

REVIEW

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**SYDNEY SPINE
SYMPOSIUM 2019**

Recurrent lumbar disc herniation

Lumbar discectomy:

- ▶ Most common operations of spine
- ▶ Most significant long term risk :
 - ▶ Recurrent disc herniation
 - ▶ Reported between 5-15%
- ▶ **Maine Lumbar spine Study:**
 - ▶ Long-term outcomes of surgical and nonsurgical management of lumbar spinal stenosis: 8 to 10 year results from the maine lumbar spine study.
- ▶ Atlas SJ¹, Keller RB, Wu YA, Deyo RA, Singer DE. **Spine (Phila Pa 1976)**. 2005 Apr 15;30(8):936-43.
 - ▶ 10 year follow up
 - ▶ 25% had reoperation, mostly by 2 years and mostly due to recurrence
 - ▶ Surgically treated patient had significantly better outcome at 1 year in terms of symptoms management

What is the natural history of lumbar disc herniation without surgery:

Strong literature that “symptoms” improve after 6-8 weeks in majority of patients.

What happens to the herniated disc:

- ?resorbed
- ?chance of further protrusion

Natural history of disc herniation:

- ▶ Danish study (2016)
 - ▶ Population of Danes
 - ▶ “Backs on Funen” original study for predictive factors for development of back pain
 - ▶ 70% reported back pain

Kjaer et al. *BMC Musculoskeletal Disorders* (2016) 17:26
DOI 10.1186/s12891-016-0865-6

BMC Musculoskeletal
Disorders

RESEARCH ARTICLE

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Progression of lumbar disc herniations over an eight-year period in a group of adult Danes from the general population – a longitudinal MRI study using quantitative measures

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To understand the natural history and consequences of lumbar disc herniation



Method:

MRI of lumbar spine from a cohort of patients at 41, 45 and then 49 years of age.

Measured the cross sectional area, dural sac compression, and disc height were calculated, in 140 disc levels.



Results over 8 years:

65% remained unchanged

17.5% decreased

12.5% increased

5% showed fluctuation

Factors influencing recurrent disc herniation after surgery:

- ▶ Literature review based on:
 - ▶ Patients related factors
 - ▶ Epidemiological factors
 - ▶ Pathology
 - ▶ Surgical factors
 - ▶ Technical factors



Epidemiological factors:

Keskimäki I, Seitsalo S, Osterman H, et al.

Reoperations after lumbar disc surgery: a population-based study of regional and interspecialty variations. *Spine (Phila Pa 1976)* 2000;25(12):1500-.

Huang W, Han Z, Liu J, et al. Risk Factors for Recurrent Lumbar Disc Herniation: A Systematic Review and Meta-Analysis. *Medicine (Baltimore)* 2016;95(2):e2378.

Kim JM, Lee SH, Ahn Y, et al. Recurrence after successful percutaneous endoscopic lumbar discectomy. *Minim Invasive Neurosurg* 2007;50(2):82-5. doi: 10.1055/s-2007-982504

Age and gender are not statistically significant factors in recurrent disc herniation after surgery.

Obesity: Huang et al did not show any significant association while Kim et al (case-controlled study) found BMI >25 was a significant factor in rLDH

Smoking:

Carragee EJ, Han MY, Suen PW, et al. Clinical outcomes after lumbar discectomy for sciatica: the effects of fragment type and anular competence. *J Bone Joint Surg Am* 2003;85-A(1):102-8.

Huang W, Han Z, Liu J, et al. Risk Factors for Recurrent Lumbar Disc Herniation: A Systematic Review and Meta-Analysis. *Medicine (Baltimore)* 2016;95(2):e2378.

- ▶ Increased risk of recurrent herniation
 - ▶ Poor healing of annulus and ligament
 - ▶ Animal models shown to have lower Type I collagen (extracellular matrix component)
 - ▶ Via vasoconstriction and reduced oxygenation and nutrients

Pathological and radiological parameters:

- ▶ Understanding the various stages of disc degeneration is important
 - ▶ Early stage:
 - ▶ Annular weakness
 - ▶ Segmental instability
 - ▶ Increased risk of recurrence
 - ▶ Late stage
 - ▶ Decreased disc height
 - ▶ Decreased segmental motion
 - ▶ Decreased risk of recurrence

Radiological parameters:

Belykh E, Krutko AV, Baykov ES, et al. **Preoperative estimation of disc herniation recurrence after microdiscectomy:** predictive value of a multivariate model based on radiographic parameters. *Spine J* 2017;17(3):390-400.

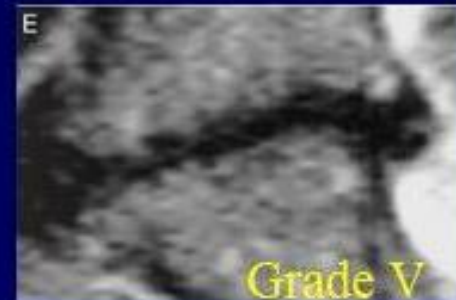
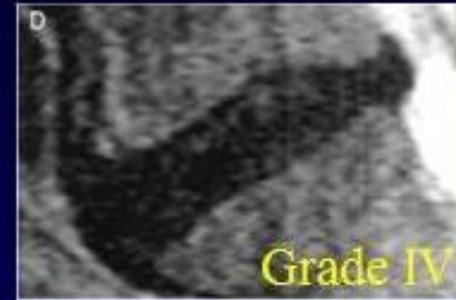
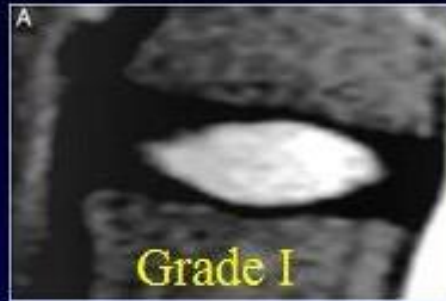
Kim KT, Park SW, Kim YB. **Disc height and segmental motion as risk factors for recurrent lumbar disc herniation.** *Spine (Phila Pa 1976)* 2009;34(24):2674-8.

Wilke HJ, Ressel L, Heuer F, et al. **Can prevention of a reherniation be investigated? Establishment of a herniation model and experiments with an anular closure device.** *Spine (Phila Pa 1976)* 2013;38(10):E587-93.

- ▶ Use of disc height index (height of the disc relative to vertebral body height)
 - ▶ Higher disc height index is associated with increased risk
- ▶ Four grades of degeneration of intervertebral disc:
 - ▶ Grade IV degenerated disc (*Pfirrmann's grade IV*, significant loss of disc height and loss of delineation between annulus and nucleus) seen much less in recurrence group, 24% vs 84%, in Grade I
- ▶ Animal model with cyclic loading:
 - ▶ Substantially higher recurrence in mildly degenerated disc vs more severely degenerated discs

Degenerative Disc Disease - Stages

- Pfirmann's grades of disc degeneration



Other radiological factors:

- ▶ ?Modic type I
- ▶ ?lumbarization or sacralization
- ▶ retrolisthesis
 - ▶ Present in 38% of rLDH vs 11.3% without rLDH (Belykh et al)
- ▶ Jalil and Ghahreman
 - ▶ 181 discectomy patients over 5 year period
 - ▶ Patients with retrolisthesis were 2.39 times more likely than those without listhesis to require revision surgery.

Type of disc herniation:

- ▶ Critically important factor in rLDH
- ▶ Disc herniation (localized displacement of disc material beyond the anatomical limits) is described as:
 - ▶ **Protrusion** : *wider neck than the posterior displacement*
 - ▶ **Extrusion**: *narrower neck*
 - ▶ Sequestration
 - ▶ migration

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Risk Factors for Recurrent Lumbar Disc Herniation: A Systematic Review and Meta-Analysis. *Medicine (Baltimore)*
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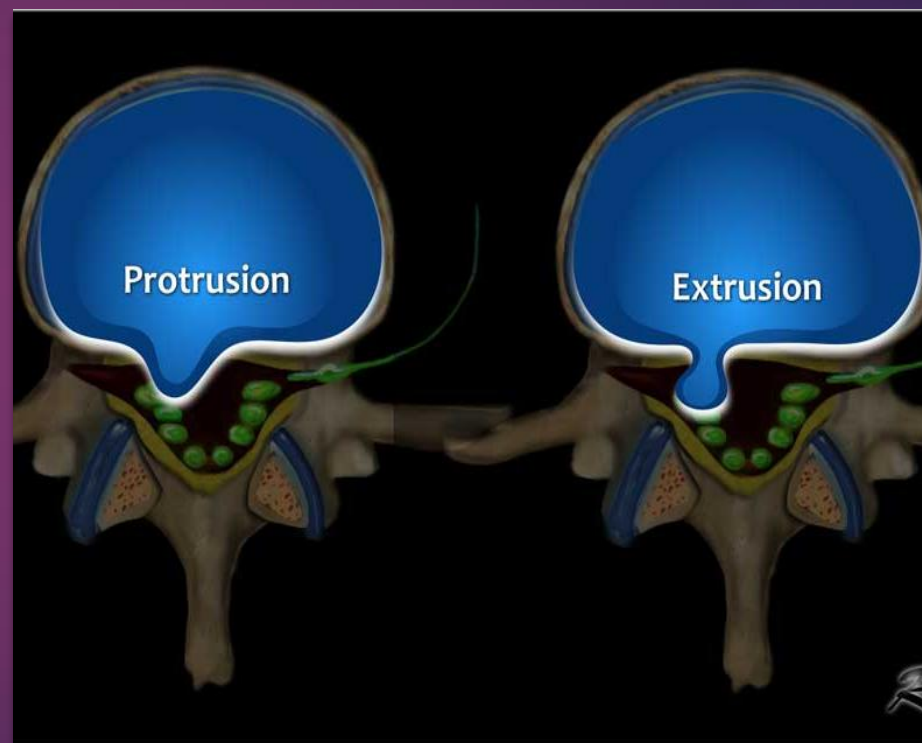
Morgan-Hough CV, Jones PW, Eisenstein SM.
Primary and revision lumbar discectomy. A 16-year review from one centre. *J Bone Joint Surg Br* 2003;85(6):871-4.

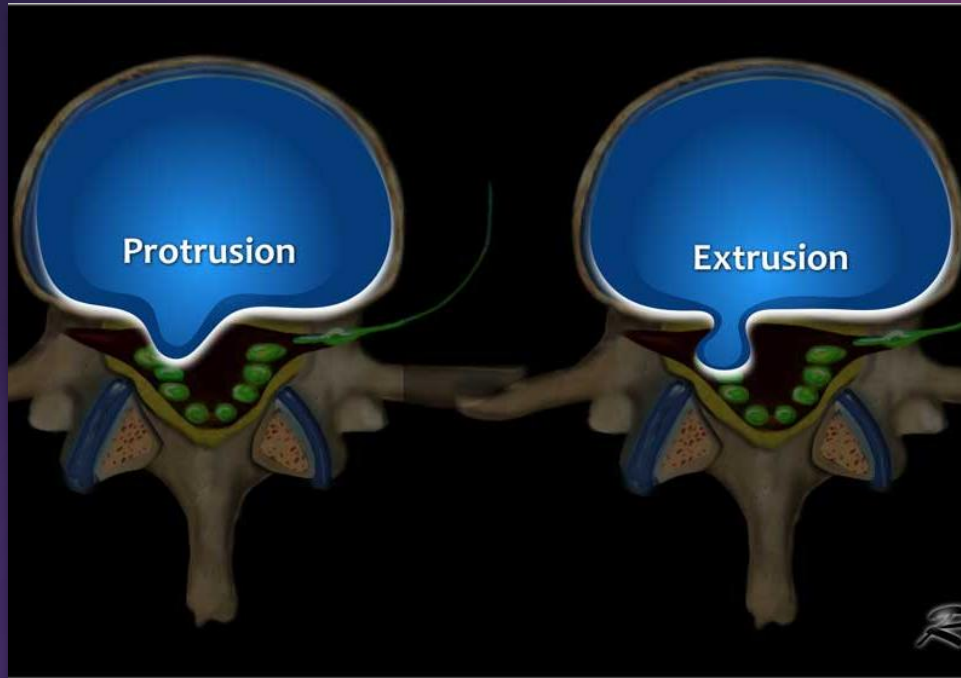
Carragee EJ, Han MY, Suen PW, et al.
Clinical outcomes after lumbar discectomy for sciatica: the effects of fragment type and annular competence. *J Bone Joint Surg Am*
2003;85-A(1):102-8.

- ▶ “protrusion” type was present in 70% of recurrent group
- ▶ 4 pooled studies, “protrusion” was statistically significantly associated with recurrence, with OR of 1.79 (95% CI, 1.15-2.79)
- ▶ Review of 553 patients, 7.9% had revision, disc “protrusion” led to 3x higher risk of recurrence than “extrusion”
- ▶ 187 patients
 - ▶ Focused on the type of disc herniation
 - ▶ based on intra-op description, disc herniation was categorized to 4 types annular defect

Carragee et al, 2003

- ▶ Type 4: Contained-fragment herniation
 - ▶ Annulus intact
 - ▶ Required surgeon to make annular defect to remove fragment
 - ▶ **38% recurrence rate**
- ▶ Type 1: fragment-fissure (extrusion):
 - ▶ Least recurrence rate of 1%
- ▶ Conclusion:
 - ▶ Degree of annular defect is most significant factor!





Surgeon's factor:

- ▶ Should we alter our surgery depending on the type of disc herniation:
 - ▶ ?Soft herniation
 - ▶ ?partial thickness disruption of annulus
- ▶ Does being aggressive increase the risk of reherniation?
- ▶ Bony decompression without annulotomy?
 - ▶ Which patient?

O'Connell J. Protrusions of the lumbar intervertebral disc, a clinical review based on five hundred cases treated by excision of the protrusion. *J Bone Joint Surg Br* 1951;33(8-30)

Williams RW. Microlumbar discectomy: a conservative surgical approach to the virgin herniated lumbar disc. *Spine (Phila Pa 1976)* 1978;3(2):175-82.

Spengler DM. Lumbar discectomy. Results with limited disc excision and selective foraminotomy. *Spine (Phila Pa 1976)* 1982;7(6):604-7.

McGirt MJ, Ambrossi GL, Datto G, et al. Recurrent disc herniation and long-term back pain after primary lumbar discectomy: review of outcomes reported for limited versus aggressive disc removal. *Neurosurgery* 2009;64(2):338-44; discussion 44-5.

- ▶ Aggressive discectomy: with curettage of disc material
- ▶ “Fragmentectomy”: only removing the fragment with little disruption of the disc space.
- ▶ 54 studies, 7224 patients:
 - ▶ Aggressive discectomy ,
 - ▶ Recurrence: 3.5%
 - ▶ Long-term back and leg pain: 27.8%
 - ▶ Fragmentectomy:
 - ▶ Recurrence: 7%
 - ▶ Long-term back pain/leg pain: 11.6%

Final words:



Studies show that type of disc herniation and degree of degeneration play a significant role in risk of recurrence.



Strong evidence that more conservative surgery while associated with slightly more risk of recurrence, has significantly less risk of long term back pain



Better imaging of the lumbar discs can be more predictive of prognosis



In high risk cases should we consider preventative surgical interventions:

AUDI (**AU**gmentation of **D**isc)
study with Kunovus Disc Device?
BARRICAD device?



Thank you.