Disclosure

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- Zimmer/Biomet/LDR: Consultant, Royalties
- Ortho Kinematics: Consultant
- Paradigm Spine: Consultant
- Titan Spine: Consultant

The Opportunity in Spinal Diseases

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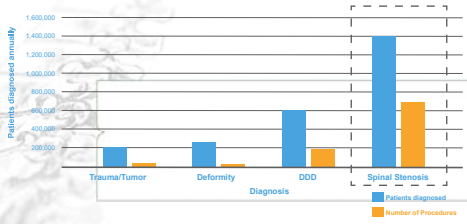
- Lumbar spinal stenosis is the largest diagnosed and treated segment in spine



Data above compiled from the following sources: MedTech360 U.S. Market For Spinal Implants, 2013, Millennium Research Group, Inc., 2013.
Nick Shamie, MD, orthopedic spine surgeon at UCLA Medical Center of Los Angeles, and a spokesman for the American Academy of Orthopedic Surgeons, cited in: WSJ (Business), Feb 15, 2011.

What is *coflex*® Interlaminar Stabilization®?

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- The *coflex*® device is a non-fusion interlaminar stabilization device that is inserted post direct surgical decompression for patients suffering from lumbar spinal stenosis

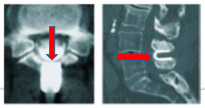
coflex® Interlaminar Stabilization®*

- Preserves motion
- Addresses leg and back pain
- Maintains foraminal height
- Preserves normal kinematics at operative and adjacent levels

Allows for flexion

Allows for extension through decompression

coflex® loads on interlaminar bone NOT the spinous process



*Claims based on US FDA PMA P110008. October 2012.

When to Think About Utilizing *coflex*®

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1 Preserve Your Decompressions WITHOUT FUSION

The coflex® device maintains foraminal height, and is proven sustainable and durable out to 5 years*

- Decompression alone could compromise the structural integrity of the segment, and potentially cause iatrogenic instability
- The natural progression of the degenerative cascade could cause the segment to reobstruct, leading to reemergence of LSS symptoms, and further surgery down the line

2 Address Both LEG AND BACK PAIN With Motion Preservation

The coflex® device allows you to achieve the same decompression value as fusion* - achieve a comprehensive decompression to address the leg pain and stabilize with non-fusion to address the back pain

- Evidence shows decompression alone does not address back pain[1]
- Patients with mechanical back pain benefit with stabilization[2]

3 Keep Stable Spondylolisthesis Patients STABLE

The coflex® device is a proven, non-fusion treatment option that fills the gap between decompression alone and decompression with fusion for patients with lumbar spinal stenosis and no instability

- Decompression alone in stable spondylolisthesis stenosis patients may advance the slip and lead to instability/failure[1]
- These patients with a stable Grade I spondylolisthesis (<3mm mendation) don't necessarily require the permanence of a fusion procedure

1 Ghermezcioli et al. - The Influence of Preoperative Back Pain on the Outcome of Lumbar Spinal Stenosis Surgery. The Spine Journal Volume 16, Number 11, pp 1398-1406

2 Hermantin et al. - Degenerative Lumbar Spondylolisthesis with Spinal Stenosis: A Prospective Study Comparing Decompression With Decompression and Intertransverse Process Arthrodesis. The Journal of Bone and Joint Surgery - Bone Joint Surg Am. 1995 Jul; 77(7): 602-603. http://ibs.bjo.org/

*Claims based on US FDA PMA P110008. October 2012.

Industry coflex® Study

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- Decompression and coflex® vs. decompression and fusion
  - Multicenter prospective randomized (2:1) trial at 21 US sites
  - coflex® N=215 and fusion N=107
- Clinical outcomes measures collected at baseline, 6 weeks, 3 months, 6 months, 12 months, 18 months and 24 months postoperatively
  - Oswestry Disability Index
  - 12-Item Short Form
  - Zurich Claudication Questionnaire
  - Visual analog scale

Davis RJ, Errico TJ, Bae H, Auerbach JD. Decompression and coflex Interlaminar Stabilization Compared With Decompression and Instrumented Spinal Fusion for Spinal Stenosis and Low-Grade Degenerative Spondylolisthesis. Spine. 2013;38(16):1526-1539.

Inclusion and Exclusion Criteria

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Davis RJ, Errico TJ, Bae H, Auerbach JD. Decompression and coflex Interlaminar Stabilization Compared With Decompression and Instrumented Spinal Fusion for Spinal Stenosis and Low-Grade Degenerative Spondylolisthesis. *Spine*. 2013;38(16):1529-1539.

Operative Details

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TABLE 3. Summary of Operative Details Continuous Variables Coflex and Fusion Control Randomized Cohorts

	Coflex			Control				Effect
1- and 2-Level Procedures	N	Mean	SD	N	Mean	SD	*P**	Size
Hospital LOS (d)	215	1.90	1.08	107	3.19	1.61	0.000	−1.01
Estimated blood loss (mL)	215	109.7	120.0	105	348.6	281.8	0.000	−1.27
Operative time (min)	214	98.0	41.1	107	153.2	55.5	0.000	−1.19
1-level procedures	N	Mean	SD	N	Mean	SD		
Hospital LOS (d)	138	1.86	1.14	68	2.87	1.45	0.000	−0.81
Estimated blood loss (mL)	138	98.0	96.3	66	290.9	207.7	0.000	−1.36
Operative time (min)	137	90.8	44.0	68	142.0	56.0	0.000	−1.06
2-level procedures	N	Mean	SD	N	Mean	SD		
Hospital LOS (d)	77	1.97	0.95	39	3.74	1.74	0.000	−1.40
Estimated blood loss (mL)	77	130.5	152.1	39	446.2	358.4	0.000	−1.31
Operative time (min)	77	110.9	31.8	39	172.7	49.3	0.000	−1.60

Davis RJ, Errico TJ, Bae H, Auerbach JD. Decompression and coflex Interlaminar Stabilization Compared With Decompression and Instrumented Spinal Fusion for Spinal Stenosis and Low-Grade Degenerative Spondylolisthesis. *Spine*. 2013;38(16):1529-1539.

Outcomes

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TABLE 4. Coflex and Fusion Control Randomized Cohorts Descriptive Statistics for ODI Score

	Coflex Total Score				Fusion Control Total Score				*t* Test	Effect
	N	Mean	SD	Median	N	Mean	SD	Median	*P**	Size†
Preoperative	215	60.8	11.8	60.0	107	60.7	11.5	60.0	0.946	0.01
Month 24	162	22.0	18.6	20.0	86	26.7	21.3	23.0	0.075	−0.24

TABLE 5. Coflex and Fusion Control Randomized Cohorts Descriptive Statistics for the SF-12 Physical and Mental Health Component Scores

	Coflex Physical Component Summary				Fusion Controls Physical Component Summary				*t* Test	Effect
	N	Mean	SD	Median	N	Mean	SD	Median	*P**	Size†
Preoperative	195	28.1	6.6	27.6	95	28.2	6.0	27.4	0.939	−0.02
Month 24	148	43.8	10.6	43.9	78	40.7	12.2	40.5	0.050	0.28
	Coflex Mental Health Summary				Fusion Controls Mental Health Summary				*t* test	Effect
	N	Mean	SD	Median	N	Mean	SD	Median	*P**	Size†
Preoperative	195	45.5	13.0	45.9	95	44.9	12.2	43.6	0.695	0.05
Month 24	148	53.3	10.2	57.8	78	51.2	11.3	56.8	0.150	0.20

Davis RJ, Errico TJ, Bae H, Auerbach JD. Decompression and coflex Interlaminar Stabilization Compared With Decompression and Instrumented Spinal Fusion for Spinal Stenosis and Low-Grade Degenerative Spondylolisthesis. *Spine*. 2013;38(16):1529-1539.

Outcomes Continued

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TABLE 6. Coflex and Fusion Control Randomized Cohorts Descriptive Statistics for Back and Max (Right, Left) Leg Pain VAS

	Coflex Back Pain VAS				Controls Back Pain VAS				*t* Test	Effect
	N	Mean	SD	Median	N	Mean	SD	Median	*P**	Size†
Preoperative	215	79.5	15.0	82.0	106	79.2	13.5	81.0	0.843	0.02
Month 24	162	23.6	26.2	12.0	86	27.0	29.3	13.0	0.345	−0.13

	Coflex Leg Pain (Worse Leg)				Controls Leg Pain (Worse Leg)				*t* Test	Effect
	N	Mean	SD	Median	N	Mean	SD	Median	*P**	Size†
Preoperative	215	76.0	20.4	80.0	106	78.3	18.4	82.5	0.307	−0.12
Month 24	162	20.6	27.4	7.0	86	24.1	30.6	8.0	0.364	−0.12

Davis RJ, Errico TJ, Bae H, Auerbach JD. Decompression and coflex Interlaminar Stabilization Compared With Decompression and Instrumented Spinal Fusion for Spinal Stenosis and Low-Grade Degenerative Spondylolisthesis. *Spine*. 2013;38(18):1529-1539.

Outcomes Continued

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TABLE 7. Coflex and Fusion Control Randomized Cohorts Descriptive Statistics for the Zurich Claudication Questionnaire

	Coflex Symptom Severity				Fusion Control Symptom Severity				*t* Test	Effect
	N	Mean	SD	Median	N	Mean	SD	Median	*P**	Size†
Preoperative	214	3.56	0.63	3.57	107	3.58	0.57	3.43	0.680	−0.05
Month 24	161	1.98	0.75	1.86	86	2.23	0.89	2.29	0.023	−0.30

	Coflex Physical Function				Fusion Control Physical Function				*t* Test	Effect
	N	Mean	SD	Median	N	Mean	SD	Median	*P**	Size†
Preoperative	214	2.75	0.45	2.80	107	2.82	0.44	2.80	0.188	−0.16
Month 24	162	1.56	0.63	1.40	86	1.80	0.77	1.60	0.008	−0.35

	Coflex Satisfaction Score‡				Controls Satisfaction Score				*t* Test	Effect
	N	Mean	SD	Median	N	Mean	SD	Median	*P**	Size†
Month 24	162	1.42	0.55	1.17	86	1.65	0.77	1.33	0.006	−0.36

Davis RJ, Errico TJ, Bae H, Auerbach JD. Decompression and coflex Interlaminar Stabilization Compared With Decompression and Instrumented Spinal Fusion for Spinal Stenosis and Low-Grade Degenerative Spondylolisthesis. *Spine*. 2013;38(18):1529-1539.

Study Conclusions

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Key Points

- Coflex interlaminar stabilization led to shorter surgical times, reduced hospital LOS, and less blood loss compared with instrumented spinal fusion for lumbar spinal stenosis with up to grade 1 degenerative spondylolisthesis.
- At 24 months, significant improvements were seen in the Coflex cohort compared with fusion in all ZCQ subdomains, SF-12 Physical Component, and a trend toward significance was seen in ODI.
- Fusions exhibited significantly increased angulation at the superior adjacent level, and a trend toward significant increase in superior level translation, at 2 years, compared with Coflex interlaminar stabilization.
- Based on the strict FDA criteria for overall success, Coflex succeeded in 66.2% of patients, compared with 57.7% of fusions at 2 years, demonstrating noninferiority.

Davis RJ, Errico TJ, Bae H, Auerbach JD. Decompression and coflex Interlaminar Stabilization Compared With Decompression and Instrumented Spinal Fusion for Spinal Stenosis and Low-Grade Degenerative Spondylolisthesis. *Spine*. 2013;38(18):1529-1539.

Patients are Getting Back to Their Lives

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In an FDA study, *coflex*® patients experienced:

- Relief of leg pain at 6 weeks*
- Lasting relief of leg pain at 5 years^
- Relief of back pain at 6 weeks*
- Lasting relief of back pain at 5 years^
- Clinical improvement in pain and function at 3 months*
- Lasting clinical improvement in pain and function at 5 years^

"With coflex®, I have my life back on track!"
*-Andrea, **coflex**® patient*

"As soon as the anesthesia wore off, I was able to walk!"
*-Ed, **coflex**® patient*

"Since the coflex surgery, my life is completely different."
*-Michael, **coflex**® patient*

*Claims based on US FDA PMA P110008. October 2012.

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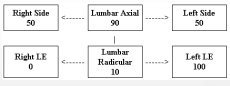
Case Study 1

History

- 64-year-old male with a BMI of 35.95 presenting for evaluation of the lumbar spine
  - Patient complains of low back pain that occasionally radiates to the left posterior thigh and calf
    - Symptoms have persisted for 6 months and are progressively worsening
  - Patient fell out of his truck about 3 months ago, which exacerbated his symptoms
    - Conservative treatments yield no relief
- Symptoms:



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Physical Examination

Spinal Exam

Scar:	Location: Lumbar. Size: 2.50cm. Right. Posterior.
Scar:	No Scar.
Deep Tendon Reflexes:	Patellar Left: 2+. Patellar Right: 2+. Achilles Left: 2+. Achilles Right: 2+.
Pedal Pulses:	Dorsalis Pedis: 2+. Posterior Tibial: 2+.
LE Edema:	No LE Edema.
UE Edema:	No UE Edema.
Atrophy:	No Atrophy.
Heel Walk:	Left: Normal. Right: Normal.
Toe Walk:	Left: Normal. Right: Normal.
Gait:	Normal. Assistance Devices: Cane.

Spinal Exam - Sensory / Palpation

Dermatomes	
Left - Lumbar:	Normal.
Right - Lumbar:	Normal.

Spinal Tenderness

Lumbar:	L1/2: No Pain. L2/3: Bilateral. L3/4: Bilateral. L4/5: No Pain. L5/S1: No Pain. SIJ: No Pain.

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Physical Examination Continued

Spinal Exam - Range of Motion

Lumbar/Thoracic:	Flexion painful. Flexion limited. Hyperextension painful. Hyperextension limited. Lateral Flexion painful. Bilateral. Lateral Flexion limited. Bilateral. Rotation painful. Bilateral. Rotation limited. Bilateral.
Hip:	Flexion normal. Hyperextension normal. Abduction normal. Adduction normal.
Knee:	Flexion normal. Extension normal.
Ankle:	Plantar Flexion normal. Dorsiflexion normal.

Spinal Exam - Provocative Tests

Cervical Tests:	
Lumbar Tests:	Clonus Test - Left: Negative. Right: Negative. Hoffman's Test - Left: Negative. Right: Negative. Babinski's Test - Left: Negative. Right: Negative. Lasegue's Test - Left: Negative. Right: Negative. Straight Leg Raise (Seated) - Left: Negative. Right: Negative.
Both:	Romberg Test - Negative.

Spinal Exam - Muscle Strength

Lumbar:	Hip Abduction normal. Hip Adduction normal. Knee Flexion normal. Knee Extension normal. Gastrocnemius normal. Tibialis Anterior normal. Peroneals normal. Extensor Hallucis Longus normal.

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Imaging Dictation

- L1-2: Unremarkable.
- L2-3: Mild to moderate facet arthrosis with minimal ligamentum flavum hypertrophy.
- L3-4: Mild to moderate narrowing spinal canal and lateral recesses with disc and facet changes approximating the transiting L4 nerve roots.
- L4-5: Clumping of the nerve roots. Disc bulge and protrusion posteriorly. Severe narrowing of the bilateral recesses compressing the transiting L5 nerve roots bilaterally.
- L5-S1: Unremarkable.

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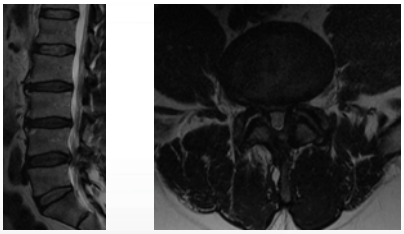
Preoperative Imaging



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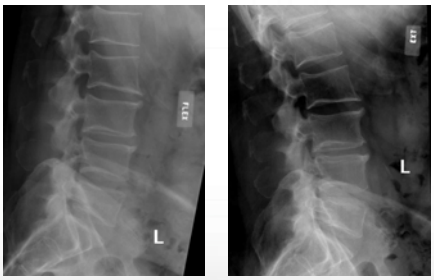
Preoperative Imaging Continued



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Surgery

- Lumbar laminotomies with bilateral foraminotomies, L4-5
- L4-5 posterior spinal instrumentation via coflex®
- The length of surgery was 124 minutes
- Estimated blood loss was 380 mL

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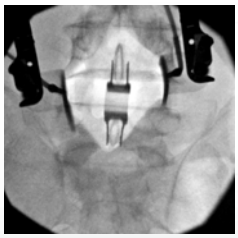
Intraoperative Imaging



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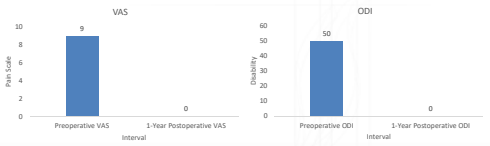
Outcome



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Case Study 2

History

- 82-year-old female with a BMI of 25.84 presenting for evaluation of the lumbar spine due to low back pain
  - Patient complains that the low back pain radiates to the right buttock and down the right posterior thigh
    - Occasional numbness and tingling in her thighs
  - Endured back pain for over 20 years
    - Patient denies any particular accident/injury, but states she has a history of falls years ago
    - Conservative treatments yield no relief
- Symptoms:

Right Side 100	<------ Lumbar Axial 20 ------>	Left Side 0
Right LE 100	<------ Lumbar Radicular 80 ------>	Left LE 0

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Physical Examination

Spinal Exam

Scar:	No Scar
Scar:	No Scar
Deep Tendon Reflexes:	Patellar Left: 2+. Patellar Right: 2+. Achilles Left: 2+. Achilles Right: 2+.
Pedal Pulses:	Dorsalis Pedis: 1+. Posterior Tibial: 1+.
LE Edema:	No LE Edema
UE Edema:	No UE Edema
Atrophy:	No Atrophy
Heel Walk:	Left: Normal. Right: Normal.
Toe Walk:	Left: Normal. Right: Normal.
Gait:	Normal.

Spinal Exam - Sensory / Palpation

Dermatomes	
Left - Lumbar:	Normal.
Right - Lumbar:	Normal.
Spinal Tenderness	
Lumbar:	Normal.

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Physical Examination Continued

Spinal Exam - Range of Motion

Lumbar-Thoracic:	Flexion normal. Hyperextension normal. Lateral Flexion painful: Bilateral. Lateral Flexion limited: Bilateral. Rotation normal.
Hip:	Flexion normal. Hyperextension normal. Abduction normal. Adduction normal.
Knee:	Flexion normal. Extension normal.
Ankle:	Plantar Flexion normal. Dorsiflexion normal.

Spinal Exam - Provocative Tests

Cervical Tests:	Clonus Test - Left: Negative. Right: Negative.
	Hoffman's Test - Left: Negative. Right: Negative.
Lumbar Tests:	Babinski's Test - Left: Negative. Right: Negative.
	Lasegue's Test - Left: Negative. Right: Negative.
	Straight Leg Raise (Seated) - Left: Negative. Right: Negative.
Both:	Romberg Test - Negative.

Spinal Exam - Muscle Strength

Lumbar:	Hip Abduction normal. Hip Adduction normal. Knee Flexion normal. Knee Extension normal. Gastrocnemius normal. Tibialis Anterior normal. Peroneals normal. Extensor Hallucis Longus normal.

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Imaging Dictation

- L1-2: Unremarkable.
- L2-3: Broad-based disc protrusion. Moderate bilateral facet arthropathy. Bilateral lateral recess stenosis. Moderate right and severe left neural foraminal encroachment.
- L3-4: Broad-based disc bulge. Moderate bilateral facet arthropathy. Moderate central canal stenosis. Bilateral mild to moderate foraminal encroachment.
- L4-5: Anterior listhesis of L4 on L5 with severe bilateral facet arthropathy and ligamentum flavum prominence. Severe central canal stenosis and bilateral lateral recess stenosis. Moderate to severe bilateral neural foraminal encroachment.
- L5-S1: Mild left neural foraminal encroachment.

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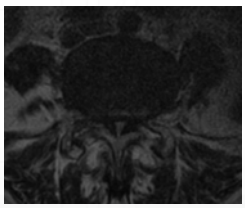
Preoperative Imaging



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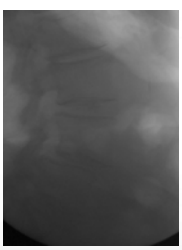
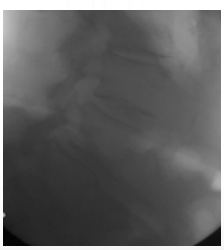
Preoperative Imaging (VMA) Continued

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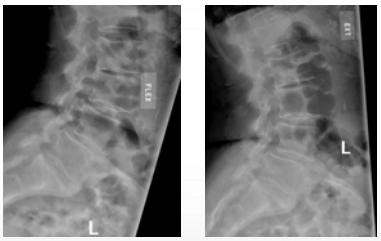
Preoperative Imaging Continued



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Surgery

- Lumbar laminotomies with bilateral foraminotomies, L4-5
- L4-5 posterior spinal instrumentation via coflex®
- The length of surgery was 131 minutes
- Estimated blood loss was 25 mL

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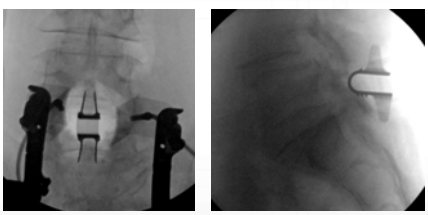
Intraoperative Imaging



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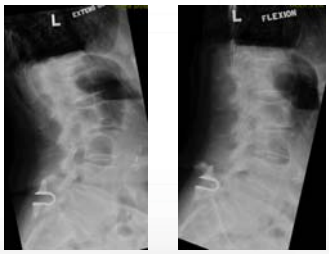
Postoperative Imaging



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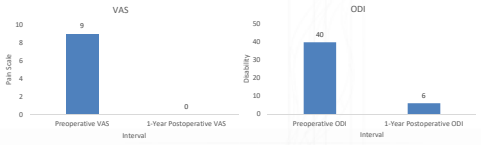
Outcome



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Case Study 3

History

- 63-year-old male with a BMI of 23.46 presenting for evaluation of the lumbar spine due to low back pain and a chief complaint of weakness
  - Lower back discomfort into legs, L>R, with numbness and weakness when up walking
    - Onset about 15 years ago while playing basketball
    - Unable to lay flat, stand upright or walk without exacerbating the issues
- Symptoms:

Right Side 10	Lumbar Axial 50	Left Side 90
Right LE 10	Lumbar Radicular 50	Left LE 90

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Physical Examination

Spinal Exam

Scar:	No Scar
Scar:	No Scar
Deep Tendon Reflexes:	Patellar Left: 2+ Patellar Right: 2+ Achilles Left: 0. Achilles Right: 0.
Pedal Pulses:	Dorsalis Pedis: 2+. Posterior Tibial: 2+.
LE Edema:	No LE Edema
UE Edema:	No UE Edema
Atrophy:	No Atrophy
Heel Walk:	Left: Normal. Right: Normal.
Toe Walk:	Left: Normal. Right: Normal.
Gait:	Antalgic Gait. Both. stooped posture

Spinal Exam - Sensory / Palpation

Dermatomes	
Left - Lumbar:	L1: Normal. L2: Normal. L3: Normal. L4: Normal. L5: Hypo-esthetic. S1: Normal.
Right - Lumbar:	Normal.
Dermatome Notes:	bilateral medial feet tingling
Spinal Tenderness	
Lumbar:	Normal.

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Physical Examination Continued

Spinal Exam - Range of Motion

Lumbar-Thoracic:	Flexion normal. Hyperextension painful. Hyperextension limited. Lateral Flexion painful. Bilateral. Rotation painful. Bilateral.
Knee:	Flexion normal. Extension normal.
Ankle:	Plantar Flexion normal. Dorsiflexion normal.
Range of Motion Notes:	unable to stand upright.

Spinal Exam - Provocative Tests

Cervical Tests:	Clonus Test - Left: Negative. Right: Negative.
Lumbar Tests:	Babinski's Test - Left: Negative. Right: Negative. Lasegue's Test - Left: Negative. Right: Negative. Straight Leg Raise (Seated) - Left: Negative. Right: Negative.
Both:	Romberg Test - Negative.

Spinal Exam - Muscle Strength

Lumbar:	Hip Abduction normal. Hip Adduction normal. Knee Flexion normal. Knee Extension normal. Gastrocnemius normal. Tibialis Anterior normal. Peroneals normal. Extensor Hallucis Longus normal.

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Imaging Dictation

- L1-2: Moderate disc space narrowing with broad-based bulge. Mild to moderate canal stenosis. Mild to moderate right foraminal stenosis.
- L2-3: Minimal disc degeneration. Mild to moderate canal stenosis. Mild foraminal stenosis.
- L3-4: Mild disc degeneration and broad-based bulge. Severe canal stenosis. Severe bilateral L4 lateral recess stenosis. Severe bilateral neural foraminal stenosis, slightly greater on the right.
- L4-5: Mild grade 1 anterolisthesis of L4 on L5. Moderate disc space narrowing with broad-based disc bulge. Severe spinal canal stenosis and bilateral L5 lateral recess stenosis. Extremely severe left and mild right foraminal stenosis.
- L5-S1: Mild disc degeneration. Mild bilateral foraminal stenosis. Moderate to severe left S1 lateral recess stenosis.

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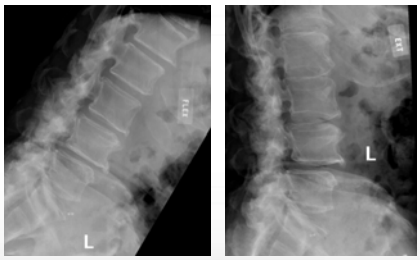
Preoperative Imaging



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Surgery

- Lumbar laminotomy with foraminotomy, L4-5, bilateral
- L4-5 Posterior spinal instrumentation via coflex®
- The length of surgery was 146 minutes
- Estimated blood loss was 50 mL

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Intraoperative Imaging

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Postoperative Imaging

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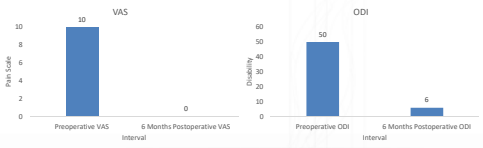
Outcome



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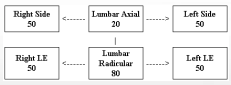
Case Study 4

History

- 52-year-old female with a BMI of 38.82 presenting for evaluation of the lumbar spine due to chronic low back pain
  - Low back pain that radiates into buttocks, hips and bilateral groin
    - Weakness into both legs
    - Onset 2 years ago
  - Patient denies any trauma, injuries or accidents
  - Sitting and walking increases the pain, laying alleviates it
  - Failed conservative treatments
- Symptoms:



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Physical Examination

Spinal Exam

Scar:	No Scar.
Scar:	No Scar.
Deep Tendon Reflexes:	Patellar Left: 0. Patellar Right: 0. Achilles Left: 0. Achilles Right: 0. unable to elicit patellar and achilles reflexes at this time
Pedal Pulses:	Dorsalis Pedis: 2+. Posterior Tibial: 2+.
LE Edema:	No LE Edema
UE Edema:	No UE Edema
Atrophy:	No Atrophy
Heel Walk:	Left: Normal. Right: Normal.
Toe Walk:	Left: Normal. Right: Normal.
Gait:	Antalgic Gait: Both. heel/toe walk increased LBP. Able to do but in severe pain.

Spinal Exam - Sensory / Palpation

Dermatomes	
Left - Lumbar:	Normal.
Right - Lumbar:	Normal.
Spinal Tenderness	
Lumbar:	L1/2: No Pain. L2/3: No Pain. L3/4: No Pain. L4/5: Bilateral. L5/S1: Bilateral. SIJ: Bilateral.

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Physical Examination Continued

Spinal Exam - Range of Motion

Lumbar-Thoracic:	Flexion painful. Flexion limited. Hyperextension painful. Hyperextension limited. Lateral Flexion painful. Bilateral. Lateral Flexion limited. Bilateral. Rotation painful. Bilateral. Rotation limited. Bilateral.
Hip:	Abduction normal. Adduction normal.
Knee:	Flexion normal. Extension normal.
Ankle:	Plantar Flexion normal. Dorsiflexion normal.

Spinal Exam - Provocative Tests

Cervical Tests:	Clonus Test - Left: Negative. Right: Negative.
Lumbar Tests:	Babinski's Test - Left: Negative. Right: Negative. Lasegue's Test - Left: Negative. Right: Negative. Straight Leg Raise (Seated) - Left: Positive. Right: Negative. Patrick's Test - Left: Positive. Right: Positive.
Both:	Romberg Test - Negative. Dejerine's Triad (Cough/Sneeze/Valsalva Maneuver) - Positive.

Spinal Exam - Muscle Strength

Lumbar:	Hip Abduction normal. Hip Adduction normal. Knee Flexion normal. Knee Extension normal. Gastrocnemius normal. Tibialis Anterior normal. Peroneals normal. Extensor Hallucis Longus normal.
Muscle Strength Notes:	increased LBP

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Imaging Dictation

- L1-2: No significant disc displacement. Bilateral facet arthrosis.
- L2-3: Small bulge combining with facet arthrosis lead to very mild bilateral neural foraminal narrowing.
- L3-4: Small diffuse bulge with facet arthrosis lead to very mild bilateral neural foraminal narrowing.
- L4-5: Disc osteophyte complex combining with facet arthrosis and ligamentum flavum hypertrophy which lead to moderate to severe right and moderate left neural foraminal narrowing with narrowing of the right or the left lateral recesses and mild to moderate central canal stenosis.
- L5-S1: Disc osteophyte complex combining with facet arthrosis moderate bilateral neural foraminal narrowing with narrowing of the bilateral lateral recesses and portal confluence.

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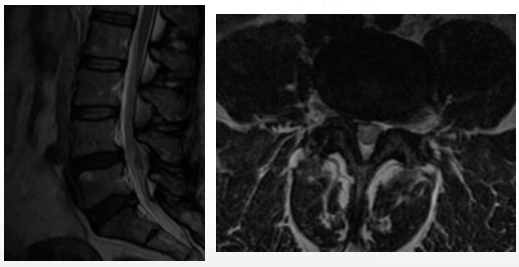
Preoperative Imaging



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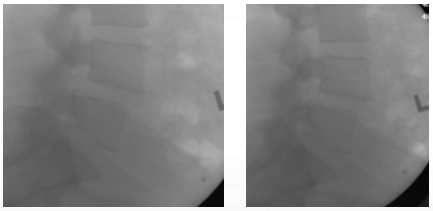
Preoperative Imaging (VMA) Continued



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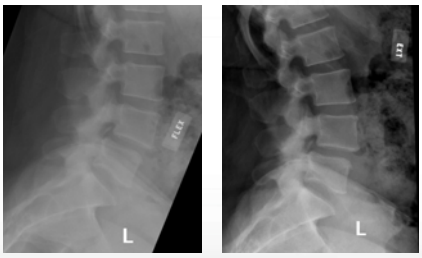
Preoperative Imaging Continued



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Surgery

- L4-5 bilateral hemilaminotomy, medial facetectomy and foraminotomy
- L4-5 non-segmental fixation using coflex® instrumentation
- The length of surgery was 125 minutes
- Estimated blood loss was 25 mL

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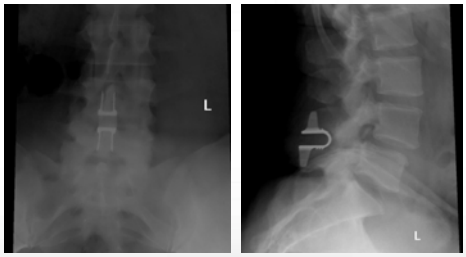
Postoperative Imaging



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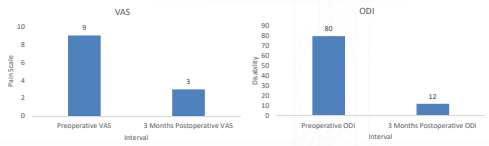
Outcome



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