## Michigan State University Classification for Lumbar Disc Herniation

- Early effectiveness of posterior 180-degree decompression via unilateral biportal endoscopy in treatment of lumbar spinal stenosis combined with MSU-1 lumbar disc herniation
- Impact of Transforaminal Epidural Steroid Injection on Pain and Disability Outcomes by Lumbar Intervertebral Disc Herniation Class: A Prospective Study
- Effect of type 2 diabetes mellitus on patients undergoing percutaneous endoscopic lumbar discectomy: a retrospective propensity score-matched cohort study
- Efficacy of Selective Nerve Root Block for Different Types of Lumbar Disc Herniation: Study Protocol for a Single-Blind, Prospective Cohort Study
- Medium- to long-term functional outcomes of artcure diffusional patch therapy for lumbar disc herniation: which herniation is more likely to require surgery?
- Surgical Strategy for Lumbar Disc Herniation based on the MSU Classification: Percutaneous Endoscopic Lumbar Discectomy versus Transforaminal Lumbar Interbody Fusion: A 5-year Retrospective Study
- Deep Learning Model for Grading and Localization of Lumbar Disc Herniation on Magnetic Resonance Imaging
- The Relationship Between Disc Herniation Morphology and Patient-Reported Outcomes after Microdiscectomy

Research shows good reliability in the Michigan State University Classification for Lumbar Disc Herniation among spine surgeons, as well as very good when reclassifying the intraobserver; having a sagittal MRI slice to classify them would be very useful, but more research is needed to give a prognostic value to the location and size of the hernia and its relation with the surgical indication <sup>1)</sup>.

Beyond standardization of radiologic description, MSU classification proved to be useful in the definition of prognosis and possibly in the selection of surgical candidates. However, these data should be confirmed by prospective studies on a larger sample of patients, also including those underway for conservative treatment<sup>2</sup>.



It simply classifies herniation size as 1-2-3 and location as A-B-C, with inter-examiner reliability of 98%. A second prospective series of 100 discectomies was performed between 2000 and 2002, based on the new criteria, to validate this classification scheme. All patients with size-1 lesions were electively excluded from surgical consideration in our study. The Oswestry Disability Index from both

series was better than most published outcome norms for lumbar microdiscectomy. The two series reported 96 and 90% good to excellent outcomes, respectively, at 1 year, and 84 and 80% at 5 years. The most frequent types of herniation selected for surgery in each series were types 2-B and 2-AB, suggesting the combined importance of both size and location. The MSU Classification is a simple and reliable method to objectively measure herniated lumbar disc. When used in correlation with appropriate clinical findings, the MSU Classification can provide objective criteria for surgery that may lead to a higher percentage of good to excellent outcomes <sup>3)</sup>.

Findings demonstrate moderate homogeneity of ratings given by residents; however, test-retest results proved the ratings to be consistent  $^{4)}$ 

Based on findings it seems that MSU classification can be used in patients' selection to achieve the best treatment outcome after intradiscal ozone injection among patients with lumbar disc herniation <sup>5)</sup>.

Beyond standardization of radiologic description, MSU classification proved to be useful in definition of prognosis and possibly in selection of surgical candidates. However, these data should be confirmed by prospective studies on a larger sample of patients, also including those under way for conservative treatment <sup>6)</sup>

Between March 2012 and September 2018, a total of 441 segments from 394 patients with LDH were included in the study. LDH was classified according to the Michigan State University (MSU) classification, in which the degree of LDH is divided into 3 levels (expressed as 1, 2, and 3) and the location of LDH is divided into 4 zones (described as A, AB, B, and C). Bilateral FJOA was graded from 0 to 3 using the criteria introduced by Weishaupt et al., and bilateral facet orientations were measured on axial MRI slices. A mixed-effects ordinal logistic regression model was utilized to determine the potential factors that may be associated with FJOA, including sex, age, body mass index (BMI), segment, facet orientation and tropism, and the degree and location of LDH.

Results: In general, the prevalence of FJOA (grade  $\geq$  2) was 66.2% in LDH segments. For both the left and right sides, the degree of LDH was associated with the severity of FJOA (p < 0.01). Age and BMI were also associated with the severity of left and right FJOA (p = 0.002 and p < 0.001 for age, p < 0.001 and p = 0.003 for BMI, respectively), while segment, facet orientation, and facet tropism were not (p > 0.05 for all). Notably, MSU-B LDH was associated with greater odds of having more severe FJOA on the herniation side (left: p < 0.001, odds ratio (OR) = 2.714, 95% confidence interval (CI) = 1.583~4.650; right: p = 0.003, OR = 2.615, 95% CI = 1.405~4.870). However, other locations of LDH were not associated with the severity of FJOA (p > 0.05 for all).

Conclusions: Both the degree of LDH and MSU-B LDH are associated with the severity of FJOA. The association between LDH and FJOA highlights the complexity of the etiology of FJOA <sup>7)</sup>

the new combined technique of ELND and PLDD using a Ho:YAG laser is a reliable method in patients with MSU classification 3AB herniated discs, with an acceptable success rate and a low complication rate within 12 months after treatment. We think that randomized controlled studies are required for this method to be included in treatment algorithms<sup>8)</sup>.

OCN is an effective treatment for radicular pain due to disk herniation. Pain duration (< 1 year), MSU disk herniation type (1A, 1B, 1C, 2A, and 2B), disk degeneration grade 2, and absence of foraminal stenosis are all associated with the successful outcome and should be carefully evaluated before OCN <sup>9</sup>.

## 1)

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