Free Paper Session IX — Spine II

9.1

Oblique Lateral Interbody Fusion for L5-S1

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Private Practice

Introduction: A minimally invasive modified anterior lumbar interbody fusion technique for the lumbosacral junction is described and reviewed.

Materials and Methods: From August 2014 to June 2015, 13 patients who underwent oblique lateral interbody fusion to L5-S1 and in 1 patient to L5-S1 and S1-2 were reviewed. The surgical technique, as well as the advantages and disadvantages of such technique, were also briefly discussed.

Results: One patient with prior long spinal fusion and L5-S1 spondylolysis with foraminal stenosis fell in the bathroom resulting in implant subsidence which necessitated revision. One patient had a laceration of the left common iliac vein during final cage impaction and retractor slippage.

Discussion and Conclusion: Oblique lateral interbody fusion is a useful technique that adds to the surgeon's armamentarium. It gives an extra option for access to the L5-S1 disc space when the patient is positioned in a lateral decubitus position. As the instrumentation is new, there are further ongoing refinements being added to the technique and instrumentation.

9.2

Ultra-short Time-to-echo Magnetic Resonance Imaging Disc Sign: A Novel Imaging Biomarker Associated with Spine Degeneration, Pain, and Disability

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Objective: Ultra-short time-to-echo (UTE) magnetic resonance imaging (MRI) assesses short T2 components. On observation, we have identified a new imaging phenotype of the intervertebral discs — the 'UTE disc sign (UDS)'. This study assessed UDS prevalence and its association with disc degeneration and pain / disability profiles.

Methods: A total of 76 southern Chinese subjects were recruited (mean age, 50.6 years) for T2-weighted (T2W), T1rho, and UTE MRIs of the lumbar spine (380 discs). The T2W MRI was used to assess disc degeneration and other phenotypes, and T1rho MRI was implemented to obtain quantitative proteoglycan disc profiles. The UDS was detected on UTE as a hyper- or hypo-intense band across a disc. Subject demographics, as well as pain and disability profiles were obtained.

Results: The UDS was noted in 25% of the subjects. In all, 80% UDS occurred at the lower lumbar levels. Subjects with UDS had significantly more disc degeneration as well as the occurrence of disc displacement, spondylolisthesis, and Modic changes. The T1rho values were lower in UDS discs than non-UDS discs. The majority of UDS could not be detected on T2W MRI. The number of UDS disc levels significantly correlated with worse disability scores compared with T2W MRI. Chronic low back gain was noted in individuals with multi-level UDS.

Conclusion: This is the first study to report UDS in humans. The UDS is a novel and easily identifiable imaging biomarker highly associated with spine degeneration and a worse clinical profile. The UDS serves as a new phenotype that broadens our understanding of degenerative disc changes and may have potential clinical utility.

9.3

Minimally Invasive Coronal Plane Deformity (Scoliosis) Correction

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Introduction: Coronal plane deformities are problems that have traditionally been treated by open surgical approaches. Examples of minimally invasive correction via large anterior interbody cages and percutaneous pedicle screws were discussed.

Materials and Methods: A total of 6 patients with degenerative lumbar and thoracolumbar scoliosis with Cobb's angle of ≥40 degrees were treated with minimally invasive anterior interbody fusion followed by percutaneous pedicle screw fixation.

Results: For the scoliosis patients the mean correction of Cobb's angle ranged from 55 degrees to 10 degrees.

Discussion and Conclusion: The effectiveness of minimally invasive deformity correction has been demonstrated for coronal place deformities. This has resulted in improvements in reducing blood loss, infection rates, and morbidity with reduced length of stay and earlier mobilisation.

9.4

Extreme Lateral Interbody Fusion and Selection Criteria for Indirect Decompression

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Private Practice

Introduction: Spinal decompression can be classified as direct and indirect. When dealing with spinal stenosis traditionally there has been a need to directly decompress the spinal canal lateral recess and / or neural foramen. Large lateral interbody devices are able to fully restore disc height and realign the spinal column; they are also able to indirectly decompress the spine. Indirect decompression via ligamentotaxis for spinal canal and / or foraminal stenosis often requires an initial leap of faith. Selection methods used to decide which patients do not require formal neural decompression were discussed.

Materials and Methods: Between September 2012 and July 2015, a total of 65 patients underwent surgery for extreme lateral interbody fusion (XLIF).

Results: Of these 65 XLIF cases, 37 did not have a formal decompression and had indirect decompression via ligamentotaxis. To date there has been no need to go back and decompress the spine. Selection criteria for patients suitable for indirect decompression were discussed.

Discussion and Conclusion: Indirect decompression is achieved through ligamentotaxis via insertion of a large lateral interbody implant. There are advantages in terms of reduced operating time, reduced blood loss, and morbidity with reduced length of stay. Elimination of the need for a formal direct decompression of the spine minimises the traditional risks of spinal decompression surgery.

9.5

A Novel Approach in the Management of Thoracic Insufficiency Syndrome in Jarcho-Levin Syndrome Using a Magnetic Controlled Growing Rod — Vertical Expandable Prosthetic Titanium Rib Hybrid Construct

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Introduction: Jarcho-Levin syndrome (JLS) is a rare condition leading to deformity of the spine with a characteristic markedly shortened thorax potentially leading to thoracic insufficiency syndrome (TIS). Use of vertical expandable prosthetic titanium rib (VEPTR) has been reported in cases of JLS. Magnetically controlled growing rods (MCGR) allow gradual distractions at small intervals to increase spinal height. To our knowledge, we are the first to report its use in patients with JLS.

Materials and Methods: We present our 8-year experience, utilising a MCGR-VEPTR hybrid construct in an 11-year-old patient with JLS, with VEPTR inserted at age of 3 years and MCGR inserted at age of 8 years. Serial radiographs were reviewed for changes in spinal length, thoracic height, abdominal height, chest width, pelvis height, and sagittal balance. Anthropomorphic body measurements were also documented. Computed tomographic scan of lung volumetry was used to assess lung function.

Results and Discussion: Over 3 years, serial VEPTR distraction resulted in a 95.5% increase in the total lung volume, reflecting clinically in a transition from preoperative ventilator dependence to complete respiratory independence. A 48.3% increase in body height measurement with combined VEPTR and serial MCGR distraction were observed over the 8-year period. An increase in spinal height on lateral radiographs since commencement of MCGR distraction was noted. Progressive kyphosis was seen with distraction, highlighting a potential shortcoming of distracting with the posteriorly positioned MCGR in a spine with a rigid anterior column.

9.6

Short- and Mid-term Clinical Results of Unilateral Laminotomy Bilateral Decompression for Degenerative Lumbar Spinal Stenosis of 122 Patients

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From 2008 to 2013, 122 patients underwent unilateral laminotomy bilateral decompression for degenerative lumbar spinal stenosis. In all, 95 (78%) patients had follow-up for >1 year, with mean follow-up period of 42 months (range, 14-80 months). Also, 15 patients defaulted follow-up within 1 year after operation, and 12 patients were excluded due to multiple co-morbidities. Their mean age was 63.2 (range, 34-80) years and a mean of 1.6 levels of decompression was done. The mean operating time was 162 minutes and blood loss was 100 mL. Mean length of stay was 4.6 days. Eleven (9%) patients required revision surgery. Dural tear was encountered in 13 (10.7%) patients. The mean preoperative visual analogue scale (VAS) back score was 5.0, VAS leg score 7.1, Japanese Orthopaedic Association (JOA) score 15.6, and Oswestry Disability Index (ODI) 50.0%. Sustainable significant improvement was achieved from 6 months to >1 year after operation. There was significant improvement ($p<0.05$) noted on latest follow-up: VAS back score 3, VAS leg score 3, JOA score 23, and ODI 33%. Patients' subjective improvement was 66%. Also, 88 (93%) patients had no regret on receiving surgery.

9.7

The Use of Recombinant Human Bone Morphogenetic Protein 2 in Lumbar Spinal Fusion Procedure

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Introduction: Recombinant human bone morphogenetic protein 2 (rhBMP-2) belongs to a superfamily of transforming growth factor–ß. It binds to cell surface receptors and control cell growth, differentiation, and migration. It is considered an adjunct to spinal fusion procedure.

Materials and Methods: It is a retrospective review of prospectively collected data to evaluate clinical outcomes and complications of spinal fusion procedure from a consecutive series. Functional outcomes were assessed using Oswestry Disability Index (ODI). Fusion rate was assessed using X-ray and computed tomography. Clinical outcomes and complications were analysed by diagnosis and primary versus revision surgery to assess whether spinal fusion procedure with rhBMP-2 was appropriate.

Results: A total of 17 consecutive adults underwent posterior spinal fusion surgery using rhBMP-2 with a mean follow-up period of 1.76 years. Two patients had defaulted follow-up. The mean patient age was 66 years. Also, 9 (60%) were in primary group while 6 (40%) were in revision group. The rhBMP-2 was used with local bone graft alone (40%), together with iliac bone graft (20%) and / or bone substitute (40%). At follow-up, radiological union was detected in 13 patients. Fusion rate was 100% in revision group and 77.8% in primary group. One patient developed osteolysis. The mean postoperative ODI was 20.4% (range, 0-55%).

Discussion and Conclusion: The efficacy of spinal fusion with rhBMP-2 is supported in this review. Reliable fusion and improved outcomes can be expected in adults undergoing spinal fusion for a wide variety of condition.

9.8

Stand-alone Cervical Cages in 2-Level Cervical Anterior Interbody Fusion in Degenerative Cervical Disease

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Introduction: Anterior cervical discectomy and fusion (ACDF) is a standard surgical procedure for treating degenerative disc disease. However, controversy remains whether to use additional anterior plating for 2-level ACDF. This study aimed to evaluate the efficacy of stand-alone polyetheretherketone (PEEK) cage in 2-level ACDF in cervical spondylotic myelopathy.

Methods: Retrospective review of 2-level ACDF with stand-alone PEEK cages for cervical spondylotic myelopathy over a 7-year period (2007-2014) in a regional hospital was performed. Fusion rate, global and segmental alignment of cervical spine, as well as subsidence rate were assessed.

Results: A total of 31 patients (80% were male) with a mean age of 59 (range, 36-87) years were recruited. Japanese Orthopaedic Association score improved from 9 to 13. C3-5 fusion involved in 45% (14/31), C4-6 in 32% (10/31), and C5-7 in 23% (7/31) of patients. Fusion was achieved in all patients with 87% (27/31) having bridging bone anterior and through disc space (type 1A) and 13% (4/31) having bridging bone through disc space but not anterior to cage (type 2A). Subsidence occurred in 22% (14/62) of cages. Mean final cervical lordosis was -11.6 degrees, which highly correlated with preoperative cervical alignment. Mean local segmental angle of the fused segment was -5.4 degrees. There was no cage migration, neither anteriorly nor posteriorly. Two patients developed adjacent segment disease requiring posterior laminoplasty after 5 years.

Conclusion: Stand-alone PEEK cage in 2-level ACDF achieves satisfactory fusion and postoperative global and segmental alignment.

9.9

Re-operation after Magnetically Controlled Growing Rod Implantation: A Review of 30 Patients with Minimum 2-Year Follow-up

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9.10

Curve Progression in Adolescent Idiopathic Scoliosis after Brace Weaning with a Minimum of 2 Years' Follow-up with Reference to the Scoliosis Research Society Standardised Criteria

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Introduction: Curve progression after brace weaning in adolescent idiopathic scoliosis (AIS) has not been well addressed. This study aimed to investigate curve evolution after brace weaning with reference to the Scoliosis Research Society criteria.

Materials and Methods: Braced AIS girls followed up for >2 years after brace weaning were reviewed. All patients had scoliosis radiographs at initial visit, at brace weaning, at 6 months, 1 year, and 2 years after brace weaning, and the last follow-up.

Results: A total of 200 AIS girls were reviewed. The Cobb's angle at brace weaning was 30.1 degrees and the duration of follow-up after brace weaning was 51.4 months. Compared with brace weaning, at 6 months, 1 year, 2 years and last follow-up after brace weaning respectively, 50 (25%), 60 (30%), 93 (46.5%) and 87 (43.5%) patients had curve progression of >5 degrees; 0 (0%), 0 (0%), 2 (1%) and 2 (1%) patients had surgery recommended; among those with Cobb's angle of ≤40 degrees at brace weaning, 7 (4.0%), 11 (6.3%), 16 (9.2%) and 18 (10.3%) patients had Cobb's angle of >45 degrees; the mean progression magnitudes were 2.6 degrees, 3.5 degrees, 5.1 degrees, and 5.4 degrees; the mean progression rates were 0.34 degrees/m, 0.16 degrees/m, 0.13 degrees/m and 0.006 degrees/m. Cobb's angle at brace weaning was significantly associated with an increase in Cobb's angle of >5 degrees and curve magnitude >45 degrees after brace weaning ($p<0.05$).

Discussion and Conclusion: Curve progression after brace weaning was observed in 43.5% AIS patients, mostly occurred within 6 months. High Cobb's angle at brace weaning indicates high risk of curve progression after brace weaning.