

the functional and automatic diagnostic method. Gender-related differences can be explained by the power-load-ratio. The higher incidence of lower back pain of women could be caused by less relative extensional power. Further studies are necessary for further investigating those aspects. The functional method offers a highly reproducible testing method, independently adjustable of a dynamometer, already with reference values for healthy people in literature.

Disc Degeneration

P304: Assessment of Lactate Production and Proteoglycans Synthesis by The Intact and Degenerated Intervertebral Disc Cells Under the Influence of Activated Macrophages: In Vitro Study

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Introduction: Inflammation is one of the main factors in the development of intervertebral disc (IVD) degeneration. Nevertheless, the cellular mechanisms of the proinflammatory cytokines' influence on IVD cells remain not fully elucidated. Synthesis of extracellular matrix is an energy-dependent process, which may be affected by the shortage of nutrient supply observed in degenerated IVD. However, the effect of inflammatory mediators on nutrient consumption and metabolic activity of IVD cells is unknown. Using the model of cocultivation with activated macrophage-like cells, we studied the effects of the inflammatory cytokines on the secretion of glycosaminoglycans (GAG) and production of lactate by the intact and degenerated IVD cells. **Material and Methods:** Cells obtained from the human annulus fibrosus fibrous ring and the nucleus pulposus (inner core) of intact (ScienCell) and degenerated (Barrow Neurological Institute BioBank) intervertebral discs were used for the experiment. Cells were expanded in monolayer, then trypsinize and resuspend in 1.2% sodium with formation of alginate beads using 102 mM CaCl₂. The IVD cells encapsulated in alginate beads (2 × 10⁵ cells/well) were cocultured with or without 60 ng/mL phorbolmyristate acetate-activated macrophage-like THP-1 cells (aTHP-1). Viability, lactate production, glucose consumption and sulfated GAGs (1,9-dimethyl-methylene blue assay) were assessed. The levels of TNF- α , IL-1 β , IL-6, IL-8, IL-10, and IL-12p70 were assessed by flow cytometry using microspheres (BD Biosciences, San Jose, CA). Cell morphology in 3D culture was studied using immunocytochemistry: whole beads were fixed and stained with phalloidin for F-actin and DAPI for DNA, and imaged on a laser confocal microscope. All experiments were repeated in triplicate. A main effects ANOVA (analysis of variance) and post hoc Mann-Whitney *U* tests were performed to compare control and aTHP-1 groups. **Results:** aTHP cells

produced significantly more IL-10, IL-6, IL-1 β , and IL-8 ($P < .05$) compared with control media and nonactivated THP-1 cells. Significant increase of IL-1 β , IL-8 levels was observed in all coculture groups compared with controls ($P < .05$). Proliferative activity ($P = .12$) and viability ($P = .01$) of both intact and degenerated annulus fibrosus (AF) and nucleus pulposus (NP) cells significantly decreased in aTHP-1 coculture groups. GAG production was significantly lower in degenerated NP and AF cells when compared with the intact groups, $P < .05$ for both cell types. Pro-inflammatory cytokines significantly decreased GAG mass/cell in all aTHP-1 coculture groups (pANOVA = 0.003). Significant decrease ($P < .05$) of lactate production was observed in all aTHP-1 coculture groups of intact and degenerated NP and AF cells compared with control. The imaging study showed smaller cell size and grouping in clusters in the degenerated IVD cells compared with intact. **Conclusion:** We revealed that pro-inflammatory cytokines have a direct effect on IVD cells in a 3-dimensional culture, reducing the rate of glycolysis, and level of synthetic activity of both intact and degenerated cells of annulus fibrosus and nucleus pulposus, which is an important factor in the progression of IVD degeneration.

P305: Enhanced Recovery Following Interbody Fusion by Transforaminal Endoscopic Techniques

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Introduction: In the past decade, transforaminal endoscopic spine surgery (TESS) has become increasingly commonly used for disc resection and foraminotomy. The transforaminal approach minimizes damage to the paraspinal muscles and should enhance patient recovery postsurgery. We aimed to evaluate the technical and clinical success of endoscopic disc resection and interbody cage fusion via a transforaminal approach. **Materials and Methods:** Forty patients (mean age 60 ± 10 years, 75 ± 14 kg, 10 males, 30 females) presenting with stenotic symptoms secondary to single-level disc protrusion and degenerative instability (Grade 1 spondylolisthesis) were admitted for surgery. Patients with significant lateral recess in-growth producing a "trefoil" canal were excluded. Median duration of symptoms was 48 months. Surgery was performed in all patients under general anesthesia in the prone position. Transforaminal discectomy removed prolapsed and central disc back to the end-plates. Titanium (Ti6Al4 V) trabecular cages (EndoLIF Oblique cage, joimax GmbH) were then inserted obliquely without graft. The operated level was stabilized further by a percutaneous pedicle screw/rod construct (Percusys joimax, GmbH or similar). Outcomes were collated with hospital stay and re-admission rates compared to those

reported on the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database for patients after posterior lumbar fusion (2005-2010: 1861 and 2011-15: 36,610 patients respectively). **Results:** Mean surgical time was 128 ± 57 minutes and radiation dose area product 1166 ± 552 cGy-cm². There were no intraoperative complications and median hospital stay was 12 hours (range 4-120) compared with ACS-NSQIP of 2.9 ± 1 days. Two cages were inserted at L2/3, 5 at L3/4, 26 at L4/5 and 7 at L5/S1. Most cages were 30 mm × 11 mm × 12 mm size and mean blood loss was 150 mL. Disc height increased with instrumentation from 7.6 ± 1.9 mm to 10.5 ± 1.6 mm anterior, and from 4.9 ± 1.0 to 9.8 ± 1.7 mm posterior ($P < .001$). Preoperative ODI decreased from 50 ± 17 to 27 ± 20 at 6 months, back pain VAS (0-10) from 7.3 ± 2.2 to 3.3 ± 2.5 (both $P < .001$) and pain in the most affected leg from 5.9 ± 3.5 to 3.7 ± 3.0 ($P < .01$). One readmission for cage displacement at 4 months (2.5%) compared with a rate of 5.4% within 30 days on the ACS-NSQIP. **Conclusion:** Our results indicate that endoscopic interbody fusion via a transforaminal approach is safe and effective. Mean hospital stay was significantly less than that reported for other fusion methods. Randomized studies are still required to determine whether instrumentation and fusion are required over and above transforaminal endoscopic decompression alone.

P306: Size Does Not Matter: Correlating Disc Size With Disability and Leg Pain

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Introduction: The size of the herniated disc is commonly mentioned as a factor when deciding if a patient requires surgical intervention. Various studies have suggested the size of the herniated disc should be considered when deciding between operative or conservative management. However, to our knowledge, there are no published studies correlating the size of the herniated disc with severity of symptoms using visual analogue scale (VAS) or Oswestry Disability Index (ODI) scores. **Material and Methods:** Data was collected prospectively. Patients were asked to complete VAS and ODI scores on the day of surgery. All patient with primary disc herniation were included. Exclusion criteria included recurrent disc herniation or any other associated spinal pathology, for example, fracture, scoliosis, and infection. T2-weighted MRI (magnetic resonance imaging) scans were reviewed on PACS software by the authors. The axial image showing the largest disc protrusion was used for measurements. The size of the disc and canal were measured. The VAS Leg score and ODI score were correlated with the size of the disc using the Pearson correlation coefficient. Interobserver and Intraobserver reliability was assessed using the interclass correlation coefficient (ICC). **Results:** Forty patients were included in the study. Ages ranged

from 20 to 72 years, with an average age of 42 years. A high degree of interobserver reliability was found. The single measure ICC was 0.85 (95% confidence interval [CI] 0.51-0.96 [$F = [9.9] = 12.4, P < .001$]). A high degree of intraobserver reliability was observed. The single measure ICC was 0.81 (95% CI 0.42-0.95. [$F = [9.9] = 9.8, P = .001$]). The Pearson correlation coefficient comparing VAS leg scores with percentage canal occupied by the herniated disc was 0.0004. When comparing ODI scores with percentage of the canal occupied by the herniated disc the Pearson correlation coefficient was -0.02 . **Conclusion:** The results of the statistical analysis show that there is a very low strength of association between the size of the disc and a patient's symptoms. This study highlights the importance of clinical assessment. Management decisions should not be made on the basis of radiological imaging but rather a clinician must consider a patient's symptoms and the impact on their life.

P307: Adjacent Level Degeneration and Post-Traumatic Deformity After Thoracolumbar Fractures

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Introduction: To evaluate thoracolumbar fractures and the complications such as adjacent disc degeneration (ADD) and posttraumatic deformity. **Methods:** We evaluated 32 patients divided into 2 equal groups, 16 in the case group (removal of the synthesis material), and 16 in the control group (not submitted to removal of the synthesis material), in order to verify if there was difference between the incidence of these complications. **Results:** There were no statistically significant differences between the groups regarding the progression of the ADD and the post-traumatic deformity, but both progressed during the 2-year follow-up. **Conclusion:** It was concluded that the removal of the synthesis material was not effective in preventing these complications after surgical fractures of the thoracolumbar spine.

P308: Basal and Cytokine-Stimulated Biomarker Production by Degenerative Lumbar Discs From Microdiscectomy Versus Interbody Fusion Patients

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Introduction: Intervertebral disc (IVD) degeneration is implicated in back pain, a leading cause of a spine-related disability.