Postsurgical outcomes with interspinous spacers in lumbar spinal stenosis: clinical outcomes and complications in a cohort of patients.

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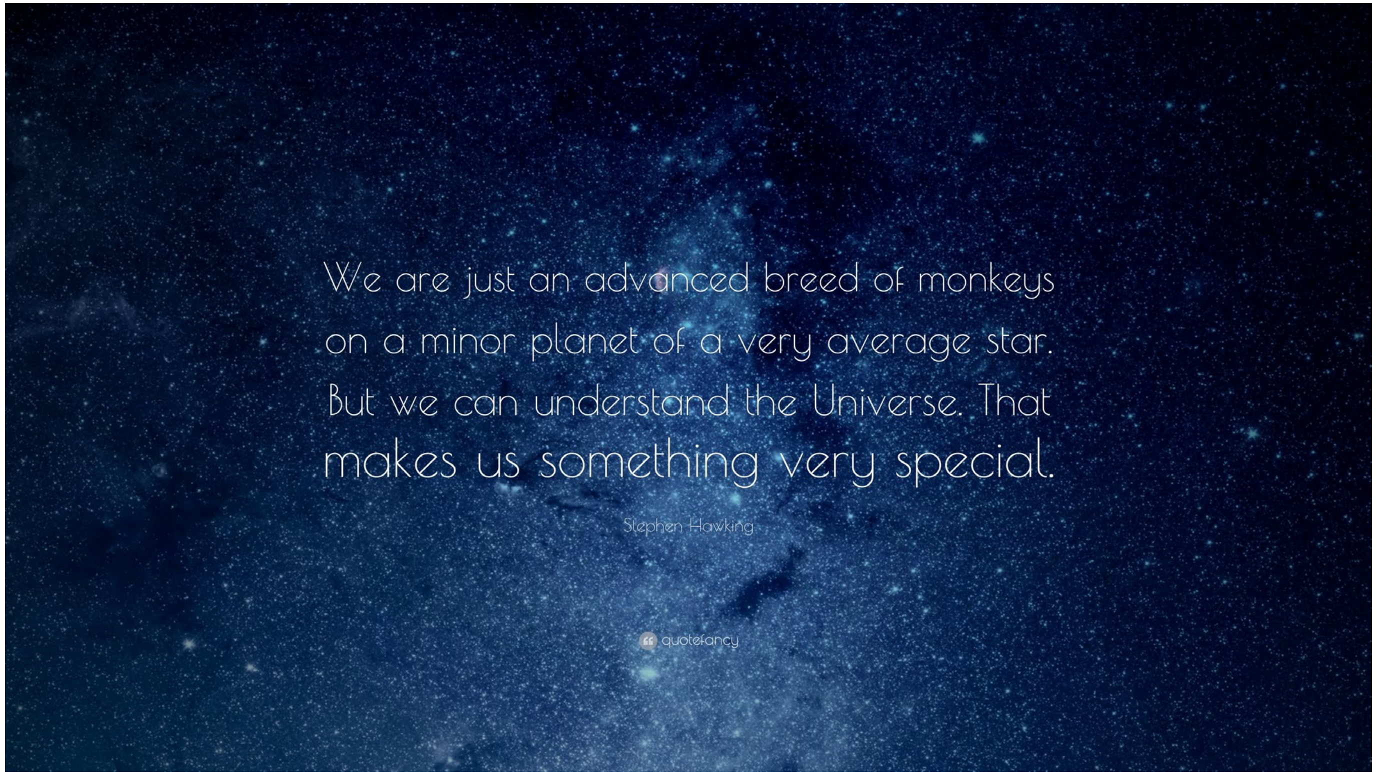
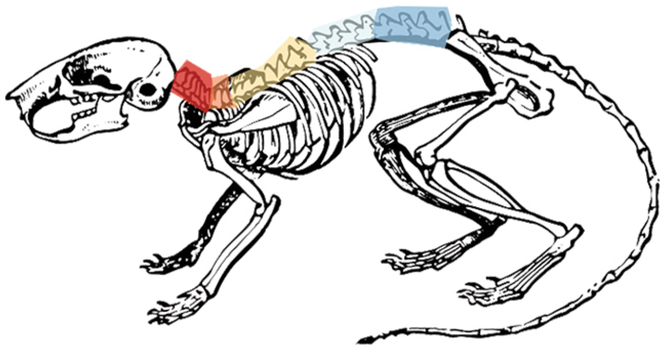
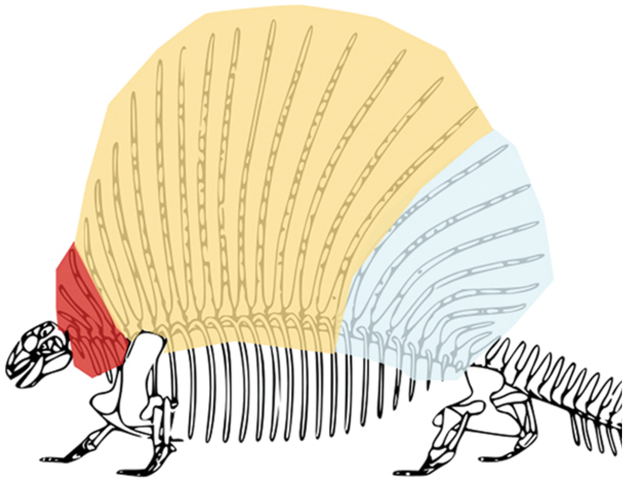

We are just an advanced breed of monkeys on a minor planet of a very average star. But we can understand the Universe. That makes us something very special.
Stephen Hawking
quotefancy

Disclosures:

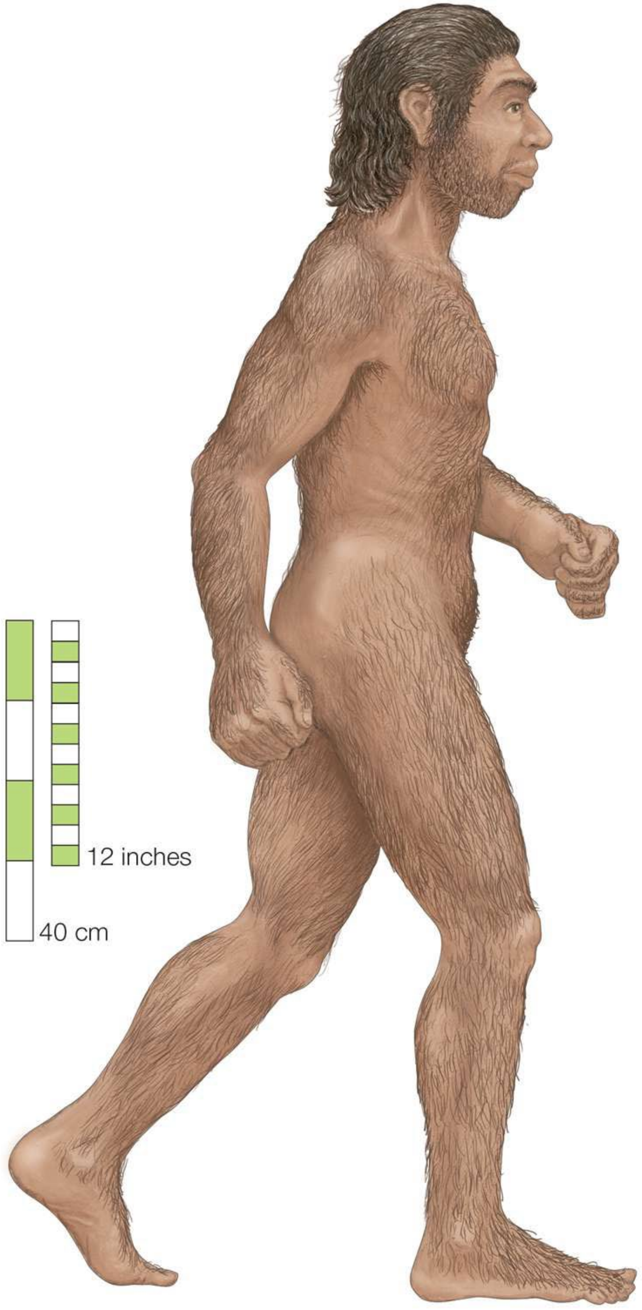
- None

The evolution of the spine fueled the rise of mammals—and human back problems Fossils show how lumbar vertebrae were freed up to adapt to myriad lifestyles



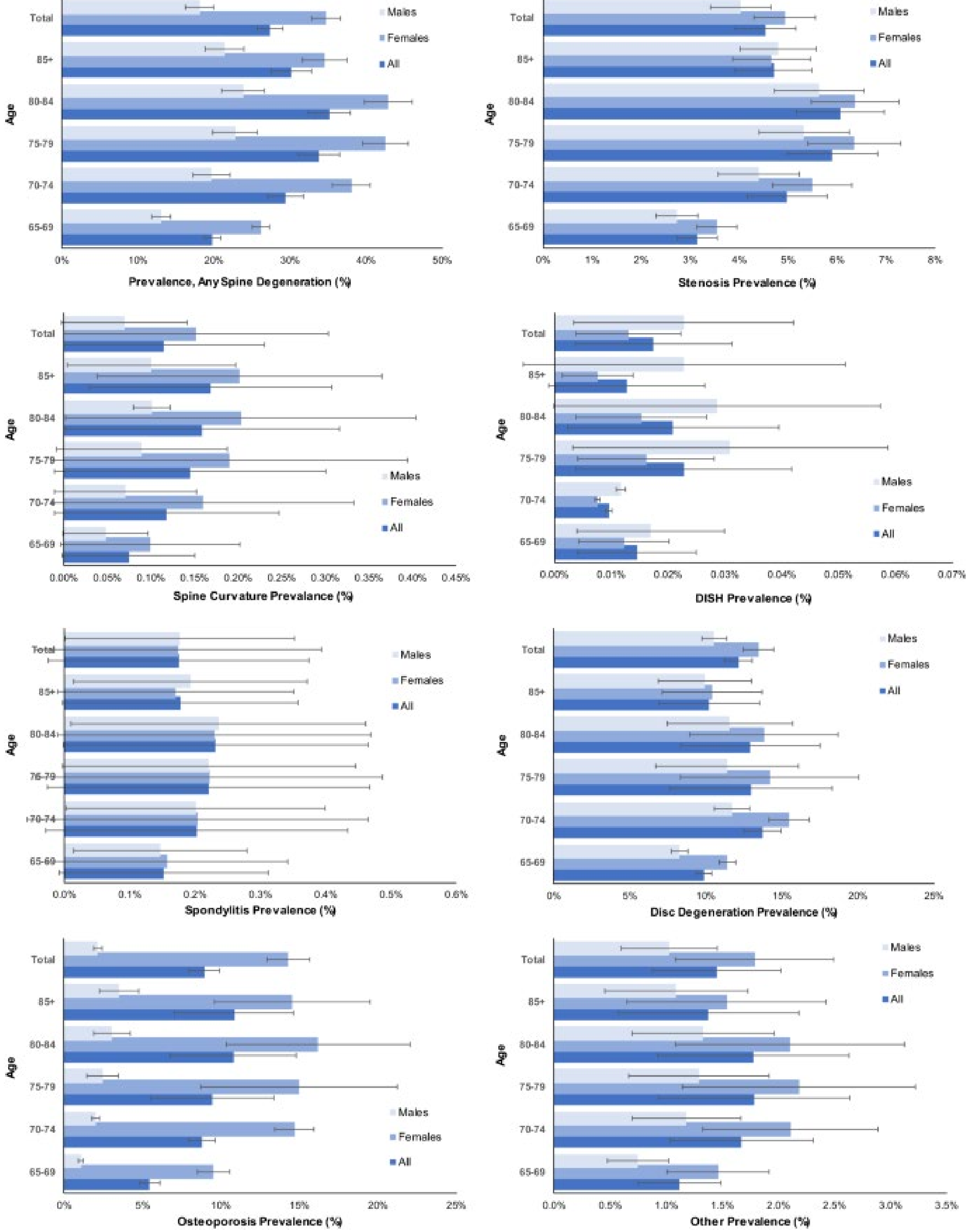


Homo neanderthalensis



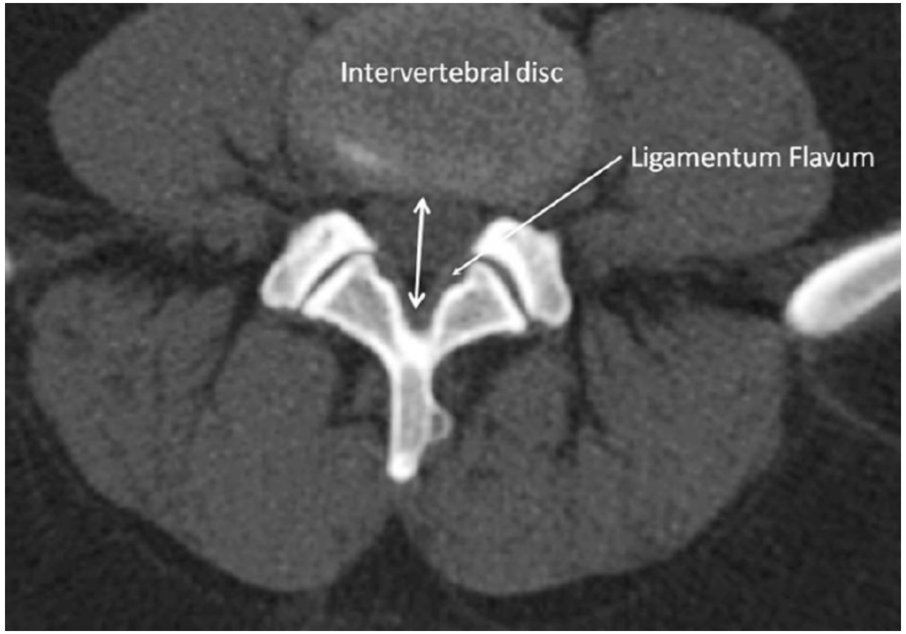
Statistics on Lumbar spinal stenosis

Parenteau, C.S., Lau, E.C., Campbell, I.C. *et al.* Prevalence of spine degeneration diagnosis by type, age, gender, and obesity using Medicare data. *Sci Rep* **11,** 5389 (2021). https://doi.org/10.1038/s41598-021-84724-6



Spinal stenosis prevalence and association with symptoms: The Framingham Study

Leonid Kalichman[1], Robert Cole[1], David H. Kim[2,3], Ling Li[2], Pradeep Suri[2], Ali Guermazi[4], and David J. Hunter[1,2]



Spine J. 2009 July ; 9(7): 545–550. doi:10.1016/j.spinee.2009.03.005.

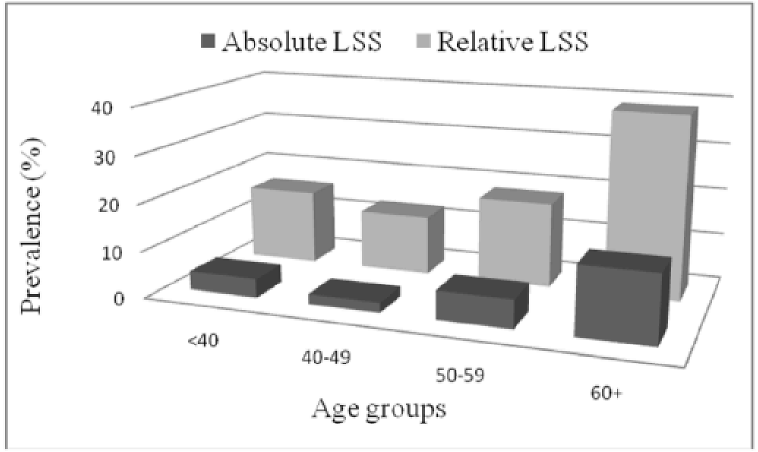


Figure 2.
Prevalence of individuals with acquired LSS (%) according the age groups.

Prevalence of congenital and acquired lumbar spinal stenosis in the population-based sample.

Type of LSS	Relative (≤12 mm) (N=191)		Absolute (≤10 mm) (N=191)	
	N	% (95% CI)	N	% (95% CI)
Congenital	9	4.71% (2.18–8.76%)	5	2.62% (0.86–6.00%)
Acquired	14	22.50% (16.80–29.10%)	14	7.30% (4.07–11.99%)
Any type	45	23.60% (17.73–30.23%)	16	8.40% (4.86–13.25%)

Lumbar spinal stenosis: an update on the epidemiology, diagnosis and treatment

Ai-Min Wu[1], Fei Zou[2], Yong Cao[3], Dong-Dong Xia[4], Wei He[5], Bin Zhu[6], Dong Chen[1], Wen-Fei Ni[1], Xiang-Yang Wang[1], Kenny Kwan[7]

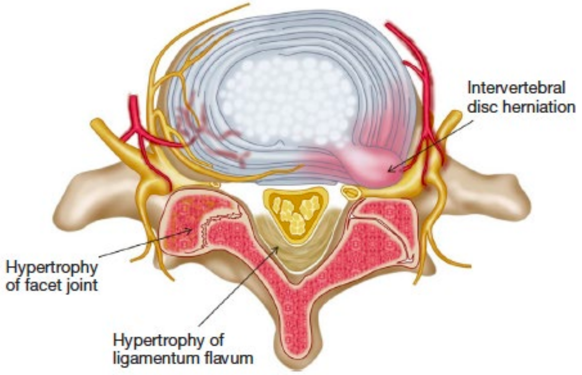


Table 1 The details of cut-off values of anteroposterior canal and the cross sectional area on CT and MRI that definition of central stenosis in previous typical literatures

Literatures	Anteroposterior canal diameter (mm)	Cross sectional area (mm^2)
CT		
Ullrich (32)	<11.5	<145
Haig (27)	≤11.95	–
Bolender (33)	<13	100–130 (early stenosis); <100 (present stenosis)
Lee (34)	<15 (suggesting narrowing); <10 (usually diagnostic)	–
Verbiest (35)	<12 (relative); <10 (absolute)	–
Schönström (36)	–	<100
Schönström (37)	–	75–100 (moderate); <75 (severe)
MRI		
Fukusaki (28)	<15	–
Koc (29)	<12	–
Mariconda (31)	–	<130
Hamanishi (30)	–	<100

Table 2 The details of cut-off values of height/depth and angle of lateral recess on CT that definition of lateral stenosis in previous typical literatures

Literatures	Height/depth of lateral recess (mm)	Angle of lateral recess
Strojnik (38)	≤3.6	<30°
Ciric (39)	>5 (normal); ≤3 (highly indicative); ≤2 (diagnostic)	–
Mikhael (40)	3–5 (suggestive); ≤3 (definitive)	–

AME Med J 2017;2:63

Lumbar spinal stenosis: an update on the epidemiology, diagnosis and treatment

Ai-Min Wu[1], Fei Zou[2], Yong Cao[3], Dong-Dong Xia[4], Wei He[5], Bin Zhu[6], Dong Chen[1], Wen-Fei Ni[1], Xiang-Yang Wang[1], Kenny Kwan[7]

AME Med J 2017;2:63

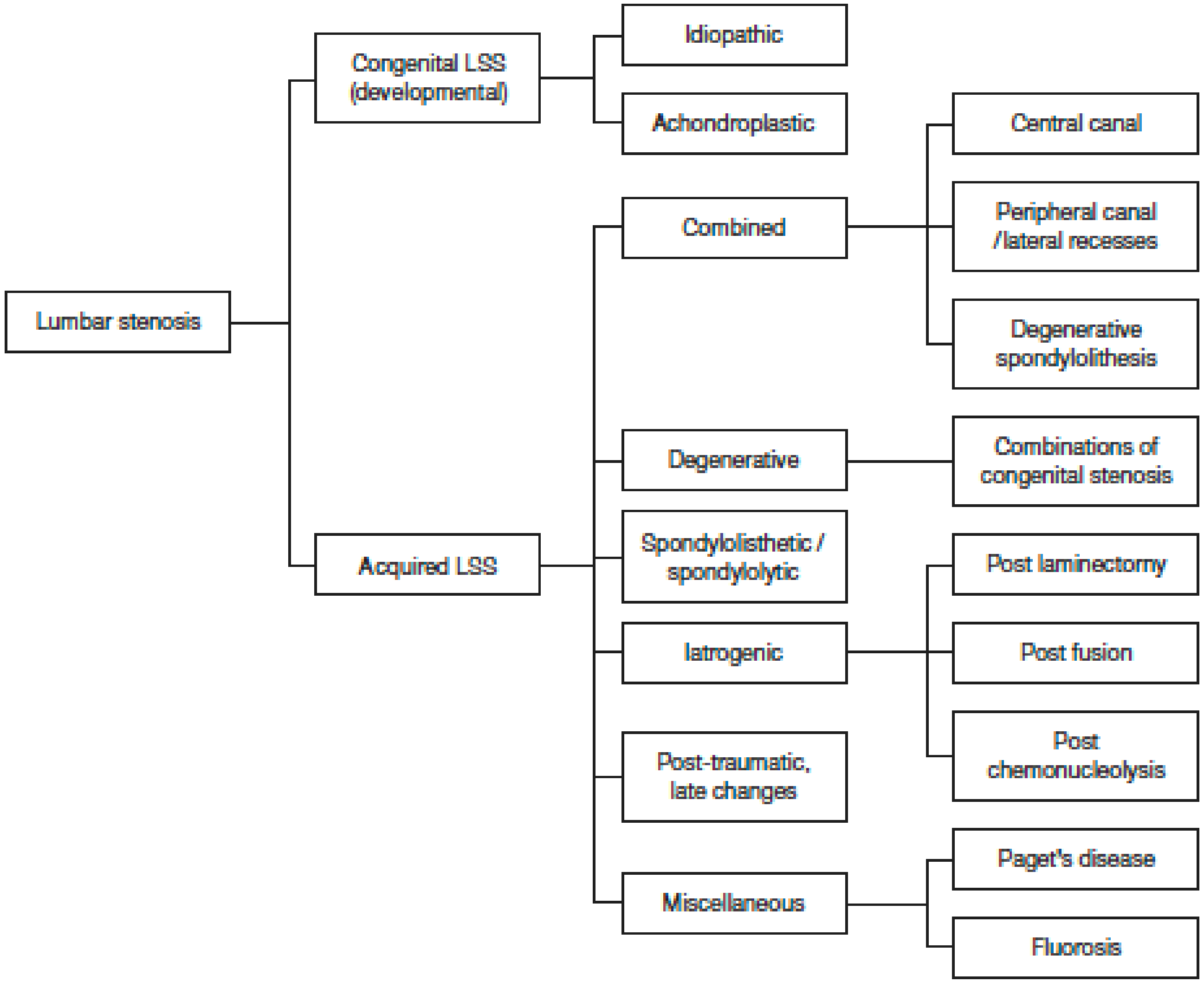


Figure 5 The Arnoldi classification of lumbar spinal stenosis.

Economics on Spinal stenosis

US regional variations in rates, outcomes, and costs of spinal arthrodesis for lumbar spinal stenosis in working adults aged 40–65 years

Micheal Raad, MD, Jay S. Reidler, MD, MPH, Mostafa H. El Dafrawy, MD, Raj M. Amin, MD, Amit Jain, MD, Brian J. Neuman, MD, Lee H. Riley III, MD, Daniel M. Sciubba, MD, Khaled M. Kebaish, MD, and Richard L. Skolasky, ScD

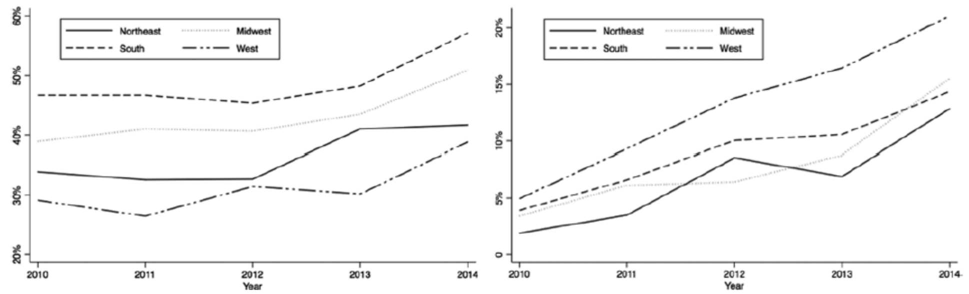


FIG. 3. Left: Rates of fusion surgery as a percentage of all LSS surgeries from 2010 to 2014. **Right:** Rates of complex fusion during the same period as a percentage of all fusions by US region. Increases were statistically significant for all fusion and complex fusion rates.

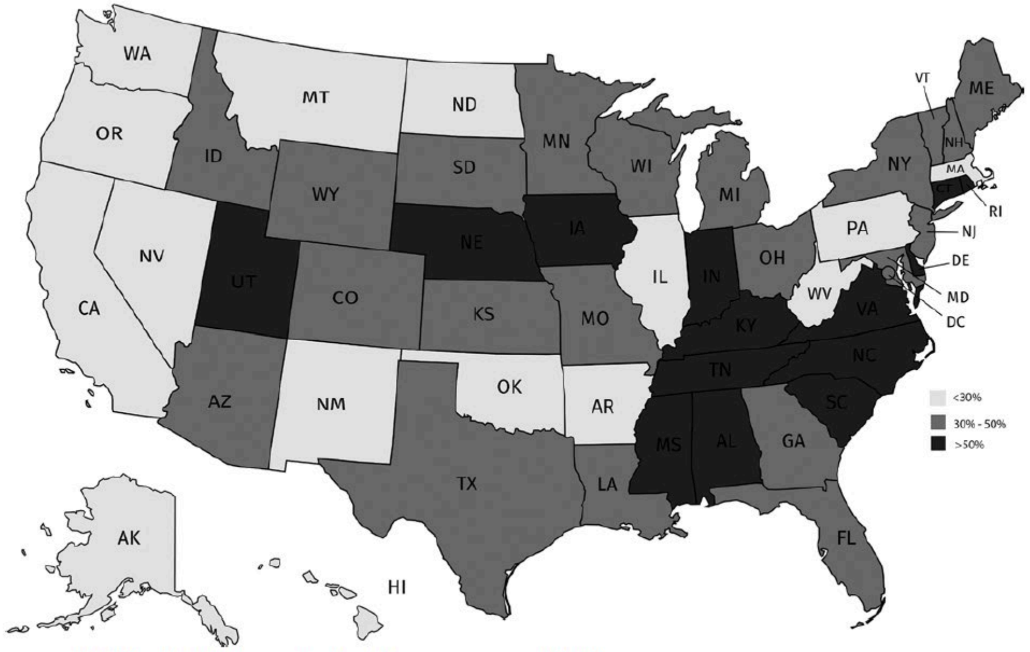


FIG. 1. Map of the US showing rates of spinal fusion surgery for isolated LSS by state.

RESULTS Rates of arthrodesis, as opposed to decompression alone, varied significantly by region, from 48% in the South, to 42% in the Midwest, 36% in the Northeast, and 31% in the West. After controlling for patient age, sex, and Charlson Comorbidity Index values, the differences remained significant. Compared with patients in the Northeast, those in the South (OR 1.6, 95% CI 1.50–1.75) and Midwest (OR 1.3, 95% CI 1.18–1.41) were significantly more likely to undergo spinal arthrodesis. On multivariate analysis, patients in the West were significantly less likely to have a pro-

J Neurosurg Spine 30:83–90, 2019

Trends in isolated lumbar spinal stenosis surgery among working US adults aged 40–64 years, 2010–2014

Micheal Raad, MD,[1] Callum J. Donaldson, BSc,[2] Mostafa H. El Dafrawy, MD,[1] Daniel M. Sciubba, MD,[1] Lee H. Riley III, MD,[1] Brian J. Neuman, MD,[1] Khaled M. Kebaish, MD,[1] and Richard L. Skolasky, ScD[1]

OBJECTIVE Recommendations for the surgical treatment of isolated lumbar spinal stenosis (LSS) (i.e., in the absence of concomitant scoliosis or spondylolisthesis) are unclear. The aims of this study were to investigate trends in the surgical treatment of isolated LSS in US adults and determine implications for outcomes.

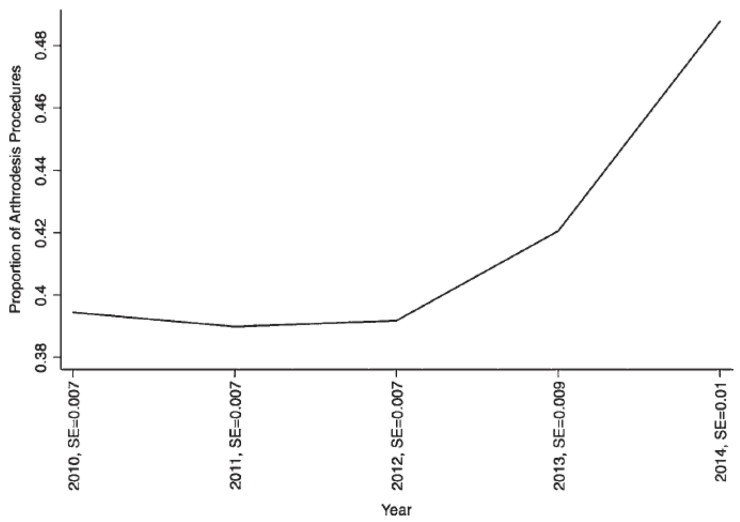


FIG. 1. Proportion of 20,279 patients aged 40–64 years who underwent surgical decompression for LSS whose treatment also included arthrodesis. This proportion increased significantly and linearly during the 5-year study period.

CONCLUSIONS From 2010 to 2014, the proportion of adults undergoing decompression with arthrodesis versus decompression only for the treatment of LSS increased, especially in the South and Midwest regions of the US. A greater proportion of these fusions were complex and were associated with more complications, higher costs, and a greater likelihood of being discharged to a skilled nursing facility.

J Neurosurg Spine 29:169–175, 2018

TABLE 3: Complication rate at the 3-month, 1-year, and 2-year follow-ups*

Complication	3-Mo FU	1-Yr FU	2-Yr FU
spine reop	10.9%	13.3%	16.9%
epidural injection	8.61%	17.1%	26.1%
spine reop &/or epidural injection	18.2%	27.0%	36.2%
infection	3.83%	4.90%	5.92%
spinal cord injury	0.60%	0.66%	0.78%
nerve root injury	0.06%	0.12%	0.12%
dural tear/puncture	5.02%	5.50%	5.98%
pneumonia	4.43%	7.78%	13.1%
pulmonary embolism	1.85%	2.51%	3.59%
myocardial infarction	1.97%	2.81%	4.49%
mechanical complication	3.47%	5.50%	8.49%
hemorrhage/hematoma	2.81%	3.89%	4.84%
heterotopic ossification	NA	NA	NA
lumbar spine fracture	2.45%	3.29%	4.19%
postlaminectomy syndrome	11.8%	19.1%	25.4%
wound infection	4.61%	6.10%	7.00%
urinary tract infection	17.9%	30.3%	40.9%
nonunion/malunion	1.73%	3.05%	4.13%
readmission (for any of the above complications)	11.1%	17.5%	24.9%
removal of hardware	1.56%	2.51%	4.25%

* FU = follow-up; NA = not applicable.

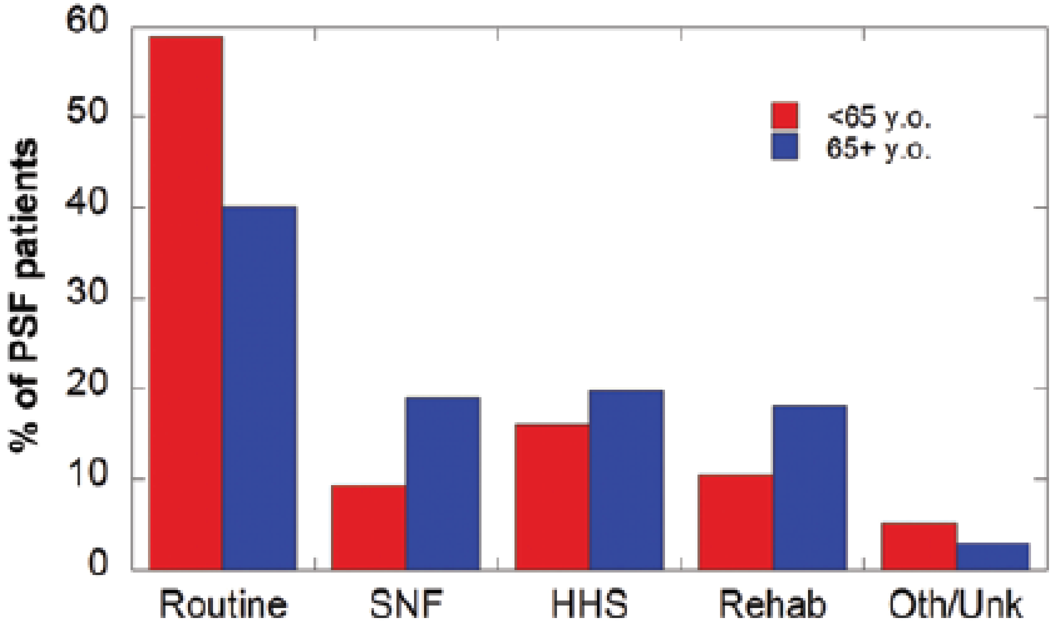


FIG. 3. Discharge status distribution of 1672 patients who underwent PSF (**upper**), categorized by age (**lower**). HHS = home health service; Oth/Unk = other or unknown; Rehab = rehabilitation facility; SNF = skilled nursing facility.

Risk factors in Lumbar spinal stenosis

REVIEW

Current concepts and recent advances in understanding and managing lumbar spine stenosis [version 1; peer review: 3 approved]

Carlos Bagley, Matthew MacAllister, Luke Dosselman, Jessica Moreno, Salah G. Aoun, Tarek Y. El Ahmadieh

Abstract

Lumbar spinal stenosis is a degenerative process that is extremely frequent in today's aging population. It can result in impingement on the nerves of the cauda equina or on the thecal sac itself, and lead to debilitating symptoms such as severe leg pain, or restriction in the perimeter of ambulation, both resulting in dependency in daily activities. The impact of the disease is global and includes financial repercussions because of its involvement in the active work force group. Risk factors for the disease include some comorbidities such as obesity or smoking, daily habits such as an active lifestyle, but also genetic factors that are not completely elucidated yet. The diagnosis of lumbar stenosis can be difficult, and involves a combination of radiological and clinical findings. Treatment ranges from conservative measures with physical therapy and core strengthening, to steroid injections in the facet joints or epidural space, to a more radical solution with surgical decompression. The evidence available in the literature regarding the causes, diagnosis and treatment of lumbar spine stenosis can be confusing, as no level I recommendations can be provided yet based on current data. The aim of this manuscript is to provide a comprehensive and updated summary to the reader addressing the multiple aspects of this disease.

F1000Research 2019, 8(F1000 Faculty Rev):137 Last updated: 03 APR 2019

Predictors of outcomes after surgery

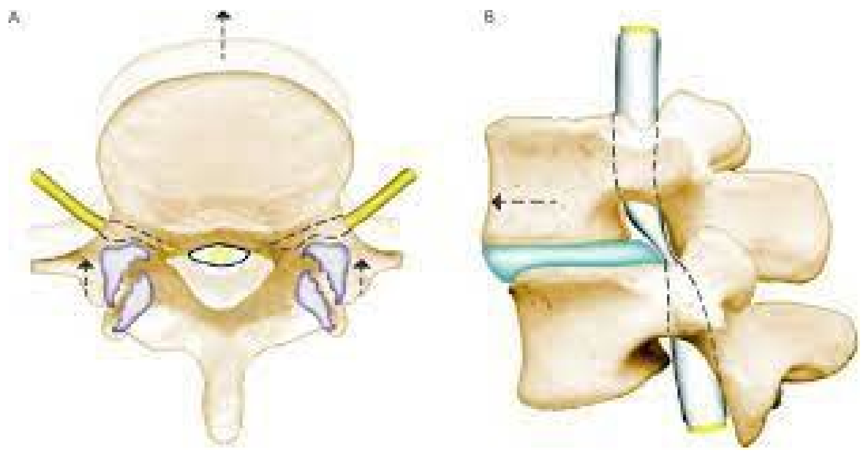
Several patient factors have been identified to predict outcomes after surgery for LSS. Age and gender do not appear to have a significant impact on prognosis after surgery[53,54]. Patients with preoperative depression tend to have worse outcomes than those without mood disorders[55]. Preoperative optimization should include assessment and treatment of depression. Smokers and obese patients have also been found to have suboptimal improvement with surgery compared with non-smoking and normal-weight individuals[56–58], indicating that smoking cessation and weight loss may also be important for preoperative counseling. Additionally, patients with predominant leg pain symptoms have been shown to improve significantly more with surgery than patients with predominantly lower back pain, although both groups still show improvement. This knowledge may be important in setting appropriate patient expectations before surgery[59,60]. Predictors for worsening following surgery have also been researched and may include young age and smoking[61].

Lumbar spinal stenosis is a highly genetic condition partly mediated by disc degeneration

Michele C. Battié, PhD*, **Alfredo Ortega-Alonso, PhD**, **Riikka Niemelainen, PhD**, **Kevin Gill, MD**, **Esko Levalahti, MSc**, **Tapio Videman, MD, PhD**, and **Jaakko Kaprio, MD, PhD**

Methods—A classic twin study with multivariate analyses considering lumbar level and other covariates was conducted. The study sample comprised 598 male twins (147 monozygotic and 152 dizygotic pairs), 35-70 years of age, from the population-based Finnish Twin Cohort. Primary phenotypes were central lumbar stenosis assessed qualitatively on MRI and quantitatively measured dural sac cross-sectional area. Additional phenotypes to examine possible genetic pathways included disc bulging and standing height, as an indicator of overall skeletal size or development.

Conclusion—Central lumbar spinal stenosis and associated dural sac dimensions are highly genetic, and disc degeneration (bulging) appears to be one pathway through which genes influence spinal stenosis.



BMJ 2016;352:h6234

Arthritis Rheumatol. 2014 December ; 66(12): 3505–3510. doi:10.1002/art.38823.

Research Article

Facet Tropism and Orientation: Risk Factors for Degenerative Lumbar Spinal Stenosis

Janan Abbas,[1,2] Natan Peled,[3] Israel Hershkovitz,[1] and Kamal Hamoud[2,4,5]

The aim of this study is to establish whether facet tropism (FT) and orientation (FO) are associated with degenerative lumbar spinal stenosis (DLSS). A retrospective computerized tomography (CT) study including 274 individuals was divided into two groups: control (82 males and 81 females) and stenosis (59 males and 52 females). All participants have undergone high-resolution CT scan of the lumbar spine in the same position. FT and FO were measured at L1-2 to L5-S1. Significant sagittal FO was noted in

greater in the stenosis males (L4-5, L5-S1) and females (L3-4, L5-S1) compared to their counterparts in the control group. Our results also showed that FT (L3-4 to L5-S1) increases approximately 2.9 times the likelihood for DLSS development. This study indicates that FO and FT in the lower lumbar spine are significantly associated with DLSS.

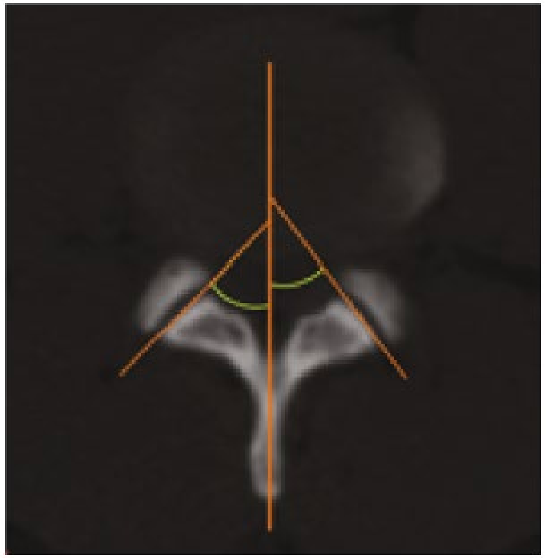


Figure 1: The measurement of facet joint orientation.

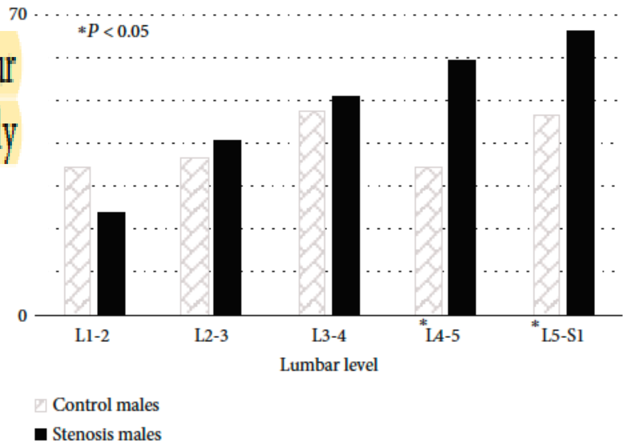


Figure 2: Prevalence (%) of facet tropism in both study groups (control and stenosis), by lumbar level, males only.

Hindawi
BioMed Research International
Volume 2020, Article ID 2453503, 6 pages
https://doi.org/10.1155/2020/2453503

Recent Preoperative Lumbar Epidural Steroid Injection Is an Independent Risk Factor for Incidental Durotomy During Lumbar Discectomy

Lawal A. Labaran, BA[1], Varun Puvanesarajah, MD[2], Sandesh S. Rao, MD[2], Dennis Chen, MD[1], Francis H. Shen, MD[1], Amit Jain, MD[2], and Hamid Hassanzadeh, MD[1]

Objective: To investigate the association between lumbar epidural steroid injection (LESI) and incidental durotomy (ID) in patients with a diagnosis of disc herniation undergoing a primary discectomy.

Conclusion: LESI increases the risk of ID in patients who undergo a subsequent lumbar discectomy within 6 months of injection.

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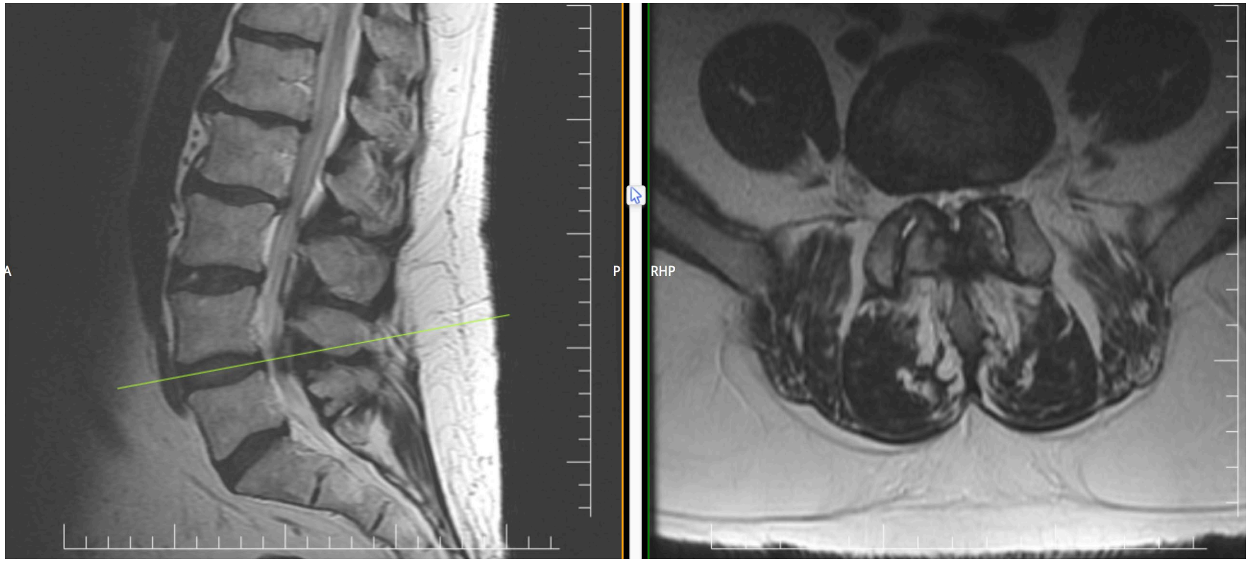
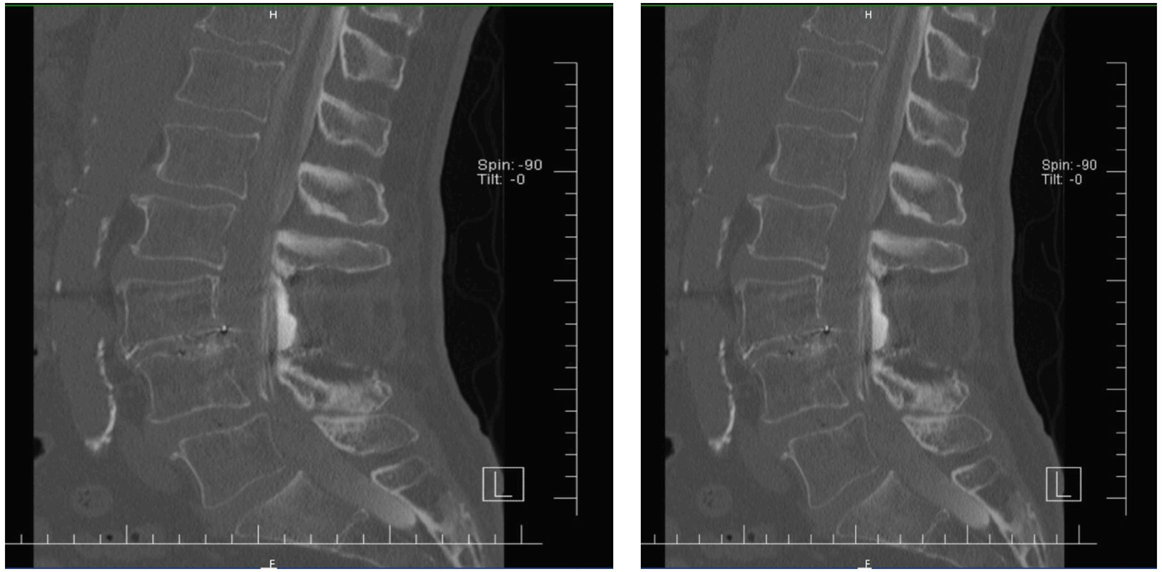
The relationship between preoperative predictive factors for clinical outcome in patients operated for lumbar spinal stenosis by decompressive laminectomy

Dobran Mauro[1], Davide Nasi[1], Riccardo Paracino[1], Mara Capece[1], Erika Carrassi[1], Denis Aiudi[1], Fabrizio Mancini[1], Simona Lattanzi[2], Roberto Colasanti[1], Maurizio Iacoangeli[1]

Conclusion: Decompressive laminectomy without fusion effectively managed LSS. It reduced patients' use of pain, anxiety, and antidepressant medications. In addition, we found that increased preoperative BMIs contributed to poorer postoperative outcomes (e.g., ODI values).

- Imaging on Lumbar stenosis





Sagittal and B. Axial T2 weighted MRI image at the L4-5 level showing spinal stenosis caused by hypertrophy of the facets and ligamentum flavum.

Non operative treatment of Lumbar stenosis:

Exercise (aerobic, strength, flexibility)

Specific exercises in lumbar flexion (cycling)

Body weight supported treadmill walking

Muscle coordination training

Balance training

Lumbar semi-rigid orthosis

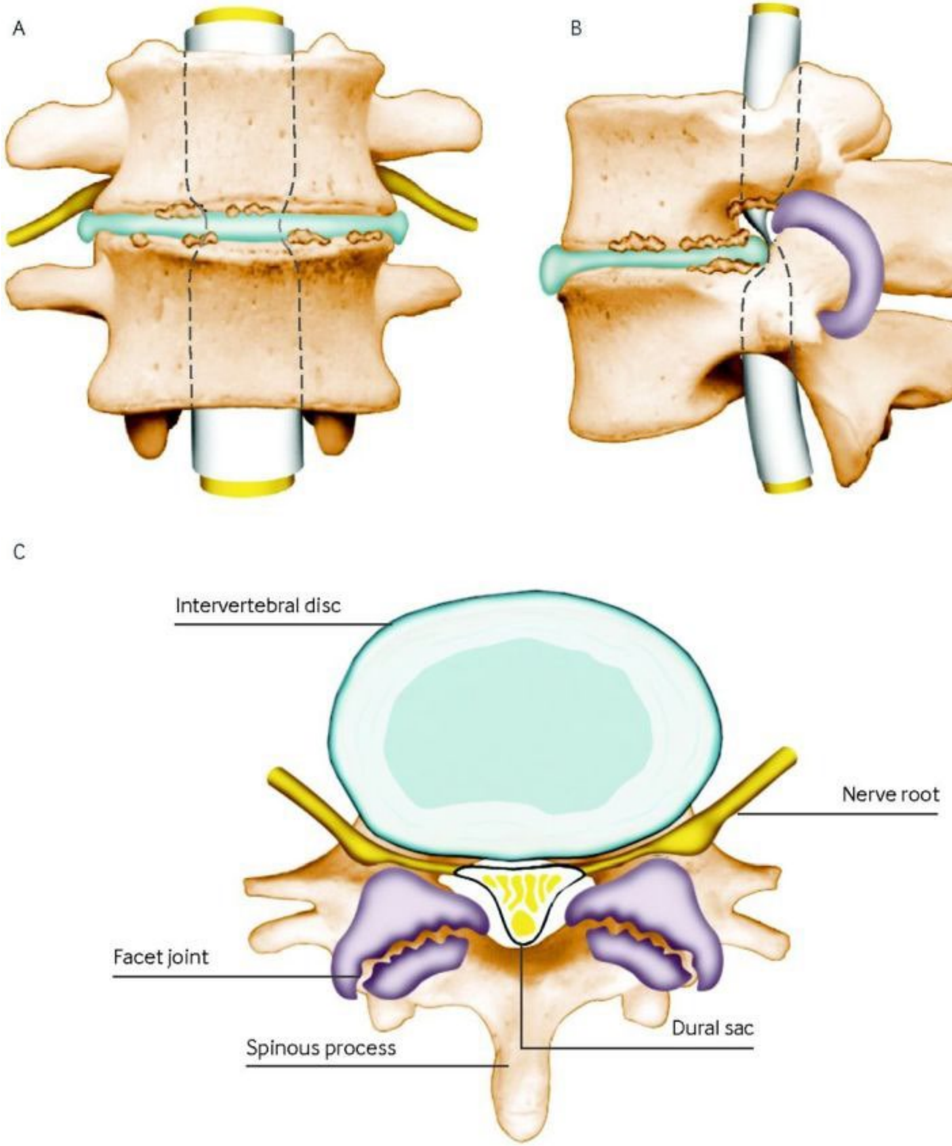
Braces and corsets

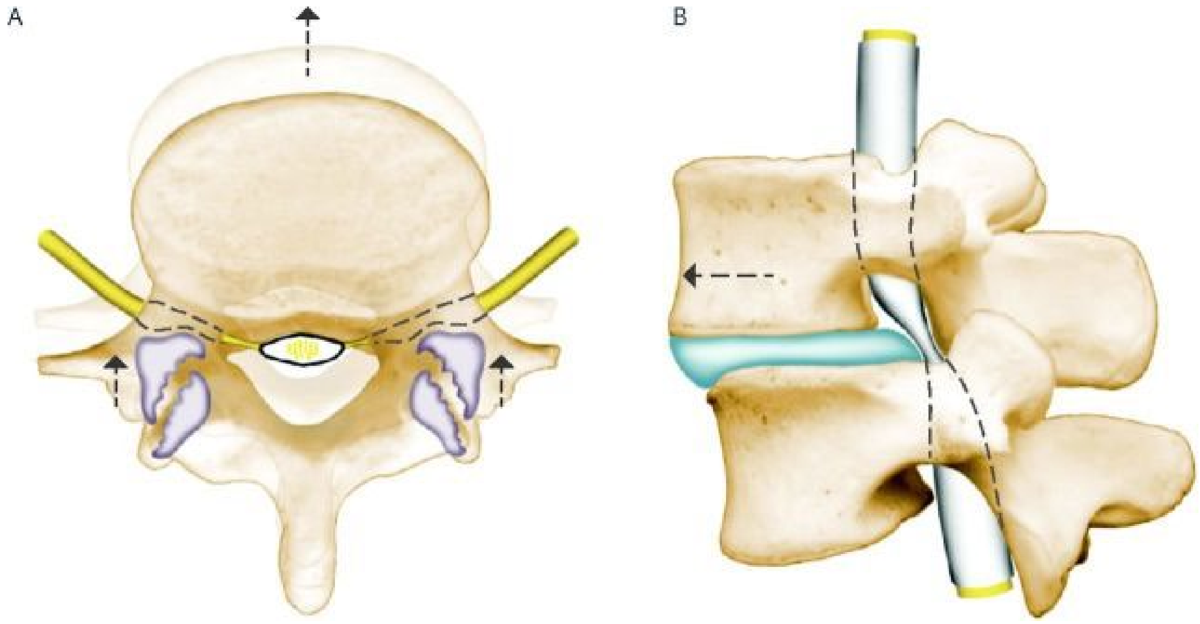
Pain relieving treatments (heat, ice, electrical stimulation, massage, ultrasound)

Spinal manipulation

Postural instruction.

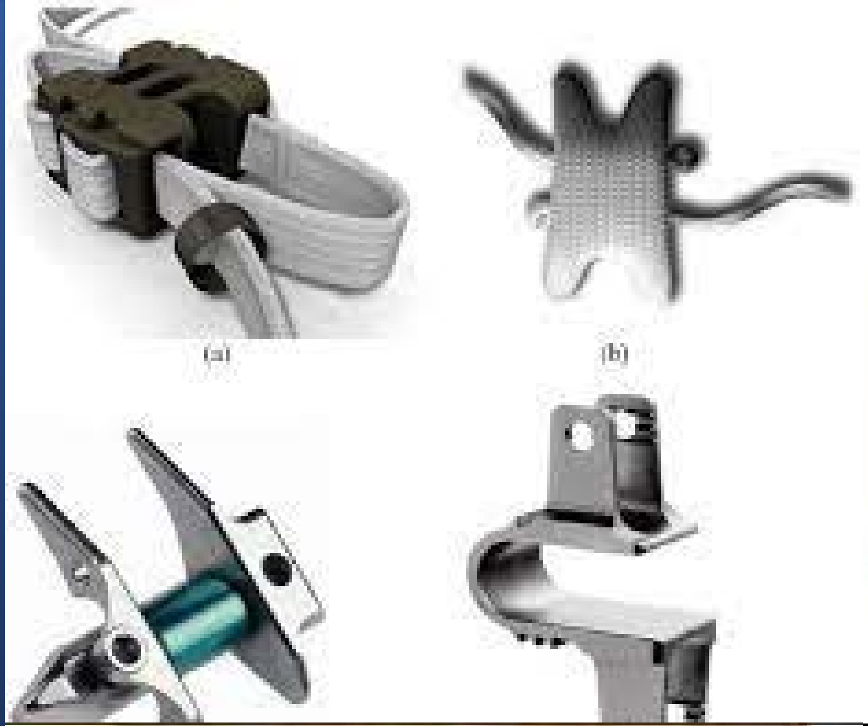
Lurie J, Tomkins C. Management of lumbar spinal stenosis
BMJ 2016 Jan 4;352:h6234.





Lurie J, Tomkins C. Management of lumbar spinal stenosis
BMJ 2016 Jan 4;352:h6234.

Non fusion procedures in Lumbar stenosis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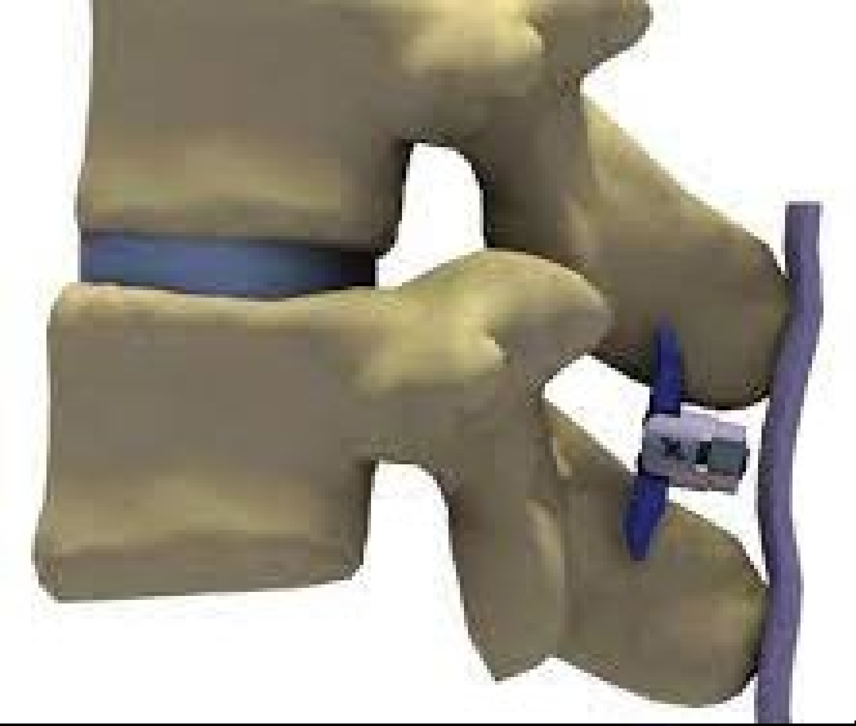



2021
2026
$18.52 mn
Market size growth
4.09%
CAGR with DECELERATING momentum
4.43%
Estimation of year-over-year growth rate of 2022
VIEW
Market size in 2021
27%
of the growth will originate from North America
The market is FRAGMENTED with several players occupying the market share

- Postsurgical outcomes with interspinous spacers in lumbar spinal stenosis: clinical outcomes and complications in a cohort of patients.

Introduction:

- Lumbar spinal stenosis represents one of the most frequent lumbar pathologies.
- Multiple management strategies include conservative and surgical options. In the last group of procedures, open and minimally invasive technique do exist to adequately manage these patients.
- We present a surgical cohort of patients with the use of the interspinous spacers placement along with posterior lumbar decompression and posterolateral fusion.

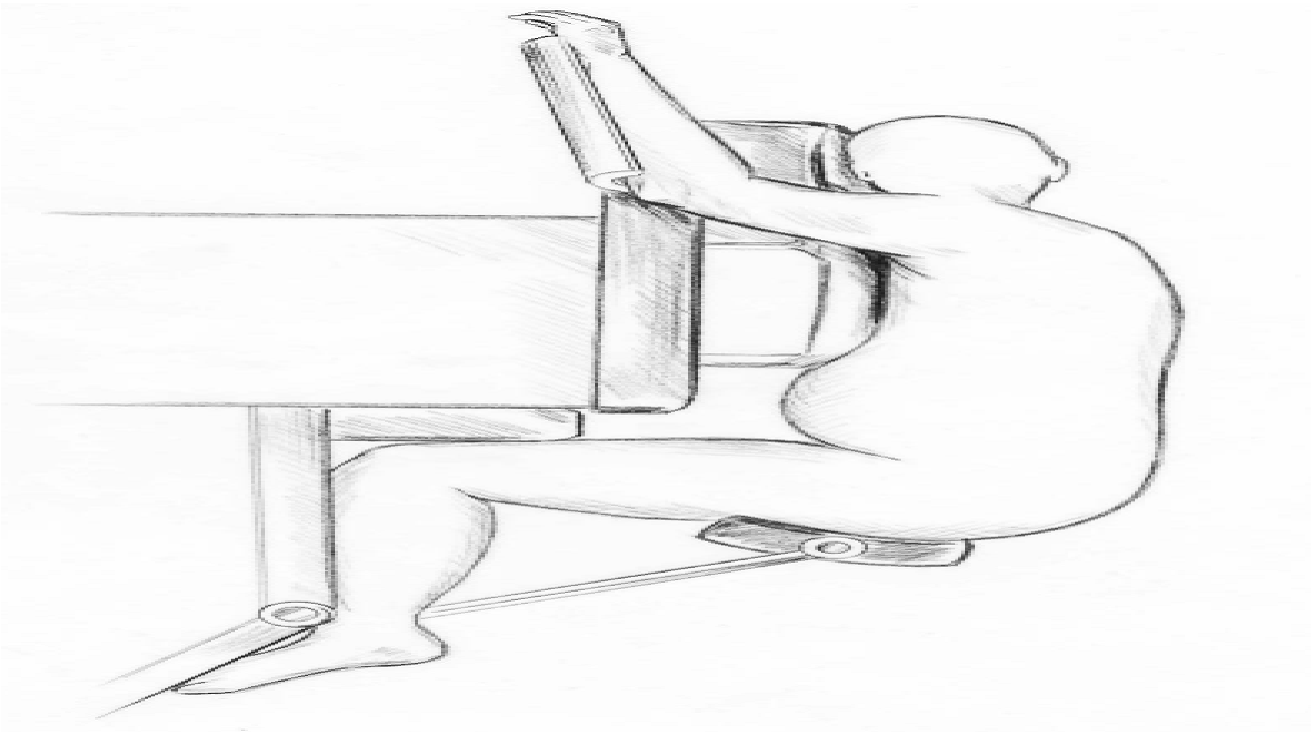
Material methods:

- All patients with diagnosis of spinal stenosis were collected for a retrospective analysis of prospectively collected data.

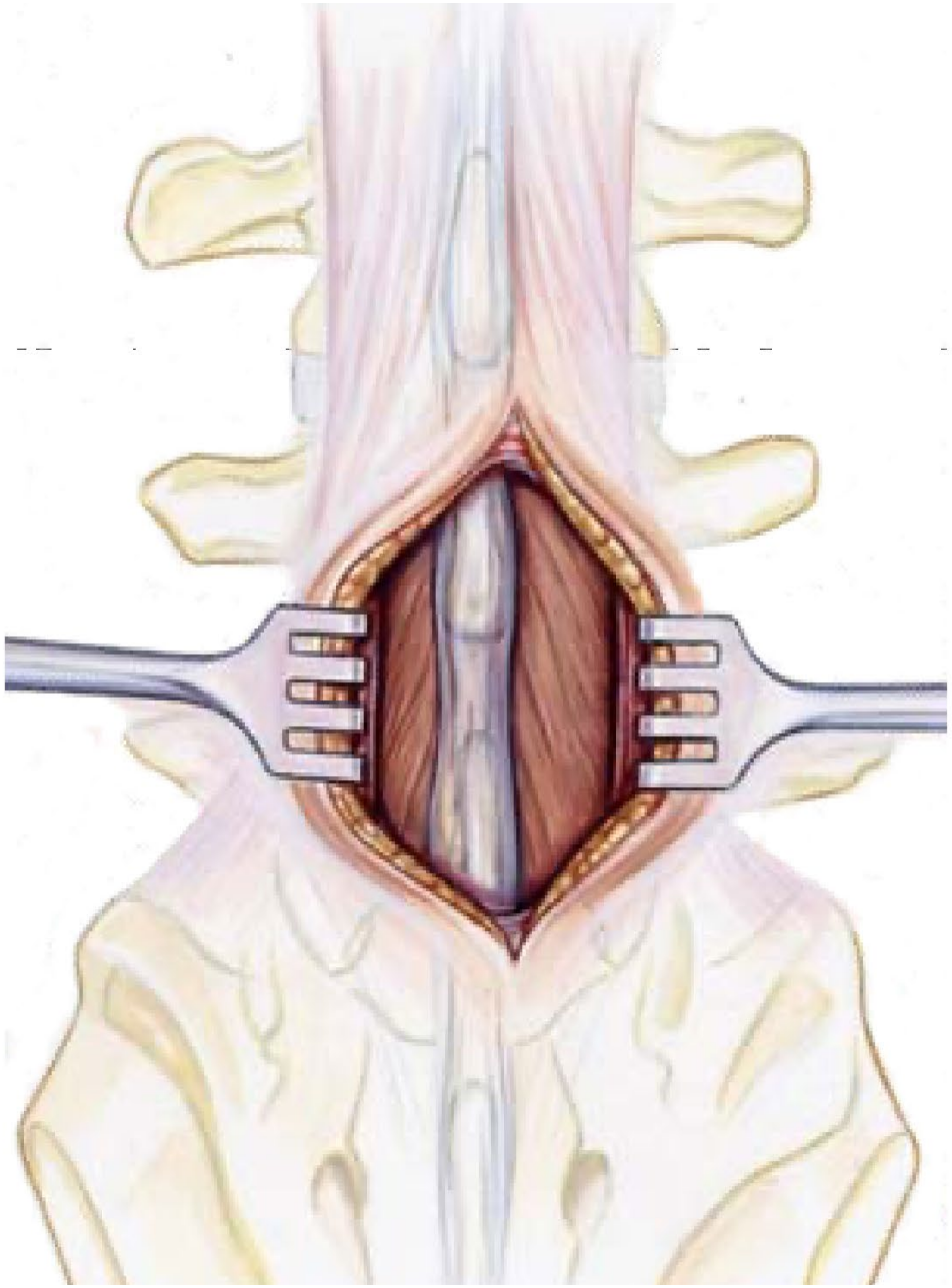
- Variables included age, gender, comorbidities, BMI, symptom presentation, length of symptoms, surgical complications, EBL, preop VAS (Visual Analogue Scale), 3 and 12-month VAS and ODI at 6 and 12 months.


• Surgical technique

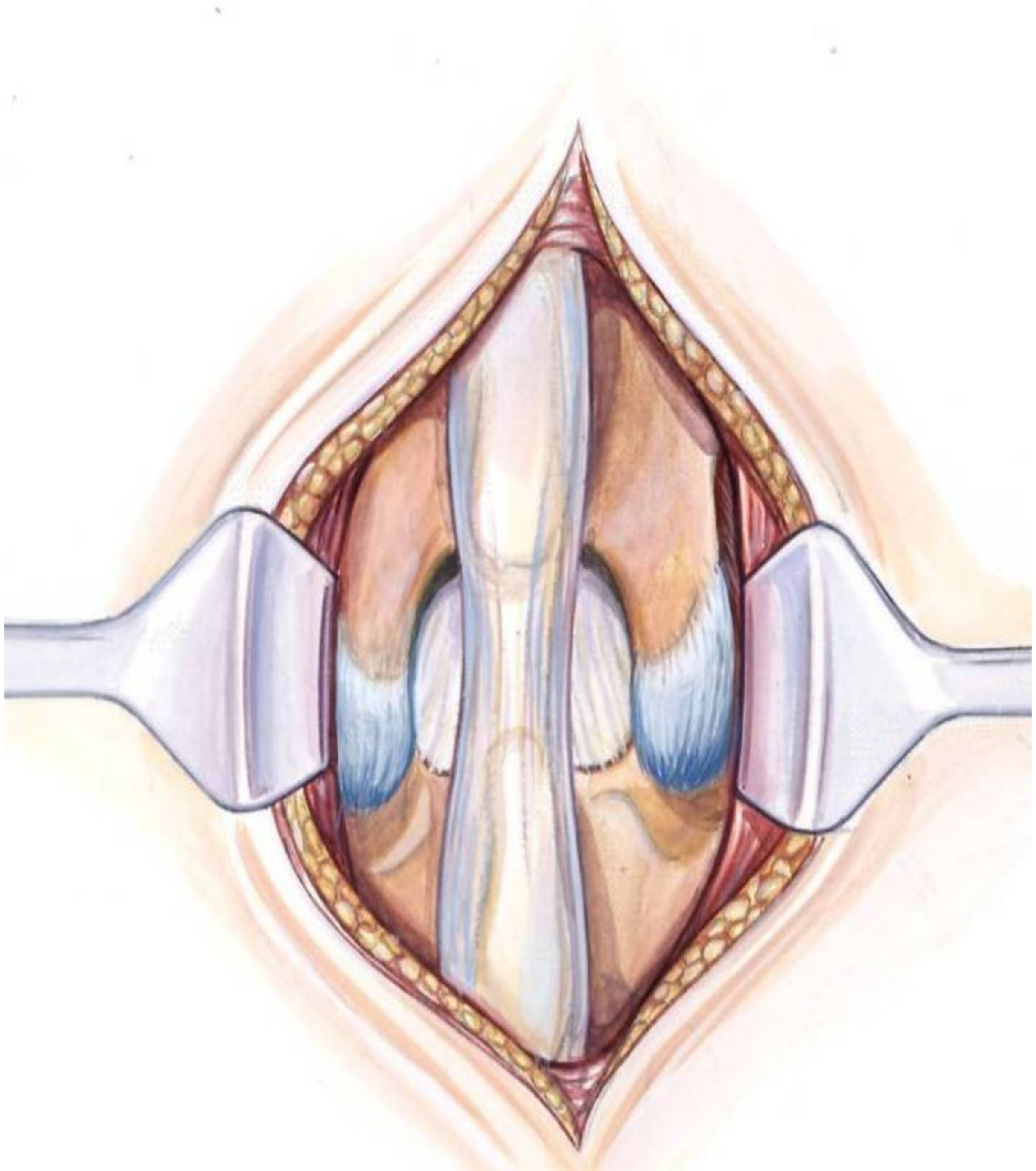
Patient positioning:



- Routine (midline) skin incision is performed.
- The muscle is sharply dissected lateral to the supraspinous ligament preserving the entire thickness of the supraspinous ligament.
- Alternatively the supraspinous ligament may be resected depending on surgeon‘s preference.

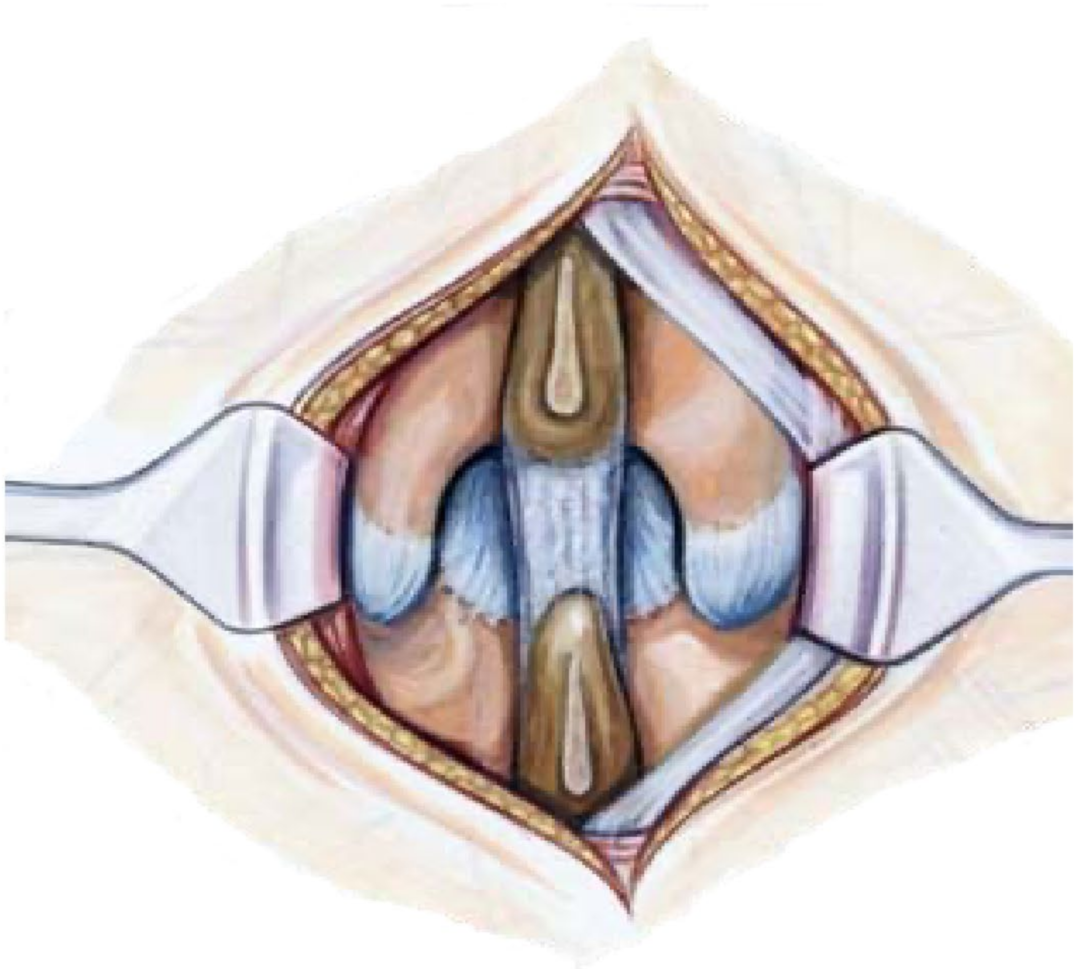


Paraspinal muscles are stripped off the laminae while preserving the facet capsules.

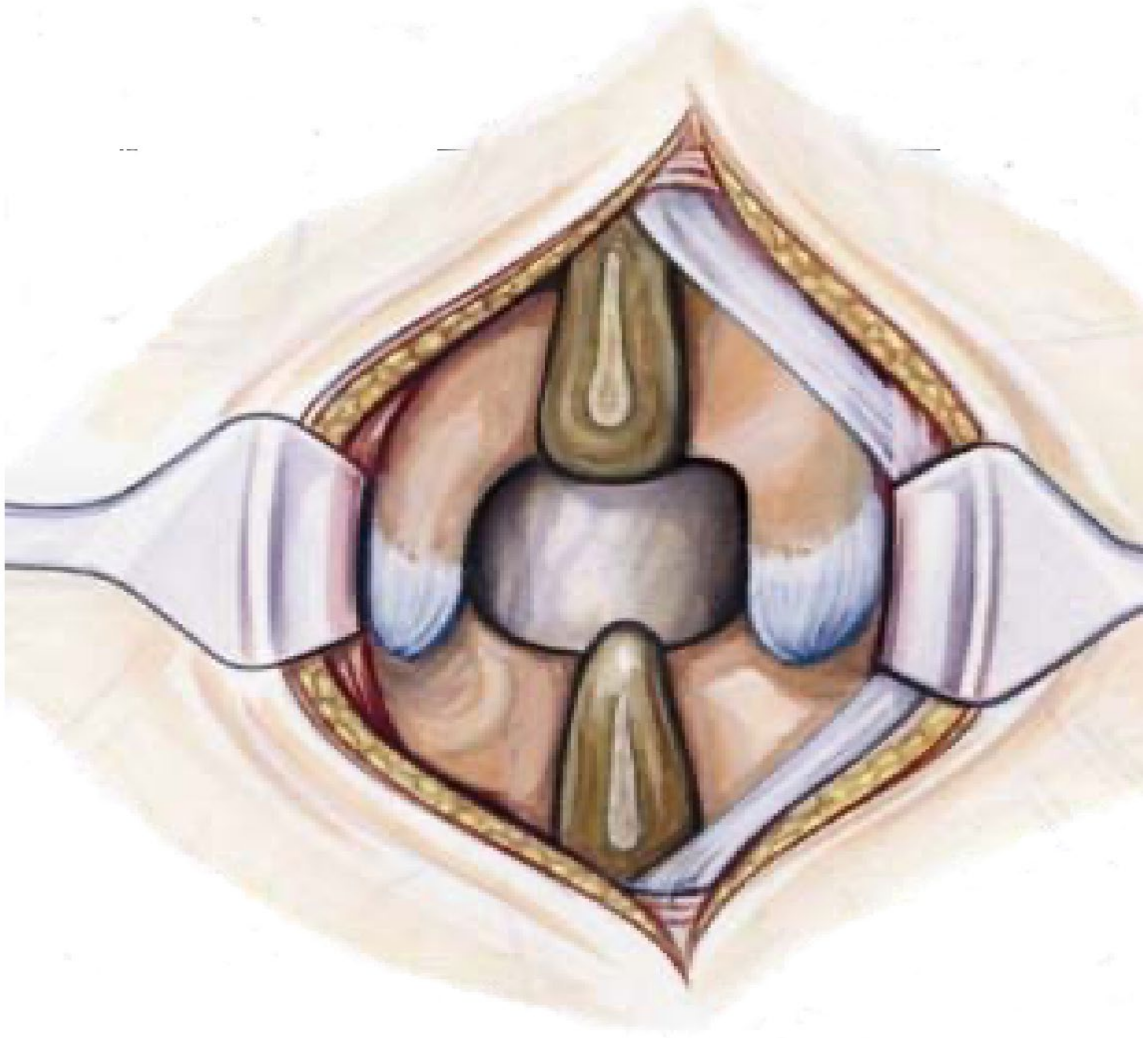


- The supraspinous ligament is dissected sub-periostally and preserved as a thick cuff and retracted laterally.

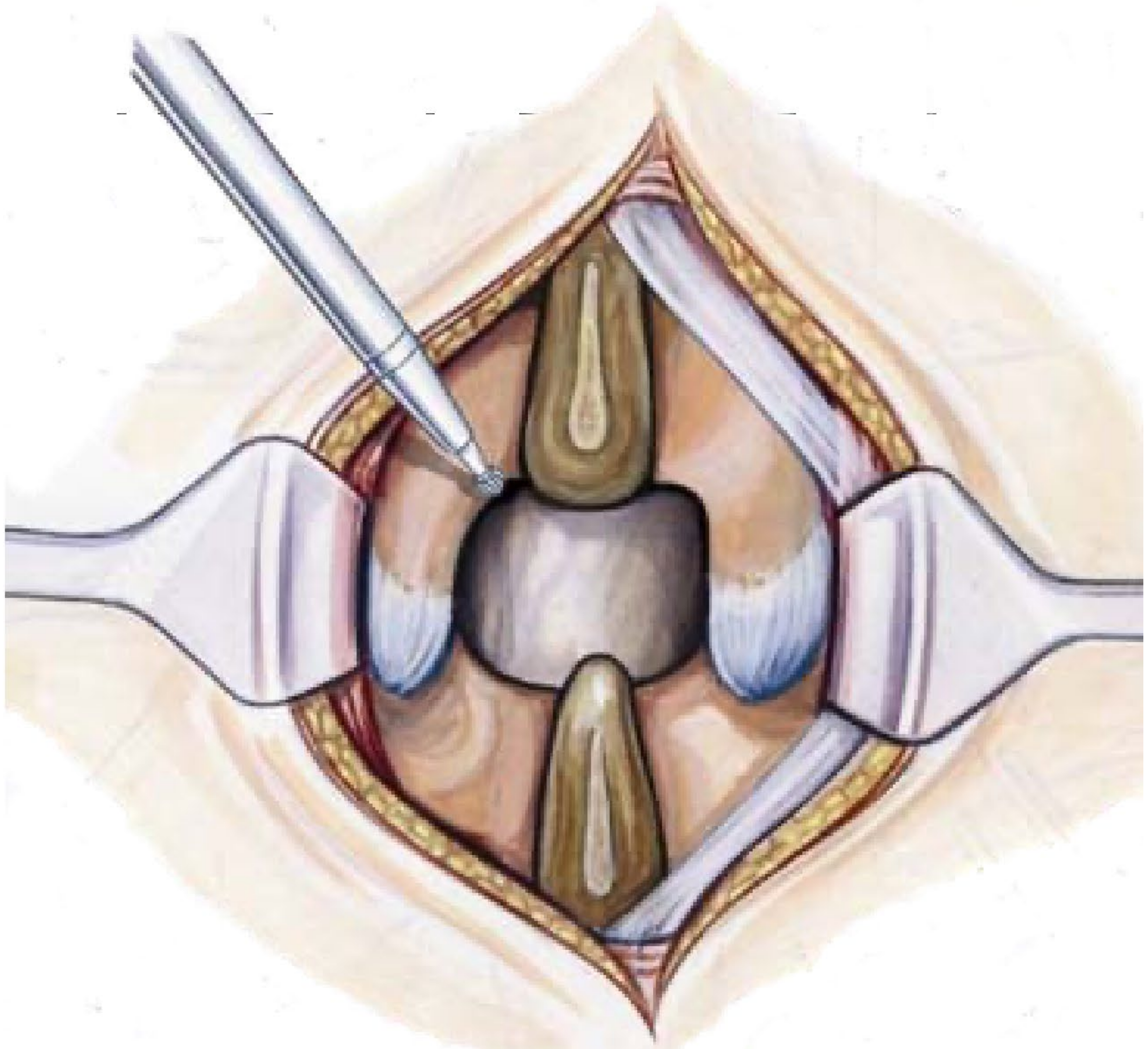
- If possible a small portion of the bony tip can be resected together with the supraspinous ligament. This will aid a faster healing after reconstruction of the ligament.



Ligamentum Flavum is then resected and microsurgical decompression is performed, relieving all points of neural compression.

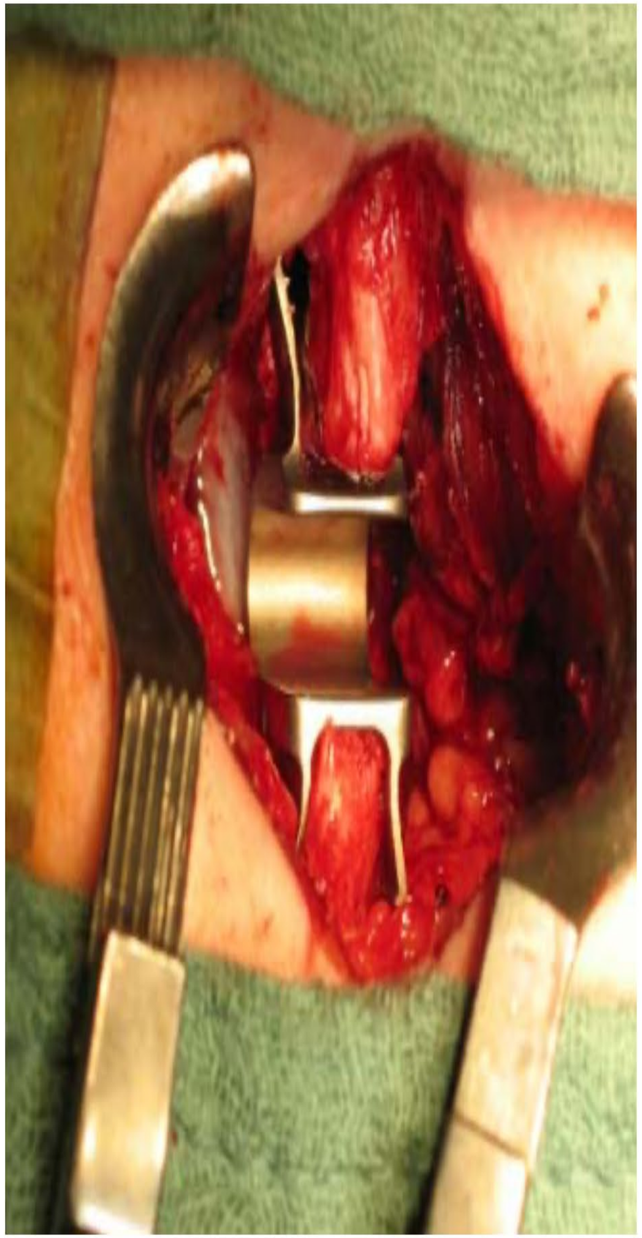


To ensure proper depth of implant insertion a small portion of the laminar surface may need partial resurfacing.



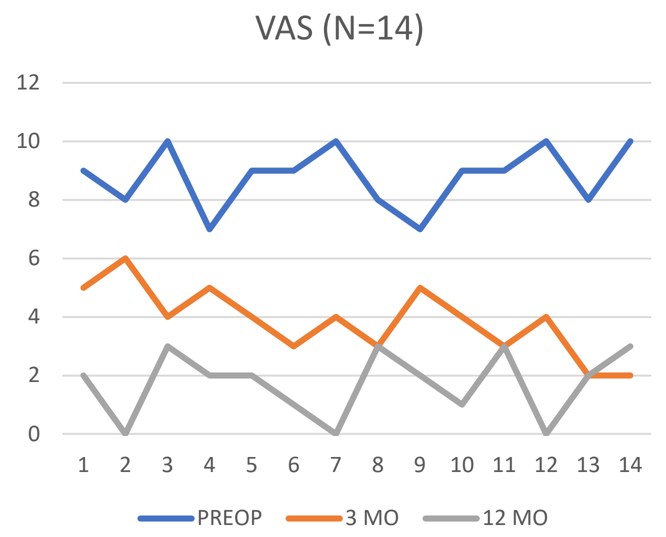
The wings may need to be opened slightly using bending pliers at the mid portion of the wing to ensure appropriate depth of insertion.

Implant is introduced via impaction utilizing a mallet.



Results:

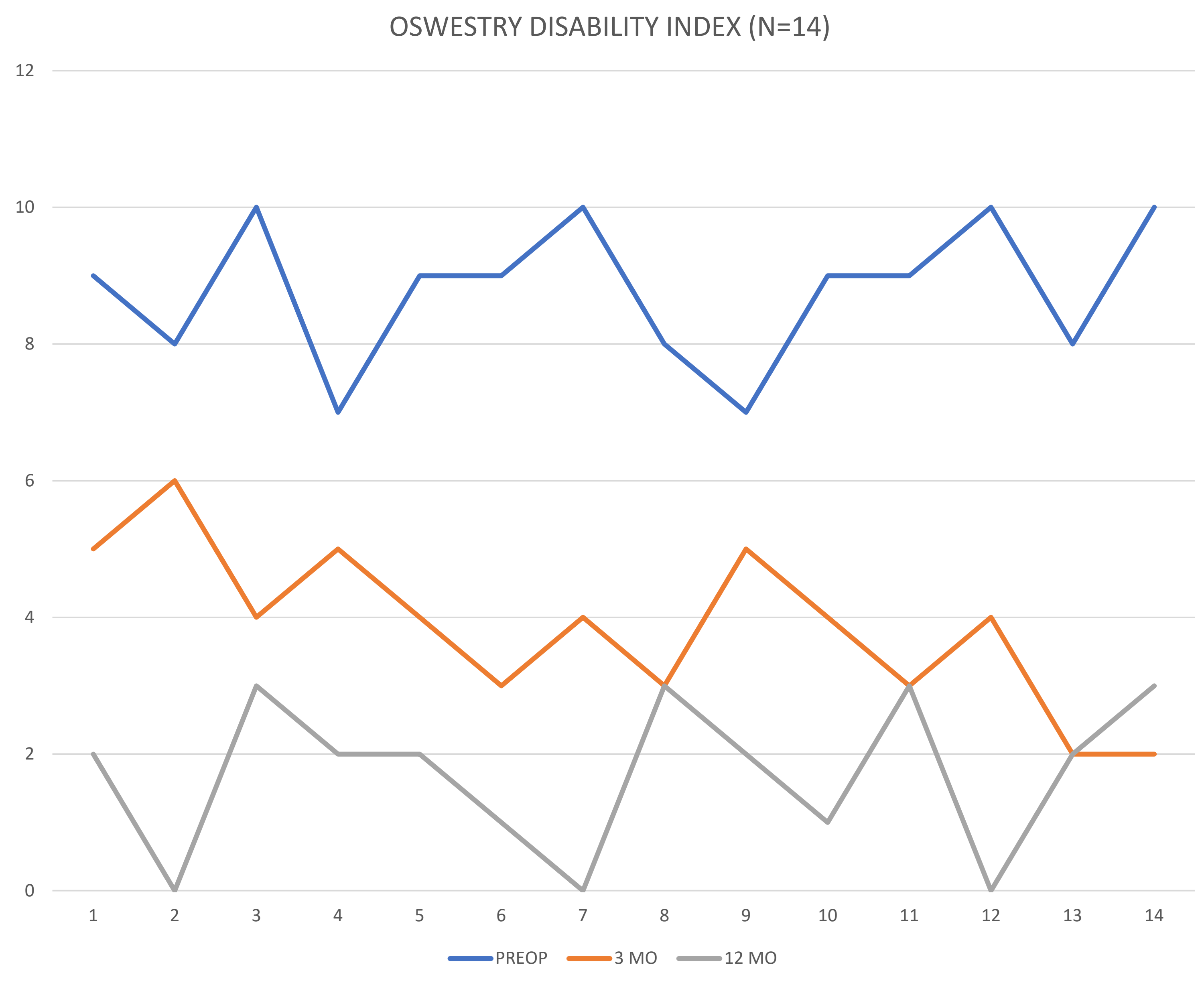
- Preliminary results showed 14 individuals with varying ages of presentation with 58.4 years on average (minimum 39, maximum 85)
- Most patients were females in 9 (64.2%) and 5 men (35.8%)
- Comorbidities were present in 60% of patients with Hypertension, Diabetes and Hypercholesterolemia in 4 of each of them (28.57%)
- Long standing claudication symptoms of 2 years approximately (minimum 1, maximum 17 years)
- Surgical complications were Zero, EBL aprox. 20cc



Postoperative outcomes:

Preop VAS (Visual Analogue Scale), was 8.5 with a postoperative VAS at 3 months of 6.7 and 2.5 at 12-month of VAS. (alpha <0.05)

Most patients had an adequate clinical improvement in clinical symptoms/pain and activities of daily living. (alpha <0.05)


OSWESTRY DISABILITY INDEX (N=14)
12
10
8
6
4
2
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Conclusions:

- Lumbar spinal stenosis is on the rise with a higher number of patients over the last few years.
- Multiple non fusion surgical procedures exist as valid alternative.
- Properly selected patients with lumbar stenosis can safely be treated with a minimally invasive placement of interspinous spacers along with decompression and posterolateral fusion.
- Spinal spacers placement (Coflex) afforded an adequate level of decompression associated with good to excellent outcomes.