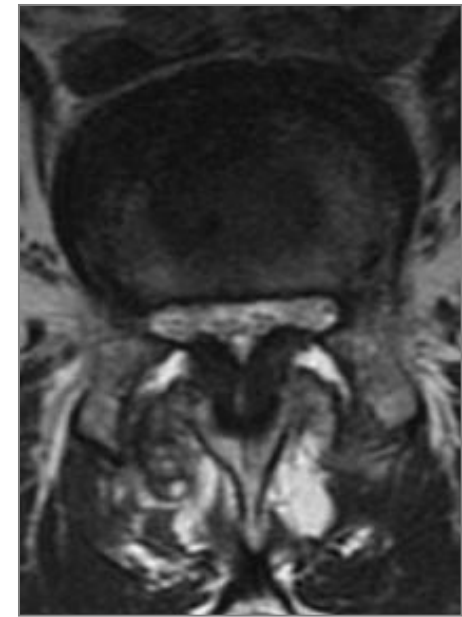
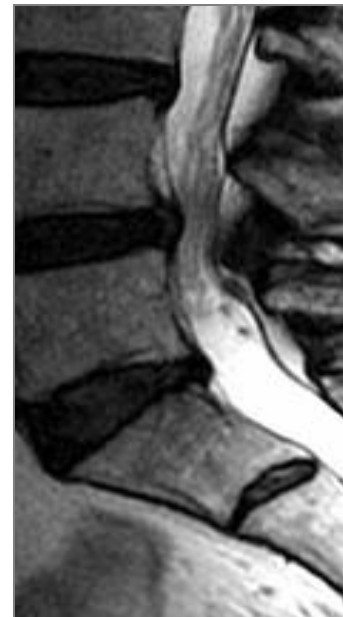
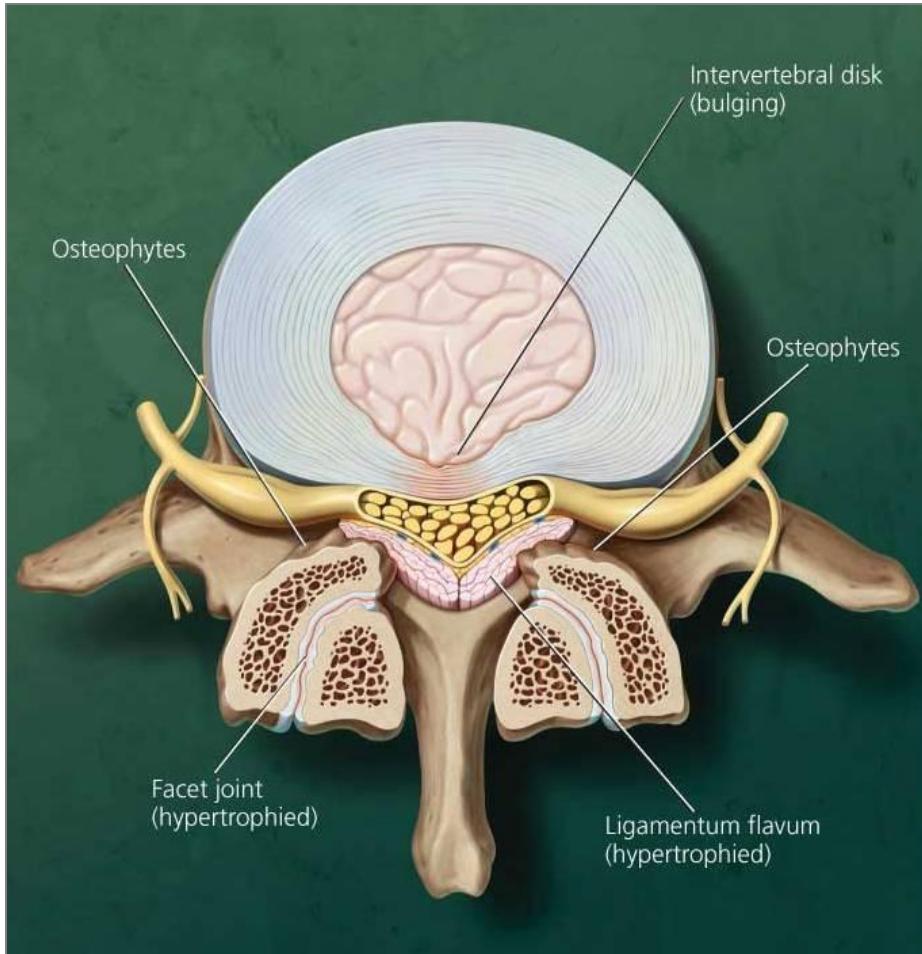


mild[®]

Percutaneous Decompression Laminotomy For LSS

Lee Griffith, MD
Axis Spine Care
Tyler, TX

Lumbar Spinal Stenosis (LSS)



LSS Neurogenic Claudication Progression Demands an Equally Progressive Decompression Option

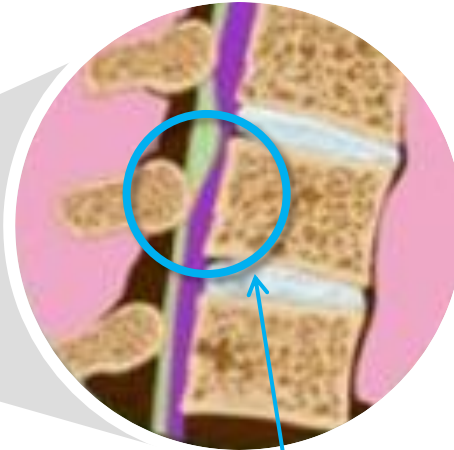
Many Patients

1.2M+ Diagnosed and in Active Treatment¹



Painful

Degenerative,
Age-Related



Narrowing of Lower
Spinal Canal

Exacerbated

By Activity

Degeneration
of Spinal
Canal Integrity

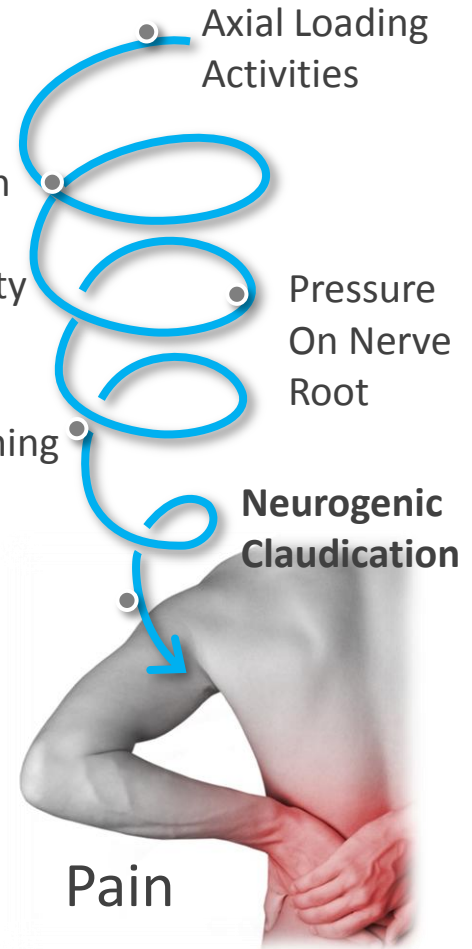
Poorly
Functioning
Venous
Return

Axial Loading
Activities

Pressure
On Nerve
Root

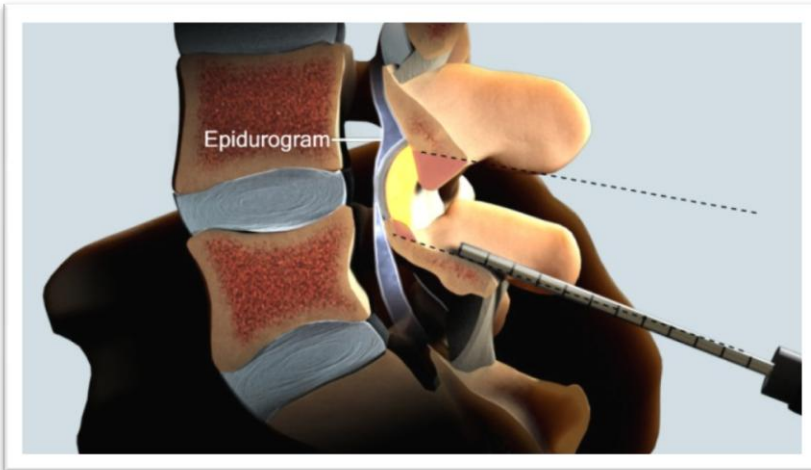
Neurogenic
Claudication

Pain



¹Longitudinal Medicare Database, Quorum Consulting.

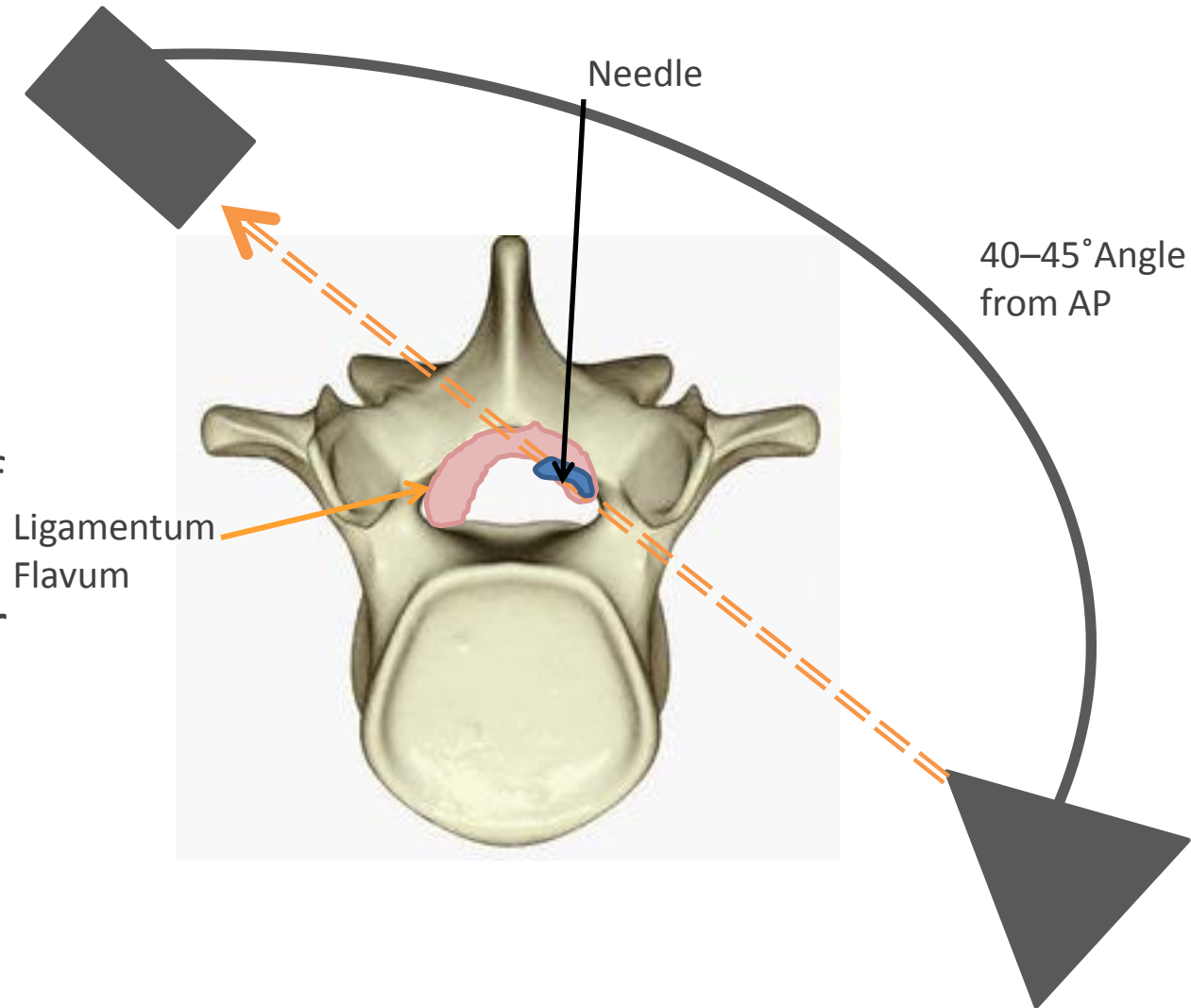
Posterior Approach and Image Guidance – Enhanced Safety and Trajectory Planning



Contralateral Oblique View

Needle Placement and Epidurogram

- Best imaging view
- Presents the thickest cross-section of the lamina
- Positions the layer of epidural contrast immediately anterior to the inner table of the lamina



mild with Guided Decompression

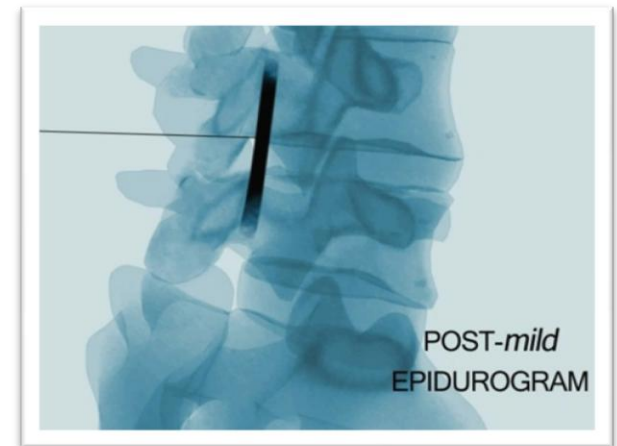


Debulk The Ligamentum Flavum

mild treats LSS by debulking the ligamentum flavum and portions of the lamina to restore space in the spinal canal.

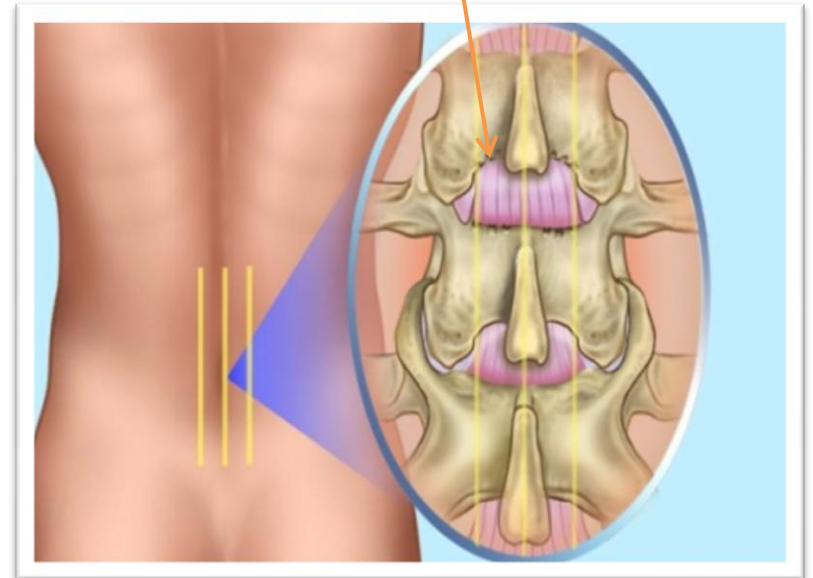
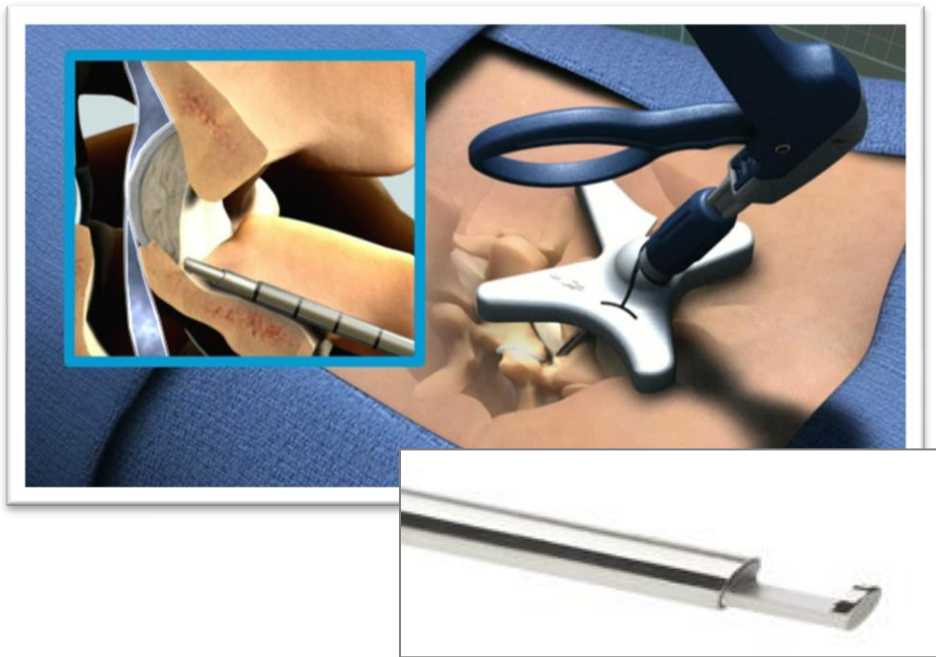
Restore Space In Spinal Canal

The restoration of space in the canal can be confirmed during the procedure utilizing the epidurogram.



Bone Sculpter Use

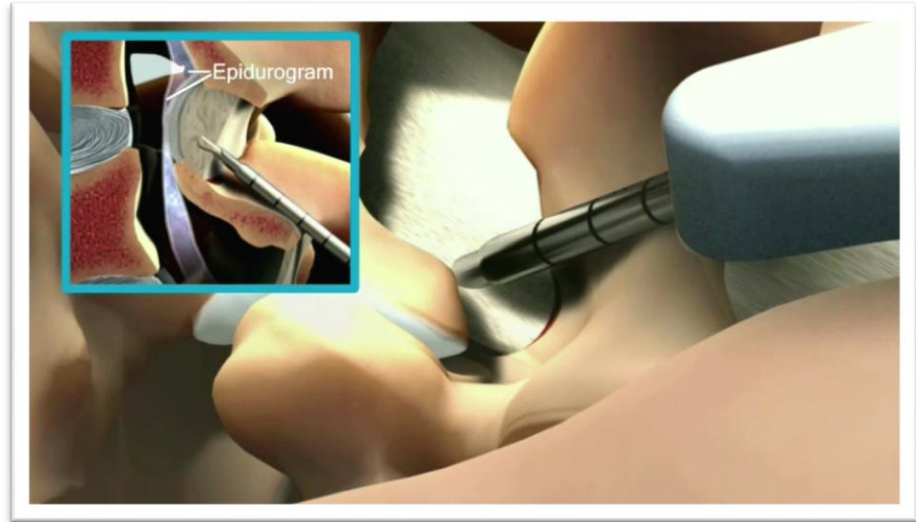
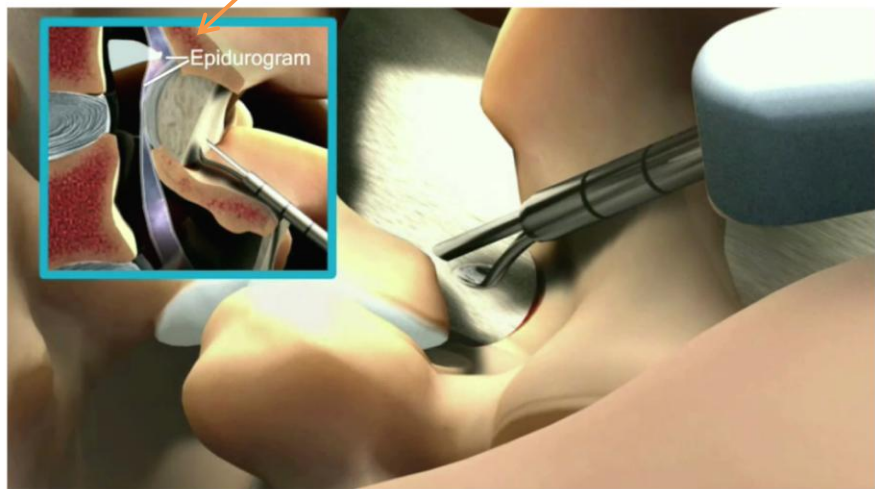
Small "bites" of lamina are taken



Bone Sculpter Tip

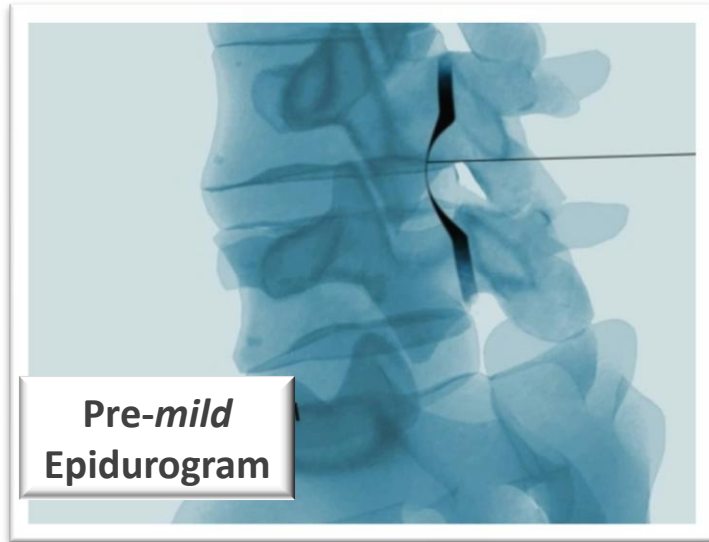
Tissue Sculpter Use

Epidurogram serves as a landmark, keeping space between dura and *mild* devices.



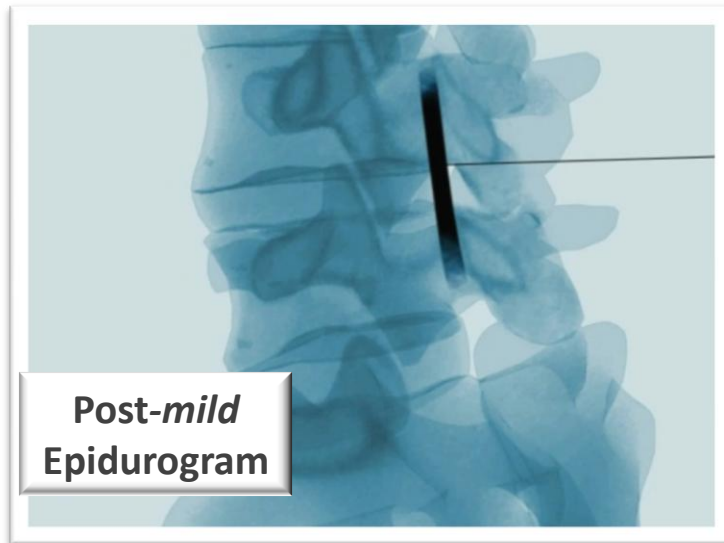
Tissue Sculpter cutter is on top and can only cut when the device is held at a 45°- 60° Angle.

mild Patient Pre- and Post-Procedure Epidurogram



Pre-Procedure Epidurogram

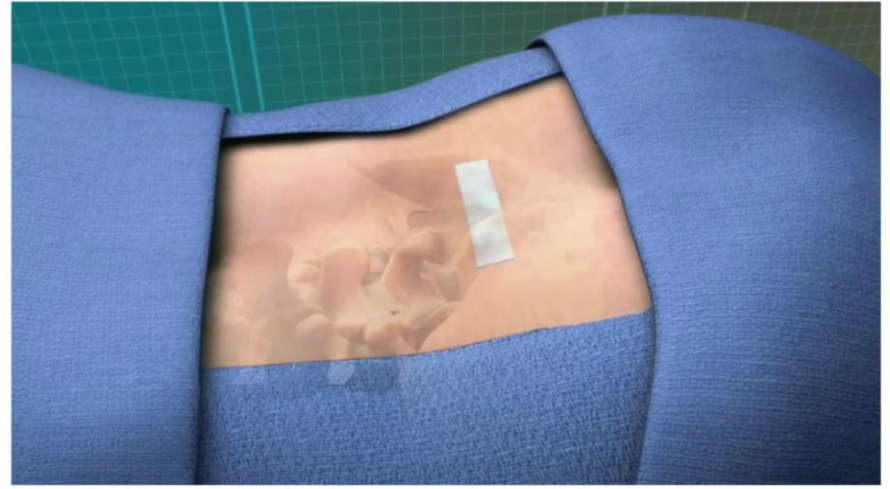
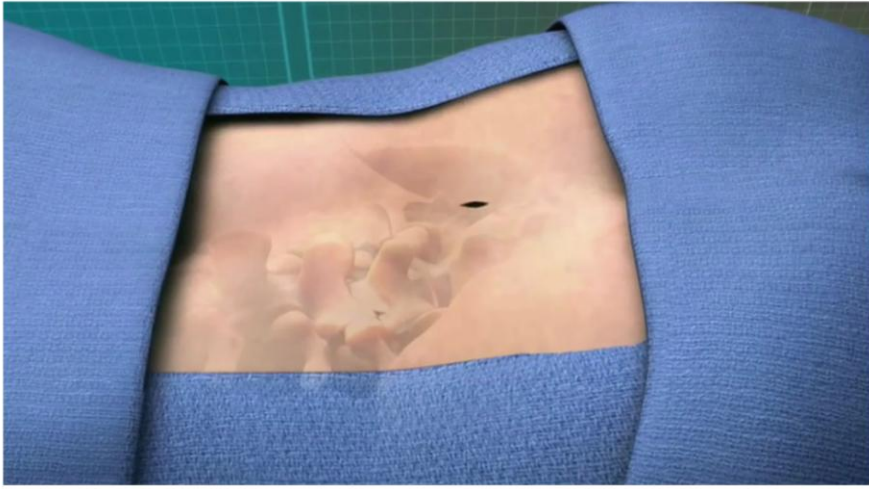
- Narrowed canal is target for the mild procedure.



Restore Space in the Lumbar Spine

- The restoration of space is confirmed during the procedure utilizing the epidurogram indicating procedure endpoint.

Removal of Devices and Sterile Adhesive Strip Closure



After adequate decompression, the Depth Guide, Portal Stabilizer and Portal are removed, thus leaving nothing behind. The portal site(s) can be closed using a sterile adhesive strip without the need for sutures.

mild Comprehensive Safety Profile

Clinical Study Data

Study	# <i>mild</i> Patients	Max. Time Post-tx	Serious Adverse Events (SAE) ¹
MiDAS Study Series	N = 140	Year 2	None
Lingreen/Grider Study	N = 42	Month 1	None
Deer Case Series	N = 46	Year 1	None
Deer/Kapural Safety	N = 90	Acute	None
Wong Case Series	N = 17	Year 1	None
Randomized Study (mild Cases)	N = 38	Month 3	None
Total	N = 373*	Acute to Year 2	None

¹Minor complications such as headache and tenderness at wound site were not collected. Serious Adverse Events include those such as blood loss requiring transfusion, nerve root damage, hematoma and dural tear.

²Represents over 800 procedures.

Key Complications in Decompression Procedures *mild* vs. Endoscopic and Open Surgery

	<i>mild</i> Study Patients	Castro-Menendez Study ¹	SPORT ² Surgery Patients
Number of Patients	373	50	394
Dural Tear	0%	10%	9.2%
Blood Loss Requiring Transfusion	0%	0%	14.3%
Hematoma	0%	2%	2%
Wound Infection	0%	4%	2%

¹Castro-Menendez et al., Microendoscopic Decompressive Laminotomy for LSS. Neurosurgery VOLUME 65 NUMBER 1 JULY 2009.

²Weinstein, et al., for the SPORT Investigators. Surgical versus Nonsurgical Therapy for LSS. NEJM 2008;358:794-810.

Key Considerations with Decompression Procedures: Simple and Complex Surgery vs. *mild*

Risks	¹ Simple Decompression Surgery	¹ Complex Fusion Surgery	² <i>mild</i> Studies
Major Medical Complications	2.1 %	5.2 %	None
Life-threatening Complications	2.3 %	5.6 %	None
Wound Complications	0.9 %	2.2 %	None
Re-hospitalization ≤ 30 Days	7.8 %	13.0 %	None
Length of Stay (Average Days)	2.7	4.6	< 1 ³
30-Day Mortality	0.3%	0.6%	None

¹Deyo, Richard, JAMA, April 7, 2010-Vol 303, No. 13.

²*mild* Year 1 data as presented at the 13th Annual Cleveland Clinic Pain Management Symposium, March 2011.

³No *mild* patients stayed more than 1 day.

Discussion of Safety Results

- Safety demonstrated in *mild* clinical studies.
 - No major medical complications including dural tear, blood loss requiring transfusion, nerve root damage, hematoma.
 - No life-threatening events and no deaths.
 - No serious wound complications or ‘< 30-day re-hospitalizations’.
 - Limited operating room time, rapid patient recovery and discharge.
- Overall, with no major device or procedure-related complications, *mild* safety profile is superior to that of both open and endoscopic decompression surgery as reported in recent published literature.

Safety Conclusions

- *mild* devices provide safe percutaneous access and safe minimal laminotomy and tissue resection.
- Dorsal approach and fluoroscopic visual guidance yield a consistently safe procedure .
- No serious device or procedure-related adverse events in nearly 400 *mild* clinical study patients.
- Safety profile is better than that of open and endoscopic surgery as reported in current literature.
- *mild* is a safe procedure early in the treatment algorithm for LSS patients with ligament hypertrophy who are suffering from neurogenic claudication.

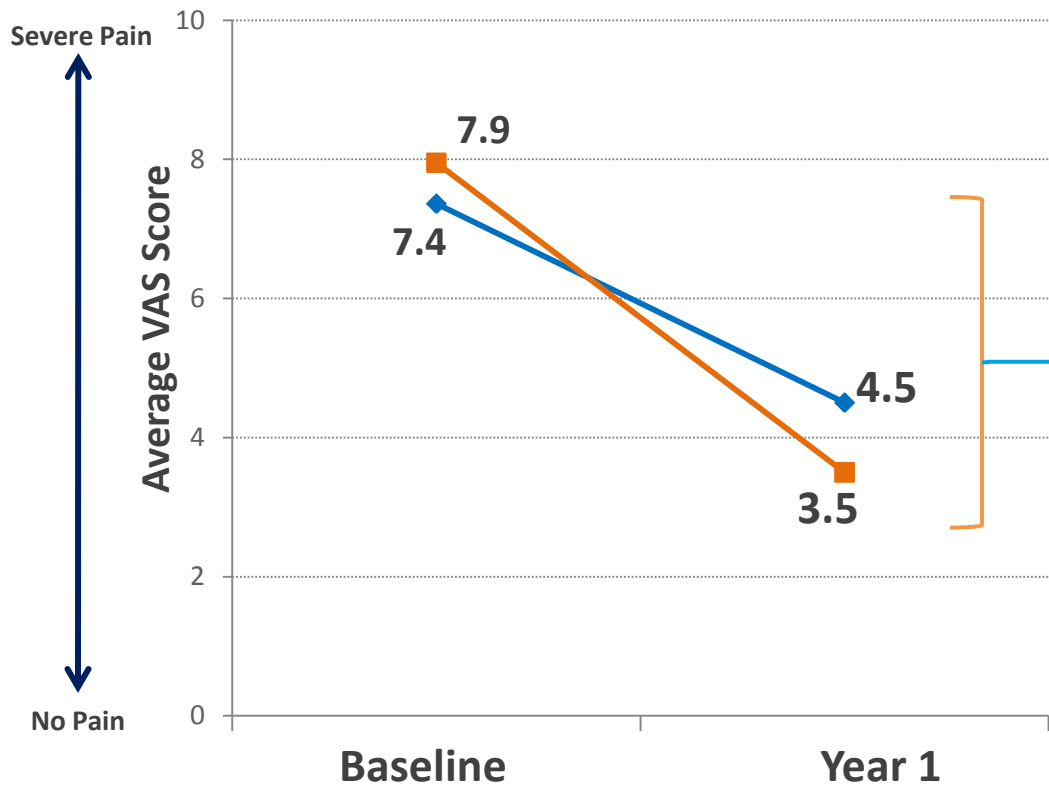
mild Long Term Outcomes*

**Published in Pain Practice, June 2011.*

Study Background for Year 1 Data

- Prospective
 - Year 1 follow-up
- Multi-center
 - 11 U.S. study centers; 58 patients
- Safety
 - Comprehensive solicited and unsolicited
- Patient-Reported Outcomes
 - VAS: 10-point Visual Analog Scale
 - ODI: Oswestry Disability Index
 - SF-12v2[®]: Health Survey
 - ZCQ: Zurich Claudication Questionnaire

Reduced Pain- Durable at Year One



◆ Year 1 All Patients 2.9 Point Reduction
■ Year 1 Responders 4.4 Point Reduction
Pain was decreased in 79% of all patients seen at Year 1.

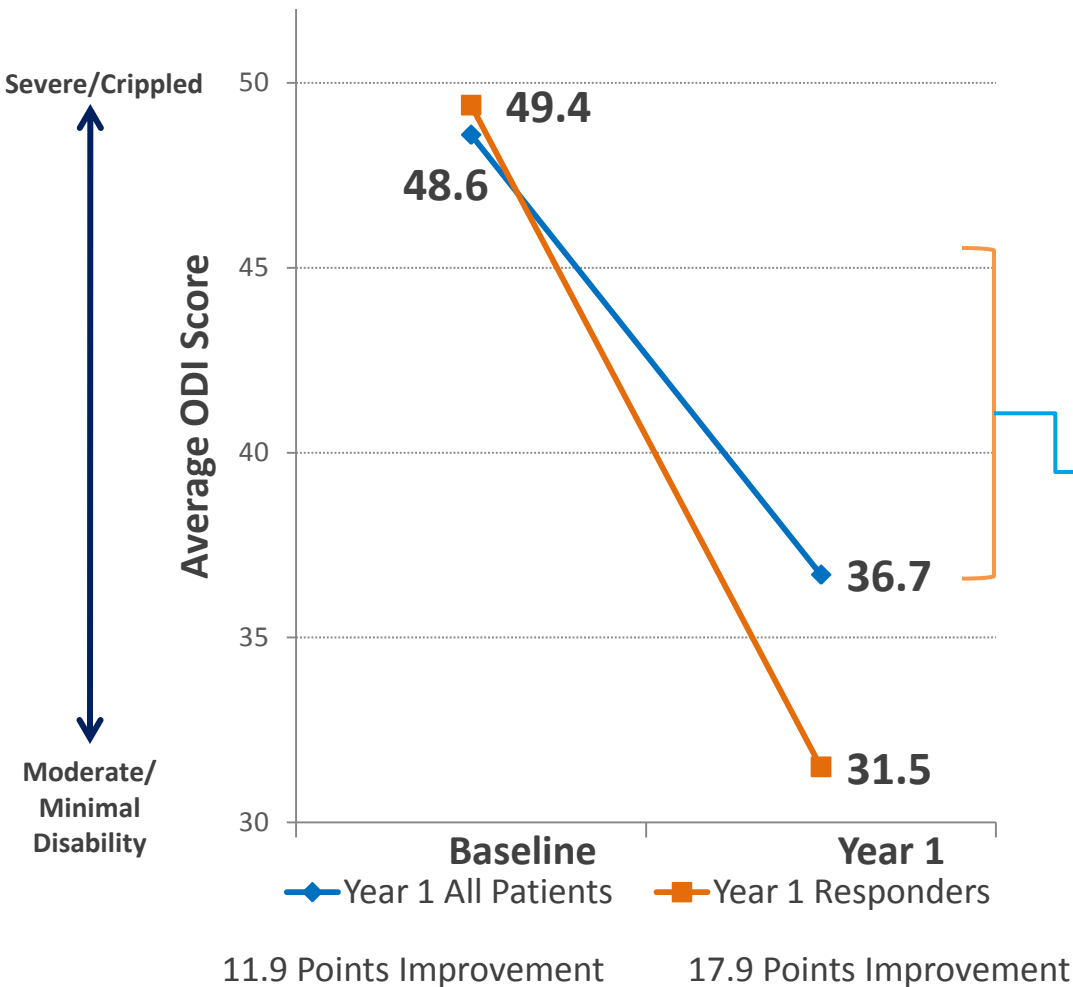
Mean Improvement at Year 1

Visual Analog Scale (VAS) 1-10

- Clinically Relevant
 - Mean Pain
 - 40% Reduced (All Pts.)
 - 56% Reduced (Responders)
- Statistically Significant
 - $p < 0.0001$, *t*-test

Responder : VAS improved 2 or more points.

Improved Function – Durable at Year 1



Mean Improvement at Year 1

Oswestry Disability Index (ODI)

- Clinically Relevant*
 - Mean mobility
 - 25% Improvement (All Pts.)
 - 36% Improvement (Responders)
- Statistically Significant
 - $p < 0.0001$, t -test

*Published opinions regarding the minimal clinically important difference (MCID) for ODI range from 4 to 18.4 points (Hägg O, Mirza SK, Roland M, Fairbank J.).

SF-12v2[®] Health Survey

SF-12v2 [®] Health Survey	Improvement 1 Year Post-Tx	Statistically Significant	Clinically Relevant
Physical Component Summary (PCS)	6.06	Yes	Yes
- Physical Functioning	5.63	Yes	Yes
- Role Physical	7.52	Yes	Yes
- Bodily Pain	11.83	Yes	Yes

- The primary focus of SF-12v2[®] was the Physical Component Score (PCS).
- PCS and the 3 scales most highly correlated with PCS were significantly improved (95% CI).
- PCS findings were clinically significant, 2–3x the minimal improvement difference (MID) of 2.

Zurich Claudication Questionnaire

	Improvement 1 Year Post-Tx	Statistically Significant	Clinically Relevant
Overall Symptom Severity	1.03	Yes	Yes
– Pain Sub-Domain	1.16	Yes	Yes
– Neuro-Ischemic Sub-Domain	0.81	Yes	Yes
Physical Function Domain	0.58	Yes	Yes

- Improvements in **all** ZCQ symptom and function domains were clinically relevant (improved > 0.5) and statistically significant (*t-test*, $p < 0.0001$) (**All Patients**) at Year 1.
- Mean ZCQ satisfaction scores **2.2 (All Patients)** and **1.9 (Responders)** at 95% CI ± 0.26 where 1= 'very satisfied'; 4= 'very dissatisfied'. Both were clinically relevant at < 2.5.

Long Term Outcomes Conclusions

1 Year After *mild* Percutaneous Decompression

- Pain intensity (VAS): Statistically and clinically reduced
- Functional mobility (ODI/ZCQ): Statistically and clinically improved
- Life quality physical components (SF-12v2[®]): Statistically improved and clinically relevant
- Durability: Sustained positive outcomes at One Year post-*mild*

Historical Decompression Options

HIGH
Complication Rates &
HIGH
Biomechanical Changes

Open or Endoscopic Procedures:

- Laminotomy/Laminectomy
- Interspinous Spacers
- Fusion

mild Decompression Option

Extremely LOW
Complication Rates &
Extremely LOW
Biomechanical Changes

Percutaneous Procedure:

- Minimal bone and tissue removed
- General anesthesia not required
- No implants

Differential Diagnosis (DDx) Relevance

- Radicular pain and neurogenic claudication can be found in *mild* candidates.
- Neurogenic claudication occurs in 94% (Hall) to 99% (Cavusoglu) of LSS patients.^{1,2}
- ESIs work short-term with radicular pain.
- ESIs do not help with neurogenic claudication.
- *mild* effectively treats LSS patients' neurogenic claudication.

¹Hall S, Bartleson JD, Onofrio BM, Baker HL, Okazaki H, O'Duffy JD. Lumbar spinal stenosis. Clinical features, diagnostic procedures, and results of surgical treatment in 68 patients. *Ann Intern Med* 1985;103(2):271-5.

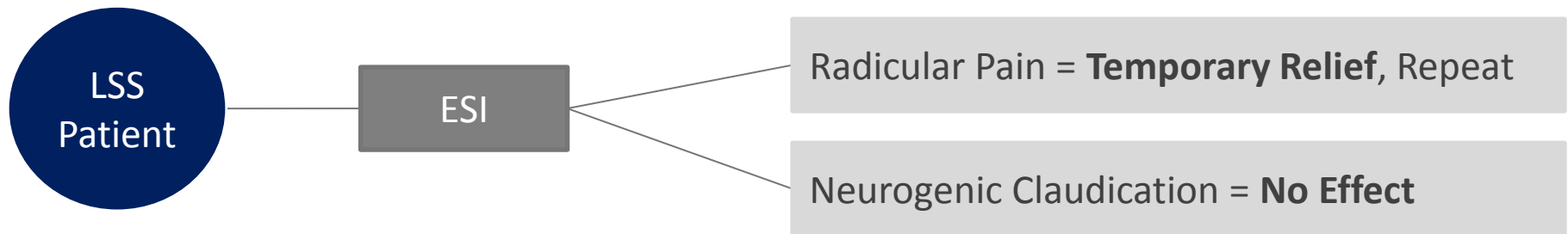
²Çavuşoğlu H, Kaya RA, Türkmenoğlu ON, Tuncer C, Çolak I, Aydın Y. Midterm outcome after unilateral approach for bilateral decompression of lumbar spinal stenosis: 5-year prospective study. *Eur Spine J* 2007;16(12):2133-42.

LSS Treatment Algorithm

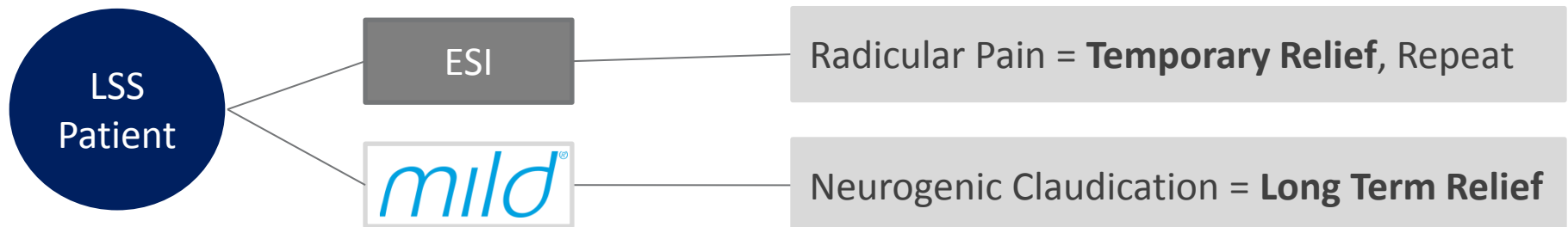
Differential Diagnosis DDx Makes a Difference

Differentiating symptoms of radicular pain and neurogenic claudication now matters.

Historical Treatment Algorithm



Current Treatment Algorithm



LSS Treatment Algorithm

Patients Exhibiting Neurogenic Claudication (NC) Symptoms

Focus on Symptoms

- LSS Symptoms
- Evidence of NC Symptoms
- **Note the DDx between Radicular Pain, NC, Vascular Claudication**

Validate DDx with MRI

- Map pain pathways
- Assess posterior pressure vs. other causes
- **Validate adequate tissue for posterior debulking HLF**

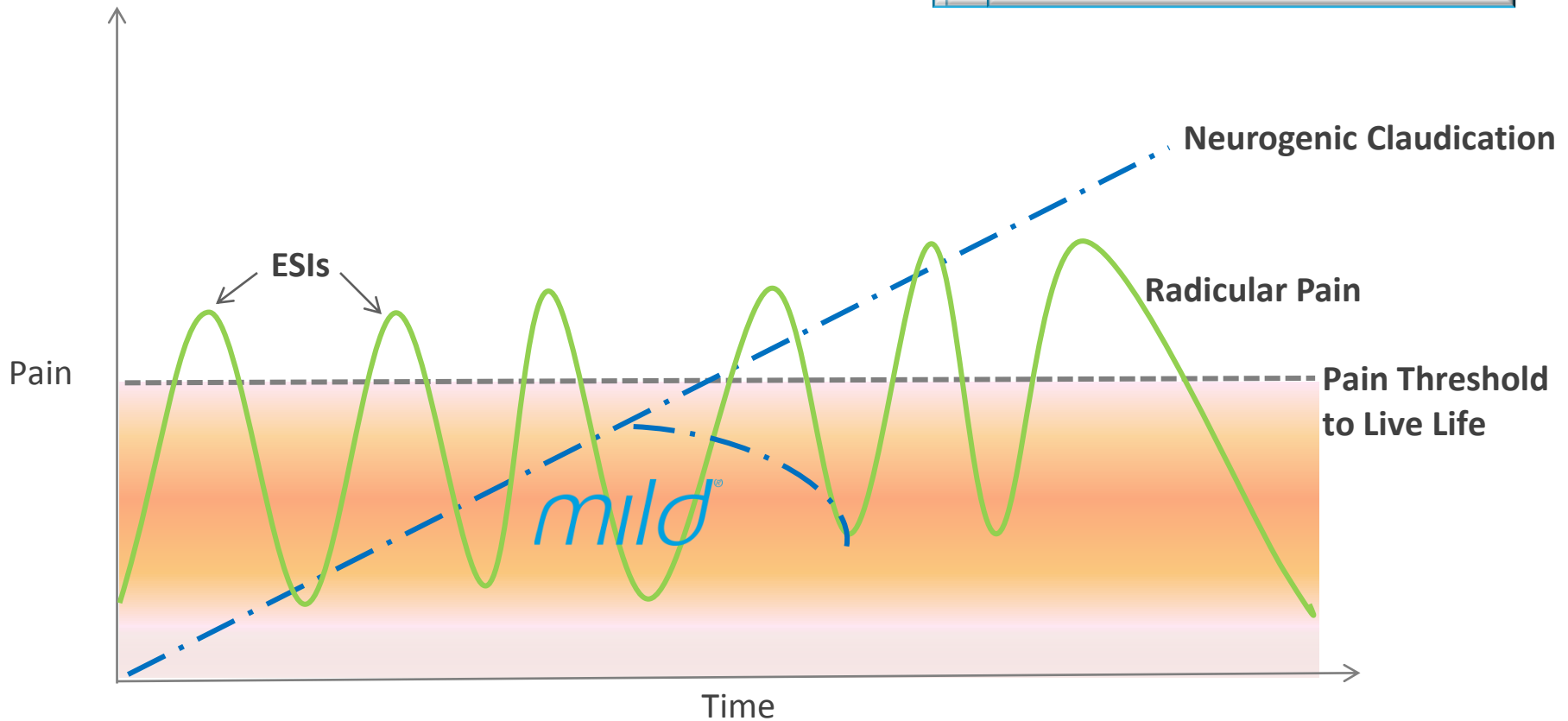
Assess Treatment Options

- Tx RP
- Tx NC pain
- Tx VC pain
- **Choose method(s) of Tx**

Managing LSS Patients' Pain

LSS/Radicular Pain can be treated with gevonesis to keep the patient below pain threshold.

Neurogenic Claudication pain increases over time and is unaffected by ESIs.



Differentiating Pain: Neurogenic Claudication or Radicular?

Ask Your Patient:	Neurogenic Claudication	Radicular Pain
Pain when walking erect?	Yes – relieved by flexion	Yes – flexion has no effect
Pain when standing erect?	Yes – relieved by flexion	Yes – flexion has no effect
Pain when seated?	No	Yes – increased pain
Pain when bike riding?	None or minimal	Yes
Bilateral pain?	Yes – most often	No – primarily unilateral
Constant pain?	No – mostly with activities	Yes
Does sharp pain discourage standing up?	No	Yes

Neurogenic claudication complaints are reduced by forward flexion, slowed gait, leaning onto objects (e.g., over a shopping cart) and limiting distance of ambulation. Downhill walking is worse than uphill.

Differentiating Neurogenic and Vascular Claudication

Activity/Finding	Neurogenic Claudication – Symptoms?	Vascular Claudication – Symptoms?
Walking	Yes – relieved by flexion	Yes – relieved by stopping
Standing erect	Yes – relieved by flexion	No – activity driven
Biking in flexed position	No	Yes – relieved by stopping
Peripheral pulse diminished	No	Yes

Note: LSS patients compensate for symptoms by flexing forward, slowing their gait, leaning onto objects (e.g., over a shopping cart) and limiting distance of ambulation. These compensatory measures, particularly in elderly osteoporotic females, are known to promote disease progression and vertebral fracture. Walking is worse in neurogenic claudication going downhill and worse in vascular claudication going uphill.

Conclusions

- *mild* provides a safe solution for the treatment of LSS.
- *mild* is a durable therapy that treats neurogenic claudication.
- Excellent statistically significant and clinically relevant patient outcomes have been demonstrated in prospective randomized and non-randomized clinical studies with the *mild* decompression procedure.
- Differential diagnosis enables appropriate treatment choice in the LSS treatment algorithm.

mild Clinical Studies

Study	Design	# Patients	Follow-up Post Tx
Initial IRB Series	Prospective, single -center	10	≤ 6 months
MiDAS Phase I	Prospective, multi-center	78	≤ 2 Years
MiDAS Phase II	Prospective, multi-center	55	≤ 2 Years
Deer/Kapural	Retrospective, multi-center	90	Acute post-tx
MiDAS ECO	Prospective, randomized, multi-center	200	≤ 2 Years
Lingreen, Grider	Retrospective, single-center	42	≤ 1 month
Deer Series	Prospective, single-center	46	≤ 2 years
Chopko High Risk Pt.	Prospective, single-center	14	≤ 6 months
Mekhail/Cleveland Clinic	Prospective, single-center	20	≤ 6 months
Brown	Prospective, randomized, double-blind, multi-center	38	≤ 3 months
TOTAL		593	

Multi-Center Comparative Outcomes Study

Currently Enrolling at Axis Spine Care

- Prospective, randomized
 - *mild* procedure
 - Epidural Steroid Injection (ESI)
- LSS patients exhibiting neurogenic claudication
- Ligamentum flavum hypertrophy
- Outcomes measures
 - VAS, ODI, SF-12v2[®], ZCQ
- Planned statistical analysis Week 16
- Comprehensive safety analysis

Summary

***mild* has science-based track record of excellence in:**

- Safety – No serious device or procedure-related adverse events reported in nearly 400 *mild* clinical study patients
- Efficacy – Pain and functional mobility statistically and clinically improved
- Life Quality – Physical components statistically and clinically improved
- Durability – Sustained positive outcomes one year after procedure

Conclusions

- Is *mild* SAFE? **YES**
 - Safety is supported by evidence-based research
- Does *mild* work? **YES**
 - Efficacy is demonstrated in pain reduction and increased mobility as reported in peer-reviewed publications and well-designed clinical trials
- Do *mild* results last? **YES**
 - Proven to last up to One Year in clinical studies
- For failed conservative therapy patients, *mild* percutaneous decompression is the only durable intervention that has proven lower associated complications and comparable efficacy compared to open or endoscopic decompression, establishing *mild* as standard of care before open or endoscopic LSS surgery