication.; AXIALIF L4-S1: Approved for this indication.; BMP: Approved for this indication.

ORAL PRESENTATION 034
The AxiaLIF® Experience: The First 285 Cases
Kyle Malone1, William Smith2, William Blake Rodgers3, Jamie Patterson4, Malone Madilyne1
1NNI Research Foundation, 2University of Los Alisos, 3Midwest Spine

INTRODUCTION: The minimally invasive, pre-sacral AxialLIF system for L5-S1 discectomy and fusion introduced in 2006 has been used in more than 5000 cases worldwide and long-term follow-up and complication data is emerging. This work focuses on our experience with the procedure in two surgeons’ first 285 L5-S1 AxialLIF® cases, namely outlining complications encountered.

METHODS: 285 patients underwent the AxialLIF® procedure for L5-S1 discectomy and fusion by one neurosurgeon and one orthopedic surgeon working independently. Results were tabulated by chart review.

RESULTS: The patients studied were 51% female, with an average age of 56 years old. 33% were smokers, 19% had undergone a prior lumbar fusion surgery, and 14% were being treated with insulin for diabetes. The primary indications for L3-S1 treatment were HNP (24%), Post-laminectomy syndrome (21%), and DDD (16%). Nearly three-quarters (73%) of patients received either unilateral or bilateral pedicle screws, 23% had bilaterally facet screws, and 2% were performed as stand-alone procedures. Additionally, 39% of the cases had multi-level procedures with the XLIF® system for lateral approach interbody fusion.

COMPLICATIONS
Wound Complications: Healing 6 cases (2.1%); Deep wound infection 4 cases (1.4%) In this series, we observed no occurrences of bowel injury and attribute these cases to normal healing complications in relatively comparable distributions seen in other surgical procedures. Retroperitoneal Hematoma: 5 cases (1.8%) These instances were observed more frequently in the early patient population (4/5 in first 100 cases) where dissection of the pre-sacral fat was not performed as precisely as in the later cases, often resulting in the disruption of small vasculature leading to post-operative retroperitoneal hematomas. Of these, only two required re-exploration to drain (figure 1) Graft Complications: 4 cases (1.4%) We observed four cases of graft extrusion through the annulus on post-operative CT. One required revision due to extrusion into the dura at L4-5 (Figure 2). The other three were non-symptomatic and required no revision. Vertebral Body Fracture: 2 patients (<1%) While rare in our series, we did observe two cases of S1 body fracture due to placement of the AxialLIF® screw in the extreme anterior body which were both revised with Stalif. This reinforces the importance of trajectory and placement of this device. Posterior Hardware Failure: Painful Hardware: 4 patients (1.4%); Fractured Facet Screws: 2 cases (<1%) Painful bilateral pedicle screws were revised and the facet screws fractured after falls in each of the patients, with revision unnecessary (Figure 3)

Pseudoarthrosis: 11 cases (3.9%); Of those that developed pseudoarthroses, most presented early (within 6-months) with schmorl’s nodes or radiolucencies surrounding the AxialLIF® implants, and 10/11 were smokers suggesting a particular risk for that sub-group of patients.

Death: 2 cases (<1%) Due to post-operative pulmonary embolism and myocardial infarction related to pre-existing comorbidities.

Conclusions: The occurrence rates of these complications in our first 285 patients are comparable and likely favorable to complications data published on other minimally invasive and open techniques for L5-S1 discectomy and fusion (namely ALIF). Long-term outcome results will be needed for full comparisons of these procedures.

ORAL PRESENTATION 035
Sacralized Lumbar As A Relative Contraindication For L4-5 Xlif®
Kyle Malone1, William Smith1, Michael Seiff2, Madilyne Fogarty1, Malone Madilyne1, Christian Ginger3, Serrano Sherrie4
1Las Vegas, NV, USA; 2The Nevada Neurosciences Institute, Las Vegas, NV, USA; 3International Spinal Development and Research Foundation, Las Vegas, NV, USA, 4NNI Research Foundation

BACKGROUND CONTEXT: eXtreme Lateral Interbody Fusion (XLIF®) utilizes a direct lateral, muscle splitting trans-psosas approach for exposure of the lateral disc space for discectomy and fusion. During the approach, the identification and avoidance of intra-psosas nerves is a major consideration, thus neuromonitoring is recommended for each XLIF® case.

PURPOSE: In one surgeon’s experience with over 1500 XLIF® levels, a trend was observed that in cases of transitional anatomy at the L4-5 level (sacralized lumbar), intra-psosas nerve interference prohibited safe access to the disc and often resulting in abortion of the lateral approach

STUDY DESIGN/SETTING: Observational Study

PATIENT SAMPLE: 351 L4-5 XLIF cases performed by a single neurosurgeon

OUTCOME MEASURES: Complications, as reported by any significant change in pain, motor ability, sensory perception, reflex, and any adverse event.

METHODS: Chart review

RESULTS: Out of 566 total XLIF cases, 351 (62%) underwent a L4-5 XLIF®. Ten (10) of those patients (2.8%) were reported as having transitional anatomy at L4-5 and 8 (80%) were unapproachable via a direct lateral, trans-psosas approach due to lumbar plexus interference as qualified by neuromonitoring. All aborted cases in our series subsequently underwent L4-S1 AxialLIF® procedures.

CONCLUSIONS: The psosas increases in size as it travels caudally on the lateral lumbar spine with the intra-psosas nerves spiraling anteriorly from a posterior-lateral to a direct lateral orientation. Performing a trans-psosas approach at L1-2 is less confounded by the psosas muscle and associated intra-psosas nerve roots than at L4-5 since at L1-2 the psosas is generally smaller and the nerve roots do not extend anteriorly.
ORAL PRESENTATION 036

Diagnoses, Improvement of Classification Differentiated Operative Access of Tumor of the Spinal Cord

Mamadaliyev Abdurakhman MD, PhD
Samarkand State Medical Institute

The work is devoted to the modern diagnostics methods and the choice of surgical access depending on the length of tumor of spinal cord. This work processes the analysis of 170 patients with tumor of spinal cord, who were treated in the neurosurgery clinics of Samarkand Medical Institute. For diagnostics purpose, thorough clinical-laboratory observations and modern X-ray and myelography (MG), CT and MRI examinations were carried out on all the patients. Men consisted of 60.6% (103 patients), women-39.4% (67 patients). The children aged up to 15 were 9.1%, patients aged between 16 to 62 were 90.9%. Extramedullar tumor was met in 61.3% patients and intramedullar tumor was observed in 38.7% cases.

For the approach in the evaluation of new formations in regard with the longitudinal axis of vertebral column and spinal cord we recommend supplement the acting anatomical-clinical classification with following forms of tumors of spinal cord: 1. Nodal or short tumors-if tumors are situated in the level of one or two vertebrae. 2. Middle length tumors-if tumors are situated in the level of 3rd -4th vertebrae. 3. Long tumors-if tumors are situated in the level of 5th -6th vertebrae. 4. Super long tumors-if tumors are spread across the longitudinal axis of vertebral column and spinal cord in the level of more than 6-7 vertebrae.

Proceeding from the recommended supplement to the classification we have worked out differentiated methods of laminectomy in order to minimize the number of resected spinal processes or balls. Hereby in onset of first factors of spinal cord affection tumor patients must have MRI, CT or contrastive MG. We use differential operative access and microsurgical techniques for different length of the tumor of the spinal cord with the aim of minimizing the post-surgical trauma and keeping stability of spinal column which is suggested as “ladder”- laminectomy.

ORAL PRESENTATION 037

Efficiency of Operativ Sparing Access for Ablation Hernia Intervertebral Discs Lumbosacral Parts of Spinal Column

Mamadaliyeva Saodat
Samarkand State Medical Institute

Due to modern methods of diagnostics (MRI, CT) diagnostics of intervertebral hernia discs, followed by radicular pains, sense shock, movement and trophism of muscle and in some cases the function of causal organs, was considerably improved. The results of surgical treatment of 424 patients with hernia discs lumbosacral parts of spinal column treated in our clinics from 2003 to 2009. After careful neurologic examination to visualize diagnose in 83% cases conducted MR-imaging unit, and in 17% cases CT and MSCT. Among the patients 57% consists of men and 43% women. Hernia discs often were met among the patients at the age of 40-50 (37.3%). MRI and CT showed that the size of discs was 5 mm-18 mm. The indication for operation is a sharp radicular and ishalgic pain syndrome, sensitive and motor neurological deficit, pelvic functions disorder and inefficiency of conservative treatment. We use sparing surgery for excision of discs – inter-laminar and hemi-laminar access to minimize surgery traumas and preserving stability of the spine. The analysis show that in 70% of the cases inter-laminar way was used to excise discs hernia partial hemilaminectomy was used in 19% of the cases. If there was an indication, they sometimes used excise of hypertrophied yellow ligament. Catamnesis studies showed that 90% of the patients had positive results and returned to their work; 9% had satisfactory results; and only 1% of the patients with hernia of the 3rd and 4th discs with the stenosis of the vertebral canal and gross neurological disorders showed moderate improvement of the neurological deficiency. Thus, excise of the vertebral discs using sparing surgery is effective when the stability of the spine can be preserved, and ability to work is recovered comparatively quickly.

ORAL PRESENTATION 038

Differentiated Approach to Kypho- and Vertebroplasty in Spine Fractures

Toma George, Rozhkova Julia
Research and Development Institute of Traumatology and Orthopaedics

INTRODUCTION: The research objective is to increase the efficiency of treatment of patients with compressive fractures of vertebral bodies in thoracic and lumbar segments. METHODS: Results of treatment of 117 patients aged from 16 to 73 are analysed. Among them 71 patients are male and 46 patients are female. In the course of the research it has been observed, that the more evident the wedging of spine and kyphotic deformity angle, the less stable the body of a person in space, and vertebra support ability degree depends on the destruction degree of its supporting columns, therefore the support ability assurance depends on the degree of restoration of vertebral body height, allocation area of the introduced osteoplastic material inside the vertebra and its volume.
INTRODUCTION: Stable hangman’s fractures are usually treated with a Halo vest fixation; however, this is not always effective in patients with polytrauma. These patients benefit from minimally invasive surgery because it allows for early rehabilitation and reduced nursing care. This is the first report on percutaneous screw fixation using three-dimensional fluoroscopy-assisted navigation (Iso-C computer navigation) in patients with polytrauma and hangman’s fractures.

METHODS: We report the five cases of hangman fractures with polytrauma treated by posterior percutaneous direct screw fixation using Iso-C computer navigation. A dynamic reference arc was attached to the spinous process of the axis through a small incision. After image acquisition, the fluoroscopy workstation generated 3-dimensional reconstructions of the imaged anatomy. We made two small, lateral incisions for percutaneous screw insertion, and used an image-guided awl to create screw trajectory. Guide wire was inserted through this screw trajectory, and a cancellous lag screw was inserted over the guide wire.

RESULTS: At the final follow-up, the patients had no neurological deficits and bony unions were achieved.

CONCLUSIONS: Iso-C computer navigation surgery acquires the intraoperative images after patient positioning. Therefore, this procedure avoids registration errors and improves accuracy and safety. Intraoperative 3D images by Iso-C can obviate the need for postoperative imaging and intraoperative acquisition of 3 dimensional images avoids registration-related problems. It will be applicable to minimum invasive surgeries. Percutaneous screws fixation using three-dimensional fluoroscopy is useful technique for treatment of hangman’s fracture.

KEYWORDS: minimally invasive surgery, three-dimensional fluoroscopy, hangman’s fracture, navigation

ORAL PRESENTATION 039
Percutaneous Screw Fixation for Traumatic Spondylolisthesis of the Axis Using Three-Dimensional Fluoroscopy-Assisted Navigation
Yasuo Ito MD, Koichiro Koshimune MD, Yoshihisa Sugimoto MD, Shinnosuke Nakahara MD
Dept. of Orthopaedic Surgery, Kobe Red Cross Hospital, Kobe, Hyogo, Japan

INTRODUCTION: Stable hangman’s fractures are usually treated with a Halo vest fixation; however, this is not always effective in patients with polytrauma. These patients benefit from minimally invasive surgery because it allows for early rehabilitation and reduced nursing care. This is the first report on percutaneous screw fixation using three-dimensional fluoroscopy-assisted navigation (Iso-C computer navigation) in patients with polytrauma and hangman’s fractures.

METHODS: We report the five cases of hangman fractures with polytrauma treated by posterior percutaneous direct screw fixation using Iso-C computer navigation. A dynamic reference arc was attached to the spinous process of the axis through a small incision. After image acquisition, the fluoroscopy workstation generated 3-dimensional reconstructions of the imaged anatomy. We made two small, lateral incisions for percutaneous screw insertion, and used an image-guided awl to create screw trajectory. Guide wire was inserted through this screw trajectory, and a cancellous lag screw was inserted over the guide wire.

RESULTS: At the final follow-up, the patients had no neurological deficits and bony unions were achieved.

CONCLUSIONS: Iso-C computer navigation surgery acquires the intraoperative images after patient positioning. Therefore, this procedure avoids registration errors and improves accuracy and safety. Intraoperative 3D images by Iso-C can obviate the need for postoperative imaging and intraoperative acquisition of 3 dimensional images avoids registration-related problems. It will be applicable to minimum invasive surgeries. Percutaneous screws fixation using three-dimensional fluoroscopy is useful technique for treatment of hangman’s fracture.

KEYWORDS: minimally invasive surgery, three-dimensional fluoroscopy, hangman’s fracture, navigation

ORAL PRESENTATION 040
Intraoperative Iso-C 3D Navigation in Cervical Instrumentation Surgery: The First 100 Cases
Yasuo Ito MD, Koichiro Koshimune MD, Shinnosuke Nakahara MD
Dept. of Orthopaedic Surgery, Kobe Red Cross Hospital, Kobe, Hyogo, Japan

INTRODUCTION: Cervical pedicle screw misplacement leads to injuries of the spinal cord, root, and vertebral artery. Recently, several authors reported on the usefulness of a spinal navigation system, which improves accuracy of pedicle screw insertion. In this study, we assessed the accuracy of cervical pedicle, lateral mass and odontoid screw insertions placed using the three-dimensional fluoroscopy (Iso-C-3D) navigation system, which is superior to conventional CT-based image guidance in terms of automatic registration and updating the intraoperative real-time images.

METHODS: A total of 100 patients with cervical lesions who had undergone cervical instrumentation surgery with intra-operative navigation using the Iso-C C-arm were included in a prospective study. The clinical workflow in the registration-free 3D navigation system camera is set up and the Iso-C 3D is moved to the start position. Automatic 3D scan is performed. After the scan, the 3D image data coordinates are transferred directly to the navigation system. In every case, intraoperative postprocedural images obtained with the Iso-C-3D were used as the intraoperative CT. Screw position was postoperatively evaluated with thin-cut CT (1.25 mm) scanning to assess the accuracy of implant placement.

RESULTS: There was no neuro-vascular injury during operation. A total of 316 pedicle screws, 77 lateral mass screws, and 5 odontoid screws were accurately placed. Only 8 pedicle screws (2.3%) violated the margin of the pedicle wall up to 2 mm. In every case, screw placement and spinal alignment after reduction were verified intraoperatively.

CONCLUSIONS: Registration-free navigation surgery with the Iso-C 3D was successfully used in 100 consecutive initial patients with cervical lesions, and showed a significant advance in the safety and accuracy of operative procedures. Intraoperative postoperative 3D images can obviate the need for postoperative imaging.

KEYWORDS: intraoperative, image-guided, cervical spine, navigation

ORAL PRESENTATION 041
Capabilities of Decompressive Operations in Degenerate Stricture Formation of the Lumbar Part of Spine
Toma Alexander, Norkin Alexey, Anisimova Anna, Gramma Svetlana
Research and Development Institute of Traumatology and Orthopaedics

INTRODUCTION: The research objective is to determine therapeutic approach and improve the results of surgical treatment of patients with stenotic complicated degenerative damages of the lumbar part of spine according to the degree of spinal canal lumen deficiency (SCLD) and lumen deficiency of intervertebral foramina (LDF).

KEYWORDS: cervical spine, navigation
METHODS: Results of surgical treatment of 51 patients aged from 35 up to 65 are analysed.

Anterior form of the spinal canal deformity has been diagnosed in 23 patients. Circular stenosis is determined in 17 patients. In 11 patients stenosis of intervertebral foramina is revealed. Maximal SCLD up to 85% is revealed in two patients with circular stenosis of the spinal canal. Maximal LDIF up to 75% is revealed in 3 patients. Transligamentary and intralaminar discectomy was performed in 19 of 23 patients with the anterior form of the spinal canal deformity. Surgical intervention with the use of endoscopic equipment was performed in 9 patients. Osteoplastic laminectomy was performed in four patients. Among 17 patients with circular stenosis of the spinal canal osteoplastic laminectomy was performed in 14 patients with SCLD from 60% up to 80%, in 6 patients with SCLD over 80%, additionally, transpedicular fixation (TF) of the damaged vertebral segment with correction of height of intervertebral space was used as well. The resection of osseous overgrowths of external surface of joints was carried out in 11 patients with LDIF up to 60% with the use of endoscopic equipment. Among 51 patients osteoplasty of the defect of osteoligamentous apparatus was performed in 36 patients.

RESULTS: The excellent result was received in 24 patients, good result - in 18 patients and satisfactory one - in 9 patients. Among 36 patients who underwent osteoplasty of osteoligamental defect, musculotunicary cicatrix formation was not revealed in anyone of them.

CONCLUSION: Preferable choice of surgical technique in decompression of the spinal canal in patients with circular stenosis with SCLD over 60% can serve osteoplastic laminectomy. When there is stenosis of intervertebral foramina with LDIF up to 60% it is expedient to carry out the decompression by means of the intralaminar approach with the use of endoscopic equipment if possible, and when there is LDIF over 60% it is expedient to perform osteoplastic laminectomy with supplemental correction of height of intervertebral spaces and TF. Application of osteoplasty of osteoligamental defect allows to prevent the development of musculotunicary cicatrizes.

KEYWORDS: stenosis, spinal canal lumen deficiency, lumen deficiency of intervertebral foramina

ORAL PRESENTATION 043

Posttraumatic Thoracic and Lumbar Kyphosis. Abolfazl Rahimizadeh MD. Pars Hospital

INTRODUCTION: Post-Traumatic late kyphosis and its correction are the interesting topics and literature contains a few case series which have been reported all by celebrate spine surgeons who have expressed their whole surgical life experience.

METHOD: 49 patients seen with post-traumatic kyphosis from 6 months to 11 years after trauma are presented including 10 cases of thoracic, 37 cases of thoracolumbar and 2 cases of lumbar region. Neglected compression fractures, inadequate or failed posterior instrumentation, failed reductions and inappropriate laminectomy in 28 males and 21 females were the cause of kyphosis, pain and development of neural impairment. Kyphosis secondary to failed surgery were more seen in females while posttraumatic neglected kyphosis was more common in males. Various forms of surgery including: posterior subtraction osteotomy, anterior corpectomy with strut graft or expandable cages and instrumentation with or without adjacent levels discectomy and finally combined anterior plus posterior approaches were applied.

RESULT: Kyphosis correction averaged 29 degree. We were satisfied in all of the patients except in two. Those with very good result had better anterior height restoration and more kyphotic angle correction. In one of two unsatisfied cases, coexistence of global kyphosis was not considered in the surgery and in the next case with stand alone expandable cage settling was seen, although both of the patients had negligible pain and were happy with the results despite of our dissatisfaction.

CONCLUSION: We reached to a conclusion that the result of surgery and restoring sagittal balance can be more promising whenever one fully assay radiologically the condition preoperatively through the consideration of the coexisting curves.

ORAL PRESENTATION 045

Surgical Management of Invasive Vertebral Hemangiomas (Report of 13 Cases) Rahimizadeh Abolfazl, S. Samadian, N. Nabiyoni, Pars Hospital Tehran Iran

INTRODUCTION: Majority of the vertebral hemangiomas are asymptomatic and does not require surgery. Only rarely a small group of vertebral hemangiomas might need special treatment due to local or radicular pain secondary to body or arch expansion, vertebral body fracture and extraosseous growth of hemangiomas. The latter is the most challenging. For hemangiomas with extraosseous extension, corpectomy with replacement by autogenous graft or titanium cages are advised. Additional anterior or posterior instrumentation might be utilized upon surgeon judgment for prevention of instability. Intraoperative vertebroplasty also have been shown to be of great value in special case under going laminectomy as an adjunct mode of treatment.

METHOD: 13 patients with vertebral hemangiomas having extraosseous growth and neural deficit are presented. In the thoracic spine and four in lumbar region. Of these thirteen, 6 were female and seven men. Nine patients underwent preoperative embolization. 11 patients underwent corpectomy with extraosseous outgrowth tumor resection in all. Stabilization was achieved through posterior pedicle screw fixation in 3 cases. Vertebrectomy plus anterior instrumentation was done in 8 additional cases. In two patients after laminectomy extraosseous tumor removal was done followed by open vertebroplasty. Posterior instrumentation was performed in only one of these two.

RESULT: All patients recovered and none of them has experienced recurrent or new symptoms to date.

CONCLUSION: Although several reports on treatment of asymptomatic or symptomatic case suffering only pain have been presented. Surveying the literature, there are only a few case reports on treatment of invasive hemangiomas with extraosseous growth and neurologic impairment. Our report of 13 cases, 10 of which done by the senior author covering all aspects of treatment with long follow up seems worthwhile.

ORAL PRESENTATION 046

Biomechanics of Disc Arthroplasty. What Can Be Done to Improve Results - Present and Future Perspectives Luiz Pimenta MD, Luis Marchi MSc, Etevaldo Coutinho MD, Leonardo Oliveira BSc. Instituto de Patologia da Coluna
BACKGROUND: Current lumbar total disc replacement (TDR) devices require an anterior approach for implantation. The anterior approach to place lumbar TDR devices has inherent biomechanical limitations and surgical risks. Within the possible intraoperative issues are: the damage to various abdominal structures, such to the grand vessels, to bowel components and to the sympathetic neural plexus, without mentioning the long discharge and rehabilitation time. Besides the surgical risks, there is resection of the anterior longitudinal ligament (ALL). Placement of a TDR device from a true lateral (XLIF) approach allows for easier, less invasive access to the disc space, as has been shown in reports of XLIF for fusion procedures. Lateral implantation of TDR also preserves the stabilizing ligaments, which are a natural restraint to excessive rotations and translations, and thereby help to minimize facet stresses. Importantly, implantation from a lateral approach leaves greater opportunity for safer revision surgery, if necessary, by avoiding scarring of anterior vasculature. Additionally, the footprint of the lateral TDR device capitalizes on the biomechanical support of the ring apophysis.

PURPOSE: To present the clinical and radiological results of a true lateral implantation of total disc replacement

STUDY DESIGN: Prospective, non randomized clinical trial to evaluate the safety and effective of the lateral total disc replacement implanted by the XLIF approach.

PATIENT SAMPLE: Patients included 16 males and 20 females, average age 43 yrs (24-60).

OUTCOMES MEASURES: VAS pain scores improved from an average of 9.3 at pre-op to 2.27 after 3 years. Oswestry Disability Index improved from an average of 57 at pre-op to 16.5 after 3 years.

METHODS: A TDR device designed for implantation through a true lateral, retroperitoneal, transpsoas approach (XLIF) was implanted in 36 patients with discography-confirmed 1- or 2-level DDD. Clinical and radiographic outcomes assessments were prospectively collected.

RESULTS: Surgeries included 14 1-level, 3 2-level, and 19 hybrid TDR/ALIF cases. The surgery was performed through a 4cm lateral incision in an average of 134 minutes (90-300) and with an average 58cc blood loss (30-150). There was no intra-op or post-op complications. Postoperative x-rays showed good device placement, with restoration of disc height, foraminal volume, and sagittal balance. All patients were up and walking within 12 hours of surgery.

CONCLUSION: Mid-term results of a laterally placed TDR device demonstrate maintenance of pain relief and functional improvement. The benefits of this technique -- minimal morbidity, avoiding mobilization of the great vessels, preserving the anterior longitudinal ligament, biomechanically stable orientation, and broader revision options -- suggest a promising new direction for TDR procedures.

ORAL PRESENTATION 047
Cementless Kyphoplasty Like Strategies. Clinical Advantages
Luiz Pimenta MD, Luis Marchi MSc, Etevaldo Coutinho MD, Leonardo Oliveira BSc
Instituto de Patologia da Coluna

INTRODUCTION: Patients with severe osteoporosis typically suffer from vertebral compression fractures (VCFs), which often cause severe back pain. Such patients carry a significant risk of increased morbidity including back pain, decreased activity, bed rest, and even increased mortality. Minimal invasive vertebral augmentation techniques such as percutaneous vertebroplasty (VTP) have proven to be effective in treating the pain associated with VCF; patients typically report rapid, significant, and durable pain relieve and improvement in daily life performance after VTP. However, serious complications of vertebroplasty have been reported, including spinal cord compression, neurologic complications, paradoxical embolization of the cerebral artery from cement leaking into epidural veins, or cement embolization via the paravertebral venous plexus to the lungs causing pulmonary infarction and clinical symptoms. Finally, the polymethylmethacrylate cement releases heat during polymerization that can damage osteocytes. The technique of kyphoplasty is similar to vertebroplasty, but includes the step of percutaneous insertion of a balloon tamp through the pedicle into the involved vertebral body. Balloon inflation purportedly achieves compaction of surrounding cancellous bone and varying degrees of elevation of the compressed vertebra. Potential advantages include the possibility of improved deformity correction and decreased potential for cement leakage, but both techniques significantly increases the incidence of an additional osteoporotic vertebral body fracture twelve months after surgery. Here we show our experience with two different systems that provide a cementless additional treatment that is similar to Kyphoplasty for this patient population.

PURPOSE: The purpose of this study was to test the safety and effectiveness of the Benvenue Fracture Reduction System and Staxx System (Spine Wave) for the treatment of vertebral compression fractures caused by osteoporosis.

STUDY DESIGN: Prospective, non randomized clinical trial to evaluate the safety and effective of the Staxx System and Benvenue Fracture Reduction System in the treatment of osteoporotic vertebral fractures.

PATIENT SAMPLE: 14 patients with a mean age of 68.1 years old were enrolled in this study.

OUTCOME MEASURES: Radiographs and outcome measures such as VAS and ODI were prospectively recorded before surgery and at 1 and 6 weeks, 3, 6, 12 and 24 months postoperatively.

METHODS: All patients presented vertebral fractures due osteoporosis in one or two vertebrae. 10 patients underwent Staxx System surgery and 4 patients underwent Benvenue Fracture Reduction System technique.

RESULTS: All surgeries but one occurred without complications. One patient faced a pistol grip failure with an expulsion of one wafer into the retroperitoneal space with damage of an iliac vase, resolved during the surgery. The VAS and ODI showed significance in improvement after 6 weeks, 3 and 6 months. After one year, the ODI and VAS started to increase in consequence of 42.8% of new fractures, being 2 adjacent and 4 nonadjacent VCFs.

DISCUSSION: Both groups presented pain relief after the procedure. This improvement shows the efficacy of the systems in stabilizing the fractured vertebrae. Using a cementless technique we were able to treat the pathology without the risks and complications of a standard Vertebraloplasty or Kyphoplasty. The osteoporosis was not treated with these techniques and other complications due this pathology made the pain scales to increase after 12 months. Both techniques appear to be an excellent alternative to more invasive procedures to spinal vertebrae stabilization in consequence of osteoporosis.

ORAL PRESENTATION 048
Experience in Cerpass System. Titanium-Ceramic Cervical Total Disc Replacement
Luiz Pimenta1,2, MD, PhD; Etevaldo Coutinho1, MD; Luis Marchi1, MSc;
INTRODUCTION: Many surgical options are available to treat the cervical spine disease. Total disc replacement has been reported to restore motion in the cervical spine, avoiding some complications of fusion like adjacent level disease. Cerpass cervical TDR product incorporates a ceramic-on-ceramic design that it is believed to increase durability and eliminates the potential problems of wear debris from other bearing surfaces such as polyethylene. And this ceramic ball and socket in a titanium core can reduce MRI artifacts, improving radiological analysis. In pre-clinical testing, the Cerpass compared favorably to other artificial spinal discs currently in FDA clinical studies. Cerpass is also designed to ensure proper placement because of its “self-centering” feature.

PURPOSE: The purpose of this study was to evaluate the indications, pain relief, radiographics, surgical technique and outcomes of the cervical disc replacement utilizing the novel Cerpass system. STUDY DESIGN/SETTING: Prospective, non randomized clinical trial to evaluate the safety and effective of the Cerpass cervical Total Disc Replacement. PATIENT SAMPLE: We report results of 12 months follow-up for total cervical disc replacement in 15 patients underwent a total of 16 Cerpass cervical discs from C4/C5 to C7/T1 for the treatment of cervical conditions. OUTCOME MEASURES: The Neck Disability Index (NDI), Visual Analog Scale (VAS), TIGT questionnaires and EuroQol (EQ-5D) were used to access pain and functional outcomes.

METHODS: The mean age was 43 years old (28 to 60 years). We performed indications for TDR in 13 patients with degenerative disc disease and 2 patients with adjacent level disease, in which group appears a Klippel Feil case. Neural decompression was performed in standard Smith-Robinson technique. Radiographic and clinical outcomes were collected preoperatively, at 1 week, at 1, 3, 6 and 12 months postoperatively.

RESULTS: At twelve months of follow-up the discs maintain a normal mean ROM and allowed satisfactory cervical sagittal balance. Mean blood loss was 118 cc (range < 50 to 550 cc). Mean length of surgery was 106 minutes (range 80 to 210 min). No infections occurred. There were no revisions procedures. The mean values in the four assessment questionnaires showed improvement during all the postoperative follow-up periods.

CONCLUSIONS: Following cervical arthroplasty with the Cerpass disc, radiographic and clinical outcome measures were encouraging. We are able to say that the Cerpass cervical artificial disc is a good option to treat painful cervical disc disease associated to radiculopathy, being effective in treating these pathologies. This is the first report of the ceramic prosthesis option for degenerative disc disease and a viable alternative to fusion, treating and avoiding adjacent level disease.

ORAL PRESENTATION 049
Cervical Arthroplasty in Elderly: Prospective 6 Year Follow Up
Luiz Pimenta, MD, PhD; Etevaldo Coutinho, MD; Luis Marchi, MSc; Leonardo Oliveira, BSc
Instituto de Patologia de Coluna, São Paulo, SP, Brazil

INTRODUCTION: Traditional treatment of cervical spondylisis and cervical herniated disc disease with neurological compression is anterior spinal decompression followed by fusion. Total disc replacement has been reported to restore motion in the cervical spine decreasing adjacent level disease rate, but indicated for the young population.

PURPOSE: The purpose of the present study is to evaluate the safety and effectiveness of the PCM artificial disc in the elderly segment. STUDY DESIGN/SETTING: Prospective non randomized clinical trial.

PATIENT SAMPLE: Series of 14 patients, mean age 65.4 y/o (Range 60 - 80) with a total of 24 prostheses.

OUTCOME MEASURES: The Neck Disability Index (NDI), Visual Analog Scale (VAS) and TIGT questionnaires were used to assess pain and functional outcomes.

METHODS: The neural decompression was performed in standard Smith-Robinson technique. Radiographic (AP, lateral and dynamics images) and clinical outcomes were collected preoperatively and postoperatively after 1 week, 1, 3, 6 months and annually.

RESULTS: At 72 months follow-up, there were no deaths, no infections, and no cases of iatrogenic neurologic progression. The mean VAS and NDI improved in all periods when compared to preoperative follow-up. One patient (4.2%) presented facet degeneration grade III in Pimenta’s scale1. Two prosthesis (8.3%) presented bone formation with no movement of the disc, and other two patients presented bone formation with decreasing of the range of motion, but with no worsening in their clinical outcomes.

CONCLUSIONS: Following cervical arthroplasty with PCM prosthesis, radiographic and clinical outcome measurements were encouraging when compared to historical data of ACDF in elderly. Considering the aging population, cervical disc arthroplasty is a good treatment option for degenerative disc disease and a viable alternative to fusion in the elderly segment of the society.
OUTCOME MEASURES: VAS pain scores improved from the average 8.84 at pre-op to 3.2 at 2 years, standard deviation 1.73 and 1.16 respectively. Oswestry scores improved from an average 58.44 at pre-op to 20.75 at 2 years with standard deviation of 12.79 and 9.32 respectively. In the two groups, stand alone or supplemented with pedicle screws, occurred fusion, with no difference of consolidation time.

CONCLUSION: Using the XLIF technique we were able to treat the deformity, improving pain, providing stabilization and fusion, with a quicker and better postoperative period. The XLIF technique has shown to be a safe and reproducible technique to treat spondylolisthesis deformity thought a minimally invasive way.

ORAL PRESENTATION 052
Facet Replacement: 4 year Follow up on a Multicenter Study
Leonardo Oliveira BSc, Luis Marchi MSc, Etevaldo Coutinho MD, Luiz Pimenta MD PhD
Instituto de Patologia da Coluna

INTRODUCTION: Fusion remains the gold standard by which mechanical low back pain from degenerative disc disease is treated. However, arthrodesis can cause increased motion and stress in the segments adjacent to a fusion by means of load transfer. Artificial mechanical total disc replacement (TDR) has been successfully used as an alternate means of treatment that can also restore the interbody geometry while preserving segmental motion. Patients with significant spinal stenosis and facet arthropathy, however, are often excluded from having TDR as increased segmental motion can exacerbate dorsal spondylotic changes. For this large population of patients for whom TDR is contraindicated, the TOPS system offers a novel mechanism of total facet replacement (TFR) that allows for excellent dynamic, multiaxial, 3-column stabilization after complete neural decompression via a standard posterior approach.

PURPOSE: The purpose of this study is to report our surgical data and clinical outcomes in patients treated with the TOPS Lumbar TFR system

STUDY DESIGN/SETTING: Prospective, non-randomized, multicenter (partial results), prospective pilot study that was approved by each individual local institutional review board.

PATIENT SAMPLE: Twenty patients were enrolled with a primary surgical indication of low back pain, neurological claudication, and/or radiculopathy resulting from spinal stenosis at L4-5 due to facet arthropathy with no frank disc herniation and only a mild degree of degenerative disc disease

OUTCOME MEASURES: Radiographs and outcome measures such as Visual Analogue Scale for pain, Oswestry Disability index, SF-36 and Zurich Claudication Questionnaire were prospectively recorded before surgery and at 1, 3, 6, 12, 24, 36 and 48 month postoperatively

MATERIALS AND METHODS: Patients ranged from 50-70 years in age with no mitigating systemic diseases or osteopenia as demonstrated on dual X-ray absorptiometry. Patients with greater than 50% loss of height or more than 11-degrees of motion on flexion-extension at L4-5 were excluded. Prior to instrumentation, a bilateral total facetectomy and laminectomy at L4-L5 levels was accomplished through a standard midline posterior approach. After decompression, the TOPS screws were inserted into the L4 and L5 pedicles to achieve maximal purchase.
via triangulating, bicortical trajectories. An appropriately sized TOPS implant was then applied and secured in place. After completion of the arthroplasty procedure, standard closure with drain placement was performed.

RESULTS: There were three intraoperative dural tears solved at the time of surgery. The mean surgical time was 160 min. All patients were mobilized early on after surgery. No postoperative infections occurred. Blood loss was less than 200 cc in each case. One patient shows segmental instability in L3-L4 due to much removal of superior L4 facet. All patients recovered uneventfully. On VAS, patients experienced a degree of post-operative pain similar to that of standard fusion patients and were discharged at an average of 2.5 days postop.

VAS, SF-36, ODI, Zurich Claudication Questionnaire and Prolo scores improved post-operatively with all patients being overall satisfied with the procedure at early assessment. Flexion-extension films within our follow-up period demonstrated preservation of motion at L4-5, no evidence of screw loosening or device malfunction.

CONCLUSIONS: The TOPS TFR system represents a dynamic, posterior arthroplasty device that provides multiaxial stability in flexion, extension, rotation, and lateral bending after total facetectomy and neural decompression. Our surgical data demonstrates that it can be safely applied through a traditional approach with low surgical morbidity and good functional and radiographic outcomes in patients with back pain and posterior disease. Additional long-term, randomized studies will be needed before conclusive statements can be made regarding the efficacy of the TOPS system.

ORAL PRESENTATION 053
Percutaneous Interspinous Process Implanted in Prone Position – 24 Months Follow Up
Leonardo Oliveira BSc, Luís Marchi MSc, Etevaldo Coutinho MD, Luiz Pimenta MD PhD
Instituto de Patologia da Coluna

INTRODUCTION: The lumbar spinal stenosis is considered one of the causes of Neurogenic Intermittent claudication. Using an interspinous spacer we were able to treat the pathology using a minimal invasive percutaneous approach to the lumbar spine, shortening the surgery time, hospital stay and rehabilitation. Neurogenic Intermittent Claudication (NIC) can be a consequence of lumbar spinal stenosis. The literature shows symptom reliefs in flexion and worsening in extension. This new technology allows lateral insertion of a novel interspinous device using a minimally invasive percutaneous approach, shortening the surgery time, hospitalization stay and rehabilitation.

PURPOSE: The purpose of the present study is to present the safety and effectiveness of the interspinous device implanted in prone position by a percutaneous approach.

STUDY DESIGN/SETTING: Prospective, non randomized single center clinical trial.

PATIENT SAMPLE: 14 patients (9 male; 5 female) with a median age of 69.6 (48-82) years and central stenosis with neurological claudication were enrolled

OUTCOME MEASURES: Analysis consists of clinical outcomes and radiological assessment of disc and foraminal height through x-ray films and CT evaluation by an independent radiologist, pain assessment by means of VAS responses and functional assessment by means of ODI.

METHODS: The operated levels were between L2-S1, totaling 19 prosthesis due to 5 two-level operations. Operative time, blood loss and hospital stay were recorded. Subjects were evaluated preoperatively and postoperatively at 1 and 6 weeks, 3, 6, 12, 24 and 36 months.

RESULTS: The posterior disc height increased by 34% after 36 months, while foraminal height increased 26% in the same period. The mean surgical time was 34.3 minutes and mean blood loss was less than 50 cc. The mean hospital stay was 23.4 hours. The mean VAS and ODI preoperative score was decreased in the postoperative quantifications.

CONCLUSION: This novel percutaneous approach offers a less invasive surgical option, maintaining the supraspinous ligament and preserving the interspinous ligament at adjacent levels, with minimal management of the interspinous ligament at the index level. This procedure allows short operative time, minimal blood loss and reduced hospitalization time. The lateral interspinous device is an excellent option to maintain motion, while improving disc and foraminal height, reducing the painful symptoms of lumbar stenosis.

ORAL PRESENTATION 054
Is Radiolucency a Signal of Pseudarthrosis?
Leonardo Oliveira BSc, Luís Marchi MSc, Etevaldo Coutinho MD, Luiz Pimenta MD
Instituto de Patologia da Coluna, São Paulo, Brazil

BACKGROUND CONTEXT: Radiolucency is shown in the literature as a consequence of micro motion, loosening of the implant, instability and pseudarthrosis. The Food and Drug Administration in their Guidance Document for the Preparation of IDEs for Spinal Systems shows all parameters required for the approval of a new product in US. For systems intended for fusion, they should be based on: Evidence of bridging bone between the involved motion segments, translational motion less than 3mm and angular motion less than 5 degrees. Radiolucency is not necessarily a fusion criteria, but data should be collected as confirmatory information. Therefore, radiolucency remains controversial.

PURPOSE: The purpose of this work is to present the radiological consequences of the AxiaLIF two levels after two years follow up.

STUDY DESIGN/SETTING: Prospective, non randomized, single center clinical trial.

PATIENT SAMPLE: 20 patients with a median age of 48.3 years (29-70 y/o) and DDD at L4-L5 and L5-S1 underwent an axial lumbosacral surgery to achieve fusion

OUTCOME MEASURES: Analysis consists of disc height measurement and fusion status through X-ray films and CT evaluation by an independent radiologist. Pain assessment was conducted by means of Visual Analog Scale (VAS), Oswestry Questionnaire responses, and through SF-36 Health Survey responses.

METHODS: All patients met inclusion exclusion criteria. Subjects were evaluated preoperatively and postoperatively at discharge, 1 and 6 weeks, and 3, 6, 12, and 24 months. Fixation of lumbosacral junction was performed through a 14 mm access cannula using an innovative minimally invasive axial presacral approach (AxiaLIF). Treatment was facilitated by insertion of an axial interbody fusion construct coupled with bone graft material and posterior percutaneous pedicle screws.

RESULTS: 360 degree minimally invasive stabilization was accomplished through three small incisions. Mean surgical time was 130.7 minutes and blood loss less than 50cc. There was minimal postoperative pain. The VAS preoperative was 8.82 with standard deviation
INTRODUCTION: The nucleus replacement devices have been developed for treating moderate forms of degenerative disc disease, trying to fill the gap between discectomy and fusion. The surgical goals are pain relief, maintenance of the disc height and flexibility at the index and adjacent levels.

PURPOSE: The purpose of the present abstract is to show our experience after 9 years using three different nucleus replacement prostheses

STUDY DESIGN/SETTING: Prospective, non randomized, single center clinical study.

PATIENT SAMPLE: 125 patients with moderate forms of degenerative disc disease were enrolled in this study

OUTCOME MEASURES: Radiographic (AP, lateral and dynamic) and clinical outcomes were collected preoperatively, 1 week and 1, 3, 6, 9, and annually through 9 years postoperatively. The VAS and ODI questionnaires were used to assess pain and functional outcomes.

MATERIAL AND METHODS: 80 patients had PDN disc prosthesis, 132 patients with PDN flaws. The device was evaluated by Medical Metrics, Inc. (Houston, TX). Adverse events were monitored intra-operatively and at all follow up evaluations.

RESULTS: Of the 18 patients, 14 were male and 4 were female. The patients had an average age of 39.2 years (range 25-55) and an average BMI of 25.4 (range 19.4-31.6).

Clinical Outcomes: At the 12 month follow up evaluation, the back pain score improved 65% and ODI scores improved 68% when compared to baseline. At the 24 month follow up evaluation, the VAS back pain score improved 80% and ODI scores improved 78% when compared to baseline. Statistically significant differences were observed at all follow-up intervals when compared to the preoperative scores.

Radiographic Outcomes: There were no failures or migration of the implanted devices and all of the prostheses are mobile in flexion/extension. One patient has experienced caudal subsidence greater than 2mm.

Adverse Events: During the surgical procedure, two patients lost greater than 1500ccs of blood requiring transfusion and one patient experienced vascular damage at L4-L5 that required further surgery to repair. These events were resolved without further incident and did not result in any adverse clinical effect post-operatively. At the six month follow up evaluation, one patient experienced retrograde ejaculation which was resolved at 12 months.

CONCLUSIONS: This is the first to report 12 month clinical results on the next generation of total disc prostheses. While a longer term follow up of these patients is necessary, the initial one year clinical data for the Physio-L lumbar disc suggests that elastomeric discs may provide a superior approach to treating degenerative disc disease.

ORAL PRESENTATION 056
Clinical Performance of an Elastomeric Lumbar Disc Replacement 24 Months Following Surgery
Leonardo Oliveira BSc, Luis Marchi MSc, Etevaldo Coutinho MD, Luiz Pimenta MD PhD
Instituto de Patologia da Coluna

AIM: Elastomeric lumbar disc replacements have been developed as a means to restore the normal shock absorption properties and physiologic center of rotation of the involved level. The Physio-L® is an elastomeric lumbar disc prosthesis which uses compliant polycarbonate polyurethane as the core material and has been designed to have enhanced endurance properties. A multi-center clinical trial is underway to determine the safety of the device in vivo and the present study reports the 24 month clinical results.

METHODS: Eighteen patients presenting with degenerative disc disease were treated by one of two surgeons at two clinical sites. Thirteen patients received treatment at a single level (L5-S1) while five patients received treatment at two levels (L3-L4/L5-S1, or L4-L5/ L5-S1). All patients were assessed pre-operatively, and at 6 weeks, 3 months, 6 months, and 12 months. Clinical outcome measurements included patient self assessment scores for Visual Analog Scale (VAS) for back pain and Oswestry Disability Index (ODI). Radiographic assessments including device subsidence, migration, and loosening of the device were evaluated by Medical Metrics, Inc. (Houston, TX). Adverse events were monitored intra-operatively and at all follow up evaluations.

RESULTS: Of the 18 patients, 14 were male and 4 were female. The patients had an average age of 39.2 years (range 25-55) and an average BMI of 25.4 (range 19.4-31.6).

Clinical Outcomes: At the 12 month follow up evaluation, the VAS back pain score improved 65% and ODI scores improved 68% when compared to baseline. At the 24 month follow up evaluation, the VAS back pain score improved 80% and ODI scores improved 78% when compared to baseline. Statistically significant differences were observed at all follow-up intervals when compared to the preoperative scores.

Radiographic Outcomes: There were no failures or migration of the implanted devices and all of the prostheses are mobile in flexion/extension. One patient has experienced caudal subsidence greater than 2mm.

Adverse Events: During the surgical procedure, two patients lost greater than 1500ccs of blood requiring transfusion and one patient experienced vascular damage at L4-L5 that required further surgery to repair. These events were resolved without further incident and did not result in any adverse clinical effect post-operatively. At the six month follow up evaluation, one patient experienced retrograde ejaculation which was resolved at 12 months.

CONCLUSIONS: This study is the first to report 12 month clinical results on the next generation of total disc prostheses. While a longer term follow up of these patients is necessary, the initial one year clinical data for the Physio-L lumbar disc suggests that elastomeric discs may provide a superior approach to treating degenerative disc disease.


ORAL PRESENTATION 057
Posterior Disc Replacement. One Year Survivorship without one of the Facets
INTRODUCTION: The lumbar degenerative disc disease has been treated over the years with methods of stabilization with good clinical results, but the absence of motion in a fused segment leads to an overload in the adjacent segment and accelerates adjacent disc degeneration. Current lumbar total disc replacement (TDR) devices require an anterior approach for implantation. The anterior approach to place lumbar TDR devices has inherent limitations, including risks to abdominal structures, and resection of the anterior longitudinal ligament (ALL). Placement of a TDR device from a posterior approach allows for easier, less invasive access to the disc space.

PURPOSE: The purpose of the present abstract is to present the clinical and radiological result of a lumbar total disc replacement implanted by posterior approach. STUDY DESIGN/SETTING: Prospective, non-randomized, single-center clinical study. PATIENT SAMPLE: 4 patients underwent surgery for the implantation of the device. OUTCOME MEASURES: Clinical and radiographic outcomes assessments were prospectively collected.

METHODS: A TDR device designed for implantation through a posterior approach (TLIF) with removal of one of the facets was implanted in 4 patients with discography-confirmed 1 level DDD. Two devices were implanted at L4-L5, one case at L3-L4 and another case at L5-S1.

RESULTS: The VAS preop was 8.25 and after 12 months decreased to 2.23. ODI preop was 49% and after 12 months decreased to 18.6%. No major complication and improvement of clinical outcomes were seen after 12 months.

CONCLUSIONS: Our results show that the posterior disc is a very safe and effective option in the treatment of DDD with motion preservation, even with removal of one of the facets, being an alternative to anterior approach for TDR placement, with clinical improvement after 12 months. Longer follow up is required, but the benefits of this technique suggest a promising new direction for TDR procedures.

ORAL PRESENTATION 058
The Subsidence Rate in XLIF Osteoporotic Patients in Standalone Procedures
Leonardo Oliveira BSc, Luis Marchi MSc, Etevaldo Coutinho MD, Luiz Pimenta MD PhD
Instituto de Patologia da Coluna, São Paulo – SP – Brasil

INTRODUCTION: Low back pain resulting from degenerative disease of the lumbosacral spine is a major cause of morbidity, disability and lost productivity. This treatable condition is often a major cause of inactivity, loss of productivity and, potentially, loss of independence in many persons, particularly older persons. For these conditions there are some non-surgical and surgical options. Within the surgical options there is an efficient and minimally disruptive technique, the XLIF. This is a lateral transpsoas approach that reaches the anterior spine portion without removing spine ligaments or disrupting surrounding muscles. The XLIF cages used for fusion reach the cortical bone bilaterally and have bigger footprint than the ALIF or PLIF ones, giving stronger support for the vertebral body. The standard cage is 18mm wide (antero-posterior size) and is able to indirect decompress the foramen, allowing improvement in clinical and radiological assessments. But we detected that in the majority of the cases there were an important endplate remodeling and subsidence, which could minimize better results in this technique. So, our thesis is that wider cages (22mm) can provide better clinical/radiological results for lumbar fusion by XLIF.

PURPOSE: The purpose of the abstract is to present an alternative to improve clinical and radiological results for lumbar fusion using the XLIF technique in stand alone constructions.

STUDY DESIGN/SETTING: Prospective, randomized, controlled, single-center clinical study to compare the clinical and radiological results after XLIF stand alone procedure using standard (18mm) and wide (22mm) cages.

PATIENT SAMPLE: After the randomization, 21 patients with central or lateral stenosis underwent the XLIF Stand Alone procedure with standard cages (18mm) at 41 lumbar levels and 22 patients with wide cages (22mm) at 36 lumbar levels.

OUTCOME MEASURES: X-rays, MRI and clinical outcome assessments using Oswestry and VAS scores were performed preoperatively, preoperatively at 1 and 6 weeks, 3, 6 and 12 months after surgery.

METHODS: The extreme lateral approach was done through the retroperitoneal space and through psoas muscle avoiding vascular and neural lesions. A partial discectomy was done and the end-plate cleaned preserving ALL, keeping the spine more stable than the traditional surgery. Radiological measurements were done using medical imaging software at preoperatively, preoperatively at 1 week and 3 months. The mean age was 67.6 y/o (40 – 83) for standard and 65 y/o (45 – 83) for wide group.

RESULTS: All patients completed 12-month follow-up evaluations. VAS and ODI scores improved equally in both groups at the all follow-up periods when compared to the preoperative scores. Although all patients had postoperatively gain in disc height and foramend measurements (56% for standard and 65% for wide), after 3 months, standard group had lost 33.9% of its disc height mean, while wide group had no significant lost. These results are completed with the found that at 3 month-follow up it was significant difference in subsidence/endplate remodeling rate, which was at 9.7% for wide and 31% for standard group.

CONCLUSIONS: Indirect decompression with XLIF is feasible and effective. With critical analysis during the surgery practice, we were able to detect that the standard cages caused an important rate of subsidence at the operated levels and the technique could be improved. The thesis was correct and the disc space restoring was achieved and sustained with 22mm cages, which could make the technique even more effective for lumbar fusion and indirect decompression.

ORAL PRESENTATION 059
Leonardo Oliveira BSc, Luis Marchi MSc, Etevaldo Coutinho MD, Luiz M Pimenta MD, PhD.
Instituto de Patologia da Coluna, São Paulo – SP – Brasil

INTRODUCTION: Lumbar total disc replacement has been widely performed with good results. On the other hand, new techniques generate new problems also. Due to emergent issue of revision surgeries and hystorical recurrent anterior approach complications (vessel injury, blood loss, muscle damaging, adherence and neural
OUTCOME MEASURES: Dynamic X-rays, MRI and clinical outcome assessments using Oswestry and VAS scores were performed preoperatively, 1 and 12 weeks after surgery. The measurements were done using medical imaging software.

MATERIALS AND METHODS: The extreme lateral approach was done through the retroperitoneal space and through psoas muscle avoiding vascular lesions. A partial discectomy was done and the end-plate cleaned preserving ALL, keeping the spine more stable than the traditional surgery.

RESULTS: We used a t-test to compare the average and standard deviation of the preoperative and postoperative data. All parameters were statistically significant (p < 0.05), showing the improvement of the disc height, canal area and foraminal space. VAS pain scores improved from an average 8.9 at pre-op to 3.25 at 3 months. Oswestry scores improved from an average 56.40 at pre-op to 32.5 three months after surgery. The only statistical difference found between both groups was subsidence rate. The standard group had 31% of subsidence while the Wide group presented 10% of subsidence rate.

CONCLUSION: The XLIF procedure provides the necessary decompression for the treatment of central and/or lateral stenosis in a minimally invasive way, preserving the ALL and all posterior elements of the lumbar canal. Using a wider implant we were able to improve the footprint of the cage, preventing subsidence in a stand alone construction.

ORAL PRESENTATION 061
The AOSpine North America Cervical Spondylotic Myelopathy Study: Two Year Surgical Outcomes Of A Prospective Multicenter Study In 280 Patients
Michael Fehlings1, Branko Kopjar2,*, Paul Arnold3, S.Tim Yoon4, Alexander Vaccaro5, Christopher Shaffrey6, Darrel Brodke7, Michael Janssen8, Jens Chapman9, Rick Sasso10, E. Woodward10
1University of Toronto, Toronto, Canada, 2University of Washington, Seattle, 3University of Kansas, Kansas City, 4Emory Spine Center, Atlanta, 5Thomas Jefferson University, Philadelphia, 6University of Virginia, Charlottesville, 7University of Utah, Salt Lake City, 8Spine Education and Research Institute, Thorton, 9Indiana Spine Group, Indianapolis, United States, 10New England Baptist Hospital, Boston.

INTRODUCTION: While there is evolving evidence suggesting a role for surgery in treating cervical spondylotic myelopathy CSM, it remains unclear that surgical treatment is associated with long-term sustained benefit.

METHODS: A total of 280 patients with clinically symptomatic CSM were enrolled at 12 North American sites in a prospective cohort study.

RESULTS: There were 40% females, average age was 56 yrs (SD 12) and 26% were smokers. Patients underwent anterior (N=169), posterior (N=97) or circumferential (N=14) decompressive/reconstructive surgery. To date, all patients have completed 1 year (n=80) (87% follow-up rate) and 183 subjects have completed 2 year follow-up. The average number of spinal levels operated on was 3.8 (SD = 1.3). There has been a significant (P < .01) improvement from baseline values to 12 months and 24 months in all relevant outcome parameters. From baseline to 24 months the modified JOA scores improved from 13.09 to 16.11. The Nurick scores improved from 4.12 to 2.48. The NDI scores improved from 39.43 to 28.37. The SF36 PCS scores improved from 37.56 to
CONCLUSION: This large prospective clinical study shows that surgical treatment for CSM is associated with significant improvements in generic and patient-specific outcome measures at one year, which are sustained at two-year follow up. Surgical treatment appears to be a highly effective option for patients with symptomatic CSM and is an approach which can be recommended based on objective clinical and patient-reported outcomes data from this study.

ORAL PRESENTATION 062
Minimally Invasive Posterior Trans Muscular C1-C2 Screw Fixation Through An Anatomical Corridor To Preserve Occipital-Cervical Tension Band . Prospective 36 months Follow-Up Study.
Diaz Roberto, Berbeo Miguel, Villalobos Luis, Vergara Manuel
Department of Neurosurgery, Hospital Universitario San Ignacio, Pontificia Universidad Javeriana, Bogota, Colombia

INTRODUCTION: C1-C2 joint is affected by multiple entities that may produce biomechanical instability. Optimal management for atlanto-axial instability has been searched by ways of different surgical techniques with different results, generating discussion between second effects. Lateral dissections can place axial neck musculature and ligaments at risk of neural denervations or vascular compromise. Minimally invasive techniques for treatment of spinal disorders, allow to our patients less morbid procedures with equal or better results compared to conventional surgery.

METHODS: We performed an anatomical cadaver study searching a novel surgical pathway, also a prospective clinical study included 9 patients with C1-C2 instability. Operative time, blood loss and hospitalization time were recorded. Subjects were evaluated preoperatively and postoperatively at 1, 3, 6, 12, 24 and 36 months

RESULTS: We founded 2 cm away from the midline, following a point parallel to C2 spinous process an anatomical corridor formed by the angle between posterior major rectus capitis muscle and inferior obliquus capitis muscle. This corridor is relatively free of important nervous and vascular structures With the purpose of preserve occipitocervical tension band decreasing morbidity of traditional procedures and less postoperative pain, we performed a MIS approach through a 2,5cm bilateral paramedian skin incision, using access MIS platform Maxcess; subsequent placing polyaxial screws (3.5 mm-4.0mm) bicortically solely into occipital condyles and C2 pedicle. Inserting was guided by anatomic landmarks and fluoroscopy, followed by fixation to a 3-mm rod. The same procedure is made in the contra lateral side in the same way. There were no intra-operative and postoperative complications. The hypoglossal canal, jugular bulb, carotid, and vertebral arteries were not injured by condyle screw placement. No fractures were identified. Minimal invasive technique patients experienced minimal post-operative pain and were discharged before 48 hours

CONCLUSIONS: As our early experience Condyle screws can be placed without injury of neurovascular structures by open or minimally invasive technique, craniovertebral junction fixation using polyaxial occipital condyle screws is feasible and could be considered as an alternative technique.

ORAL PRESENTATION 063
Difference in Outcome After “Standard Discectomy” and “Microdiscectomy” for Herniated Disc in the Lumbar Spine: A Prospective Nonrandomised Multisenter Study.
Sørlie Andreas 1–3, Solberg Tore 1–3, Nygaard Oystein 2,4, Brox Jens Ivar 2,5, Hellum Christian 2,6, Austevoll Ivar 7, Skoglund Arne 8
1Helse Nord RHF, SKDE, 2Nasjonalt Kvalitetsregister for Ryggkirurgi, Tromsø, 3NevroKirurgisk avd. UNN-HF, Tromsø, 4Nasjonalt Senter for Spinale Lidelser, St. Olavs Hospital, Trondheim, 5Ortopedisk avd., Rikshospitalet, Oslo, 6Ortopedisk avd., Ullvål Universitetssykehus, Oslo, 7Ortopedisk avd, haukeland Universitetssykehus, Bergen, 8Ortopedisk avd, Gjøvik sykehus.

The Norwegian Registry for Spine Surgery (NORspine) is a clinical registry for quality control and research, aimed at improving the outcome of patients operated for degenerative disorders in the lumbar spine. Earlier studies comparing the effectiveness of microdiscectomy with standard discectomy for lumbar disc herniations are conflicting.

The relative effectiveness of these two operative techniques within a large cohort, recruited from daily clinical practice.
MATERIALS AND METHODS: NORspine data form a cohort of the first 4636 patients reported from 25 different institutions in Norway. Data were collected at admission for surgery (baseline) and at 3 and 12 months after surgery. Inclusion criteria were treatment for lumbar herniated disc using either microdiscectomy (N=848) or standard discectomy (N=180). We evaluated patient-reported outcome data at 12 months. Primary outcome measures were: Between group differences in functional status (Oswestry Disability Index), health-related quality of life (EQ-5D) and radicular leg pain. Secondary outcome measures were: Pain, work status and perceived benefits of the operation. Multivariate analyses were used for risk factor analyses.

RESULTS: Our data indicate a better outcome after microdiscectomy, compared with standard discectomy, 1 year after the operation.

CONCLUSIONS: Surgical units performing standard discectomies may improve the quality of their treatment by introducing microdiscectomy as the main modality for treating lumbar disc herniation.

ORAL PRESENTATION 066
Surgical Treatment of Six Hundred and Eithty Intramedullary Spinal Cord Tumors.
Yang Jun
Beijing Tiantan Hospital

OBJECTIVE: To summarize our experience in dealing with intramedullary spinal cord tumors (IMSCTs).

METHODS: Data from 680 IMSCTs operated on in the last 5 years were analyzed retrospectively including tumor's location, histologic type, radiologic finding, clinical manifestation, resection rate, and prognosis.

RESULTS: The diagnosis of the tumor was confirmed by pathology, including 310 ependymomas, 110 astrocytomas, 26 angioblastomas, 53 cavernous angiomas, 25 lipomas, 66 teratomas, and 90 dermoid cysts. On long-term follow-up there was improvement in 360 patients, no change in 100, and deterioration in 20, tumor recurrence in 70, with 1 death.

CONCLUSION: Most intramedullary spinal cord tumors need operative treatment as early as possible. For benign tumors, which had definite margin between tumor and medulla, total resection was the optimal choice. For malignant ones, partial resection or biopsy was proposed, and radiation was necessary.

ORAL PRESENTATION 068
Failed Back Surgery Syndrome
Younus Aftab1, Abdulrasheed Aden
Helen Joseph Hospital - Johannesburg

INTRODUCTION: Failed back surgery is a nonspecific term that implies that the final outcome of surgery did not meet the expectation of both the patient and the surgeon as it was established before surgery. Expected outcome varies according to the type of structural problems, the number and types of prior surgeries and the psychological health of the patient.

MATERIALS AND METHODS: We present six cases of failed back surgery. All of them underwent multiple operations on the lumbar spine, i.e. multiple discectomy, laminectomy and/or fusion. The etiology in 3 patients was recurrent disc herniation above the level of fusion. One patient had nonunion of fusion mass; two had neuropathic pain and iatrogenic instability. In addition, 2 patients had facet and sacroiliac joint pain. The number of previous spinal operations varied from 3 to 21. The time lapse of symptoms ranged from 3 months to 5 years. All of these patients had negative x-rays that could not explain the cause of their symptoms, and either CT scan / CT myelogram or MRI scans was done to identify the problem.

In all of these patients, the first line of treatment was conservative, namely with analgesia, antidepressants, physiotherapy, caudal and facet joint block. Two patients underwent revision surgery for removal of implant and discectomy just above the fusion level. In one patient, pain could not be controlled, and he was referred to a neurosurgeon for implantation of spinal cord stimulator. This ultimately gave him relief.

CONCLUSION: Failed back surgery syndrome is unfortunately a common problem with enormous cost to patient, insurer and society. With a careful history, examination, imaging studies, psychological evaluation and diagnostic injection, a diagnosis can be made in over 90% of the cases. These patients should be treated conservatively with good team work, which include surgeon, psychiatrist, physiotherapist and the anaesthetist.

ORAL PRESENTATION 069
Conservative Treatment of the Unifacet Dislocation of the Cervical Spine
Aftab Younus, Abdulrasheed Aden, Susan De Lange
Helen Joseph Hospital - Johannesburg

INTRODUCTION: Unifacet dislocation of the cervical spine is a very common injury. Most of the authors recommend urgent close reduction in an awake, alert and cooperative patient. If the reduction could not be achieved by closed means, then open reduction and internal fixation is recommended. The belief is that conservative treatment can lead to chronic neck pain and facet joints osteoarthritis. The aim of this paper is to evaluate the short term outcome of conservative treatment of these injuries.

MATERIAL AND METHODS: In the period 2002 to 2005 we identified 13 patients with unifacet dislocations of lower cervical spine. None of them had neurology. All of these patients were treated in skeletal traction with cone caliper and weight depending on the level of injury. All of them were kept in traction for 6 weeks and then in SOMI brace for further 6 weeks. At the end of 12th week the brace was removed and flexion and extension X-ray views were performed. These patients were followed up for an average of 2 years (from 6 months to 4 years). We noted that two out of thirteen patients continued having chronic neck pain, but the remaining eleven patients had satisfactory results.

CONCLUSION: Conservative treatment of unifacet dislocations of the lower cervical spine can achieve satisfactory results. In our series only 15% developed chronic neck pain.

ORAL PRESENTATION 070
Atlanto-Axial Rotatory Subluxation with Unifacet Dislocation Subaxial Cervical Spine - A Rare Combination
Younus Aftab, R. Bhaga, Abdulrasheed Aden
Department of orthopaedic Surgery Helen Joseph Hospital, Johannesburg
And The University of Witwatersrand
Atlanto-axial rotatory subluxation is a very rare injury in the adults. Most of the cases reported are of nontraumatic nature, children being most affected. The combination of atlanto-axial rotatory subluxation with a unifacet dislocation of subaxial cervical spine is even rarer. To our knowledge it has never been described in English language orthopaedic literature.

In this case report we are using a poster to discuss the case of a 37 year old female patient who was involved in a motor vehicle accident. She sustained atlanto-axial rotatory subluxation and C5-C6 unifacet dislocation. Initial treatment, investigations, definitive surgical management, as well as final outcome are discussed.

**ORAL PRESENTATION 071**

Conservative Treatment of the Unifacet Dislocation of the Cervical Spine

Aftab Younus, Abdulrasheed Aden, Susan De Lange

Helen Joseph Hospital - Johannesburg

**INTRODUCTION:** Unifacet dislocation of the cervical spine is a very common injury. Most of the authors recommend urgent close reduction in an awake, alert and cooperative patient. If the reduction could not be achieved by closed means, then open reduction and internal fixation is recommended. The belief is that conservative treatment can lead to chronic neck pain and facet joints osteoarthritis. The aim of this paper is to evaluate the short term outcome of conservative treatment of these injuries.

**MATERIAL AND METHODS:** In the period 2002 to 2005 we identified 13 patients with unifacet dislocations of lower cervical spine. None of them had neurology. All of these patients were treated in skeletal traction with cone caliper and weight depending on the level of injury. All of them were kept in traction for 6 weeks and then in SOMI brace for further 6 weeks. At the end of 12th week the brace was removed and flexion and extension X-ray views were performed. These patients were followed up for an average of 2 years (from 6 months to 4 years). We noted that two out of thirteen patients continued having chronic neck pain, but the remaining eleven patients had satisfactory results.

**CONCLUSION:** Conservative treatment of unifacet dislocations of the lower cervical spine can achieve satisfactory results. In our series only 15% developed chronic neck pain.

**ORAL PRESENTATION 072**

Posterior Stabilization of the Lower Cervical Spine with Lateral Mass Plates / Rods and Screws

Kailash Kannan

Sri Ramachandra University, Chennai, India

Posterior cervical fixation using lateral mass plates and screws is becoming increasingly used and accepted. Advantages include increased rigidity, ability to be used in cases where the lamina or spinous processes are deficient or missing, use across the occipito-cervical or cervico-thoracic junction, and need for less postoperative bracing. Safe placement of lateral mass screws requires complete exposure and identification of the boundaries of the lateral masses. The starting point for screw placement is 1 to 2 mm medial to the center of lateral mass. The screws are angled outward 10 to 20 degrees and cranially 20 to 30 degrees to be parallel to the facet joints. An adjustable drill guide facilitates safe drilling and tapping techniques. All 27 patients with unstable cervical spines treated with lateral mass systems and autogenous bone graft had healed fusions based on flexion-extension radiographs. The reductions achieved postoperatively were maintained at follow-up. Two patients had transient radiculopathies secondary to screw placement. The indications for lateral mass fixation include cases where the lamina or spinal processes are deficient or missing, multilevel or rotational instabilities, when extension to the thoracic spine or occiput is required or when decreased bracing is beneficial.

**KEYWORDS:** cervical spine; cervical spine fixation; cervical spine injury; cervical spine surgery

**ORAL PRESENTATION 073**

Two Interspinous Devices (Diam® and CollexTM) for Lumbar Spinal Stenosis Over Two Years Follow-Up Study

Sang Hoon Yoon, Wook Ha Kim, Seung-Jae Hyun, Ki-jeong Kim, Hyun-Jib Kim.

Seoul National University Colledge of Medicine, Seoul National University Bundang Hospital

**PURPOSE OF STUDY:** To show efficacy of interspinous devices (i.e. CollexTM and DIAM®) for lumbar spinal stenosis (LSS)

**MATERIALS AND METHODS:** A consecutive series was studied retrospectively with patients who suffered from LSS and were treated by decompressive laminectomy with interspinous devices (i.e. CollexTM and DIAM®) from May 2003 to December 2007. Fifty-four patients minimal follow-up over 2 year were enrolled. Twenty eight female and thirty one male were collected. The mean age was 66.3±7.16 and the mean follow-up duration was 34.72±8.58 (month). Clinical outcome (back VAS, leg VAS, ODI) and radiologic results (Foraminal height, range of motion) were collected. Preoperative status of the operated segment was evaluated by Pfirrmann’s grade, preexisting spondylolisthesis and Modic change. Every parameter was collected preoperatively and postoperatively at one month and last visit after surgery.

**RESULTS:** Twenty eight patients were treated with CollexTM (U group) and twenty six patients treated with interspinous device (DIAM®) (DIAM group). By means of preoperative back VAS, leg VAS and ODI, significant improvement (p<0.001) was noticed at the last follow-up after surgery. At the last follow-up, back VAS, leg VAS score and ODI score were higher in the DIAM group than in the U group but there were no significant differences. (p=0.225, 0.177, 0.667) The Foraminal height ratio increased more significantly at postoperative 1 month (U: DIAM = 119.3%; 100.8%, p=0.028). But at final visit after surgery there was no significant difference of foraminal height between U (102.5%) and DIAM (91.9%) group (p=0.384). **CONCLUSIONS:** CollexTM and DIAM® achieved good clinical improvement for LSS patients after surgery. CollexTM made more increment of FH than DIAM did just after surgery. But CollexTM showed maintenance of FH until final follow up but DIAM does not. The authors guess this reason why there is difference from quality of material of interspinous devices.

**ORAL PRESENTATION 074**

Pedicular Screws and Rods for Thoraco– Lumbar Fracture Stabilization Among Nepalese Patients
**ORAL PRESENTATION 075**

Correlation of Disc Height in Radiographs and MRI Findings to Histological Assessment of Human Intervertebral Discs

Delio E. Martins¹, Valdeci M. Oliveira², Maria T. S. Alves³, Marcelo Wajchenberg¹, Elcio Landim¹, Eduardo B. Puertas³, Akira Ishida¹.

¹Sao Paulo Federal University, Sao Paulo, Brazil, ²Faculdade de Ciencias Medicas e da Saude, Juiz de Fora, MG, Brazil, ³Sao Paulo Federal University, Sao Paulo, Brazil, ⁴Santa Casa de Misericordia, Sao Paulo, Brazil.

**INTRODUCTION:** There is controversy regarding which imaging method is best for identifying early degenerative alterations in intervertebral discs. During the degeneration of intervertebral discs, losses of water, proteoglycan and collagen content from inside the disc occur. These can be noted on magnetic resonance images with T2 weighting as decreased signal intensity, and on radiographs as a loss of thickness of the intervertebral discs. The thickness of intervertebral discs also seems to be correlated with early alterations in the discs. Disc thickness seems to be one of the best parameters for correlations with morphological abnormalities in the discs. However, there is few data in the literature correlating the thickness with the nerve ends present in degenerated discs.

The aim of the present study was to correlate the abnormalities present on magnetic resonance images with the thickness of the intervertebral discs and with the quantitative and qualitative variations in the nerve ends present in the lumbar intervertebral discs of humans.

**METHODS:** Ten lumbar spinal columns were extracted from human cadavers of mean age 51 years (30-85y) and subjected to magnetic resonance imaging and simple radiography. They were classified according to the degree of disc degeneration seen on magnetic resonance and the thickness of the discs measured on radiographs according to Farfan’s modified method (figure 1). The intervertebral discs were then extracted, embedded in paraffin and analyzed immunohistochecmically with protein S100, and the nerve fibers were counted and classified within 48 hours after death. The nerve fibers were counted over the whole extent of the disc, at 400x magnification, with the aid of a JVC video camera (model TK 1180V). The image was captured from the Olympus microscope (model BX40) to a Pentium MMX 233 MHz software in the Windows® environment. The fibers were measured and classified according to size and shape (figure 2), using the classification system of Freeman and Wyke.

**RESULTS:** The correlations between the variables were evaluated by means of the Spearman rank correlation coefficient (rs) and its significance was tested. The significance level of 0.05 (α = 5%) was adopted. No correlation was observed between the thickness of the intervertebral discs and the degree of degeneration seen on magnetic resonance images. Only the uppermost lumbar discs (L1/L2 and L2/ L3) presented a correlation between the thickness and the type I and IV nerve ends.

**CONCLUSIONS:** Reduced disc thickness is unrelated to increased presence of nerve ends in the intervertebral discs, or to the degree of disc degeneration.

**ORAL PRESENTATION 076**

Sacrococcygeal Chordoma. A 10 Year Follow Up of 20 Cases Treated Surgically

Ashok Bajracharya

National Academy of Medical Sciences, Bir Hospital, Kathmandu, Nepal

**BACKGROUND:** This to report our long-term experience of surgically treating 20 cases of Sacrococcygeal Chordoma by single surgeon at one centre.

**MATERIALS:** Twelve male and 8 female patients with various degrees of skeletal involvement up to S1.

**METHOD:** After thorough Clinico-radio-pathological evaluation they had been treated by surgical excision with wide margin through either from back if small or from back and front if big in size with sacrifice of as necessary nerve roots sparing S1 root without any use of implants.

**RESULTS:** Patients were followed up to 10 years. Postoperatively all had satisfactory outcome. Immediate post op complications included hemorrhage, wound dehiscence, infection. Only 3 had neurological deficits of various grades but functionally were not incapacitating. Sexual functions were abolished in all male patients. One had recurrence after 2yrs and died. One more died from other...
unrelated cause. Remaining 18 are still living without recurrence. They are being presented with photographic illustrations.

CONCLUSION: Surgical excision with wide margin in Sacrococcygeal Chordoma is rewarding even after long term follow up.

ORAL PRESENTATION 077
Surgical Management of Cervical Spondylotic Myelopathy
Gushcha Artem
(1) The Burdenko Neurosurgical Institute Moscow Russia

The purpose of this study to define efficiency of application methods exact differentiated surgical decompression for cervical spondylotic myelopathy, to clarify elimination of prevailing clinical symptoms of cervical myelopathy depending on character and localization of degenerative changes, to define expediency and necessity of application of various types instrumentation.

METHODS: Research is based on the clinical outcome, results of neuroimaging and neurophysiologic investigation of 343 patients with cervical spondylotic myelopathy after surgical decompression. Direction of decompression and parameters of instrumentation were planet according to vector of compression, depending on character of compression (soft, hard disc) and extension of compression. All circular stenosis myelopathic patients subdivided in the groups according to spine deformity (kyphosis, hypercrosis, normal curvature). The electrophysiological data (transcranial magnetic stimulation; somatosensor evoked potentials) to localize primary compressive force were perfomed. According to spine deformities, direction of compression, electrophysiological data – differentiated surgical decompression (anterior approaches with instrumentation - 195; anterior multilevel electrophysiological data – differentiated surgical decompression performed. According to spine deformities, direction of compression, electrophysiological data – differentiated surgical decompression (anterior approaches with instrumentation - 195; anterior multilevel discectomy – 42; laminoplasty -45; laminectomy with instrumentation 31; combined approach -21) were perfomed. The dynamics of neurological myelopathic symptoms was carried out according to Nuric scale with definition of a degree of restoration in conformity with criteria of the Japanese Orthopedic Association (JOA).

RESULTS: We founded significant increasing Recovery Rate – 56% (JOA score) and Nurick restoration- 2-4 (3,43 ± 0,327) as follow up after differential surgical decompression (with electrophysiological investigation and algorithm controlling) in comparison with previous clinical outcome (165 cases) patients without differentiated surgical decision ( Recovery Rate- 44%; Nurick – 2,75 ±0,459; P<0,001).

CONCLUSION: On the big clinical material the advantage of algorithm of the choise surgical method adequate decompression for the compressive spondylotic myelopathy was show.

ORAL PRESENTATION 078
Thoracoscopic Surgery for Spine and Neurogenic Tumors.
Gushcha A.I., Arestov S.
Burdenko Neurosurgical Institute, Moscow, Russia

The purpose of this study to define advantages of thoracoscopic for surgical treatment of thoracic primary and metastatic tumors, neurogenic extravertebral and “dumbbell” tumors.

METHODS: 46 patients with spine tumors (metastasis- 30; primary – 16); 24 neurogenic and 11 “dumbbell” were operated thoracoscopically. Histological - primary chondrosarcoma, osteoblastoclastoma, malignant lymphoma and metastasis - lung, kidneys, breast, prostate, melanoma and benign schwannoma were found. The Tokuhashi score for metastases before operation was 3-6 (average 4,7) Thoracoscopic and video assisted operation included solitary vertebrectomy at Th3-Th11 levels with titanium mesh spsoindodesis and lateral plate fixation. For benign extravertebral tumors or “dumbbell” – total resection were performed. All patients were subjected radiation and adjuvant therapy after surgery if indicated. The results of thoracoscopic surgery were compared with group of patient operated and instrumented by posterolateral approach with costotransversectomy and following instrumentation (43 cases). Preoperative Tokuhashi score, somatic level and neurological status were identical in the both groups. The comparison criteria were life expectancy, dynamics of neurological deficit (according to modified Frankel score), quality of life (Euro Quality of Life – 5D) and complications rate.

RESULTS: Thoracoscopic and video assisted approach in comparison with posterolateral approach significantly reduce the complication rate from 47,2% to 21,3% (p<0,05) and increases Quality of Life 0,96 ± 0,014 ( in comparison with posterolateral approach 0,83 ± 0,040, p=0,001). Preoperative Euro Qual. level were statistically identical. The activation day for the thoracoscopic group was 5,36 ± 3,34 which significantly shorter then for the open surgery patients 10,25 ± 5,34 (p<0,001).

CONCLUSION: Further development of thoracoscopic surgery in spinal department make it possible to increase effectiveness of treatment of various spine tumors with reducing complication rate and activization period.

KEYWORDS: thoracscopy, neurogenic tumor

ORAL PRESENTATION 079
Bludovsky David1, Zidek Slavomir2, Hes Ondrej1, Kazakov Dmitrij2
1Department of Neurosurgery, Charles University Hospital in Plzen, Czech Republic, 2Skl Institute of Pathology and Anatomy, Charles University Hospital in Plzen, Czech Republic

INTRODUCTION: The authors present the case of a dumbbell-shaped psammomatous melanotic schwannoma of the thoracic spine involving the Th-9 sensory root. The 46-year-old female patient complained of experiencing thoracic pain and weakness of her lower extremities for 5 months, and was admitted to the hospital. The mild paraparesis and hypesthesia from the border in Th9 dermatoma distally were diagnosed.

METHODS: The patient workup included plain X-rays with destruction of Th9 pedicle on the right side and magnetic resonance images, which revealed the presence of a slightly hyperintense Th9/10 intra-extraspinal extradural lesion, moderately enhancing, which had eroded and enlarged the intervertebral foramen. A posterior approach was used to perform a Th8–9 laminectomy, including foraminotomy Th9/10 and total removal of the tumor.

RESULTS: Histopathological examination of the lesion revealed it to be a psammomatous melanotic schwannoma without the Carney complex genetic pattern. The authors review the literature concerning melanotic schwannomas and report only 106 cases of melanotic schwannoma that were not related to the Carney complex and only two in dumbbell shape. The particular focus of this review is on the possibility of the malignant progression of melanotic schwannoma, local recurrences, metastasis, and survival rate.
RESULTS: Within the disc space, fusion status was estimated by the presence of bridging trabeculae (A/P) from reconstructed CT, one year after the index procedure. The anterior to posterior disc space ratio (ADH, PDH), and calculated the anterior to posterior disc space ratio (A/P) from reconstructed CT, one year after the index procedure. The fusion status was estimated by the presence of bridging trabeculae within the disc space.

METHODS: During a nine month period, twelve DCI's were implanted in ten patients with cervical spondylotic myelopathy or radiculopathy with degenerative disc disease under the C3 level after anterior cervical discectomy. We measured the anterior and posterior disc space heights (ADH, PDH), and calculated the anterior to posterior disc space ratio (A/P) from reconstructed CT, one year after the index procedure. The fusion status was estimated by the presence of bridging trabeculae within the disc space.

RESULTS: Eight patients were male with a mean age about 47 years (range 27-56 years). Two patients were operated at two levels with equal number of DCI's. Six implants were at the C6-C7 level, four at the C5-C6, and one at the C3-C4 and C4-C5 levels. The average ADH was 7.2mm (range 5.8-9.1mm), PDH was 7.6mm (range 6.6-9.0) while the A/P averaged 0.98 (range 0.7 – 1.125). Eight segments resulted in documented fusion.

CONCLUSIONS: One year after the insertion of DCI's, there was a tendency to maintain the PDH more successfully than the ADH, resulting, thus, in changes of the cervical lordosis. Fusion of the operated segment could not be avoided by the presence of such an implant. Larger controlled studies with longer follow-up are needed to reveal the role of DCI in cervical spine.

KEYWORDS: Dynamic cervical implant, degenerative disorders, outcome

ORAL PRESENTATION 081
Bludovsky David1, Runt VACLav1, Choc Milan1, Michal MichaelF, Kastner Jan1
1Department of Neurosurgery, Charles University Hospital in Plzen, Czech Republic, 2Sihl Institute of Pathology and Anatomy, Charles University Hospital in Plzen, Czech Republic, 3Clinic of imaging methods, Charles University Hospital in Plzen, Czech Republic

INTRODUCTION: Hemangioblastomas (HBs) are rare lesions accounting for 1–5% of all spinal cord tumors. Seventy-five percent of spinal HBs are intramedullary. Lesions of the conus medullaris and the cauda equina are sporadic and typical in von Hippel-Lindau disease.

METHODS: We describe a case of a 58 years old man presenting with radicular pain. Magnetic resonance images showed a highly vascular tumor of the cauda equina. The patient was submitted to a L2 laminectomy and complete resection of a reddish-brown, highly vascular lesion.

RESULTS AND CONCLUSIONS: Histopathological study revealed a hemangioblastoma. Von Hippel-Lindau disease was not prooven. The patient is without pain or radicular lesion and without tumor recurrence two years after operation. These tumors should be dissected and removed en bloc, once the intrallesional resection, even with the smaller lesions, will be associated with profuse bleeding. Although cauda equina hemangioblastoma is a rare cause of lumobischialgia and radiculopathy, we have to keep in mind this possibility especially when neurological findings are not typical.

KEYWORDS: hemangioblastoma – cauda equina – von Hippel-Lindau syndrome

ORAL PRESENTATION 082
Dynamic Cervical Implants in Cervical Spondylosis
Brotis Alexandros1, Triantafyllou Triantafyllos1, Bakopoulou Maria1, Tasiou Anastasia1, Fountas Konstantinos2, Paterkis Konstantinos1
1University of Thessaly, Medical School, Department of Neurosurgery

INTRODUCTION: Dynamic cervical implants (DCI) are nucleus-like implants designed to maintain flexion–extension cervical mobility as well as compression after anterior cervical discectomy. Their ultimate goal is to prevent fusion at the operated level and degeneration at the adjacent segment. Our aim is to study the disc space height and the fusion status of the operated segment one year postoperatively.

METHODS: During a nine month period, twelve DCI's were implanted in ten patients with cervical spondylotic myelopathy or radiculopathy with degenerative disc disease under the C3 level after anterior cervical discectomy. We measured the anterior and posterior disc space heights (ADH, PDH), and calculated the anterior to posterior disc space ratio (A/P) from reconstructed CT, one year after the index procedure. The fusion status was estimated by the presence of bridging trabeculae within the disc space.

RESULTS: Eight patients were male with a mean age about 47 years (range 27-56 years). Two patients were operated at two levels with equal number of DCI's. Six implants were at the C6-C7 level, four at the C5-C6, and one at the C3-C4 and C4-C5 levels. The average ADH was 7.2mm (range 5.8-9.1mm), PDH was 7.6mm (range 6.6-9.0) while the A/P averaged 0.98 (range 0.7 – 1.125). Eight segments resulted in documented fusion.

CONCLUSIONS: One year after the insertion of DCI's, there was a tendency to maintain the PDH more successfully than the ADH, resulting, thus, in changes of the cervical lordosis. Fusion of the operated segment could not be avoided by the presence of such an implant. Larger controlled studies with longer follow-up are needed to reveal the role of DCI in cervical spine.

KEYWORDS: Dynamic cervical implant, degenerative disorders, outcome

ORAL PRESENTATION 083
Dynamic Interspinous Device: Clinical Results and Expanded Clinical Indications
Moraes Nuno1, Moreira da Costa JAs
Clinica Neurologica e da Coluna Vertebral
INTRODUCTION: Viking is an interspinous lumbar device which has been designed to be a shock absorber and to provide dynamic stabilization. This device is the one of the first type of dynamic interspinous systems and it's constructed in PAEK with several concentric spirals that allows a complete ROM of 20º in flexion/extension and in lateral bending, respectively. Viking respects the kinematics and biomechanics of the disc and facet joints and the spirals can be compressed and distracted up to 2.5 mm.

METHODS: The purpose of this study is to assess the clinical safety and effectiveness of this interspinous device. We performed a retrospective study of 43 patients with main indication of discogenic back pain and facet joints syndrome, lumbar spinal stenosis, lateral recess syndrome, degenerative spondylolisthesis grade 1 and following lumbar discotomy to avoid the further degenerative processes cause of lumbar pain and instability. Safety was assessed by documenting any intra and post-operative general and neurological complications. Effectiveness was evaluated by recording pre- and post-op, at 6 weeks, 3, 6 or 12 months Oswestry Disability Index (ODI) and visual analogue scale (VAS) scores.

RESULTS: A total of 46 Viking implants have been implanted in 43 patients since November 2007. The implantations were on L3/L4 (5), L4/L5 (36) and L5/S1 (5) levels. No major intra or post-operative neurological complications occurred. Most patients were discharged from the hospital 2–3 days after surgery. Early clinical results showed that good pain relief was established and maintained from 6 weeks through 1 year. Function using the ODI questionnaire showed continuous improvement.

CONCLUSIONS: The early clinical experience demonstrated that the Viking interspinous device is safe. The pain relief, improvement in function, lack of intra-operative and post-operative neurological complications and maintenance of the disc height as well of the range of motions suggests that the VIKING is a viable alternative to fusion and disc replacement surgery and can be used in many degenerative conditions and to restore the neural foram en height.

KEYWORDS: interspinous device; Viking; spine surgery; surgical indications.

ORAL PRESENTATION 084
Anterior Cervical Corpectomy: Indications and Surgical Nuances
Dimos Bouramas, Nikolaos Paidakakos, Friderikos Sotiriou, Konstantinos Kouzounias1, Nikolaos Gekas
Department of Neurosurgery, Athens Naval Hospital

INTRODUCTION: The objective of this study is to discuss the surgical indications, outcomes and complications of anterior cervical corpectomy, and to pinpoint surgical pearls.

METHODS: Between August 2006 and July 2009, a total of 12 patients (8 males and 4 females, age range: 42 - 75 yr, mean: 53.2 yr) underwent anterior cervical corpectomy for severe ossification of posterior longitudinal ligament (OPLL), multilevel cervical spondylotic myelopathy (CSM) with extensive kyphosis or failure of previous anterior cervical diskectomy and fusion (ACD-F). Grafts and anterior cervical plates were employed to restore cervical stability in all patients.

RESULTS: Among these patients, 8 underwent one-level corpectomy and 4 two-level corpectomy. After a follow-up of 6 - 24 months, the mean preoperative Japanese Orthopaedic Association (JOA) score increased from 11.3 +/- 2.1 to 13.9 +/- 3.1 after surgery. The final plain radiographs showed improved cervical lordosis and fusion in all cases. The complications included temporary hoarseness in 2 cases, screw pullout in 1 case, CSF leakage in 1 case, and temporary nerve root palsy in 1 case.

CONCLUSION: The results of the current study demonstrated effectiveness of anterior cervical corpectomy. It can achieve a better clinical outcome in the treatment of severe OPLL and/or CSM, or in case of failed ACD-F But it is technically demanding and carries a higher risk.

KEYWORDS: Cervical corpectomy, OPLL, CSM

ORAL PRESENTATION 085
Analysis of MRI Results for Adolescent Idiopathic Scoliosis with Spondylosis and Spondylolisthesis
Balioglu Mehmet MD
Baltalimani Bone Disease and Education Hospital

INTRODUCTION: Lower back pain in Adolescent Idiopathic Scoliosis (AIS) may be due to Spondylosis or Spondylolisthesis, a condition which refers to a defect in the pars interarticularis. An X-ray may not suffice in determining the nature of this pain. It is important to evaluate MRI results in order to reach an accurate diagnosis.

METHODS: The MRI results taken over a 10 year period of 107 AIS patients (17 male, 90 female) were evaluated retrospectively. The mean age of these patients was 13.7 years (7 - 18). 9 patients were diagnosed with spondylosis and spondylolisthesis. All patients met the cobb angle criteria: >10 degrees. The presence of lower back pain was investigated. MRI results enabled us to diagnose patients with either spondylosis or spondylolisthesis.

RESULTS: MRI results revealed 98 spinal colons (91.6%) as normal: no spondylolysis or spondylolisthesis. Of the remaining 9 patients (8.6%) the following irregularities were diagnosed: grade 1 (8 case) spondilolisthezis/ spondylolisis and grade 4 spondylolisthesis (1 case). All patients diagnosed with spondylosis or spondylolisthesis showed defects in the pars interarticularis on the L5 vertebra.

CONCLUSIONS: According to medical literature, spondylosis or spondylolisthesis occurs in 6% of patients with Idiopathic Scoliosis. Our study showed that 8% of 107 AIS patients were diagnosed with either spondylosis or spondylolisthesis. This indicates the condition is relatively common in AIS patients and not always easily diagnosed. Particularly for lower grade spondylosis, in which pain may not be detectable, MRI results offer the most accurate diagnosis.

ORAL PRESENTATION 086
Osteoporotic Fractures Treatment With Kyphoplasty
Stefanos D. Pichas MD, Polithodorakis Ioannis MD, Katsiafas Christos MD
Arta General Hospital, GREECE

INTRODUCTION: Kyphoplasty has become the golden standard for the treatment of Osteoporotic fractures. We are presenting our last 2 years experience with this method (with a minimal followup of 6 months)

METHODS: We have analyzed our own 2 years results, for 30 patients and a total of 67 levels. 28/30 (93%) were females, and the mean age was 65 years (Range 46-80).
We used the VAS to assess the improvement on pain, and the Oswestry disability Index to assess the functional outcome.

RESULTS: Out of 30 patients, more than 70% had a very significant improvement (ODI 0-20% and VAS<4)

Regarding the functional outcome, although someone would expect a linear correlation, there was more of a VAS than an ODI improvement.

Mean VAS has improved from 6.35 to 2.77 in the first month and to 1.73 in 6 months.

Mean ODI has improved from 56.9 to 30.5 and 26.4 respectively. (p>99%) (Charts 1 and 2)

CONCLUSION: Nowadays Kyphoplasty is a safe, quick and very efficacious standalone procedure especially for the treatment of osteoporotic fractures

**ORAL PRESENTATION 087**

Clinical and MRI Analysis of Caudal Regression Syndrome and Concomitant Anomalies

Balioglu Mehmet1, Barsali Aysegul
Baltalimani Bone Disease and Education Hospital

INTRODUCTION: Caudal Regression Syndrome (CRS), also known as Caudal Dysplasia and Sacral Agenesis Syndrome, is a rare congenital malformation characterized by varying degrees of developmental failure early in gestation. It can affect the lower extremities, the lumbar and coccygeal vertebrae, and corresponding segments of the spinal cord. CRS consists of multiple congenital anomalies, mainly caudal segment defects. The purpose of our study was to review the clinical and Magnetic Resonance Imaging (MRI) results of patients with CRS to better understand the condition and its concomitant anomalies.

MATERIALS AND METHODS: Between the years 2006 - 2009 a retrospective study was conducted using the MRI results, radiological and clinical data of pediatric patients who came to our hospital with spinal problems related to congenital or neuromuscular conditions. Of 77 patients, 48 were diagnosed with congenital spinal deformities (scoliosis/kypnosis) and 29 were diagnosed with neuromuscular deformities. 7 (6 female, 1 male) patients were diagnosed with CRS (All these patients were diagnosed with partial or total Sacral Agenesis). Radiographs were reviewed to classify each patient by Renshaw type. The mean age was 81 (30-180) months. The 7 CRS patients were examined to study the presence of congenital anomalies concomitant with CRS. A retrospective analysis of patients with neuromuscular and congenital scoliosis was conducted using clinical and MRI results. The following conditions were given close attention: A family history of maternal diabetes mellitus, any medication used during pregnancy, a history of genetic illness, pediatric anorectal malformation, cleft mouth, diaphragm hernia, anomalies in the urinary, cardiovascular and respiratory systems, sirenomilia, spinal deformities such as lumbar, sacral, coccygeal partial or total agenesis/ hypoplasia, hip dysplasia, popliteal webbing and flexion.

RESULTS: Of 77 patients, 7 (9%) were diagnosed with Sacral Agenesis related to CRS. According to the Renshaw classification, 3 children were defined as type 4, 2 children were defined as type 2 and 2 children were defined as type 1. The mother of 1 patient was diabetic. 3 patients showed a history of marriage between relatives. The following conditions were diagnosed: 1 ectopic anus, 1 cleft mouth, 2 urinary system anomalies (1 narrow urethra and reduced bladder, 1 dyplastic kidney), 1 cardiovascular anomaly (ASD and PDA), 2 Thoracic Insufficiency Syndrome, 3 displaced hips (2 bilateral and 1 lateral), 1 syndactyly, 4 scoliosis (2 including kyphosis), 1 amelia. Using MRI results the following were diagnosed: 1 diaphragm hernia, 1 chiari malformation, 3 multi-level hemivertebra anomalies, 3 syringohidromyeli, 2 tethered cord, 1 diastometamyeli, 3 spina bifida, 1 lumbar agenesis, 6 partial or total sacral agenesis and 1 sacral dermal sinus. 1 patient received an operation for a diaphragm hernia. 3 spina bifida patients received an operation in the lumbar area and 1 received a shunt. The Amelia patient was operated on for cleft mouth, syndactyli and ectopic anus.

CONCLUSION: In this study 9% of the patients were diagnosed with CRS (Sacral Agenesis) in combination with congenital and Spina Bifida related spinal deformities. This indicates that the condition may not be as rare as most studies suggest. Our retrospective study allowed us to see the various concomitant conditions which often occur with CDR. Better understanding the condition at an early age will allow us to devise new treatment and maximize recovery.

**ORAL PRESENTATION 088**

The AOspine North America Geriatric Odontoid Fracture Study: Mortality Outcomes in Surgical vs Conservative Treatment In 158 Patients with Long Term Follow-up

Jens Chapman 1, Alexander Vaccaro2, Michael Fehlings3, Branko Kopjar1, Kledia Pollo1, Zoya Bauer1
1University of Washington, Seattle, USA, 2Thomas Jefferson University, Philadelphia, USA, 3University of Toronto, Toronto, Canada

INTRODUCTION: There is a controversy whether surgery or conservative management is the best treatment option for geriatric odontoid fractures.

METHODS: Medical records of 158 consecutive patients with type II odontoid fracture treated between 2003 and 2008 were reviewed. Mortality information was obtained from public sources. The follow-up ranged from 1 to 7 years. We used Cox proportional hazard regression to compare mortality between surgical and conservatively treated patients adjusting for age, gender, time to treatment, comorbidities (Charlsbn score) and feeding tube placement.

RESULTS: There were 56% females with an average age of 82 yrs (range 65--101). Patients underwent surgical (N=65, 41%) or conservative (N=93, 59%) treatment. Median survival time was 4.2 years. Important predictors of mortality were age, male gender, Charlson comorbidity score, feeding tube placement and conservative treatment. After adjustment for the other predictors, patients treated surgically had 50% reduction in mortality compared to conservatively treated subjects. At 1 year, about 22% patients in the surgical group and 44% patients in the conservative group expired.

CONCLUSION: This large clinical study with long term follow-up suggest that surgical treatment is associated with improved survival in geriatric (>65 y) subjects with type II odontoid fractures. This could be due to the better outcomes of surgery or due to unadjusted differences in patient baseline characteristics, which are currently being examined in a prospective multicenter AOspine study.

**ORAL PRESENTATION 089**

Our Experience with ALIF Stand - Alone in Lumbar Spine-12 to 38 Months Follow-Up
**INTRODUCTION:** The study presents the results of the surgical treatment of cervical spondylotic myelopathy via a posterior approach involving laminectomies, subaxial lateral mass fixation and fusion.

**METHODS:** Between July 2006 and July 2008, 77 patients with cervical spondylotic myelopathy underwent posterior decompression with laminectomies and pedicle screw fixation of the cervical spine. All patients were selected based on the presence of multi-level degenerative disease and the correction of cervical lordosis on the pre-operative dynamic radiographs. Patient demographics, co-morbidities and post-operative complications were recorded and analysed. Functional outcome was assessed by using the Japanese Orthopaedic Association (JOA) score.

**RESULTS:** There were 38 male and 39 female patients with an average age 68.8 years. The average follow up period was 17 months. The mean pre-operative JOA score was 9.1, whereas the mean post-operative score was 12.6 on the latest follow-up visit. 10 patients had unsatisfactory clinical results and consequently underwent anterior procedures with significant improvement. Complications included 1 epidural haematoma, 3 superficial infections and 4 cases of myofascial pain. In three cases there was mild dysfunction of the C5 nerve root which resolved spontaneously with conservative measures.

**CONCLUSION:** In the present series of patients posterior decompression with laminectomies and fusion is an effective method for the management of cervical spondylotic myelopathy.

**ORAL PRESENTATION 092**

**Extension of Echinococcal Spinal Infestation Extra and Intradurally After a Decade of Extinction**

Samadian Mohammad

Loghman-Hakim Hospital

Simultaneous intradural, extradural, vertebral and paravertebral invasion of hydatid cyst, pathologic fracture, and multiple vertebral involvement are all rare encountered conditions in echinococcal infestation. This report presents a double stage circumferential reconstruction and adjuvant long term chemotherapy on a patient suffering from above conditions. The patient was closely monitored...
neurologically and radiologically, and the authors believe that aggressive surgical treatment and sustained cyclical albendazole therapy can increase the quality of life and life expectancy.

ORAL PRESENTATION 093
Results of Treatment of Intradural Perimedullary AVM.
Yuri P. Zozulya, Yevheniy I. Slynko
Kiev, Ukraine, Institute of Neurosurgery.

BACKGROUND: Intradural perimedullary arteriovenous malformations arisen on the surface of the spinal cord and described mostly as fistulas are relatively rare lesions. Controversy still exists regarding the exact nature and structure of these lesions. Recently it was suggested that they probably are a mixed group of malformations located on the surface of spinal cord.

METHODS: The radiologic and operative features of perimedullary arteriovenous malformations were analyzed in 21 consecutive cases. The patients were treated by endovascular, surgical or combined occlusion/resection. Surgical and endovascular treatment results were carefully analysed and evaluated.

RESULTS: Perimedullary vascular malformations were subclassified into 5 groups based on their anatomy and appearance: 1) high vertebral intradural perimedullary fistulas; 2) low vertebral intradural perimedullary fistulas; 3) intradural perimedullary arteriovenous fistulas in thoracic region; 4) perimedullary arteriovenous fistulas of the spinal cord cone; and 5) perimedullary arteriovenous malformations. The prominent neurologiical improvement after treatment was observed in 6 patients. Partial regress was demonstrated in 8 patients, and in 5 patients the neurological symptoms remained unchanged. Clinical deterioration was observed in 2 patients.

CONCLUSIONS: In perimedullary arteriovenous malformations, a surgical strategy should be based on the knowledge of changes in physiological parameters such as blood flow and of the individual anatomy of malformation. It was always essential to disconnect the distal portion of feeding vessel near a place where they empty into the draining veins.

ORAL PRESENTATION 094
Neurosurgical Approaches and Treatment Results of the Ventral Craniovertebral and Upper Cervical Intradural Tumors
Yuri P. Zozulya, Eugene I. Slynko, Al-Qashqish Iyad Ischaq
Institute of Neurosurgery, Kiev, Ukraine

INTRODUCTION: The surgical treatment of the intradural ventral craniovertebral and upper cervical tumours is difficult. Surgery required differentiated surgical approaches, which must provide optimum visual control of the tumour removing.

MATERIAL AND METHODS: During the period 2000-2004 we examined and operated 24 patients with intradural craniovertebral and upper cervical tumours ventral and ventrolateral localizations. The patient age varied from 24 to 82 years. The tumour localizations depending on the level were: craniovertebral tumours - 3 patient; C1-C2 – 7 patients; C2-C3 - 14 patients. To axial localization the tumours were divided on: ventral - 15 patient; ventrolateral - 9 patient. The histology of the tumours was: neurinoma -9 patients; meningioma -10; neurofibroma - 3.

RESULTS: In all patients was carried the total tumor resection. The follow-up period varied from 2 to 47 months. The posterolateral approach was used in 4 patients, far lateral approach - 16, extreme-lateral approach – 4 patients. The clinical result of the surgical treatment was excellent or good in 15 patients (62%), fair in 7 patients (30%), and poor in 2 patients (8%). No death occurred.

CONCLUSION: The adequate choice of the surgical approach first of all depends on the tumours localizations and its size. The far-lateral and posterolateral approach in the most cases is the best choice for the intradural craniovertebral and upper cervical ventral and ventrolateral tumours. Those approaches require minimum dissection and less traumatic compared to extreme-lateral approach.

ORAL PRESENTATION 095
Reconstruction of Spinal with Telescopic Devices.
Yuri P. Zozulya, Yevheniy I. Slynko
Kiev, Ukraine, Institute of Neurosurgery.

AIM OF BACKGROUND: The new methods of spinal fixation allowed more wide use of anterior approaches for anterior spinal decompression.

MATERIAL AND METHODS: Development and adaptation of a titanic telescopic device for replacement of bodies cervical, thoracic and lumbar vertebrae named BodyVertEx is lead, biomechanical researches on 6 models of a spine were made. The technique is applied at 9 patients with traumatic, at 8 patients with tumoral damages, and at 4 patients with a compression of dural sac and a spinal cord with hernias of disks, osteofits (disc-spinal compression): at a cervical level - in 10 cases, on thoracic level - in 7, and in 4 cases - at a lumbar level.

RESULTS: During development the technique of surgical access to a spine, corporectomy and decompression of a spinal cord is advanced, the techniques of installation and fixing of telescopic devices is developed. The estimation of the nearest results is made at an extracting of the patients, the remote results are appreciated at 18 patients in terms from 6 months till 2 years. The complications connected to surgical access and installation of telescopic devices in the postoperative period, it has not been marked. Reliable fixing of telescopic devices has allowed to mobilize all patients within 2-6 days after operation.

CONCLUSION: Dynamics of neurological changes at installation of telescopic devices did not differ from those at patients with application of an anterior decompression and installations of other fixing devices.

ORAL PRESENTATION 096
Collagen Dural Matrix Plus as an Adhesion Barrier: avoid Symptoms Due to Scar Tissue After Lumbar Discectomy: Clinical Trial
Inaki Arrotegui MD, PhD
Hospital General Universitario de Valencia – Spain

BACKGROUND: Dural adhesions resulting from peridural fibrosis can cause persistent pain and may load to re-operation. The need exists for treatments to prevent dural adhesions and minimize the impact of peridural fibrosis on post-operative outcome of spine surgery. Collagen Dural matrix has traditionally been used for the repair of dural defects in both cranial and spinal procedures. Because of DuraGen's excellent clinical profile, it may be useful as an adhesion barrier.
PURPOSE: The objective of this prospective randomized double blind clinical study was to investigate the potential benefits of using the Collagen Dural Matrix plus as an adhesion barrier following spine surgery.

PATIENTS AND SETTING: patient data was used. The study cohort (collagen matrix group) consisted of consecutive patients (100 patients who were treated with DuraGen. Patients in the standard procedure group (100 patients in all) were operated by the same surgeon

METHOD: 2006-2008 (DuraGen Plus 200 cases 2 years follow up) was conducted by the investigator at a single site

• Control Group 100 standr procedure (Discectomy) 2006 Matrix Group 200 standr+ matrix (2006) Clinical follow-up+ statistical tests+ vas questionare
• Study Design.

Patients underwent spinal surgery and completed follow-up evaluations at no less than 12 - 24 months post-operation. Patients with previous spinal surgery, congenital spinal conditions, or a penetrating injury to the spine were excluded. All operations were conducted by the authors at the Hospital General Universitario de Valencia, Spain.

OUTCOME MEASURES: MRI scans of patients prior to initial surgery were performed when deemed necessary by the surgeon. Following surgery, pain was assessed at various times post operation (3 months. 3 to 6 months, 6 to 12 months, and 12 to 24 months). A post-operative MRI scan was performed on patients experiencing excessive pain to assess extent of peridural scarring and adhesions.

Post-operative Pain Assessment. Pain was assessed at each follow-up visit as follows: 0 = no pain; 1 = mild pain; 2 = moderate pain; 3 = severe pain. Mean post-operative pain scores for the collagen matrix group at all time points were lower than those for the standard procedure group and were statistically lower at 3 to 6 months 3 to 6 months.

RESULTS: From the DuraGen plus Group Postsurgical fibrosis was found in 2% vs 8% Standard group Pain Outcomes: Results from the Control Group (Standard Practice): Patients with more fibrosis, shown by the arrows, exhibited more significant symptoms. Mean post-operative pain scores for the DuraGen Group were lower at all time points and statistically lower at 3 to 6 months. The difference in re-operation rate between the collagen matrix group and the standard procedure group is statistically significant (p<0.001). CONCLUSIONS: The use of DuraGen plus resulted in statistically significant surgical outcomes 2% vs 8%. None of the 100 patients from the collagen Group required re-operation due to clinical symptoms. Collagen Graft Matrix plus: Was easy to use over the exposed tissues (thecal sack and nerve root). Discouraged the pain from fibrosis due to real physical barrier. Avoid FBSS due to scar tissue symptoms after lumbar disc surgery.

ORAL PRESENTATION 097
Lumbar Epidural Varices. Its Neurosurgical Treatment.
Yuri P. Zozulya, Yevheniy I. Slinko, Sergei I. Shinkaruk
Institute of Neurosurgery, Kiev, Ukraine

Varices of epidural veins of lumbar spine (VEVS) are an acquired pathology which manifests by dilatation of internal vertebral venous plexus. The dilated veins in the epidural spaces or in the intervertebral foramens cause irritation or compression of the thecal sac and nerve roots, which results in lumboradiculopathy. VEVS develops as an independent process or it may be accompanied by degenerative changes of the lumbar spine. Resection of varicose veins can be complicated by significant venous bleeding.

The purpose of the present study was to develop diagnostic criteria for VEVS and methods of surgical treatment, to analyze the results of treatment.

MATERIALS AND METHODS: In our study there were 43 operated patients in which lumboradiculopathy was caused by VEVS. The mean duration of symptoms was 11 months (range 5 - 49 months). The age of these patients ranged from 26 to 68 (mean, 41) years. Segmentary varicosities were found in 14 patients, local – in 21, extensive – in 8 patients. Before operation the patients were examined by MRI and intraosseous venography.

RESULTS: Of 43 operated patients varicose veins were switched off totally in all 14 patients with SVEVS. Of 21 patients with LVEVS total switching off was performed in 17 patients, partial – in 4 patients. In the patients with EVEVS radical switching off was not performed; in all patients the varicose veins were switched off partially.

In our studies after surgery regress of lumbar radicular syndromes to a certain extent was observed in all patients. Radicular pain regressed in 12 of 14 patients with SVEVS; in 18 of 19 patients with LVEVS, and in 3 of 4 patients with EVEVS. Sensory disturbances of nerve roots regressed in 6 of 10 patients with SVEVS; in 11 of 15 patients with LVEVS and in one patient with EVEVS. Motor deficits regressed in 3 of 8 patients with SVEVS; in 3 of 6 patients with LVEVS and none among patients with EVEVS.

CONCLUSIONS: Thus, epidural varicosity is a specific form of spinal pathology. Its diagnostics and surgical treatment are complicated and are only developed nowadays. However, a precise diagnostics and well planned surgery allows obtaining a positive result of treatment.

ORAL PRESENTATION 098
Neurosurgical treatment and results of spinal vascular tumors.
Yuri P. Zozulya, Eugene I. Slinko
Institute of Neurosurgery, Kiev, Ukraine

OBJECT: The purpose of this study was to analyze patients diagnosed with symptomatic vascular tumors of spine and spinal cord treated at our department over a 20-year period to better define the course of those tumors, result of treatment.

METHODS: Sixty cases of symptomatic vascular tumors affecting the spine and spinal cord were retrospectively reviewed. This group included 19 patients with hemangiomas, 15 -- hemangioblastomas, 9 -- angiosarcomas, 5 -- hemangiopericytomas, 5 -- angiofibromas, 3 -- angiolipomas, 3 -- hemangioendotheliomas, 1 - neoplastic angioendotheliomatosis. The pathology, neuroimaging findings, methods of treatment, results, similarities and differences between each tumor type at each location, are reviewed.

The cases display a spectrum of different highly vascular pathological findings involving the vertebral body, epidural space, intradural extramedullary space, and intramedullary lesions. The primary therapeutic modality used in our series is a surgery, the second are embolization, radiation, observation.

CONCLUSIONS: The vascular tumors are different in their origin, histologic appearances and behavior. The unification of this type of tumor as vascular is relative. The main differences of these tumors are the origin of their neoplastic component (endothelial or perivascular) and the degree of malignity.
ORAL PRESENTATION 099
Clinical and Radiological Outcomes of TLIF Applications With or Without Pedicle Screw: A Prospective Comparative Study
Kotil Kadir
Istanbul Educational and Research Hospital, Neurosurgery Clin.

OBJECTIVE: Retrospective study of a prospectively followed cohort. Transpedicular fixation technique, by means of anterior or posterior approaches, is known to be a biomechanically stronger method in cervical vertebral pathologies, compared to other techniques. However, its frequency of use is very low in the routine practice, as the pedicle is thin and risk of neurovascular damage is high.

METHODS: Post-operative malposition of the transpedicular screws of the 105 pedicles of the 20 patients we operated due to degenerative stenosis and trauma, infection, and tumor in the cervical region, were investigated. Fixation was performed between C3 and C7, and iliac wing and lamina were used as autografts for fusion.

RESULTS: In postoperative computed tomography (CT) scan, the applied screw was observed to have directly penetrated into the vertebral foramen in only one (0.9%) pedicle during the fixation process; however, the blood circulation appeared normal in angiography. In terms of screw-pedicle relations, the screws were at their correct places in 87 pedicles (82.8%), while non-critical lateral orientation was detected in 7 (6.6%), and medial orientation in another 8 pedicles (7.3%). Anterior-posterior surgery was performed in only one tumor case, while adequate anatomical arrangement and fixation was obtained in the other 19 cases. The average length of the screws used 32 mm for C3-7. A total of 97 (92.3%) pedicles of this series had an intrapedicular width of 3.2 mm or less. In three cases, mini-laminotomy technique was used, and fixation was performed by visualization of the spinal canal. The cases were followed up for a total of 17 to 34 months (25.7).

CONCLUSIONS: Use of the CPF provides a very strong three column stabilization but also carries a high risk of vascular injury without nerve damage. Intraoperative images techniques may reduce the risk of malposition. But, they are expensive for the undeveloped countries. Only fluoroscopy technique with experienced surgeon is acceptable for CPF in an undeveloped country due to cost-effectiveness. CPF can be performed in a one stage posterior procedure without need of anterior decompressive surgery.

ORAL PRESENTATION 100
Radio - Opacifi cation of Calcium Phosphate (CaP) Cement for Spinal Augmentation: Cadaveric and Biomechanical Study
Michael Gerling MD, Nasim Chowdhury, Neel Shah, Karen Fernandez, David Ross, Alexandra Carver MD, Naël Shanti MD, Sabet Hajeer MD, Daniel Levin MD, Srinivas Kolla MD, Scott Lehto MD.
SUNY Downstate Medical Center, Brooklyn, NY, USA.

INTRODUCTION: Vertebral cementation is frequently performed for treatment of osteoporotic vertebral compression fractures (OVCF). Fluoroscopic guidance is used to determine injection volume and prevent potentially devastating complications of epidural leakage. Concern regarding the high incidence of adjacent level fractures with standard PMMA cement has stimulated interest in Calcium Phosphate cement (CaP), though its imaging characteristics are poorly characterized. A cadaveric model of epidural cement leakage evaluated the need for radio-opacifier in CaP cement during cementation and to evaluate changes in biomechanical properties.

METHODS: Using a standard posterior approach, various size cubes of CaP cement (1, 2, and 3mm) containing 0%, 5%, 10%, and 15% Zirconia radio-opacifier (by weight) were placed on the posterior cortex of T11 and T12 to simulate epidural cement leakage. Controls contained PMMA. 4 blinded radiologists evaluated 476 total images comprised of 31 lateral fluoroscopic images of each condition and null images (no cubes present). 12mm x 6mm pegs representing each cement type underwent load to failure compression testing.

RESULTS: Detection of 15% Zirconia leaks was comparable to PMMA and more easily detected than the 0% Zirconia leaks (p= 0.046). Odds Ratio analysis of concentration and correctness equaled 1.04, indicating a 15% cube is 1.8 times more likely to be detected than the 0% cube. Logistical regression for concentration and correctness indicated a linear relationship (p=.07). Odds Ratio analysis for size and correctness equaled 2.33 indicating a 3mm cube is 29.6 times more likely to be detected than a 1mm cube. Logistical regression for size and correctness indicated a linear relationship (p <.0001). Maximum load to failure showed no difference for the various concentrations (p=.2799).

CONCLUSIONS: In this model, cement was not easily detected in the spinal canal. Addition of radio-opacifier may improve detection of CaP cement leaks without affecting its biomechanical properties.

ORAL PRESENTATION 101
Dysfunctional Attitudes and Somatization Evidence of Surgery Applicable HNP ( Hernia Nukleosus Puplosus ) Cases
Gülbin Yılmaz1, Esra Engin2, Sertaç İşlekel3
1Phd Student of İnternal Medicine Nursing School of Agean University, İzmir, 2Associate Professor of Psychiatric Nursing School of Agean University, İzmir, 3Professor Dr of Neurosurgery Faculty of Medical of Agean University, İzmir

INTRODUCTION: This research has been indication of surgical treatment of patients somatization symptoms with patients of HNP and non-functional relationship between attitudes and planned to examine.

METHODS: Demographic data, Hathaway and Kinley by(1943) developed Somatization scale, and Weisman and Beck by(1978) developed by the patients' depression are associated with the dysfunctional attitudes emerge often reveals which aims to dysfunctional attitudes scale by using the cross-sectional and descriptive has been made. Data for evaluating the number, percentage, Pearson correlation test, t-test and ANOVA, Scheffe In further analysis, Duncan, Tamhane tests were applied.

RESULTS: Patients’ dysfunctional in their attitudes scale total score of 169,68 ± 26.21, their mean scores in somatization scale is 13.36 ± 5.76. Male patients' somatization symptoms was statistically significantly higher than female patients. Patient distribution according to their level of education, dysfunctional attitudes were found to be different. Of patients 100% of the doctors they receive information about the disease, % 87.9 's what happened to the right of the disease has been identified as the know The study involved 43.9%of the patients, earlier internal and surgical treatment methods, (Analgesics, Physical Therapy and Rehabilitation-training, operations), % 56.06 patients admitted the non-medical methods (cup hitting, back puller, herbal remedies, spas)
they were found. Very bad reviews and poor general health of patients with somatization mean that was significantly higher (p<0.001).

CONCLUSION: According to research findings in patients with pathological levels of somatization with patients of HNP and non-functional position has not been determined. However, variables may not be addressed, such as study of patients with diseases related to their level of knowledge is good that these results can give. Therefore, holistic perspective can be given in cases of HNP for care of patients, psychological assessments, and similar studies be done in larger populations is very important. The work in this area due to lack of comparison and interpretation of trial findings become the power. Training for this patient group can be said of the event. Information relating to operations prior to the operation, the proposed treatment of patients after operation (diet, exercise, etc.). It is important to implement the transmission of consulting services. Organic induced complaints can be viewed in conjunction with depression, psychiatric problems such as somatization about team members being more careful is required. To this end, consultation liaison unit to provide the cooperation and collaboration for the patient's mental status assessment, patient education and counseling in charge of a consultation-liaison psychiatry nurse duties may be recommended to receive.

KEYWORDS: Hernia Nucleospusul, Somatization, Dysfunctional Attitudes

ORAL PRESENTATION 102
C1 Lateral Mass Screw in Posterior Atlantoaxial and Occipitocervical Stabilization: Indications and Surgical Outcome
Samadian Mohammadi, Alavi Ehsan
Loghman Hakim Hospital, Shahid Beheshti university of medical sciences

We report the successful use of a recently described technique of posterior fixation of the C1 lateral mass and the C2 pedicle with polyaxial screws and rods. The objectives of this study were to assess the safety and the clinical/radiographic outcomes in patients undergoing cervical spine surgery using C1 lateral mass screws. We performed C1 lateral mass screw fixation according to Harms technique for atlantoaxial or occipitocervical stabilization in 7 cases including 3 cases with odontoid fracture, 2 cases with atlantoaxial traumatic subluxation and one cases with Os odontoidum. The early clinical and radiologic follow-up data indicated solid fusion of C1 and C2 vertebrae with no observed neural or vascular damage related to this technique. In our small case series, we don't observe any case of irritation of occipital nerve, vertebral artery injury. To minimize this risk, preoperative CT assessment of the path of the VA is mandatory prior to placement of C-1 lateral mass screws.

ORAL PRESENTATION 103
International Variations in The Clinical Presentation And Management Of Cervical Spondylotic Myelopathy. One Year Outcomes of The Aospine Multi-Center Prospective Study.
M. Fehlings 1, B. Kopjar 2,*, R. Bartels 3, G. Barbugallo 4, H. Defino 5, P. Arnold 6, Q. Zhou 7, M. Zileli 8
1University of Toronto , Toronto, Canada, 2University of Washington, Seattle, 3CanisiusWilhelmina Hospital, Nijmegen, The Netherlands, 4Medical University of Catania, Catania, Italy, 5University of Sao Paulo

INTRODUCTION: Little information is available with respect to differences in global approaches to treatment of cervical spondylotic myelopathy (CSM).

METHODS: To date, 303 patients with clinically symptomatic CSM have been enrolled in a prospective multi-center controlled, cohort study involving 13 sites in Europe, Asia, South America and North America. Data were analyzed using multivariate techniques adjusting for baseline differences (age, gender, surgical approach, number of spinal levels and baseline outcome parameter value) in patient populations (SAS 9.2 PROC MIXED).

RESULTS: There were 38% females with an average age of 55yrs (SD 13). Patients underwent anterior (60%), posterior (37%) or circumferential (3%) decompressive/reconstructive surgery with the surgical techniques chosen by the treating team. There were significant differences in presentation and surgical approaches among the regions. To date, 126 patients have completed 1 year follow-up. There has been a statistically (P < .01) and clinically significant improvement from baseline values to 12 months in all outcome parameters. The MJOA improved from 13.21±2.79 at baseline to 15.40±2.62 at 12 months. The NDI improved from 38.16±19.42 at baseline to 28.17±19.02 at 12 months. The Nurick improved from 4.03±1.17 at baseline to 2.82±1.51 at 12 months. The PCS improved from 34.95±8.65 at baseline to 43.38±10.68 at 12 months. The MCS improved from 38.86±10.11 at baseline to 45.44±11.51 at 12 months. Of note, the amount of improvement varied across the regions. Asia & Pacific and Latin America had better outcomes then North America and Europe. The reasons for these differences are under investigation and will be clearer as the follow-up progresses.

CONCLUSION: This large prospective global clinical study shows that surgical treatment for CSM is associated with significant improvements in generic and patient-specific outcome measures at one year. There are however significant variations in extent of improvement that needs to be further investigated.

ORAL PRESENTATION 104
Posterior Surgical Correction of Severe Adult Scoliosis
Alattar Wissam
Private Istiqlal Hospital

OBJECTIVE: Adult scoliosis is a presentation of deformity after skeletal maturity and the pathophysiological description of adult scoliosis as a curve that start before skeletal maturity and patient does not seeking treatment until or after skeletal maturity because of limited or deficient treatment capacity.

METHOD AND TREATMENT: Our study discussed our experience in dealing with 25 adult neglected scoliosis referred from Iraq with cob angle more than 90° with limited budget and time of hospitalization. Their main complaining are pain, difficulty in breathing and cosmosis. All are treated by posterior surgical correction and fusion using different implant, and some need smith Peterson osteotomy and kyphoplasty.

RESULTS: One case superficial infection. One case temporary weakness resolved within 6 months. One case bleeding resolved with blood transfusion.
CONCLUSION: Our aim to improve their quality of life following these surgeries in the form of relieving of pain, improve their pulmonary function test, prevent progression of the curve, improve balance, provide spinal deformity correction (Cosmosis), and decrease the Cobb angle to 20° to 30°.

ORAL PRESENTATION 105
Long Term Outcome of Decompressive Laminectomy for Degenerative Lumbar Spinal Stenosis
Todaro Carlo Antonio, Pappalardo Helga, Attuati Luca, Rocca Aleandro, Oriani Mario
Dept of Neurosurgery. ICCS of Milan.

STUDY DESIGN: This retrospective study was conducted to analyze the clinical results in 165 patients who underwent decompressive laminectomy for degenerative lumbar spinal stenosis.

OBJECTIVES: To describe the long-term outcome of decompressive laminectomy performed for degenerative lumbar spinal stenosis, and to investigate preoperative factors that influenced outcomes, especially the different types of stenoses (constitutional or acquired), the segment involved (rigid, soft or mobile segments), the anatomical parts of canal (central and/or lateral). We moreover analyzed the risk factors predisposing patients to poor results.

SUMMARY OF BACKGROUND DATA: The success rate of surgical treatment of decompressive laminectomy for lumbar spinal stenosis varies. Long-term follow-up investigations have indicated deterioration of outcome; however, the causes of deterioration have not been fully investigated, and there have been no reports with a long term follow-up.

METHODS: Of 165 patients who underwent decompressive laminectomy from 1990 through 1995, 37 were followed up for a minimum of 7.5 years. The mean age at surgery was 74.9 +/- 9.1 years (range, 43-85), and the average follow-up period was 5.5 +/- 2.1 years (range, 5.1-10.4). The results were evaluated by the criteria of the Japanese Orthopedic Association Lumbar Score, and the outcome was classified as excellent at more than 75% improved score; good, 50-75%; fair, 25-49%; and poor, 0-24% or less. Associations between preoperative clinical and radiographic variables and clinical outcome were evaluated statistically.

RESULTS: In all patients, the average score improvement of 55.2 +/- 31.6% was regarded as acceptable. The postoperative score and percentage of improvement of low back pain were lower than those of leg pain and walking ability. Rate of improvement was evaluated as excellent in 29% of patients, good in 40.6%, fair in 20%, and poor in 10.4% patients. 12.8 % of patients required additional surgery because of disc herniation at the laminectomised segments and 10.4 % because of spinal instability. The patients with multiple laminectomy (P = 0.034) and foraminal stenosis (spondylosis with spondylolisthesis and degenerative spondylolisthesis) (P = 0.018) showed a significantly poorer outcome than the remainder of the patients.

CONCLUSIONS: Long-term follow-up showed that even without spinal fusion, quite one patient out of three were evaluated as excellent or good. Patients with degenerative spondylolisthesis and patient who need multiple laminectomy, should be given information about the possibility of earlier deterioration of the outcome, and alternative or additional treatment such as concomitant spinal fusion with decompression may be considered.

ORAL PRESENTATION 106
Combined Anterior and Posterior Approach for Atlanto-Axial Subluxation Due to Transverse Ligament Rupture and Calcified Remnants
Samadian Mohammad, Alavi Ehsan
Loghman Hakim Hospital, Shahid Beheshti university of medical sciences

INTRODUCTION: Trauma to the cervical spine in adults most commonly involves its lower part, but in children, although such lesions are rare, they are mostly found in the region of C1 and C2. Ligament injuries at the atlantoaxial joint in children are even rarer, since local trauma usually causes a fracture through the synchondrosis of the dens.

METHODS: A 12 years old girl with history of vehicle accident, 3 months ago, had referred to our clinic because of progressive neurologic deficits. In examination, she had painful torticollis, frank signs of quadriplegia and spasticity. Dynamic radiographs showed PADI of 13mm and non-reducible atlanto-axial subluxation. MRI indicated signal changes in medulla and two compressive osseous fragments behind the C1 anterior arch.

RESULTS: In first stage, we do performed transoral anterior decompression and because of reduction failure during this intervention, we had done posterior atlanto-axial fusion with Brooks wiring method. The patient improved significantly with complete relief of pain, torticollis and quadriplegia.

CONCLUSION: Diagnosis of this traumatic lesion requires a high level of suspicion. Conservative treatment is likely to fail; surgical stabilization is indicated.

ORAL PRESENTATION 107
Intraoperative Planning for Safe Spinal Instrumentation Using the O-Arm and Neuronavigation in Children with Traumatic Rotatory Atlantoaxial Subluxation
Walid Attia, MD, PhD, Khalid Al Musreia, MD, FRCSC, Lahlbih Soualmi, PhD
King Fahad Medical City, Neuroscience Center, Spine Department.

INTRODUCTION: Cases of traumatic rotatory atlantoaxial subluxation in children are at times difficult to stabilize. Surgical challenges include yet not limited to; fractured pedicles or lateral masses, medial vertebral arteries, single vertebral arteries, and narrow pedicles. The use of intraoperative CT-quality O-arm, and neuronavigation are still tested as aiding tools in such operative modalities.

METHODS: Seven cases of rotatory atlantoaxial traumatic subluxation are operated upon during the year 2009 in our institute by the first two authors are included in this prospective study. All of them had technical challenges regards difficulty of screw placement. All had undergone open reduction and instrumentation using atlas lateral mass and axis pedicle screws and bone allografting. In all cases the Medtronic O-arm and Medtronic StealthStation were used as intraoperative mapping tools.

RESULTS: All hardware was safely placed in the desired planned trajectories for all the seven cases. Intraoperative tools were so useful in securing neural and vascular tissue safety together with tough bony purchases of the hardware from the first and only trial of application. Intraoperative CT taken by the oarm was a useful confirmatory intraoperative test of proper hardware placement.
CONCLUSION: The intraoperative use of the O-arm and stealthStation is very useful in safe and proper placement of difficult atlas lateral mass and axis pedicle screws. Intraoperative confirmation of the proper hardware placement by intraoperative CT is of utmost value in completing the procedure.

ORAL PRESENTATION 108
Surgical Results of Modified Unilateral Open-Door Expansive Laminoplasty with Hydroxyapatite Spacers and Titanium Miniplates: Analysis from Minimum of 1-Year Follow-Up
Se-Hoon Kim MD, Sang-Kook Lee MD, Sung-Kon Ha MD, Sang-Dae Kim MD, Dong-Jun Lim MD, Jung-Yul Park MD
Department of Neurosurgery, Korea University Ansan Hospital, Ansan, Korea

OBJECTIVES: Treatment of cervical spondylotic myelopathy still remains controversial and challenging. To overcome the difficulties in performing laminoplasty and to make a safer, stronger and easier procedure, hydroxyapatite (HA) spacers and malleable titanium miniplates were used in the conventional unilateral open-door laminoplasty and a retrospective analysis was made for its efficacy.

METHODS: From Aug 2007 to Feb 2009, 24 patients (16 males, 8 females) underwent a unilateral open-door laminoplasty using HA spacers, miniplates and miniscrews. Ten patients had cervical spondylotic myelopathy and fourteen had ossification of posterior longitudinal ligament. The patients' neurological status was evaluated according to the JOA scale preoperatively and at the final visit. Follow-up X-rays and CT scans were checked at 4 and 12 months.

RESULTS: Total of 86 laminae were elevated with the mean of 3.6 levels, and mean operation time was 198 minutes. JOA grade was improved from preoperative 8.1 to postoperative 13.9. The average recovery rate by Hirabayashi formula was 72%. Neurological deterioration or implant-related complications such as breakdown/dislocation of the HA implants or delayed dural laceration were not observed during the mean follow-up period of 15 months.

CONCLUSIONS: Though several reports, usually after spinous process-splitting double-door laminoplasty with HA spacers, demonstrated complications as delayed dural laceration and aggravation of myelopathy due to a dislodged HA spacer, the use of HA blocks and miniplates in the unilateral open-door laminoplasty appears to be not only a rapid and easy procedure but also an efficient early stabilizing method, as well as preventing the risks from the technical difficulties.

KEYWORDS: laminoplasty, unilateral open-door, hydroxyapatite (HA) spacers, titanium miniplates

ORAL PRESENTATION 109
Clinical and Radiological Analysis of Vertebral Body Reconstruction in the Thoracolumbar Spines Using Synex™ Expandable Cage
Se-Hoon Kim MD, Sang-Kook Lee MD, Sung-Kon Ha MD, Sang-Dae Kim MD, Dong-Jun Lim MD, Jung-Yul Park MD, Jung-Keun Suh MD
Department of Neurosurgery, Korea University Medical Center Ansan Hospital, Ansan, Korea

OBJECTIVES: In the operative treatment of spinal trauma or tumor, the reconstruction of the anterior and middle columns of the thoracolumbar spine is still controversial. Expandable cage for vertebral body reconstruction (VBR) of the thoracolumbar spine has several advantages over other nonexpandable implants. We present our clinical experience with the use of Synex™ (Synthes) expandable cage after corpectomy combined with posterior or anterior screw fixation.

MATERIALS AND METHODS: From May 2009 to Dec 2009, eleven consecutive patients (6 males, 5 females) underwent reconstruction of the thoracolumbar spine using a Synex™ expandable cage between T6 and L5. Twenty-two patients had a burst fracture in thoracic or lumbar spine, four had tuberculous spondylitis, and three had metastatic spinal tumor. All the patients underwent single-level or multilevel vertebrectomy and VBR using a Synex™ cage, combined with posterior or anterior screw fixation. A retrospective analysis was performed to investigate clinical outcome using Frankel scale and VAS score, and radiological outcome. The patients were evaluated preoperatively, at 1, 2 and 6 months postoperatively.

RESULTS: No neurological deterioration was identified and implant-related complication was not demonstrated during the mean follow-up period of 12 months. One case of cage subsidence was noted in a severe osteoporotic patient. Clinical and radiological outcomes with the Synex™ expandable cage in the VBR of the thoracolumbar spine appears promising. The loss of correction or reduction was negligible.

CONCLUSIONS: The Synex™ expandable cage is relatively safe and easy to manage, and recommendable for indications requiring VBR, such as vertebral body fracture, posttraumatic kyphosis, spondylitis, and vertebral body tumor/metastasis.

KEYWORDS: Synex™ expandable cage, vertebral body reconstruction, thoracolumbar spine
RESULTS: No neurological deterioration was identified and implant-related complication was not demonstrated. One case of cage subsidence was noted in a severe osteoporotic patient. The loss of correction or reduction was negligible.

CONCLUSIONS: The Synex™ expandable cage is relatively safe and easy to manage, and recommendable for many indications requiring VBR via posterior approach alone. Clinical and radiological outcomes with the Synex™ expandable cage in the VBR of the thoracolumbar spine via posterior approach alone appears very promising.

KEYWORDS: Synex™ expandable cage, vertebral body reconstruction (VBR), thoracolumbar spine, posterior approach

ORAL PRESENTATION 111
Disruption of Nrf2 Enhances Upregulation of Matrix Metalloproteinase-9 in the Mouse After Spinal Cord Injury
Mao Lei
Department of Neurosurgery, Jinling Hospital, School of Medicine, Nanjing University, Nanjing, Jiangsu Province, China.

Inflammatory response plays an important role in the pathogenesis of secondary injury after spinal cord injury (SCI). Matrix metalloproteinase-9 (MMP-9) acts as an important factor in the acute periods of SCI and its expressing is correlated with a dysfunction in inflammation including disruption of the blood-spinal barrier. Nuclear factor erythroid 2-related factor 2 (Nrf2) is a key transcription factor that plays a crucial role in cytoprotection against inflammation. The present study investigated the role of Nrf2 in the spinal cord upregulation of MMP-9, tumor necrosis factor-α (TNF-α) after SCI. Wild-type Nrf2 (+/+ ) and Nrf2 (−/−)-deficient mice were subjected to a murine SCI model induced by the application of vascular clips (force of 10 g) to the dura after a three-level T8-T10 laminectomy. The wet/dry weight ratio was used to reflect the percentage of water content of 10 g) to the dura after a three-level T8-T10 laminectomy. The wet/dry weight ratio was used to reflect the percentage of water content and TNF-α expression is correlated with a dysfunction in inflammation. 

Sulforaphane (SFN) is one of the most potent inducers of the phase II enzymes extracted from cruciferous vegetable, and possessing potent anti-inflammatory activity. The present study explored the influence of SFN on the expression of MMP-9 in a murine SCI model induced by the application of vascular clips (force of 10 g) to the dura after a three-level T8-T10 laminectomy. MMP-9, tumor necrosis factor-α (TNF-α) in spinal cord tissue and spinal cord water content were investigated after the injury. The mice treated with SFN at 1hr after SCI were shown to have a greater decrease in the expression and activity of MMP-9 compared to the mice with SCI. This decrease of MMP-9 in the mice treated with SFN was associated with decreased level of spinal cord water content and TNF-α. The results suggest that SFN can decreases matrix metalloproteinase-9 expression following spinal cord injury in mice with attenuating the spinal cord inflammatory response.

KEYWORDS: spinal cord injury, sulforaphane, matrix metalloproteinase-9, TNF-α.

ORAL PRESENTATION 112
Sulforaphane Attenuates Matrix Metalloproteinase-9 Expression Following Spinal Cord Injury in Mice
Mao Lei
Department of Neurosurgery, Jinling Hospital, School of Medicine, Nanjing University, Nanjing, Jiangsu Province, China.

Inflammatory response plays an important role in the pathogenesis of secondary injury after spinal cord injury (SCI). Matrix metalloproteinase-9 (MMP-9) acts as an important factor in the acute periods of SCI and its expressing is correlated with a dysfunction in inflammation. Sulforaphane (SFN) is one of the most potent inducers of the phase II enzymes extracted from cruciferous vegetable, and possessing potent anti-inflammatory activity. The present study explored the influence of SFN on the expression of MMP-9 in a murine SCI model induced by the application of vascular clips (force of 10 g) to the dura after a three-level T8-T10 laminectomy. MMP-9, tumor necrosis factor-α (TNF-α) in spinal cord tissue and spinal cord water content were investigated after the injury. The mice treated with SFN at 1hr after SCI were shown to have a greater decrease in the expression and activity of MMP-9 compared to the mice with SCI. This decrease of MMP-9 in the mice treated with SFN was associated with decreased level of spinal cord water content and TNF-α. The results suggest that SFN can decreases matrix metalloproteinase-9 expression following spinal cord injury in mice with attenuating the spinal cord inflammatory response.

KEYWORDS: sulforaphane, matrix metalloproteinase-9, TNF-α.

ORAL PRESENTATION 113
F.D.A. I.D.E. Prospective Randomized Comparison of Three Lumbar Artificial Disc Replacements (A.D.R.) With Minimum Three – Year Follow Up
Kenneth A Pettine MD
The Spine Institute

INTRODUCTION: To establish safety and efficacy between the Maverick™ (M), Charité ™ (C), and Kineflex™ (K) A.D.R.s.

METHOD: Follow up on three ADR’s performed by two surgeons, at one I.D.E. site were reviewed. There were 25 Maverick, 31 Charité, and 35 Kineflex patients. The majority of A.D.R.s were performed at L5-S1 vs. L4-L5 (M) 19 to 6, (C) 19 to 12 and (K) 28 to 7. Inclusion/exclusion criteria will be discussed.

RESULTS: Re-operations included: (M) 1 infection , (C) 3 implant complications (K) 1 implant complication. These cases will be presented. ODI results for all groups: Pre-op = (M) 57.6, (C) 63.8, and (K) 61.1; One-year post-op = (M) 16.3, (C) 27.3, and (K) 20.4; Three-year post-op = (M) 14.6 (p<0.001), (C) 20.5 (p<0.001), and (K) 19.3 (p<0.001) VAS results for all groups: Pre-op = (M) 74.1, (C) 85, (K) 83.9; One year post-op = (M) 27.9, (C) 31.4, and (K) 27.3; Three-year post-op = (M) 20.5 (p<0.001), (C) 33.8 (p<0.001), (K) 26.9 (p<0.001) F.D.A. clinical success was met in (M) 90%, (C) 83.5%, (K) 90.3% of patients. Patients with a VAS less than 2 occurred in (M) 68%, (C) 29%, (K) 47%. Patients with an ODI less than 10 occurred in (M) 67% (C) 33%, (K) 52%. Patient satisfaction at three-year follow up was (M) 96%, (C) 84% and (K) 91%.

CONCLUSIONS: All three ADR’s demonstrated safety with a trend to more device related complications with (C) 3 compared to (M) 1 and (K) 1. They all showed efficacy with a statistically significant improvement in ODI and VAS at three year follow-up (p<0.001). F.D.A. clinical success was (M) 90%, (C) 83.8%, (K) 90.5%. This is the only class one data comparing three ADR’s from one IDE site.

ORAL PRESENTATION 114
Metanalysis of Class I and II Data on Results of Anterior Cervical Decompression and Fusion
Kenneth A. Pettine MD, Lukas Eisermann BS
The Spine Institute

INTRODUCTION: To establish safety and efficacy between the Maverick™ (M), Charité ™ (C), and Kineflex™ (K) A.D.R.s.

METHOD: Follow up on three ADR’s performed by two surgeons, at one I.D.E. site were reviewed. There were 25 Maverick, 31 Charité, and 35 Kineflex patients. The majority of A.D.R.s were performed at L5-S1 vs. L4-L5 (M) 19 to 6, (C) 19 to 12 and (K) 28 to 7. Inclusion/exclusion criteria will be discussed.

RESULTS: Re-operations included: (M) 1 infection , (C) 3 implant complications (K) 1 implant complication. These cases will be presented. ODI results for all groups: Pre-op = (M) 57.6, (C) 63.8, and (K) 61.1; One-year post-op = (M) 16.3, (C) 27.3, and (K) 20.4; Three-year post-op = (M) 14.6 (p<0.001), (C) 20.5 (p<0.001), and (K) 19.3 (p<0.001) VAS results for all groups: Pre-op = (M) 74.1, (C) 85, (K) 83.9; One year post-op = (M) 27.9, (C) 31.4, and (K) 27.3; Three-year post-op = (M) 20.5 (p<0.001), (C) 33.8 (p<0.001), (K) 26.9 (p<0.001) F.D.A. clinical success was met in (M) 90%, (C) 83.5%, (K) 90.3% of patients. Patients with a VAS less than 2 occurred in (M) 68%, (C) 29%, (K) 47%. Patients with an ODI less than 10 occurred in (M) 67% (C) 33%, (K) 52%. Patient satisfaction at three-year follow up was (M) 96%, (C) 84% and (K) 91%.

CONCLUSIONS: All three ADR’s demonstrated safety with a trend to more device related complications with (C) 3 compared to (M) 1 and (K) 1. They all showed efficacy with a statistically significant improvement in ODI and VAS at three year follow-up (p<0.001). F.D.A. clinical success was (M) 90%, (C) 83.8%, (K) 90.5%. This is the only class one data comparing three ADR’s from one IDE site.
PURPOSE: What are the clinical results of anterior cervical discectomy and fusion (ACDF)? Most spine surgeons would answer a one-level ACDF has a 95% fusion rate and 95% excellent clinical results. This perception is based on class III or class IV data, retrospective reviews typically performed by a spine fellow or resident on a senior author’s surgical series.

MATERIALS AND METHODS: Class I and class II data from five FDA IDE studies involving ACDF were reviewed. The studies include: BAK-C cage and Affinity cage filled with local reaming of autogenous bone, versus intervertebral allograft without plating. The Prestige artificial disc, ProDisc artificial disc, and the Bryan artificial disc versus intervertebral allograft with plating.

RESULTS: At two year follow-up the BAK-C had a 12% reoperation rate, the BAK-C control allograft without plating had a 17.5% reoperation rate, the Affinity cage had a 9.2% reoperation rate, the Affinity allograft control without plating had an 18.1% reoperation rate. This resulted in an overall reoperation rate of 12.7% of ACDF without plating. The studies involving an allograft with plating included the Bryan control, which had a 4.1% reoperation rate, the Prestige control had a 19.9% reoperation rate, and the ProDisc control had an 8.3% reoperation rate for an overall reoperation rate of 9.5% of ACDF with plating. Clinical success (based on a greater than 15 point improvement in ODI, no reoperation, and no neurologic deterioration) was achieved in 70%.

CONCLUSIONS: Based on a metaanalysis of class I and class II data, the results of ACDF are a 10% reoperation rate at two-year follow-up due to pseudoarthrosis, adjacent level degeneration or revision of the index surgical site and a 70% clinical success. These results emphasize the importance in differentiating the validity of information gained from class I and II versus class III and IV data.

ORAL PRESENTATION 115
Prospective Evaluation Of The Charite™ Lumbar Artificial Disc Replacement With Minimum Three-Year Follow Up
Kenneth A Pettine MD
The Spine Institute

PURPOSE: Results of Charite A.D.R. from a completely independent FDA IDE study site were evaluated. The surgeon has no financial ties to Depuy and was not involved in the Charite study.

METHOD: Sixty-six single level Charite surgeries at one FDA IDE site were reviewed. Inclusion/Exclusion and demographics will be discussed. Oswestry Disability Index (ODI), Visual Analogue Scale (VAS), patient satisfaction, and flexion/extension radiographs were evaluated pre-op and at 6 weeks, 3 months, 6 months, 12 months, 24 months and 36 months post-op. Clinical success was defined by at least 25% improvement in ODI at 24-months.

RESULTS: Operating time average: 104 minutes at L4-L5 and 79 minutes at L5-S1. Average blood loss: 45 cc at both levels. Hospitalization average: 22 hours. Three patients required re-operation.

ODI results: Pre-op = 63.8; twelve months = 27.25; twenty-four months = 20.5 (p<0.001). 36 months = 2.6 (p<0.001). VAS results: pre-op = 85.1; twelve months = 31.4; twenty-four months = 33.8 (p<0.001). 36 months = 19.8 (p<0.001). At twelve month follow up 32% of patients had an ODI less than 10. At twenty-four months the percentage increased to 33% and 38% at thirty-six months. Also at twelve months 39% of patients had a VAS of less than two. At twenty-four months the percentage changed to 29%. These patients were considered basically “pain free “with “normal” function. Clinical success was met in 84% of the patients. Patient satisfaction at two-year follow up was 88% and increased to 92% at three years.

CONCLUSION: Charite patients demonstrated clinical efficacy with significant decrease in ODI and VAS (p<0.001) from pre-op to three-year follow up. FDA Clinical success was met in 84% of the patients. Satisfaction was 92% at three years. These results are better than reported in the Charite IDE study.

ORAL PRESENTATION 116
Lumbar Decompression Followed by Coflex™ Interlaminar Implant VS. Pedicle Screw Posterior Lateral Fusion for Treatment of Stenosis
Kenneth A Pettine MD
The Spine Institute

INTRODUCTION: To compare the clinical safety and efficacy of CoFlex™ Interlaminar Fixation vs. instrumented fusion following standard decompression for lumbar stenosis.

METHODS: A prospective randomized comparison of CoFlex vs. fusion from four FDA IDE sites are reported. Randomization was 2:1 CoFlex vs. fusion. Every patient underwent one or two level decompression followed by placement of a CoFlex Interlaminar implant vs. pedicle screw fixation with posterior lateral bone graft. Inclusion and exclusion criteria will be discussed along with patient demographics. FDA clinical success was based on Improvement of at least 15 points in the ODI at 24 months compared to baseline, no re-operations, revisions, removals or supplemental fixation and no major device-related complications. Follow up was completed at 6 weeks, 3 months, 6 months, and one year with physical exam, SF -12, VAS, ODI, and radiographic analysis.

RESULTS: 28 one level surgeries (19 CoFlex and 9 Fusion) and 11 two level surgeries (8 CoFlex and 3 Fusion). Average pre-op ODI in the CoFlex group was 55 (range 40 to 70). Average pre-op ODI in the fusion group was 59 (range 42-72). Post-op ODI in the CoFlex group was 10.5 (range 0-40) a 81% improvement. Post-op ODI in the fusion group was 34.8 (range 14-56) a 41% improvement. Pre-op VAS in the CoFlex group was 74.2 (range 56-94). Average pre-op VAS in the fusion group was 73.5 (range 64-90). Post-op VAS in the CoFlex group was 13.2 (range 0-68) a 80% improvement. Post-op VAS in the fusion group was 34.2 (range 11-66) a 53% improvement.

CONCLUSION: Both the CoFlex and the fusion groups demonstrated safety with no device related complications and no reoperations or revisions. Both groups showed statistical improvement in ODI and VAS at follow up. The subjects randomized to Coflex demonstrated statistical superiority in all clinical measurements compared to fusion.

ORAL PRESENTATION 117
Prospective Randomized Series Comparing Maverick™ Lumbar Total Disc Replacement (TDR) with Anterior Lumbar Interbody Fusion (ALIF)
Kenneth A Pettine MD
The Spine Institute

INTRODUCTION: Data from an IDE clinical trial with a five-year follow-up comparing the Maverick (25 patients) with ALIF (11 patients) was evaluated. All Maverick patients had two-year follow-
up and 19 had five-year follow-up. Ten ALIF patients had two-year follow-up and seven had five-year follow-up.

METHODS: Patients were randomized 2:1 (Maverick:ALIF). Indications for surgery were similar to lumbar fusion. Inclusion/Exclusion criteria and demographics will be discussed.

RESULTS: Maverick pre-op Oswestry Disability Index (ODI) mean was 56; Two years post-op it was 15 for an average improvement of 74% (P<0.001). Five-year ODI was 9.6 (P<0.001). ALIF pre-op ODI mean was 58; at two-years it was 41 for an average improvement of 29% (P<0.05. Five-year ODI was 38.3. Maverick pre-op Visual Analog Scale (VAS) mean was 7; Two-year post-op was 2 for an average improvement of 71% (P<0.001). Five-year VAS was 1.5 (P<0.001). ALIF pre-op VAS was 8; Two-year was 6 for an average improvement of 25% (P<0.04).

Five-year VAS was 6. Fourteen of the 19 Maverick patients had an ODI less than 10 and a VAS less than two at five-year follow-up. Clinical success was achieved in 84% of the Maverick patients and 55% of the ALIF patients. One Maverick patient required reoperation versus three in the ALIF group. One additional ALIF patient is awaiting posterior fusion. Average hospital stay for both groups was 1.6 days. Time to unrestricted activity averaged six weeks in the Maverick group and six months in the ALIF group. Overall patient satisfaction was 93% for Maverick and 78% for the ALIF.

CONCLUSION: These results are similar to those reported by six other IDE sites at two-year follow-up. The combined results of 173 Maverick patients from seven IDE sites indicate statistical superior clinical outcomes compared to ALIF at one-year, and two-year follow-up (P<0.001). Two-year results were unchanged at five-year follow-up.

ORAL PRESENTATION 118
Clinical and Radiographic Outcome of the NeoDisc Cervical Total Disc Replacement (TDR) at Two-Year Follow-up
Kenneth A Pettine MD
The Spine Institute

INTRODUCTION: Clinical data from a prospective randomized FDA IDE clinical trial was reviewed to evaluate the clinical results of the NeoDisc cervical TDR verses one-level allograft with plating Anterior Cervical Fusion (ACF).

METHOD: At pre-op and follow up visits VAS, NDI, patient satisfaction and flexion/extension radiographs were evaluated. Medical Metrics Inc made all radiographic measurements independently. Indications for surgery were similar to cervical fusion. Inclusion/exclusion criteria and patient demographics will be discussed. Success was defined as a greater than 15 point improvement in Neck Disability Index (NDI) with no revision or device removal and no major device related adverse events.

RESULTS: NDI success was achieved in 72% of the controls and 89.3% of the NeoDisc patients. Average pre-op NDI was 64.3 in controls and 69 in the NeoDiscs. Average two-year post-op NDI was 40 in the controls and 24 in the NeoDiscs. The average pre-op VAS was 85.5 in the controls and 80.7 in the NeoDisc group. The average two-year post-op VAS was 43 in the controls and 29 in the NeoDisc group. Reoperations occurred in three of the controls secondary to pseudoarthrosis. One patient with the NeoDisc underwent a redo anterior decompression and replacement of the NeoDisc at six-month post-op.

Pre-operative range of motion averaged 10.7°. NeoDisc range of motion averaged 8.4° at six months and 8.2° at two-year follow-up. Longer-term radiographic follow-up is necessary to ascertain the clinical significance of endplate radiographic changes observed in some patients.

CONCLUSIONS: Two-year minimum follow-up was completed in 84% (25 of 31) of the control group and 94% (28 of 30) of the NeoDisc group. These results indicate a statistically significant superior NDI (P<0.018) in the NeoDisc group compared to the one-level ACDF group. Range of motion was maintained and revision has occurred in one of the 32 NeoDisc patients.

ORAL PRESENTATION 120
Kyphoplasty for the Treatment of Osteoporotic Fractures
Stefanos D. Pichas MD, Christos Katsiafas MD, Aygeris Panagiotis MD, Ioannis Polythodorakis MD.
Arta General Hospital, GREECE

INTRODUCTION: Kyphoplasty has become the golden standard for the treatment of Osteoporotic fractures. We are presenting our last 2 years experience with this method (with a minimal follow up of 6 months)

METHODS: We have analyzed our own 2 years results, for 30 patients and a total of 67 levels (Mean: 2.23 levels/patient, Range 1-10). 28/30 (93%) were females, and their mean age was 65 years (Range 46-80). We have used the VAS to assess the improvement on pain, and the Oswestry disability index to assess the functional outcome at 1 and 6 months post op.

RESULTS: Out of 30 patients, more than 70% had a very significant improvement (VAS<=3 at the 1 month followup) and this percentage became even better (>80%) at 6 months followup. Regarding the functional outcome almost 60% and 65% had an ODI <=30% at 1 month and 6 months respectively. It is noticeable that although someone would expect a linear correlation, there was more of a VAS than an ODI improvement especially at 6 months. Mean VAS has improved from 6.35 to 2.77 in the first month and to 1.73 in 6 months. Mean ODI has improved from 56.9 to 30.5 and 26.4 respectively. (P<0.01)(Charts 1 and 2) The total complication rate was 5.97% (2 cement leaks to the paravertebral tissues,1 leak to the canal and 1 CSF leak that immediately stopped). No serious complications occurred.

CONCLUSION: Nowadays Kyphoplasty is a safe, quick and very efficacious standalone procedure especially for the treatment of osteoporotic fractures. It provides very satisfactory relief for pain with minimal complications.

KEYWORDS: Kyphoplasty, Osteoporotic fractures

ORAL PRESENTATION 121
Perioperative Analgesia in Fusion Procedures
Stefanos D. Pichas MD, Dimopoulou Chrysa MD, Papageorgiou Kostas MD, Christos Katsiafas MD, Aygeris Panagiotis MD, Ioannis Polythodorakis MD.
Arta General Hospital, GREECE

INTRODUCTION: Patients who undergo multilevel posterior lumbar fusion are a special group by themselves because the significant operative trauma causes great amounts of pain.
METHODS: We have treated 37 patients with:

Intraoperatively
Regional intramuscular administration of: 50-100mg Fentanyl + Topical Anaesthetic e.g Ropivacaine (Naropane) 5-10ml
Postoperatively
Intravenous Pump: Pethidine 200-250mg/day + Paracetamol 2gr/day + Metoclopramide.

We administrate the VAS 18 hrs after surgery to compare the efficacy of our analgesic regimen. The control group is an equal number of patients, undergoing the same procedures who were treated with IV administration of 50mg of Pethidine 4 times per day + NSAIDs.

RESULTS: The subgroup treated with the full analgesic regimen has diminished its VAS results from 6.92 (Pre Op) to 2, 57 (18h Post Op) while the subgroup treated with IV analgesia alone reduced the VAS score from 6.77 (Pre Op) to 4.41 (18hrs Post Op) (p<0.01)

CONCLUSION: Intraoperative regional anesthesia combined with postoperative IV continuous drip pump is highly efficacious with the control of pain for the patient who has had a lumbar or thoracic fusion procedure. We highly recommend it compared to standard IV bolus administrations.

KEYWORDS: Analgesia, Fusion, Pump

ORAL PRESENTATION 122
Posterior Lumbar Fusion: Minimal vs Standard - A Multivariable Analysis.
Stefanos D. Pichas MD, Christos Katsiafas MD, Avgeris Panagiotis MD, Ioannis Polythodorakis MD.
Arta General Hospital, GREECE

INTRODUCTION: With the introduction of Minimal invasive fusion during the recent years, we are facing the dilemma of Minimal vs Standard posterior lumbar fusion operations. Our department has performed a series of Minimal invasive fusion procedures during the last 2 years, and we are assessing the results by comparing them with a similar sample of standard operations.

METHODS: A total of 57 patients suffering from degenerative spine diseases, were treated with posterior lumbar fusion - in conjunction with laminectomy, discectomy and TLIIF where needed – Of these, 31 were treated with minimal invasive surgery and 26 with standard surgery.

We are comparing our clinics results for Minimal and Non Minimal Fusion, by assessing multiple parameters. Namely VAS, ODI, duration of hospitalization, operative time, and postoperative pain.

RESULTS: The 1 and 6 months follow up returned almost identical results for both methods, concerning the improvement in the ODI and the VAS (p>0.50!)

In terms of hospital stay and associated costs, MI surgery returned significantly better results: Mean 4.3 days vs 6.6 days (p<0.01), and the same applied for postoperative pain (Mean 2.2 vs 3.7) (p<0.01).

On the other hand Standard surgery had significantly shorter operative durations (Mean 125 mins vs 226 mins)

CONCLUSIONS: Both methods seem to yield the same results. The complication rates are also comparable. Patients who undergo minimal invasive procedures have a significantly shorter hospital stay and associated cost and less postoperative pain.

On the other hand there is also a significant increase in operative time, which is almost completely attributable to the fact that the technology of minimal invasive spine instruments seems to be in certain cases immature.

We feel that with the advancement of the technology this problem will be solved and minimal invasive surgery will gain a clear advantage.

KEYWORDS: Lumbar Fusion, Minimal invasive, vs

ORAL PRESENTATION 123
Measuring Disability – ODI or RMDQ?
Stefanos D. Pichas MD, Christos Katsiafas MD, Avgeris Panagiotis MD, Ioannis Polythodorakis MD
Arta General Hospital, GREECE

INTRODUCTION: The effort to assess the functional outcome of lumbar interventions requires the use of standardized scales. The most commonly used -by far- functional outcome scales are the Oswestry Disability Index (ODI) and the Roland Morris Disability Questionnaire (RMDQ)

With this study we are trying to give an answer to the question: Which is the best scale to use to assess disability in patients with lumbar disease.

METHODS: We have administered the VAS for pain and both the ODI and the RMDQ to a series of 205 patients who were treated in our department with lumbar pain and sciatica.

They were treated by Epiduroscopy (70%), Kyphoplasty (20%) or Fusion (10%)

After the treatment they were readministered the VAS, as well as the ODI and RMDQ, at 1 and 6 months post-op.

We have finally run the Cronbach’s Alpha scale reliability test to assess the correlations between the VAS and each one of the ODI and RMDQ, as well as the correlation between ODI and RMDQ

RESULTS: Surprisingly -given the fact that the sample did not include patients with neurologic deficits, none of the examined disability scales correlated as well as expected with the VAS.

Of the factors suspected for this dissociation, increasing age and female gender where found to have a statistically significant effect. (p<0.01)

The Cronbach’s Alpha was 0.464 for RMDQ and 0.187 for ODI

They correlated to each other much better with 0.829. (Chart 1)

CONCLUSION: Although the correlation of both ODI and RMDQ with the VAS was unsatisfactory, the significant difference between 0.464 and 0.187 in favor of the RMDQ suggests that it is a more appropriate scale to assess disability in patients with low back pain and sciatica.

KEYWORDS: Disability Scale, ODI, RMDQ

ORAL PRESENTATION 124
Epiduroscopy – A promising Low Back Pain Alternative Treatment.
Stefanos D. Pichas MD, Dimopoulou Chrysa MD, Papageorgiou Kostas MD, Christos Katsiafas MD, Avgeris Panagiotis MD, Ioannis Polythodorakis MD
Arta General Hospital, GREECE

INTRODUCTION: Lumbar pain and sciatica are the leading causes of referral to a spine surgeon. Many of these patients can be treated – at least initially - by conservative means. Our department treats most...
“newcomers” suffering of chronic low back pain by Epiduroscopy, administration of epidural medication and adhesiolysis, before any other more interventional treatment.

In this study we are discussing our last 2 years experience with this method.

**METHODS:** We have performed a total of 134 Epiduroscopy procedures to a group of 106 patients (Age range 29-88 yrs, mean 59.9, 37 Males and 69 Females)

We have used the VAS scale for assessing pain and both the Oswestry disability index (ODI) and the Roland Morris disability Questionnaire (RMDQ) to assess disability Pre-Op as well as 10 days and 6 months post treatment.

**RESULTS:** 78.3% of the patients had 1 procedure, 16% had 2 and 5.7% had 3.

13 of 106 (12.3%) failed the 6 Months followup, because they have been operated in the meantime.

The VAS showed a reduction of mean pain from 7.19 pre-op to 3.86 in 10days and 3.98 in 6 Months. The ODI demonstrated a reduction from 44.36 to 25.41 and 23.70 respectively and the RMDQ confirmed the findings with 13.53, 7.75 and 7.56. (p<0.01) (Charts 1,2,3)

Furthermore 56.2 % of patients had their pain reduced by more than 50% (Chart 4).

There were no complications

**CONCLUSION:** Epiduroscopy is a safe and efficacious treatment for patients with lumbar pain. Although the results are not satisfactory enough in as much as 40% of cases it is an appealing alternative, considering it is extremely minimal and low cost.

**KEYWORDS:** Epiduroscopy, Pain

---

**ORAL PRESENTATION 125**
Clinical Analysis of Simple Decompression Vs Interspinous implants (CoflexTM) in Lumbar Central Stenosis: A Prospective Study

Yoo-Hyun Cha, M.D., Tai-Hyong Cho, M.D., Ph.D., Jung-Keeun Suh, M.D., Ph.D.
Department of Neurosurgery, Korea University College of Medicine, Seoul, Korea

**STUDY DESIGN:** A prospective and consecutive study of surgical results obtained during serial follow-up investigations in patients who underwent surgery (Simple decompression vs Coflex implantation) for central lumbar spinal stenosis.

**OBJECTIVE:** The CoflexTM Interspinous Process Decompression System (Spine motion, Germany) is an interspinous device used with increasing frequency in the treatment of degenerative lumbar spine conditions. To date, limited data are available on clinical usefulness with CoflexTM compared with simple decompressive procedures. The aim of this study was to analyze the safety and efficacy of the CoflexTM compared with simple decompressive surgery in central lumbar stenosis.

**METHODS:** Between September 2006 and August 2009, 114 patients were treated, 50 in the control group and 70 in the CoflexTM. The mean follow-up duration was 18 vs 24 months. They were clinically evaluated at the preoperative, 1 month, 3 month, 6 month, 1-year and 2-year stage with plain X-rays and clinical questionnaires (Visual Analogue Scale score for low back pain and leg pain, Oswestry Disability Index).

---

**RESULTS:** By 36 months, most of the patients reported clinically significant improvement in their symptoms in both group. Five complications were recorded in CoflexTM group: 2 surgical site infections, 1 device dislocation and 2 spinous process (SP) fractures. 6 patients underwent reoperations (PLIF) due to unresolved symptoms or recurrences.

**CONCLUSION:** The results of this prospective study indicate that the CoflexTM offers considerable clinical and radiological improvement and decrease a rate of reoperation due to unresolved stenosis symptoms compared with the simple decompressive procedure. Also the CoflexTM was as safe as simple decompression.

---

**ORAL PRESENTATION 126**
Is Pull-Push Spinal MRI Meaningful In Dynamic Manner

Tarık Yazar
Univ. Of Ankara, Deph. Of Orthopaedics and Traumatology

In patients who are suffering from low back pain only in standing position, vertical MRI investigations are very important. Standing MRI is a new and progressing concept in the literature. From time to time dynamic instabilities in spine are quite difficult to diagnose.

We performed classical MRI in horizontal position under traction and compression. This traction and compression were applied by two assistants. The cooperation of the patient is vital in such operations. The patient must not shake during the MRI process for at least 30 minutes. Otherwise, artefacts will disturb the images.

We performed 9 pull-push MRI investigations in october 008-november 008. All of these patients had back pain while standing and had had operations before.

Three of the previous operations were for traumatic and the others were for degenerative decompression purposes.

Case 1: a-b In traction

trTraksiyond 54321211

In traction there is no listhesis in T 12 – L 1 segment.

Same case; C in compression

There is no neural pressure in the channel when in traction. When the same patient is under compression, there is serious pressure in the channel and on conus medullaris.

Please pay attention to the T12-L1 listhesis under compression. Agumentation done without taking the position of posterior soft tissue complex can be seen.

In this case solution: posterior reduction and stabilization

Case 2.........Case 9

**RESULT:** We must pay attention to the pull-push MRI investigations, they can be very useful, they can positive effect to the indication revisions can be more satisfactory with this investigations.

**SPECIAL NOTE:** I would like to extend my personal regards to Dr W. Rauschning because his speech in october 008 in Izmir, Turkish Spine Congress stimulated us on this issue.

---

**ORAL PRESENTATION 127**
Surgical outcome prognosis for the patients with degenerative lumbar spine disease.

Y.I Zhuravlev, G.I. Nazarenko, A.M. Cherkashov, V.V. Ryazanov, A.G. Nazarenko
Burdenko Neurosurgery institute
INTRODUCTION: The relevance of disc disease outcome prognosis for management is governed by rapid advances of medical technologies. Unfortunately, it's not possible to achieve favorable results in all cases; that's why feasibility of the surgical outcome prognosis becomes obvious. Objective of this study was to develop algorithms for outcome prognosis for patients with lumbosacral spine degenerative disc disease.

METHODS: We have analysed outcomes of 389 patients which were operated on from 1997 to 2008. According to the operation type 4 groups of patients were formed.

1-st group – radiofrequency destruction of facet nerves of lumbar vertebra
2-nd group – percutaneous laser discectomy of lumbar discs with clinically significant protrusion detected
3-rd group – microdiscectomy at one or more levels with intervertebral disc extrusion without
4-th group – discectomy followed by stabilization. Patients were examined before and after surgery, 6 months later, in 1 and 2 years.

Surgical outcome was assessed with the modified criteria of Kawabata et al. (1973) (good, satisfactory, doubtful outcomes). Data were analysed with original “RECOGNITION” software, allowing to get patients’ identification algorithm applied to possible outcomes. The following methods have been applied: “test recognition algorithm”, “decision trees”, “logical patterns”, database case studies. Voting procedure for group decision gathering and decision making became the distinctive feature of the study.

RESULTS: Prognostic accuracy (rate of correct answers at cross-validation) was 89.7 - 100% for laser discectomy (group II), 87.9 - 96.9% for spinal stabilization (group IV), 93.8 - 99.2% for microdiscectomy (group III), and 94.9 - 100% for radiofrequency destruction of facet nerves (group I).

CONCLUSION: Algorithms obtained can be used for outcome prognosis of the arbitrary new patients. The prognostic system allows to select an optimal operation type. Collective algorithms application and voting procedure affect efficiency of the prognosis.

KEYWORDS: outcome, prognosis, lumbar

ORAL PRESENTATION 128
Robotic Guidance Spine Surgery
Konovalov NA, Shevelev IN, Kornienko VN, Asyutin DS, Isaev KA, Solenkova AV, Nazarenko AG, Zelenkov PV
Burdenko Neurosurgical Institute of RAMS, Moscow, Russia

INTRODUCTION: Robotic assistance provides higher effectiveness and safety especially in complex anatomy environment. It also enables the novel, previously unavailable surgical techniques, such as Go-Lif for lumbar spine fusion. The aim of the study is to assess the applicability and effectiveness of the robotic assistance in surgical treatment of degenerative lumbar spine.

MATERIALS AND METHODS: 14 cases were included in this study, treated between August 2009 and January 2010 in Spinal Department of our Institute with robotic assistance device (SpineAssist; MAZOR Surgical Technologies, Caesarea, Israel). 11 patients had degenerative spine disease, 1 case with osteoporotic vertebral body fractures in thoracal and lumbar spine, 2 cases had oncological lesions of spine. Robotic assistance accompanied 8 cases of pedicular screw fixation (5 of those percutaneously); 5 cases of Go-Lif standalone or with TLIF (this type of surgery is impossible without robotic assistance); 1 percutaneous vertebroplasty and kyphoplasty.

Preoperative assessment included MRI, X-rays and high-resolution CT (slice ≤1 mm). Particular interest of the study was focused on the novel fusion technique for lumbar spine: Go-Lif (Guided Oblique Lumbar Interbody Fusion).

RESULTS: robotic assistance enabled optimal screw placement. No implant-related complications were recorded. Surgery time was much longer in first 2 cases, though in further cases it decreased nearly to conventional (without robot) surgery time. For radiation dose same tendency was observed. Based on control CT, accuracy of implant placement with robotic assistance is 1 mm.

CONCLUSION: Robotic assistance is a safe additional technique enabling accurate screw placement according to planned trajectories in both percutaneous and open surgeries. High accuracy of screw placement minimizes the risk of intraoperative complications. Robotic assistance enables the novel technique of spine fusion: Go-Lif (Guided Oblique Lumbar Interbody Fusion), previously unavailable due to complex positioning of the screws.

ORAL PRESENTATION 129
Surgical treatment of synovial cysts of the lumbar spine
Bludovsky David, Zidek Slavomir
Department of Neurosurgery, Charles University Hospital in Plzen, Czech Republic

INTRODUCTION: Synovial cysts represent a pathological entity common in the joints of the extremities and rarely in the spine. They develop from the apophyseal joints; majority is in the lumbar spine. Usually they grow dorsally, but their possible growth into the spinal canal cause compression of neural structures.

METHODS: The authors present their own experience with 25 patients with synovial cysts of the lumbar spine who underwent surgical treatment between 2005 and 2009. Symptoms, diagnostic tools, treatment options and operative possibilities are discussed. Postoperative follow-up consist of neurological status, graphical examination (flexion-extension X-rays), Oswestry score and visual analog scale in this group of patients.

CONCLUSION: Our findings suggest that synovial cyst is not always a sign of instability as we can find in some papers but we have to examine these patients carefully not to miss this possibility, especially in the case of bilateral cysts in one segment. We present our algorithm in treatment of this relatively rare cause of sciatica.

KEYWORDS: synovial cyst – lumbar spine – sciatica - spondylodiscitis

ORAL PRESENTATION 130
Surgical Results of Thoracic Myelopathy Due to Ossification of the Ligamentum Flavum in Caucasian Patients
Mohammad Samadian MD, Ghiwe Sharifi MD, Ehsan Alavi MD, Karim Haddadian MD, Omidvar Rezaei MD
Department of Neurosurgery Loghman-Hakim Hospital Shahid Beheshti University of medical Sciences, Tehran, Iran

INTRODUCTION: Symptomatic thoracic ossification of the ligamentum flavum (OLF) is a rare cause of thoracic myelopathy in non-
Japanese population. The most common affected site is lower thoracic spine. Most patients present with paraparesis. With improvement in imaging methods, more cases are diagnosed especially in Caucasian population.

MATERIAL AND METHODS: 11 Caucasian cases from 2004 to 2009 were operated in Loghman-Hakim Hospital and Day General Hospital. Three patients were female and 8 patients were male. Mean age range was 49.8 yr (38-75 yr). We followed the patients for 8 to 58 months (mean follow-up: 19 m.). Patients presented with pain, sensory deficit, paraparesis, and incontinence. We compared preoperative and postoperative mJOA scores. We described new classification of OLF according to axial CT scan and MRI.

RESULTS: The most involved levels were T10/T11 and T11/T12. Mean preoperative JOA was 5.6 and mean postoperative JOA was 9.1. The recovery ratio was 16%–100% (mean 67.2%). Complication of surgery was transient deterioration of paraparesis in one case and intraoperative dural tear in another case.

CONCLUSIONS: OLF was established as a rare disease in non-Japanese patients. However, with improvement in imaging methods, more cases of OLF are seen in Caucasian populations. In symptomatic cases, surgery should be performed as soon as possible.

ORAL PRESENTATION 131
The Incidence of Severe Thoracocervical Spine Trauma at Alert Patients Escaping Diagnosis at the E.R.
Stefanos D. Pichas MD, Christos Katsiafas MD, Avergis Panagiotis MD, Ioannis Polythodorakis MD.
Arta General Hospital, GREECE

INTRODUCTION: The current state of the art initial screening for trauma patients suspected of cervical trauma consists of plain neck x-rays for all neurologically intact alert patients and a cervical spine CT for comatose patients. Sometimes though there are patients with severe trauma who escape diagnosis and the results are potentially catastrophic. Is this preventable?

METHODS: We conducted a meta-analysis of all patients examined at the surgical E.R. for cranio-cervical trauma during the last 2 years (2850 patients, mean age 53.2 yrs, 71% male, 29% female) and cross-linked this database to the patients who were examined by appointment to neurosurgical or the orthopedics department. We found a common subgroup of 156 patients (mean age 41.8 yrs, 64% male and 36% female) who were examined at the E.R. after trauma, and returned for persistent cervical or upper thoracic pain.

RESULTS: Out of this group of patients, 2 severe cases escaped initial diagnosis. Both were alert at the E.R.
1. A T1 fracture with dislocation without neurological deficit to a patient who has had a cervical spine CT scan
2. A C7 teardrop fracture to an intoxicated patient who has had plain X-rays that did not show below the C6-C7 level.

CONCLUSION: The incidence of severe thoracocervical trauma leaving the E.R. undiagnosed is approx. 1/1500 patients or 1/75 of thoracocervical trauma patients. Current screening should provide adequate control. Caution should be taken to always include all C vertebrae in the plain film and on failure perform a cervical CT scan. To further reduce the possibility of severe trauma escaping diagnosis the cervical CT should include the T1 vertebra.

KEYWORDS: cervical trauma, upper thoracic trauma, incidence, undiagnosed

ORAL PRESENTATION 132
The Importance of ADHESIOLYSIS During Epiduroscopy
Stefanos D. Pichas MD, Christos Katsiafas MD, Avergis Panagiotis MD, Ioannis Polythodorakis MD.
Arta General Hospital, GREECE

INTRODUCTION: Epiduroscopy is a simple technique performed more frequently by anesthesiologists than by neurosurgeons, for the treatment of persistent low back pain. Although simple, its degree of efficacy is considerably variable between performers of the method. We are attempting an explanation to the phenomenon.

METHODS: A total of 106 patients were treated with 134 procedures of epiduroscopy, performed by all 3 members of our staff. The difference in technique between the 3 was solely the degree of insistence on adhesiolysis. 71 procedures were performed by Dr. A with diligent adhesiolysis and the other 63 procedures were performed by Drs. B and C with minimal adhesiolysis. We have administered the VAS for pain, and the RMDQ for disability before the procedure, as well as 10 days and 6 months afterwards, and we compare the results for the two subgroups, to test the effect of adhesiolysis on the success of the procedure.

RESULTS: 13/106 patients (12.3%) – 8 of Gr. A and 5 of Gr. B - were operated before the 6 months followup. The patients of the subgroup A (Diligent adhesiolysis) had a mean improvement on VAS of 3.5 at 10 days and 3.37 at 6 months and a mean improvement on RMDQ of 6.12 (10d) and 6.29 (6m), while patients of Subgroup B (Minimal adhesiolysis) had a mean improvement of 2.67 (10d) and 2.32 (6m) at VAS and 4.57 (10d) and 4.89 (6m) at RMDQ.

Both results are statistically significant at 95% confidence level (p <0.05).

CONCLUSION: Diligent adhesiolysis definitely plays an important role to the success of Epiduroscopy. Even so, it is not the sole determinant of success. A multivariate analysis should be performed, to evaluate all successful outcome prognostic factors.

KEYWORDS: Epiduroscopy, Adhesiolysis, Pain

ORAL PRESENTATION 133
KYPHOPLASTY: Balloon vs Titanium Mesh
Stefanos D. Pichas MD, Christos Katsiafas MD, Avergis Panagiotis MD, Ioannis Polythodorakis MD.
Arta General Hospital, GREECE

INTRODUCTION: Kyphoplasty is a safe, quick and efficacious procedure for the treatment of osteoporotic fractures. The most recent evolution of the procedure is kyphoplasty with a titanium mesh as opposed to the standard balloon. We are assessing the new instrumentation with a series of 15 patients during the last year (with 6 months follow-up).

METHODS: We have analyzed our own 2 years results, for 31 patients and a total of 70 levels. 28/30 (93%) were females, and the mean age was 65 years (Range 46-80).
16 patients (39 lvs) were treated with balloon kyphoplasty and 15 patients (31 lvs) were treated with titanium Mesh kyphoplasty. We used the VAS to assess the improvement on pain, and the Oswestry disability Index to assess the functional outcome. We have also measured the degree of expansion of the collapsed vertebrae on plain X-Ray for all levels after the procedures.

RESULTS: The results concerning pain were almost identical for both methods, but with mesh kyphoplasty there was a 55% higher mean improvement of the vertebral body height (3.5mm vs 2.3mm) (p<0.01)

We also noticed an increased improvement on ODI with mesh kyphoplasty, compared to the improvement with balloon, which corresponded to the degree of vertebral height restoration. Although barely important statistically (p<0.1), this might be an important finding in the long run.

CONCLUSION: Titanium mesh kyphoplasty is an improvement over balloon kyphoplasty. Although the patients main complaint – pain – is equally addressed by both methods, mesh kyphoplasty provides superior vertebral body restoration which seems to reflect to a slightly better functional outcome.

KEYWORDS: Kyphoplasty, Osteoporotic, Balloon, Mesh

ORAL PRESENTATION 134
(Very) Small Sample Statistics – The Perfect Way to Go Wrong: My Experience With Nucleoplasty – 2 Case Reports.
Stefanos D. Pichas, MD
Arta General Hospital, GREECE

INTRODUCTION: It is common knowledge that very small samples yield statistically significant results in very rare occasions and almost always with very predictable outcomes. What usually escapes some researcher's mind though, is the fact that these exact cherished rare findings might be VERY WRONG!! Here is my experience with Nucleoplasty!

METHODS: I attended 5 nucleoplasty procedures during a 3 months period. In the week following the interventions 2/5 patients had a foot drop that required immediate surgical intervention. A new MRI has revealed severe enlargement of the disc prolapse explaining the clinical deterioration. So, despite the international data, I was ready to publish "Nucleoplasty carries a 40% risk of severe complications" …Meanwhile, several other patients that underwent nucleoplasty seemed to be doing fine, but since I didn't attend the procedures I hadn't included the results in my database. After incorporating those and analyzing the results, things seemed quite different!

RESULTS: In a series of 65 patients performed in our hospital during the last 5 years the total severe immediate complication rates was … the 2 cases that I have witnessed or 3%.

There was significant improvement at the VAS (Mean VASPre: 7.12 and VAS2yrs: 2.79) and RMDQ (Mean RMDQPre: 12.3 and RMDQ2yrs: 7.23) in a 2 years followup. (p<0.01)

Less than 10% of patients required another intervention in this interval.

CONCLUSION: Avoid statistics with very small samples, especially when the outcome is extraordinary. Especially avoid extraordinary publications until your sample is big enough not to be turned upside – down by a couple of “unexpected” specimens.

Keep extraordinary findings for what they are: case reports!

ORAL PRESENTATION 135
Semi-Quantitative Radiological Assessment of Muscle Bulk in Degenerative Spines
Bhagawati DD MSc MRCS,1 Krishnan H BSc MBBS,2 Akmal M MD FRCs(Orth)3

1North West Thames LAT ST3 Orthopaedics, Watford General Hospital, 2Foundation Year 2, Hillingdon Hospital, 3Consultant Orthopaedic Surgeon and Honorary Senior Lecturer, Imperial Healthcare

INTRODUCTION AND BACKGROUND: Kirkaldy-Willis described the sequence of changes that occur in disc degeneration(1)(2). The Degenerative cascade of Dysfunction, Instability and Stabilization is thought to underlie the pathophysiology of low back pain. Many works have been published on the involvement of the anterior elements, ligaments and facets joints in the degenerative cascade(2)(3). In our study, we focused on the role of the paraspinal musculature. In particular the variations in muscle bulk as expressed by fat muscle ratios in degenerative disc disease, spinal stenosis and spondylolisthesis compared to patients with back pain but normal MRI scans.

We tested two hypotheses. Firstly, patients with diseased spines on MRI had significantly lower muscle bulk as expressed by a low muscle/fat ratio on MRI compared to normal controls. In the second hypothesis we tested whether diseased levels had significantly lower muscle bulk than undiseased levels.

METHOD: The MRI (Signa Horizon LX GE) scans of 129 patients between the ages of 14 to 95 presenting with lower back pain were examined. The scans were performed during May and June 2009. Of these 29 who had undergone recent spinal trauma, surgery or intervention or had a Gadolinium enhanced MRI were excluded from the study. The MRI findings of 100 patients were reported by Neuroradiologists. Subjects were divided into those presenting with back pain with normal MRI (NS), Spondylolisthesis (SL), Disc Herniation (DH) and Spinal Stenosis (SS).

Axial images at mid-disc level were analysed at L4/L5 and L5/S1 levels. The images were then split into left and right halves using the centre of the vertebral as the bisecting line. At each level the Psoas Muscle was analysed, the Multifidus and the Erector Spinae group were split into equal sized thirds and subsequently analysed. With the use of Microsoft Software a grey scale was created by varying the luminance was analysed, the Multifi dus and the Erector Spinae group were split into five shades which were assigned the numbers 1,2,3,4 and 5 respectively. Once created each muscle segment was given a number to correspond to the scale.

The results were analysed using SPSS 17. Parametric analysis with Wilcoxon rank-sum test was performed.

RESULTS: Kulmogorov-Smirnov Z test demonstrated all groups conformed to a non-parametric distribution (all P<0.05). Comparing NS to DH, there was significantly less muscle bulk in all dorsal muscle groups at both levels (all P<0.05) except Zone 1 at L5/S1 (P=0.054).

There were no significant differences in Psoas bulk. Comparing NS to SS there was significantly less muscle in all groups including Psoas at both levels (all P<0.05).

Comparing NS to SL there were significant differences in all dorsal groups (all P<0.05) except Zone 1 at the L5/S1 level (P=0.074). There were no differences in Psoas bulk. There were no differences in muscle bulk between diseased and non diseased levels.
DISCUSSION AND CONCLUSION: The first hypothesis was valid. So disc degeneration, stenosis and spondylolisthesis were associated with lower muscle bulks than controls. This was most pronounced in the dorsal musculature. This extended to Psoas only in patients with stenosis. The second hypothesis was proved false. So there were no significant differences between diseased and non diseased segments. This study provides a semi-quantitative correlate for the Degenerative Cascade hypothesis.

REFERENCES:


ORAL PRESENTATION 136
Minimally Invasive Transforaminal Lumbar Interbody Fusion (Mi-TLIF): Lessons Learned After 5 Years and 275 Cases
Vassilios I. Vougioukas, Petros T. Stavros
Athens Medical Center

OBJECTIVE: Current advantages in spine surgery aim to minimize approach-related morbidity compared with conventionally conducted procedures. The authors describe their 5-year experience with a modified minimally invasive technique for performing mono-, bi-, or multisegmental transforaminal lumbar interbody fusions (MI-TLIF) for the treatment of degenerative lumbar instability.

METHODS: A modified minimally invasive TLIF technique was performed in 164 patients with single level, 87 patients with two level and 24 patients with multilevel lumbar instability. A uniportal PEEK-TLIF cage (Capstone, Medtronic or OLC, Stryker) was placed in the interbody space through a 20 mm wide tubular retractor (METRx, Medtronic). Additional percutaneous pedicle screw fixation was conducted in all cases (Sextant and Longitude, Medtronic).

RESULTS: Clinical follow-up ranged between 12-60 months. Damage to adjacent soft tissue, intraoperative blood loss and total operative time was compared to the standardized TLIF and PLIF procedures. Clinically relevant pseudarthrosis requiring revision surgery was detected in 12 cases (4.4%). Instrumentation related additional morbidity was seen in 2 (0.72%) patients with screw misplacement and 4 (1.45%) cases with an early phase cage dislocation.

CONCLUSIONS: The presented modified MI-TLIF technique represents a safe and efficient technique for the treatment of certain cases of degenerative lumbar instability. Due to the limited exposure treatment of intra- as well as postoperative complications remains a surgical challenge. Careful selection and critical evaluation of each case is essential in order to avoid major drawbacks during and after minimally invasive spinal fusion surgery.

ORAL PRESENTATION 137
Treatment of Chronic Degenerative Discarthropathy and Lumbar Stenosis with the Use of Interspinosum Distructors
Efstatios Samaras, Apostolos - Marios Zamptehinis, Olympia Karypidou,

Athanasios Zisakis, Aikaterini Panteli, Vasillios Varsos
Red Cross Hospital, Athens, Greece

INTRODUCTION: Spine degenerative disease and lumbar stenosis consist a wide area of surgical techniques due to the increase of life expectancy and the development of new technological and surgical approaches.

METHODS: Retrospective study of 163 patients history and operative notes (71 men and 92 women). Mean age of the patients who have been decompressed with the use of interspinosum distructors (U) in one or more levels is 53.23. In these cases were not included i) spine cases with previous fractures, ii) spondylolisthesis grade>2 (Meyerding scale) and iii) pure lumbar disc herniation.

RESULTS: 1. Laminctomy with or without discectomy, was performed in all patients before the introduction of the interspinosum destructors
2. 51 patients were fused with the use of PLIF
3. Two patients were reconsidered due to PLIF olisthesis without severe neurological deterioration in the future
4. One patient with CSF leakage and inflammation. Conservative treatment
5. Postlaminctomy syndrome.

CONCLUSION: The surgical treatment of lumbar stenosis with U destructors is a simple and useful technique, which is promising for long life results with no neurological symptoms and signs.

ORAL PRESENTATION 138
Complications of Spinal Instrumentation
Gholamreza Bahadorkhah MD, Mohammad Reza Ehsaei MD,Fariborz Samini MD,Hamed Kheradmand MD,Zabihyan Samira MD
Department of Neurosurgery, Mashhad University of Medical Sciences Mashhad. Iran

OBJECTIVE: In order to recognize, to evaluate and compare the common complications resulting from different techniques used in instrumentations of thoracolumbar and lumbar spine injuries such as the pedicular screw and older techniques, all thoracolumbar and lumbar spine injured patients that consecutively underwent spinal instrumentation were recorded and evaluated during fifteen years period and the results for pedicular screw is presented in this article.

MATERIALS AND METHODS: A total of 330 patients, 238 men and 112 women ranging between the ages of 9 to 74 years underwent thoracolumbar and lumbar stabilizing instrumentation with different types of pedicular screws and anterior device systems during March 1996 through April 2004. Clinical records and follow up notes were reviewed and data was analyzed with SPSS-10 software and statistically tested with T-student and Chi-squares (Pearson) test (P<0.05).

RESULTS: During the study 330 patients had pedicular screws alone or screw hooks, and 20 cases had different anterior devices. Early complications had occurred in 16.3% of patients during their hospitalization or first 8 weeks from their operations and late complications in 6.2% were seen two months after their operations.

CONCLUSION: In order to reduce intraoperative and early and late complications due to instrumentations of thoracolumbar and lumbar spine injuries in addition to meticulous surgical technique, application of a better implant designs and a more conceptual rigid segmental fixations along with image guidance are of the outmost importance.

KEYWORDS: thoracolumbar spine, lumbar spine, instrumentations, complications
ORAL PRESENTATION 139
The Impact of Achieving Sagittal Balance in Spinal Surgery Results
Stefanos D. Pichas MD, Christos Katsiafas MD, Averis Panagiotis MD, Ioannis Polythodorakis MD.
Arta General Hospital, GREECE

INTRODUCTION: In the last few years we have noticed an international trend of correcting sagittal balance – in addition to treating the patients primary problem - during spinal surgery. The theory behind this is that the majority of failures in spinal surgery results from “imbalanced” patients.

METHODS: We have retrospectively analyzed the postoperative results of 65 patients who were treated operatively with spinal fusion in our hospital during the last 2 years for lumbar disease.

We gave special attention to the 14 FBS procedures, but we also examined the VAS and RMDQ postoperative results in relation with the patients postoperative balance.

RESULTS: 8/14 FBS patients (57%) were operated elsewhere between 1 and 9 yrs ago (Mean 2.8 years) 6/14 (43%) were our own patients who had to be reoperated in a timeframe between 1 month and 24 months (Mean 8.6 Months).

In the group of patients who did well the Mean C7 plumb line deviation was 3.4 cm (Range 0.2 – 10.6) and only 17 % were unbalanced.

In the FBS group the Mean C7 plumb line deviation was 7.9 cm (Range 1.8 to 16.9) and 64 % were unbalanced.

The mean VAS for balanced patients was 2.8, vs 3.8 for unbalanced patients.

The mean RMDQ for balanced patients was 5.3, vs 8.3 for unbalanced patients.

CONCLUSION: Sagittal balance correction seems to be an important prognostic factor for the success of lumbar spinal surgery.

Balanced patients have significantly better VAS (p<0.05) and RMDQ (p<0.01) outcomes.

The rate of FBS increases proportionately with greater postoperative offsets.

KEYWORDS: Sagittal Balance

ORAL PRESENTATION 140
Cervical Meningioma: Clinical and Surgical Study: Expectations and Outcome.
Mostafa Mohamed, Moussa Wael, Zidan Ihab
Neurosurgical DPT, Faculty of Medicine, Alexandria University, Alexandria, EGYPT

OBJECT: Clinical and surgical study of patients suffering from cervical meningiomas as well as expectations and outcome. In the cervical region, the meningiomas usually occur in an anerolateral location which poses a surgical difficulty in surgical removal. Different approaches have been designed for tumour removal, mostly by laminectomy with or without partial facet joint removal. An anterior approach has been described for removal of the anteriorly placed tumour through corpectomy.

METHODS: We Evaluated 20 consecutive patients in whom surgery was performed between March 2007 to June 2009 in the Main Alexandria University Hospital at Egypt.

Patients were subjected to complete history taking, general and neurological examination and investigations including MRI of the cervical spine in all cases. Eighteen patients were operated using posterior approach and two patients using anterior approach. The surgery was performed at upper cervical region in 18 cases and at lower cervical region in 2 cases. The patients were followed-up clinically for six months.

RESULTS: Upper cervical meningioma was more frequent than lower cervical meningioma and intradural meningioma were the most frequent (95%) of cases. The posterior approach was most frequently used (90% of cases). Total tumour excision was achieved in 80% of cases, while subtotal tumour removal was achieved in 20% of cases. Most cases (80%) improved postoperatively, posterior approach could achieve total removal of the tumour in about 83% of cases, while anterior approach could achieve that in 50% of cases. Complications occurred in about 17% of cases operated posteriorly and in 30% of cases operated anteriorly.

CONCLUSION: Posterior approach is safe and effective for total removal of cervical intradural meningioma. Even in subtotal removal of the meningioma, patients had clinical improvement in most of the cases and the incidence of tumour regrowth was not significant.

Anterior approach is not needed for excision of anteriorly situated lesions as it is more extensive and adds no advantage over posterior approach.

ORAL PRESENTATION 141
The Minimally Invasive Extreme Lateral Transpsoas Approach for the Treatment of Acute and Chronic Thoraco - Lumbar Fractures
Adam S. Kanter MD, Richy Madhok MD, Kristen Jones MD, David O. Okonkwo MD, PhD
Department of Neurosurgery, University of Pittsburgh School of Medicine, Pittsburgh, PA, USA RUNNING TITLE: Novel MIS Approach for Burst Fractures

INTRODUCTION: Thoracolumbar fractures that require surgical intervention have traditionally been managed with anterior, posterior, or combined approaches. Contemporary minimally invasive techniques have evolved to enable direct access to the anterior spinal column via the extreme lateral transpsoas approach.

METHODS: The authors retrospectively reviewed the clinical characteristics and surgical outcomes of twelve patients in which an extreme lateral trans-psoas approach was performed for thoraco-lumbar fractures since November 2008. Particular attention was given to clinical indication, length of surgery, estimated blood loss, length of hospital stay, disposition, and complications. The authors present the technical nuances of this surgical approach and two clinical case illustrations.

RESULTS: From November 2008 to November 2009, twelve patients received a corpectomy and expandable interbody cage placement using an extreme lateral transpsoas approach. Six patients were males, six were females with a mean age of 49 years. Pathologies included five acute burst fractures, two pathologic fracture and five chronic burst fractures that had failed previous treatment. The average length of surgery was 4.6 hrs, average blood loss was 907 ml, with a 6.2 day average length of stay (range 2 – 12 days). One patient had a brief episode of postoperative atrial fibrillation and one patient required a readmission for chest tube placement for a pleural effusion. No other patient had any intraoperative or postoperative complications. Five patients were discharged to rehab while seven were discharged.
to home. Clinical and radiographic follow up was available in 10/12 patients, mean of 3.1 months (range 12-1month) and in all patients there was clinical improvement of their symptoms with radiographic correction of their deformity, fusion and no hardware failures.

**CONCLUSIONS:** The extreme lateral transpsoas approach is a safe and effective minimally invasive treatment option for the management of thoracolumbar burst fractures. Further follow up and experience will be necessary to evaluate more thoroughly this technique.

**KEYWORDS:** Thoracolumbar burst fracture, spine trauma, extreme lateral approach, minimally invasive spine surgery

**ORAL PRESENTATION 142**

**Curved correction in Adult Scoliosis Utilizing Extreme Lateral Interbody Fusion (XLIF) and Posterior Pedicle Screw Instrumentation**

Adam S. Kanter MD, Matthew J. Tormenti MD, Matthew B. Maserati MD, Christopher Michael Bonfield MD, David O. Okonkwo MD PhD

Department of Neurological Surgery, University of Pittsburgh Medical Center

**INTRODUCTION:** Radiographic curve correction in the treatment of adult scoliosis has been associated with improved clinical outcomes. We have recently employed a combined minimally-invasive extreme lateral transpsoas approach with interbody fusion (XLIF) and open posterior segmental pedicle screw instrumentation with transforaminal lumbar interbody fusion (TLIF) at the lumbosacral junction.

**METHODS:** We retrospectively reviewed deformity cases performed at UPMC Presbyterian Hospital over a 12 month period. Eight patients underwent combined transpsoas and posterior approaches for adult degenerative thoracolumbar scoliosis. The comparison group consisted of 4 adult patients who underwent a traditional posterior only scoliosis correction. Intra-and post-operative complications were collected. Pre- and post-operative AP and lateral standing long cassette scoliosis films were reviewed and comparisons made in coronal deformity, apical vertebral translation (AVT) and lumbar lordosis. Clinical outcomes were evaluated by comparing pre-operative and post-operative visual analog scores (VAS).

**RESULTS:** The median pre-operative coronal Cobb angle in the combined approach was 38.5° (range 18-80°). Following surgery median Cobb angles was 10° (p<0.0001). The mean pre-operative AVT was 3.6cm, improving to 1.8cm post-operative (p= 0.031). The mean pre-operative lumbar lordosis in this group was 47.3°. The mean post-operative lordosis was 40.4°. When the groups were compared, mean values for curve correction were higher for the combined approach than the posterior only approach. Conversely, mean AVT correction was higher in the posterior only group. One patient in the posterior only group required instrumentation revision for adjacent segment kyphosis. One patient who underwent transpsoas extreme lateral approach with interbody fusion suffered an intra-operative bowel injury necessitating laparotomy and segmental bowel resection; this patient later underwent an uneventful posterior only correction of her scoliotic deformity. Two patients (23%) in the extreme lateral group sustained motor radiculopathies and 6/8 patients (75%) experienced post-operative thigh parasthesias or dysesthesias. Motor radiculopathy resolved in one patient but persists 3 months following surgery in the other. Sensory symptoms persist in 5/6 patients at most recent follow-up. Mean clinical follow-up time was 10.5 months for the combined group and 11.25 months for the posterior only group. Mean VAS decreased from 9.1 to 3.5 in the combined group. Mean VAS decreased from 9.5 to 4 in the posterior only group.

**CONCLUSIONS:** Radiographic outcomes such as Cobb angle and apical vertebral translation were significantly improved in patients who underwent a combined transpsoas and posterior approach. Lumbar lordosis was maintained in all patients undergoing the combined approach. Combination of extreme lateral and TLIF/posterior segmental instrumentation techniques may lead to less blood loss and to radiographic outcomes that are comparable to traditional posterior-only approaches. However, the surgical technique carries significant risks that require further evaluation and proper informed consent.

**ORAL PRESENTATION 143**

**Surgical Approach to Cervical Spondylosis**

Muwaffak M. Abdulhak, M.D. FRCS©

Dept of Neurosurgery, Henry Ford Health System

**INTRODUCTION:** Cervical spondylosis can cause compression of the spinal cord or nerve roots. This results in pain, radiculopathy or myelopathy. Surgery helps restore function although associated with some risks. Outcome can be maximized by choosing the appropriate approach.

**DISCUSSION:** Cervical spondylosis represents a plethora of degenerative pathology ranging from early disc desiccation to severe stenosis with neural element compression. If left untreated it can lead to significant and irreversible dysfunction. Surgical treatment for cervical spondylosis has been used for years. Treatment results depend on the nature of the pathology and surgeons skills. The paper discusses various surgical approaches and develop an algorithm for when to perform anterior, posterior or combined (360) approach, role of corpectomy versus disectomy in the adequacy of the decompression. clinical applications, advantages and potential complications of each treatment option

**CONCLUSION:** Cervical spine surgery has evolved significantly in the last few years for many factors discussed earlier. It is a valid treatment for advanced spondylosis. When applied appropriately it can restore function and alter the natural history. The success of the surgery depends on the appropriateness of the approach and the skills of the surgeon. Meticulous technique is required to maximize the outcome.

**ORAL PRESENTATION 144**

**Thoraco - Lumbar Trauma Classification & Management**

Muwaffak M. Abdulhak, M.D. FRCS©

Dept of Neurosurgery, Henry Ford Health System

**BACKGROUND:** Traumatic spine injury is a common and serious one. It is estimated that about 150,000 Spinal fractures occur in USA alone each year. The cervical spine accounts for over half of them, the thoracic and lumbar spine account for majority of the rest ,over fifty percent present with neurological deficit, two third of which are complete. The majority of these injuries are caused by motor vehicle accident. Injuries related to recreational sports and falls from heights are in the far second.

**PURPOSE:** To become familiar with various classification schemes of thoracic and thoraco-lumbar fractures, with special attention to mechanism of injury. In addition awareness of various surgical approaches; ventral, ventro-lateral, dorsal and extra-cavitary approaches

World Spinal Column Journal, Volume 1 / No: 2 / May 2010
with emphasis of on advantages and disadvantages of each.

METHODS: Will discuss initial management for patients with spinal cord injury and work up with attention to concurrent injuries. Fracture management includes the role of various surgical approaches with highlights of each approach based on mechanism of injury, location, neurological status and need for decompression.

RESULTS: Will look at outcome following early and late decompression, surgical stabilization, their advantages and disadvantages vs. non-surgical management and its potential drawbacks.

CONCLUSION: Traumatic injuries of the thoraco-lumbar spine are high velocity injuries, typically associated with significant neurological deficit as well as other organ trauma. Familiarity with different fracture types, mechanism of injury, as well as timing and role of surgery is a mandate to successful outcome.

ORAL PRESENTATION 145
Anterior Cervical Microscopic Osteophytectomy – Foraminotomy and Titanium Cage Fusion Without Plate Fixation in Patients with Cervical Spondylosis Affecting 3 and 4 Cervical Levels
V.Kotselas, L. Lekas, K. Kostavaras, N.Atzemi-Moldow, K. Zikopoulos, Ch. Georgopoulos
Department of Neurosurgery, Henry Dunant Hospital Anaplasti Rehabilitation Centre

INTRODUCTION: We present a series of 96 patients with cervical myelopathy due to spondylosis, who underwent anterior cervical microscopic discectomy, osteophytectomy and foraminotomy with titanium cage fusion without plate fixation, in >2 cervical levels, with excellent results.

METHODS: During a 16-years period (1994-2009) 412 patients suffering from cervical degenerative disease underwent anterior cervical microdiscectomy, osteophytectomy, foraminotomy and titanium cage-augmented fusion without plate fixation.

Ninety two patients had surgery in >2 segments: 81 patients in 3 and 11 patients in 4 levels. Age ranged between 31 and 71 years old. The clinical presentation was cervical myelopathy with or without radical syndrome. They were examined with MRI and dynamic C-spine x-rays. Follow up with x-rays was performed 4 months, 1 and 3 years after surgery. All patients followed rehabilitation program.

RESULTS: All patients improved post-op and there were no serious complications. Only 1 patient had surgery again one level above the previous fusion. Hospital stay was 1 day for 85 patients. Follow up time ranged between 4 to 10 years. Clinical and radiographic outcome at follow up were excellent, with good stability of cage fusion.

CONCLUSION: In multiple level C-spine degenerative disease with myelopathy, the anterior cervical microdiscectomy, osteophytectomy, foraminotomy and titanium cage-augmented fusion is safe, adequate and provides excellent long term results. There is no need for plate fixation.

ORAL PRESENTATION 146
Microscopic Discectomy and Minimally Invasive Intervertebral Space Stabilization with Titanium Cages in Degenerative Disc Disease of the Lumbar Spine
V.Kotselas, L. Lekas, K. Kostavaras, N. Atzemi-Moldow, K. Zikopoulos, Ch. Georgopoulos

INTRODUCTION: We present a series of 264 patients with lumbar disc disease, who underwent bilateral microdiscectomy and minimally invasive intervertebral space stabilization with B-twin expandable titanium cages.

METHODS: During a 6 years period (2004-2009), 264 patients underwent bilateral lumbar microdiscectomy and minimally invasive intervertebral space stabilization with B-twin expandable titanium cages. The clinical presentation was radicular pain with or without neurological deficit and/or cauda equina symptoms. Patients were examined with MRI and dynamic L-spine x-rays. Follow up with x-rays was performed 4 months, 1 and 3 years after surgery.

In 99% hospital stay was 1 day. All patients followed rehabilitation program and backschool.

RESULTS: Follow up time ranged between 16 months to 6 years. All patients improved post-op (excellent results in 96%, good in 4%) and there were no serious complications. There was no disc recurrence. Radiographic follow up results were satisfactory. Fusion was found in 5 patients.

CONCLUSION: Microdiscectomy and minimally invasive intervertebral space stabilization with B-twin expandable titanium cages avoids destruction of the posterior stability structures of the L-spine and extensive traction on the roots. It is safe and adequate and minimizes the risk of transferring problems to neighbouring vertebra due to «functional stabilization».

ORAL PRESENTATION 147
The XLIF as a Revision Method in the Failed Lumbar Spine Surgery
Petros Stavros1, Vassiliis Vougoukas2, Eugenia Stylianessi, Georgios Kyrous1
1Spinemaster, 2Athens Medical Center

OBJECTIVES: We evaluate the possibilities of the XLIF method as a revision technique in the cases of instrumented failed back surgery were a removal of intersomatic implants was mandatory.

MATERIAL AND METHODS: From 07/2007 to 8/2009 48 (28 male & 20 female) patients and a total of 63 lumbar segments were treated through the XLIF method for different indications. 21 DDD, 5 degenerative spondylolisthesis, 3 post-traumatic instability and 19 for failed back surgery. The mean follow up period was 1 year. The revision group of 19 patients included 12 monosegmental, 4 bisegmental and 3 plurisegmental pseudarthroses. In all but one case at least one TLIF or ALIF operation was precedent to the XLIF revision. In one case an XLIF was the primary operation. In all cases posterior transpedicular screw stabilization was performed. In many cases a special created instrument set for the material removal was used. The following parameters were evaluated pre- and postoperatively: pain score (V.A.S), blood loss, operation time, mobilization time, height and segmental height of the operated segments, intra- and postoperative complications.

RESULTS: Pain score improved considerably (from a medium 7,6 preop. to a 3,4 postop.), the mean blood loss was 55ml per operated segment, and operative time was 55 min. per segment. The mobilization of the patient was possible in a mean time of 30 hours after the operation. Restoral of the 85% of the physiological segmental height was possible. There was only one case of mild intraoperative bleeding and one case...
of postoperative intrapsoas hematoma without a revision necessity.

CONCLUSIONS: The XLIF represents a safe and efficient revision method for the failed lumbar spine surgery. In the cases were the L5/S1 segment is not included in the fusion we believe the XLIF constitutes a very valid alternative to the classical anterior approach techniques. It is friendly to the surgeon and less invasive for the patient with advantages for the postoperative recovery. Special instrument sets may be required for an easier removal of the previously implanted material.

ORAL PRESENTATION 148
Relation of the Development of Adjacent Segment Degeneration after Two Levels Posterolateral Fusion for Degenerative Lumbar Instability with Preoperative Facet Tropism and Sagittal Alignment at full fusion
Saoud Abdeljattah, Saoud Khaled
Ain Shams University

BACKGROUND: After lumbar spinal fusion, adjacent segment degeneration (ASD) is a concern to both patients and surgeons and is a potential cause of further spinal surgery. Although ASD may be considered as a part of the normal aging process and degenerative change, it could be influenced by changes in the stress acting on the adjacent segment after spinal fusion. There are confusing reports in literature on whether ASD development affects the patients’ outcome, in terms of changing his clinical status to the worse or not.

No enough studies has correlated the development of ASD especially the symptomatic cases and postoperative sagittal alignment and the presence of preoperative facet tropism.

The authors hypothesized that mal-alignment of the sagittal balance after posterior spinal fusion at least increases (If not causes) the phenomenon of ASD development and progress. Also the authors hypothesized that facet tropism may play a role in the development and/or advancement of ASD

PATIENTS AND METHODS: This prospective study was run in Ain Shams University hospitals and hospitals of ministry of health in Cairo from April, 2004 till January, 2008. We had 53 patients (39 females and 14 males with ratio of 2.8:1). All were operated upon for degenerative indication and were selected according to strict inclusion criteria and all were fully fused by April of 2005. Range of follow up was 30-40 months with mean of 33 months but we considered the 30 months follow up visit as the final follow up.

Patients were categorized into group A with no facet tropism and B with facet tropism of the levels intended for fusion and their adjacent segments. Every group was subcategorized according to sagittal alignment at full fusion (measured using Cobb method) into group 1 with normal lordosis angle of 20-65 degrees and group 2 with hypolordotic alignment and group 3 with hyperlordotic alignment.

Patients were assessed clinically according to modified functional scale of Ghiselli et al and radiographically by AP and lateral plain films and dynamic laterals in the post fusion visits to assess ASD signs in the adjacent segments above and below fusion. The changes were graded according to University of California at Los Angeles Grading Scale for Intervertebral Space Degeneration. MRI was added for patients with symptomatic ASD and was done for all patients at the final follow up.

RESULTS: The results of this work prove that the incidence of asymptomatic ASD at 30 months follow up was only 5.2% and the symptomatic ASD was only 2.4% for the directly adjacent segment above fusion at 30 months follow up for group A1 patients (0.96% per year) and this is far less than the recorded symptomatic ASD in most series that amounts to 3% per year of follow up so it is 7.5% for that length of follow up.

In group A2 with hypolordotic alignment there was 50% incidence of symptomatic ASD in the directly adjacent segment above fusion and 50% incidence of symptomatic ASD in the directly adjacent segment above so actually all the segments directly above fusion got ASD in this group.

In group A3 all the levels directly below fusion showed ASD (66.7% Asymptomatic and 33.3 symptomatic) and all are in the directly adjacent segment below and that proves that hyperlordosis puts extra-demand on the adjacent segment below fusion.

In group B1 of facet tropism even with the preservation of physiological lordosis we had all levels directly above fusion levels showing ASD at the 30 months follow up (80% asymptomatic and 20% symptomatic) which is significantly different than the same alignment group with no facet tropism in our series (5.2% and 2.4% respectively).

B2 and B3 groups patient population were insufficient for proper result analysis.

CONCLUSION: The results of this work prove that keeping lordotic alignment performing lumbar fusion for degenerative diseases within physiological ranges decreased the incidence of both symptomatic and non symptomatic ASD and that the disturbance of this alignment increased the incidence of symptomatic and non symptomatic ASD in the segments directly above fusion in hypolordotic alignment and in the segment directly below in hyperlordotic alignment and thus keeping physiologic lordosis plays detrimental role in decreasing the incidence of ASD and that this should be taken care of during surgery. Also the authors concluded that patients with facet tropism are more likely to develop ASD than those with no tropism so those patients should be informed of this possibility and that they are more likely to need treatment that could be surgical for that condition in a while after fusion surgery. More patient population and longer follow up are needed to further solidify the concluded facts.

ORAL PRESENTATION 149
The Tips of Navigation System for the Minimally Invasive Spine Stabilization Surgery
Koji Sato, M.D., Toshibiro Ando, Yoshito Katayama, Yasushi Fukaya, Shinji Kitamura
Department of Orthopedics and spine surgery, Nagoya Daini Red Cross Hospital

INTRODUCTION: We have started minimally invasive spine surgery (MISS) since 1999. We have used spinal surgery navigation system since 2005 April. MISS implant system launched since 2005 October in Japan. Before navigation, we used fluoroscope at the MISS. It was not convenient and the exposure was problem for the medical staff.

METHODS: It was 350 cases fixation surgery with navigation system( VectorVision and Iso-C 3D) since 2003. We were performed from one to three level vertebra fixation of MIS-PLIF; minimally invasive spine stabilization for multiple level lesions as for metastasis, trauma, and osteoporotic fracture cases. We checked the operating time, X-ray exposure minutes and the benefits for MISS in this study.

RESULTS: We were performed MIS-PLIF procedure for average 100 minutes for one level fixation. Average imaging time was 1.2 minutes.
INTRODUCTION: Cages are often used for fusion after a cervical discectomy, and various bones substitutes are available to enhance bone healing. Bone Morphogenetic Protein (BMP) has also been used because of its high bone inductivity, but several studies report postoperative prevertebral soft tissue swelling as a major adverse effect amongst other. The purpose of this prospective study was to report on the clinical and radiological outcome of patients undergoing anterior cervical fusions (ACDF) using an autogenous bone marrow impregnated hydroxyapatite-collagen scaffold as a bone substitute.

METHODS: Thirty six consecutive patients with various indications underwent ACDFs using a polyetheretherketone (PEEK) cage filled with two strips of 2x1cm hydroxyapatite-collagen scaffold impregnated with 2ml of autologous bone marrow (iliac crest). +/- a plate depending on the intraoperative stability of the construct. Preop and postop Neck Disability Index questionnaire (NDI) was used for functional evaluation. Neck and arm pain were evaluated using visual analog scale (VAS) ranging from 0 (no pain) to 10 (maximal pain). Fusion was assessed using standard anterior-posterior and lateral XR views and a CT scan in patients who agreed. Statistical analysis for the NDI and VAS was performed using the non parametric Wilcoxon signed rank test. Statistical significance was set at p<0.05.

RESULTS: There were 9 patients with one level ACDF, 3 patients with 2 levels and one with 3 levels. The latest postoperative clinical follow-up (FU) was 12 month. The mean preop NDI score was 57.3% and postop 22.2% (p=0.012). The mean neck pain VAS was 8.2 out of 10 for preop and 3.1 postop (p=0.05). The mean arm pain VAS was 6.6 for preop and 0.2 postop (p=0.018). The latest radiological FU was 12 month. Seven out of thirteen patients agreed to undergo a CT scan for a more accurate fusion assessment. The mean follow-up time for the CT scan was 4.9 month (R:3-7) and all these patients, except the one with the 3 levels ACDF, showed solid fusion at that time. Seventeen out of 18 operated levels (94%) showed clear signs of bony fusion on standard Xrays. One patient with a 3 level ACDF showed only partial fusion at one level on the CT scan.

CONCLUSION: To the best of our knowledge, no report has been published on the use of bone marrow impregnated hydroxyapatite-collagen scaffold in ACDF. This bone substitute has the advantage of relying on the inductive properties of the patient’s own bone marrow cells. The results of this preliminary study suggest that it yields high fusion rates together with excellent clinical results.

ORAL PRESENTATION 151
Spinal Cord Stimulation for the Treatment of Failed Back Surgery Syndrome
Krasoudakis Antonios1, Vakis Antonios2, Koulousakis Athanasios1
1ESY, 2University Hospital Heraklion Crete, 3Klinik fur Stereotaxic und Funktionelle Neurochirurgie der Universitat zu Köln Deutschlan

The aim of this study was to evaluate the clinical efficacy of the Spinal Cord Stimulation technique to patients suffering Failed Back Surgery Syndrome (FBSS) in 2005 totally 130 patients underwent several neuromodulation procedures for treatment of intractable pain in Clinic of Stereotactic and Functional Neurosurgery of Cologne University.

Thirty six of them (27, 6%) were treated for failed back surgery syndrome (FBSS) with a combination of neuropathic and nociceptive pain components. Prior neuromodulation all of them had undergone ineffective conservative treatment. In 25 of them(53%) Spinal Cord Stimulation was performed.

Time of follow up was at least 6 months after the initial procedure and results were evaluated with Cologne Score System. (CSS, 0= best, 30= worse).

The Cologne Score system examines three parameters: 1. Visual Analogue Score (VAS) for pain relief with a 0-10 scale, where 0 represented no pain and 10 represented worst pain, 2. Use of Drugs scale, a 0-10 scale where 0 is no use of drugs and 10 is WHO class III drug combination, 3. Quality of Life Scale a 0-10 scale where 0 represented normal living while 10 represented worsened condition after neuromodulation.

Before neuromodulation treatment the average CSS score for the 36 patients was 22.9 (range 17 to 29 respectively) and at the time of follow up the average CSS was 9.24 (range 1-27). The complication rate in our series was low(8%) and the overall complications were mostly technical and not severe. We believe that neuromodulation techniques and especially Spinal Cord Stimulation can be adopted generally as a safe and effective alternative treatment for FBSS.
assessed risk factors for lumbosacral plexus palsy related to pelvic fracture that can be evaluated during the acute injury phase with diagnostics such as CT.

**METHODS:** This study included 22 patients who had AO classification type B or C pelvic fractures. The 22 patients had 27 posterior osteoligamentary lesions. The average injury severity score (ISS) was 27.5 (range 16 to 50). Age, sex, ISS, suicidal jump, longitudinal displacement, sacral transverse fracture, pubic fracture, lumbar transverse process fracture, type of pelvic fracture (AO), and type of sacral fracture (Denis) were examined for a correlation with the lumbosacral plexus palsy. Using coronal reconstruction CT, we considered a 10 mm or greater displacement at the sacrum or sacroiliac joint to be a longitudinal displacement. Transverse sacral fracture was diagnosed by sagittal reconstruction CT.

**RESULTS:** Five of the 22 (22.7%) patients had lumbosacral plexus palsy (8 of 27 pelvic fractures) detected during treatment. The incidence of lumbosacral plexus palsy was not related to age, sex, ISS. Incidence of palsy was significantly higher when the patient's affected side had longitudinal displacement. Patients who had made a suicidal jump or had a sacral transverse fracture also had a significantly higher risk for lumbosacral plexus palsy. Palsy was not related to the type of pelvic fracture (AO) or sacral fracture (Denis).

**CONCLUSIONS:** In this study, longitudinal displacement of the pelvis, transverse sacral fracture and trauma from a suicidal jump were risk factors for lumbosacral plexus palsy. These risk factors were helpful in our examination of patients who had severe pelvic fracture with loss of consciousness.

**KEYWORDS:** Lumbosacral plexus, palsy, pelvic fracture, suicidal jump

**ORAL PRESENTATION 153**
Evaluation of Patients with Thoracic Disc Herniation Before and After Anterolateral retroplural Approach
Sharifi Guive
Loghman Hakim Hospital, Shahid Beheshti university of medical sciences

**INTRODUCTION:** Anterolateral approach provides direct access to the anterior and anterolateral spinal column and requires a retropleural dissection after removal of one or more ribs. The authors aimed to develop management strategies for the treatment of herniated thoracic discs and to define indications for selection of surgical approaches.

**METHODS:** Quasi clinical trial study of 21 patients whom were undergone the operation for thoracic disk herniation with limited anterolateral approach between 2002-2009 in Loghman Hakim Hospital has performed with pre- and post-operation evaluation by mJOA score.

**RESULTS:** Clinical outcome according to the JOA Score showed significant postoperative improvement, increasing from 8.0 ± 3.3 points to 9.2 ± 2.9 points postoperatively (p<0.01). The mean recovery rate was 13.4 ±56.9%, and 19 patients (90.4%) showed improvement. In the soft disc group, there was improvement in all categories, but the hard disc group showed less improvement. The central disc group showed improvement in sensory function, but the lateral disc group showed little improvement. Regression analysis revealed a statistically significant correlation between the preoperative and postoperative score, symptom duration and recovery rate.

**CONCLUSION:** Clinical outcome after surgery of a herniated thoracic disc proved successful, especially when the disc was considered to have a soft consistency.

**KEYWORDS:** thoracic disk herniation, anterolateral approach

**ORAL PRESENTATION 154**
Extreme Lateral Interbody Fusion (XLIF) in the Treatment of Degenerative Spine Disease
Konstantinos Paterakis, Alexandros Brodis, Anastasia Tasiou, Maria Bokopoulou, William Smith, Kostas Fountas
Neurosurgical Department, University Hospital of Larissa, GREECE

**INTRODUCTION:** Interbody fusion is a surgical technique that aims to treat degenerative disc disease and instability of the spine. One of the several interbody fusion techniques described in the literature, is extreme lateral interbody fusion (XLIF), a minimally-invasive maximal access procedure which addresses this pathology by avoiding the back muscles resulting thus, in minor trauma, reduced blood loss and early mobilization of the patient.

**MATERIAL AND METHODS:** During one year's period 6 men and 4 women aged 20-72 (mean age 56) had one or multiple levels XLIF for the treatment of various degenerative conditions of the thoracolumbar spine. Among them 2 of the patients suffered from thoracic disc disease and the rest of the patients from lumbar spine pathology; 2 from degenerative disc disease, 3 from stenosis/instability, 2 from degenerative scoliosis and 1 from adjacent segment disease. Patients were assessed by means of the Oswestry Disability Index (ODI) and the Visual Analog Scale (VAS) preoperatively and 3 months postoperatively.

**RESULTS:** A total of 21 levels were treated. Operative time ranged from 45 to 210 minutes, blood loss ranged from 20-200 ml, patients were mobilized into the first 24 hours and remained hospitalized less than 4 days. ODI and VAS improved by 43.5% and 48.2% respectively. No complications occurred.

**CONCLUSION:** Minimally invasive procedures, in comparison to conventional ones, offer not only a reliable alternative solution but they should be used as the first choice procedure in the treatment of degenerative spine disease.

**KEYWORDS:** Interbody fusion, extreme lateral interbody fusion, minimally-invasive, degenerative spine disease, instability, adjacent segment disease

**ORAL PRESENTATION 155**
Clinical Accuracy of Three-Dimensional Fluoroscopy (IsoC-3D)-Assisted Upper Thoracic Pedicle Screw Insertion
Yoshishita Sugimoto, Yasuo Ito, Yasuyuki Shiozaki, Ietsuro Mazaki, Masato Tanaka
1Okayama University Hospital, JPN, 2Kobe Red Cross Hospital, JPN

**INTRODUCTION:** Correct screw placement is especially difficult in the upper thoracic vertebrae. At the cervicothoracic junction (C7-T2), problems can arise because of a narrow pedicle and obstruction by the patient's shoulder when using a lateral image intensifier. Other upper thoracic vertebrae (T3-6) pose a problem for screw insertion due to a narrower pedicle rather than the lack of visibility with a lateral intensifier.

**METHODS:** We inserted 154 pedicle screws into 78 vertebrae (C7 to T6) in 38 patients. Twenty three patients had spinal trauma, 12 had...
using the three-dimensional fluoroscopy navigation system. Clinically, misplacement at the level of the C7 and upper thoracic (T1-6) vertebrae between T3 and T6, 61 of 64 (95.3%) screws were classified as grade 1, and 3 of 64 (4.7%) screws as grade 2.

CONCLUSIONS: In this study, we could reduce pedicle screw misplacement at the level of the C7 and upper thoracic (T1-6) vertebrae using the three-dimensional fluoroscopy navigation system. Clinically, significant screw deviation in the present study was considered grade 3, and this occurred in 0% of the placements.

KEYWORDS: navigation, upper thoracic pedicle screw, IsoC-3D, misplacement

ORAL PRESENTATION 156
Surgical Results of Micro-Endoscopic Spinal Surgery for Patients with Chronic Renal Failure - Including an Assessment of the Psychological Factors Affecting Pain -
Nakanishi Kazuo, Yamane Kentaro
Kure Kyousai Hospital, Japan

INTRODUCTION: Surgical treatment for spondylosis in dialysis patients is becoming more common in Japan. Many dialysis patients suffer from complications, including an increased risk for sudden death, and depending on the patient’s overall condition, minimally invasive surgery must be selected in some cases. In this study, we performed micro-endoscopic surgery for spondylosis in dialysis patients to examine the efficacy of treatment.

METHODS: A total of 54 cases were examined, including 10 dialysis patients who underwent micro-endoscopic surgery (D) and 44 non-dialysis patients who underwent micro-endoscopic surgery during the same period (ND). The VAS score, the Japanese Orthopaedic Association (JOA) scores, and the Rolland-Morris Disability questionnaire (RDQ) were assessed. We also used the self-assessment depression scale (SDS) to assess psychological factors affecting pain.

RESULTS: The preoperative and postoperative JOA scores were 6 and 12 (D), 7 and 13 (ND). The preoperative and postoperative RDQ scores were 19 and 9(D), 13 and 5(ND). The preoperative and postoperative SDS scores were 50 and 41(D), 44 and 33(ND). All scores had significantly improved in both groups. Complications were observed in 2 patients.

CONCLUSION: The benefits of micro-endoscopic surgery for dialysis patients include the following: muscles and ligament tissues can be preserved; less bleeding; early postoperative ambulation; and decompression on both sides with minimal bone resection on one side. As such, micro-endoscopic surgery is less invasive and may be sufficiently appropriate for high-risk dialysis patients. The shortcomings include the fact that, compared with typical cases of stenosis, micro-endoscopic surgery is more difficult to perform in dialysis patients due to the adhesion of amyloid, as well as the fact that the method is ineffective in cases in which fractions and instability are quite severe. But, it is believed that micro-endoscopic surgery is also effective for psychological factors.

KEYWORDS: dialysis, micro-endoscopic surgery, self-assessment depression scale.

ORAL PRESENTATION 157
Vertebral Rotation During Pedicle Screw Insertion in Patients with Cervical Injury
Yoshihisa Sugimoto, Yasuo Ito2, Yasuyuki Shiozaki1, Tetsuro Mazaki2, Masatoshi Tanaka1
1Okayama University Hospital, JPN, 2Kobe Red Cross Hospital, JPN

INTRODUCTION: Cervical pedicle screws, when misplaced, tend to perforate laterally. One of the reasons for lateral perforation is vertebral rotation during screw insertion. However, actual vertebral rotation during pedicle screw insertion is unknown. In this study, we measured vertebral rotation during pedicle screw insertion in patients with cervical injury.

METHODS: We inserted 76 pedicle screws into 38 vertebrae (C2 to C7) in 17 patients. All patients had some type of cervical injury. Screws were placed using intraoperative acquisition of data acquired with the isocentric C-arm fluoroscope (Iso-C3D) and computer navigation. We made screw holes using an image-guided awl, and we took images of cervical vertebrae in the neutral and rotational positions using navigation. Images of 76 insertions and rotational positions were taken while each cervical vertebra was under maximum stress at the time we were making the pedicle hole by awl.

RESULTS: Average cervical vertebra rotation was 10.6 degrees (range 6 to 17) at C2, 9.1 degrees (5 to 13) at C3, 7.8 degrees (6 to 9) at C4, 6.7 degrees (4 to 11) at C5, 4.9 degrees (2 to 8) at C6 and 2.8 degrees (0 to 4) at C7. Vertebral rotation in the upper and middle cervical spine rotated more than the lower cervical spine vertebrae. Of the 76 pedicle screws inserted into vertebrae between C2 and C7, 74 screws (97.4%) were classified as Grade 1 (no pedicle perforation).

CONCLUSION: In this study, upper and middle cervical vertebrae in patients with neck injuries rotated more than the lower vertebrae. We should be especially careful of cervical rotation during screw insertion from C2 to C6, so as to prevent vertebral artery injury.

KEYWORDS: rotation, cervical pedicle screw, trauma, Iso-C3D

ORAL PRESENTATION 158
The Management of Syndromic Craniofacial Patients with Sleep Apnoeas Related to Chiari Malformation
Al – Jumaily Mohammed

INTRODUCTION: Many children with craniofacial syndromes present with many systematic problems including respiratory problems. Although some of these are obstructive in nature, many other are central in origin. The central drive of respiration may be affected by the pressure induced by associated Chiari malformations. A foramen magnum decompression results in improvement of the respiratory pattern and central apneas.

PATIENTS AND METHODS: 10 patients with diverse craniofacial abnormalities presenting with respiratory abnormalities with or without apneas underwent sleep studies. During these studies, SaO2, pulse, respitrace bands x2, transcutaneous CO2, end tidal CO2, ECG
heart rate and video monitoring were recorded during sleep of these patients. Those with central apneas went on to have an MRI scan of the head and the craniocervical junction. In cases where an associated Chiari malformation was detected, a foramen magnum decompression was performed. A follow-up sleep study is done post-operatively.

RESULTS: 6 children presented with central apneas, 3 with an obstructive picture and one without neither central nor obstructive. A foramen magnum decompression was done in those whose MRI scan revealed a Chiari malformation. Post-operative sleep studies revealed significant improvement.

CONCLUSION: Brain stem compression from a Chiari malformation should always be kept in mind in cases of craniofacial syndromic children presenting with central apneas. Sleep studies followed by an MRI of the craniocervical junction should be performed in these patients. A Chiari decompression is usually associated with a significant improvement.

**ORAL PRESENTATION 159**

The Importance of CT Myelogram in the Management of Patients Inconclusive MRI Results

Al – Jumaily Mohammed

INTRODUCTION: In this era of advanced non-invasive imaging, the CT myelogram (CTM) still finds its place in current spinal practice. In this paper, we try outlining the indications of this diagnostic tool in today’s investigation arsenal.

PATIENTS AND METHODS: 54 patients who had CTM following an MRI scan for symptoms related to their cervical, thoracic, lumbar or to more than one region of their spine. These were analysed to identify the indications for the CT-myelogram. The outcomes of both MRI and CTM were compared. The patients who required surgery following the CTM and their surgical findings were noted.

RESULTS: The indications for the CTM were unclear results obtained from the MRI images in 4, investigation of central canal stenosis in 25, lateral recess stenosis in 24, and intradural cyst in 1 patients. In all patients with unclear MRI results, the CT-myelogram gave the required information however none required surgery. There was additional information obtained by the CTM in 11 patients out of the 25 patients who had central canal stenosis, and 9 out of the 24 patients with lateral recess stenosis. All patients with additional information on the CTM and central canal stenosis, and all but one of those with lateral recess stenosis went for surgery. In these patients who had surgery, the surgical findings confirmed the CTM results.

CONCLUSIONS: We conclude that in all patients where there are symptoms that are unexplained by the MRI or inconsistency between symptoms and MRI findings, a CTM should be offered to exclude any surgical indication.

**ORAL PRESENTATION 160**

Management of Spinal Epidural Abscess. Experience of a British Centre.

Al – Jumaily Mohammed

INTRODUCTION: Spinal epidural abscess is a rare entity, but has doubled in frequency in the last two decades. Presentation and early diagnosis may be difficult leading to a delay in treatment. In addition to an absence of clear guidelines for managing these patients, treatment often revolves around empirical recommendations and personal preferences.

In our study we reviewed our experience of managing spinal epidural abscess over the last 5 yrs.

METHODS: We performed a retrospective study of 10 cases of MRI-proven spinal epidural abscess treated in the Walton centre for Neurology and Neurosurgery during the last 5 years. Demographic factors, clinical presentation, predisposing factors, in-hospital stay, management and outcome were analysed. In addition to follow up extended over 1 year.

RESULTS: The majority of patients presented with back pain. Neurological deficit was the second most common presentation (e.g. leg weakness).

30% had a positive blood culture prior to starting treatment, 3/10 patients underwent a CT guided biopsy of which only one was positive.

5/10 patients had operative intervention, in four of which the culture was positive.

Staphylococcus aureus was isolated in 50% of patients. All patients had a course of antibiotics, the most frequent duration was 6 – 12 weeks. Mean hospital stay for surgically managed patients was 25 days, for conservatively managed patients it was 21 days.

No Inpatient mortalities were recorded.

CONCLUSIONS: Spinal epidural abscess requires early and appropriate management guided by positive cultures. MRI with contrast is the mainstay of imaging. Identifying the causative micro organism is essential but not always possible. All patients require a minimum of 6 weeks antibiotic therapy. Surgical treatment should be considered depending on the patients neurological status and MRI findings. Follow up is essential to detect recurrences.

**ORAL PRESENTATION 161**

Complications of Spinal Instrumentation

Gholamreza Bahadorkhani MD, Mohammad Reza Ehsaei MD, Fariborz Samini MD, Hamed Kheradmand MD, Zabihyan Samira MD

Department of Neurosurgery, Mashhad University of Medical Sciences Mashhad. Iran

OBJECTIVE: In order to recognize, to evaluate and compare the common complications resulting from different techniques used in instrumentations of thoracolumbar and lumbar spine injuries such as the pedicular screw and older techniques, all thoracolumbar and lumbar spine injured patients that consecutively underwent spinal instrumentation were recorded and evaluated during fifteen years period and the results for pedicular screw is presented in this article.

MATERIALS & METHODS: A total of 350 patients, 238 men and 112 women ranging between the ages of 9 to 74 years underwent thoracolumbar and lumbar stabilizing instrumentation with different types of pedicular screws and anterior device systems during March 1996 through April 2004. Clinical records and follow up notes were reviewed and data was analyzed with SPSS-10 software and statistically tested with T-student and Chi-squares (Pearson) test (P<0.05).
RESULTS: During the study 330 patients had pedicular screws alone or screw hooks, and 20 cases had different anterior devices. Early complications had occurred in 16.3% of patients during their hospitalization or first 8 weeks from their operations and late complications in 6.2% were seen two months after their operations.

CONCLUSION: In order to reduce intraoperative and early and late complications due to instrumentations of thoracolumbar and lumbar spine injuries in addition to meticulous surgical technique, application of a better implant designs and a more conceptual rigid segmental fixations along with image guidance are of the outmost importance.

KEYWORDS: thoracolumbar spine, lumbar spine, instrumentations, complications