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LLIF vs TLIF

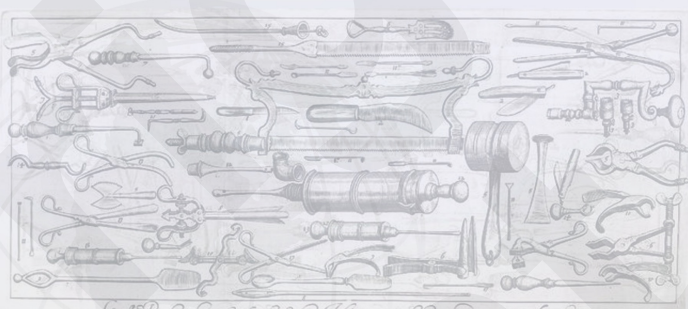
Mr M J H McCarthy
vs
Dr S Hegde

Fusion Portfolio Minimally Invasive Surgery Biomaterials Motion Preservation

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Armamentarium



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Indications for Surgery

- **What are you trying to achieve?**
 - Non-maleficence - "first, do no harm" (primum non nocere).
- **DO THE APPROPRIATE OPERATION FOR THE PATIENT AND THEIR PATHOLOGY AND YOUR SKILL / ABILITY**

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Indications for Surgery - DRS

- **Decompression**
 - Spinal cord / nerve roots
- **Realignment**
 - Correct deformity
- **Stabilisation**
 - Prevent / Treat
 - Neurological deficit / deformity / pain
 - (Non fusion technology form of "stabilisation")

All may require fusion

Require Instrumentation

Instrumentation increases fusion

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The 7 Ps

- Proper
- Planning and
- Preparation
- Prevents
- Piss
- Poor
- Performance



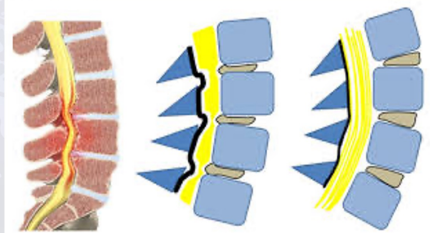
Attention to detail
Never let your guard down

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APPS

- Anatomy
- Pathology
- Planning
- Surgery



Recent Topic = Lordosis

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ORIGINAL ARTICLE ACTA ORTOP BRAS 14(4) - 2006

LUMBAR LORDOSIS: A STUDY OF ANGLE VALUES AND OF VERTEBRAL BODIES AND INTERVERTEBRAL DISCS ROLE

LUIS HENRIQUE FONSECA DAMASCENO¹, SILVIO RICARDO GUARIMPERI CATAPÊ², ANTONIO DORIVAL CAMPOS³, HELTON LUIS ANNECIBO DERRICK⁴

Sample	Damasceno et al., n=350	Stagnara et al., 1982 ⁽²⁾ n=100	Wambolt and Spencer, 1987 ⁽²³⁾ n=50	Guilgui et al., 2003 ⁽¹³⁾ n=250	Vialle et al., 2005 ⁽²²⁾ n=300
L1	2.15° (14 to -9)	5° (12 to -3)	3°	4°	9.8°
L2	-0.36° (7 to -8)	3° (11 to -5)	1°	1.25°	1.2°
L3	-1.56° (8 to -10)	1° (10 to -7)	-2°	-0.52°	-0.6°
L4	-2.89° (4 to -14)	-1° (8 to -10)	-4°	-2.65°	-2.6°
L5	-9.23° (0 to -19)	-8° (5 to -27)	-10°	-8°	-8°
L1-L2	-4.99° (4 to -12)	-8° *	-6°	-5.6° *	4.55° *
L2-L3	-6.89° (0 to -15)	-10° *	-7°	-7.9° *	5.4° *
L3-L4	-9.25° (-2 to -20)	-10° *	-9°	-9.7° *	9.8° *
L4-L5	-12.29° (-2 to -26)	-14° *	-11°	-14° *	14° *
L5-S1	-15.58° (-4 to -35)	-13° *	-11°	-16° *	15.3° *

* measurement values for intervertebral discs assumed from measurements of vertebral segments, because they were not shown in the original study.

Table 7 - Vertebral bodies and intervertebral discs measurements found in this study and those described by other authors.

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	Mean Angle (°)	Standard Deviation	Range (°)	% participation in curvature L1S1 (range)
L1-L2	-4.99 *	2.9	4.0 to -12.0	8.16 (-8.57 to 24.00)
L2-L3	-6.89 *	2.73	0.0 to -15.0	11.35 (0.00 to 27.27)
L3-L4	-9.25 *	2.54	-2.0 to -20.0	15.38 (3.03 to 30.95)
L4-L5	-12.29 *	3.39	-2.0 to -26.0	20.43 (3.81 to 42.86)
L5-S1	-15.58 *	5.43	-4.0 a -35.0	26.07 (5.80 a 56.52)

(*)Averages different from each other with p<0.001

Table 2 - Intervertebral discs measurements

Lumbar curvature	Damasceno et al., n=350	Jackson and McManus, 1994 ⁽¹²⁾ n=100	Jackson et al., 1998 ⁽¹⁴⁾ n=50	Korovesis et al., 1998 ⁽¹⁵⁾ n=99	Cheng et al., 1998 ⁽⁶⁾ n=387	Tüzün et al., 1999 ⁽¹⁶⁾ n=150	Tsuji et al., 2001 ⁽¹⁷⁾ n=489	Guilgui et al., 2003 ⁽¹³⁾ n=250
L1S1	-60.9° (-33 to -89)	-60.9° (-31 to -88)	-62.1° (-41 to -86)				-54.2°	-59°
L1L5	-45.1° (-15 to -78)			-45.7°	-41.95°	-45.85°		-43° (-13.6 to -69)

Table 6 - Lumbar lordosis measurement values found in this study and those described in literature by other authors.

>50% LL @ L4-S1 (21deg vs 28deg)

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Fusion

- **Fusion – think:**
 - α contact surface area (1/ α subsidence)
 - $\uparrow$ compression $\downarrow$ tension
 - autograft > allograft > synthetic
 - vascular > avascular
 - structural graft > non structural
 - BMP...
 - And unfortunately fusion may not be α clinical outcome

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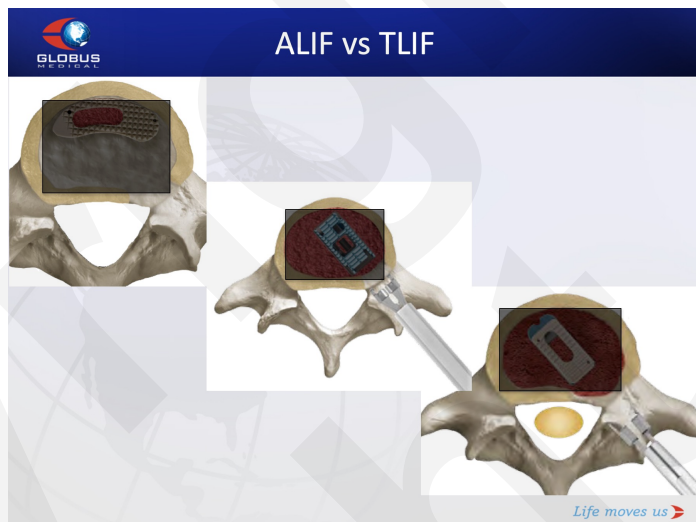
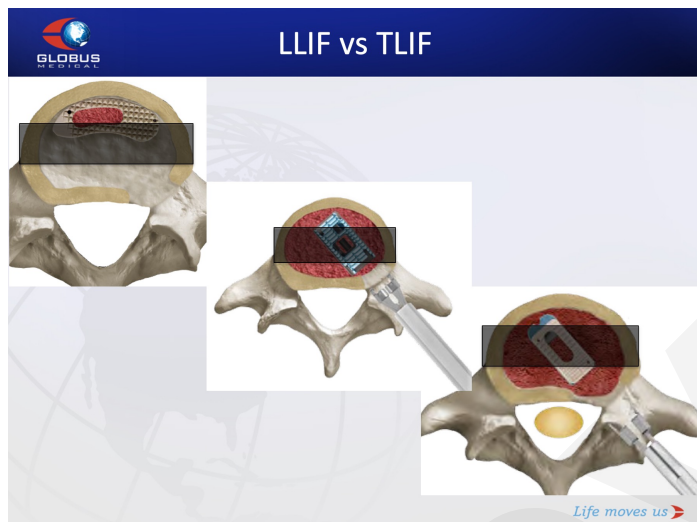
But...

- Joints are designed to move
- Fusion is abnormal
- Beware – nature against you!

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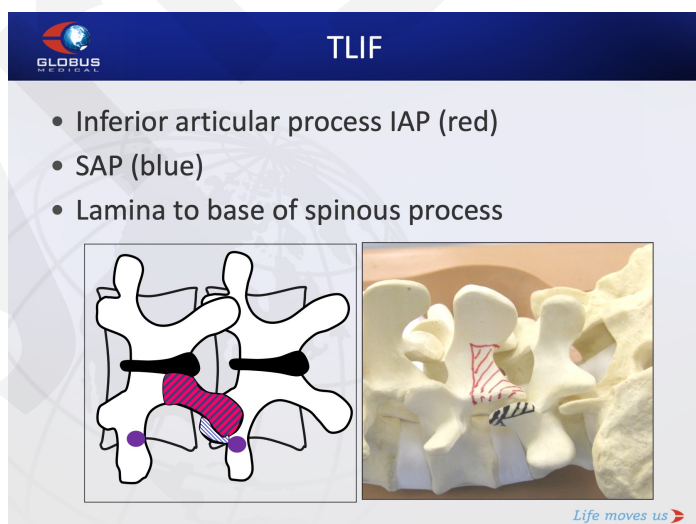
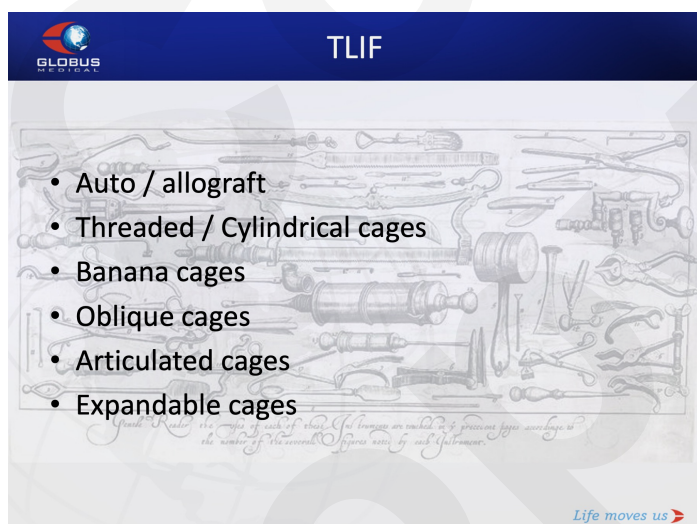
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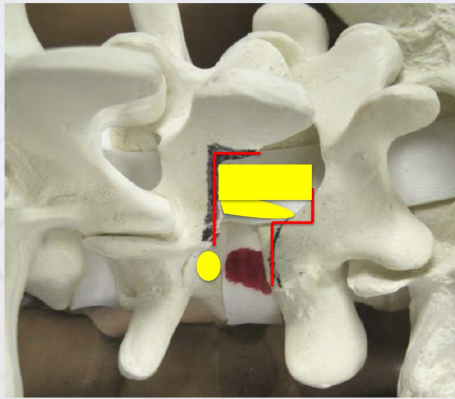
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Surgical Options

	Advantages	Disadvantages
PLIF	Bilateral access to canal, restores lordosis	Painful, infection, neural / dural injury scarring, limited higher up
Mini Open and MIS PLIF	Less painful, low infection, less blood loss, faster recovery	Fusion?, neural / dural injury scarring, limited higher up
Open TLIF	Access, fusion	Painful, infection, neural / dural injury scarring, endplate damage / subsidence
Mini Open TLIF	Less painful, low infection, fusion, less blood loss	Neural / dural injury scarring, disc preparation, endplate damage / subsidence
MIS TLIF	Even less pain, low infection, avoids paraspinal muscle damage, less blood loss, faster recovery	Fusion?, neural / dural injury scarring, disc preparation, endplate damage / subsidence
LLIF + Perc Post	Good fusion, less painful, low infection, T5-L5, avoids canal, less visceral vessel injury then ALIF, avoids paraspinal muscle damage, less blood loss, faster recovery	L4/S1 - No, endplate damage / subsidence, plexus injury, diaphragm injury, pneumothorax
ALIF + Perc Post	Best fusion, best restoration lordosis, less painful, low infection, avoids canal, avoids paraspinal muscle damage, mostly less blood loss than a TLIF	Access Surgeon, ilio-lumbar vein, visceral vessel injury, ileus, not above L3





Proficiency Point
MIS TLIF =
25 cases

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LLIF

- LLIF
 - Tension intact ALL / PLL
 - Indirect decompression
 - Large surface area for fusion across strongest area of bone
 - Good for laterolisthesis > rotated spine
 - Multiple levels same incision
 - (Obese people - fat can be swept away)

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LLIF Algorithm First Question

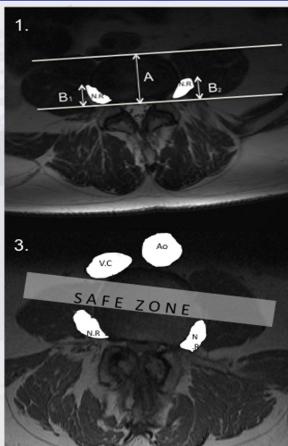
- Contraindications:
 - L5/S1
 - Low seated L4/5 (look at crests)
 - High grade slip
 - Retroperitoneal scarring / pathology
 - Medical comorbidities / contraindications to surgery
- Yes – then use other technique

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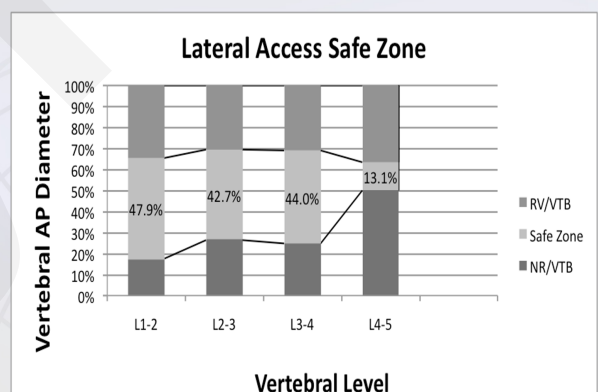
LLIF Algorithm Second Question

- Is direct decompression of spinal canal needed?
 - Yes
 - Consider single procedure / approach with TLIF / PLIF
 - Surgical philosophy / ability – 2 stages with LLIF may give better deformity correction / fusion

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1. Have A Simple Strategy

- Is an interbody fusion required:
 - Restore foraminal height (up / down)
 - Improve fusion
 - Revision of failed posterolateral fusion
 - Restore lordosis / correct deformity
 - Biomechanics – shear / large disc height / entire facet removed / long construct involving L5/S1

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2. Have A Simple Strategy

- Is a direct posterior decompression required? (vs indirect ligamentotaxis)
- How many levels need to be fused?
- How long will it take?
- Is there a slip – how big / is it reducible?
- Etcetera...
- **DO THE APPROPRIATE OPERATION FOR THE PATIENT AND THEIR PATHOLOGY AND YOUR SKILLS / ABILITY**

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In Summary...



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Things can go seriously wrong



- **DO THE APPROPRIATE OPERATION FOR THE PATIENT AND THEIR PATHOLOGY**

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Should have gone to specsavers!

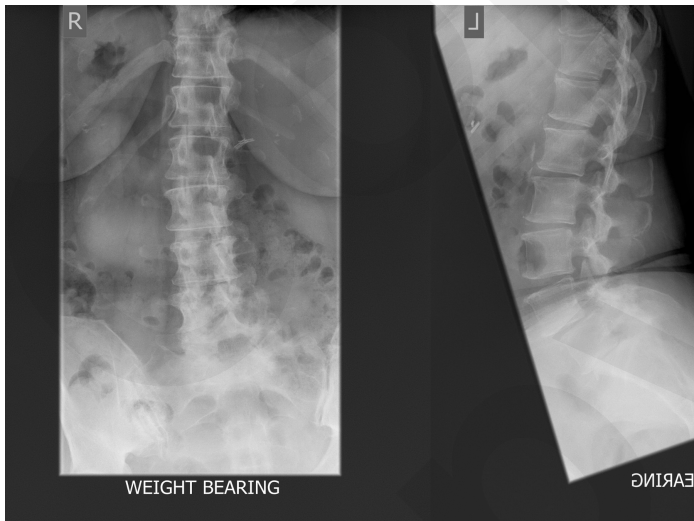
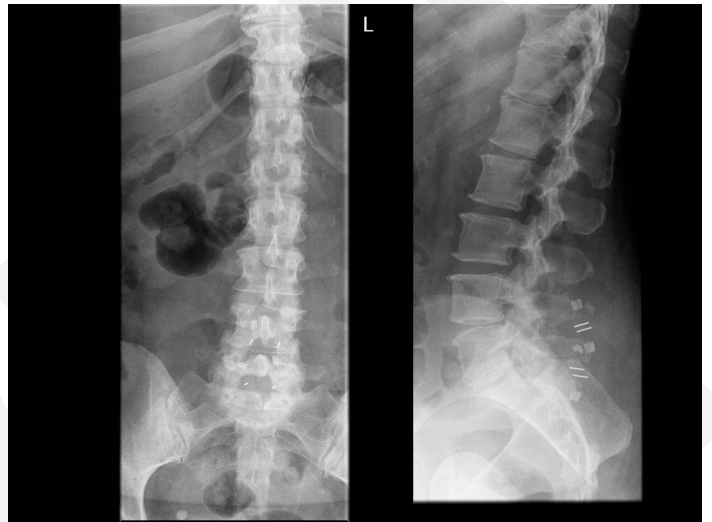


**Attention to detail
Never let your guard down**

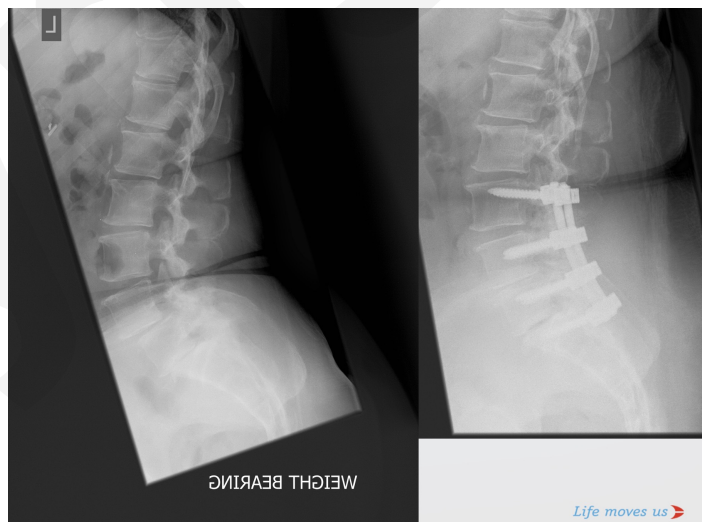
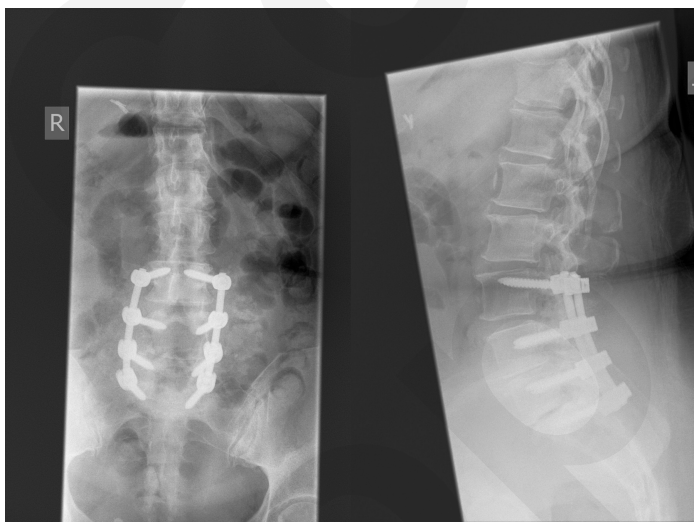
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- 60 year old female
- Previous Wallis / decompression – infected
- L4/5/1 slips
- Severe stenosis

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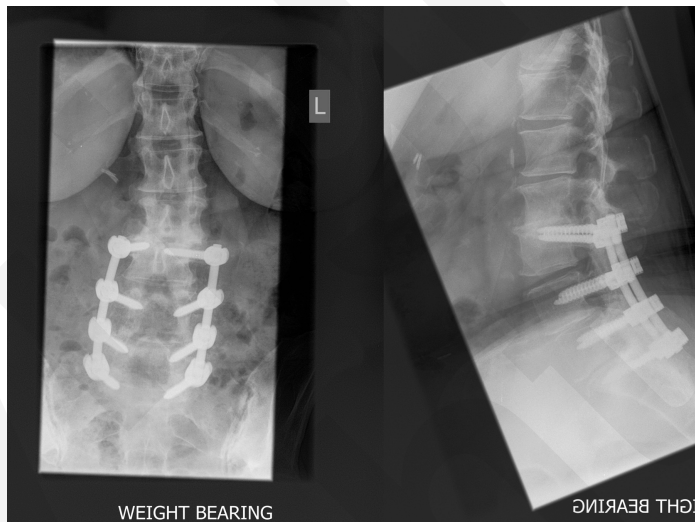


WEIGHT BEARING

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- Given patients size and previous surgery fixed in situ with revision decompression
- But, L5 screw vs root injury at op (identified and screw replaced) resulting in Trendelenburg gait
- Hysterectomy for tumour
- Craniotomy for meningioma
- Now – ASD and severe stenosis again
- Plus SIJ pain...

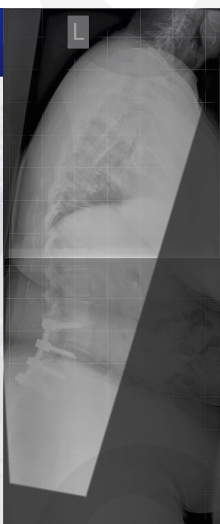
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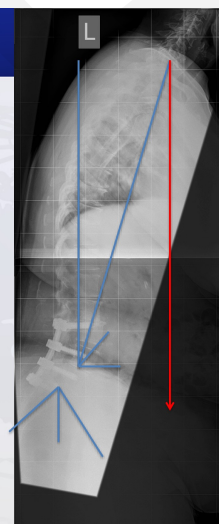
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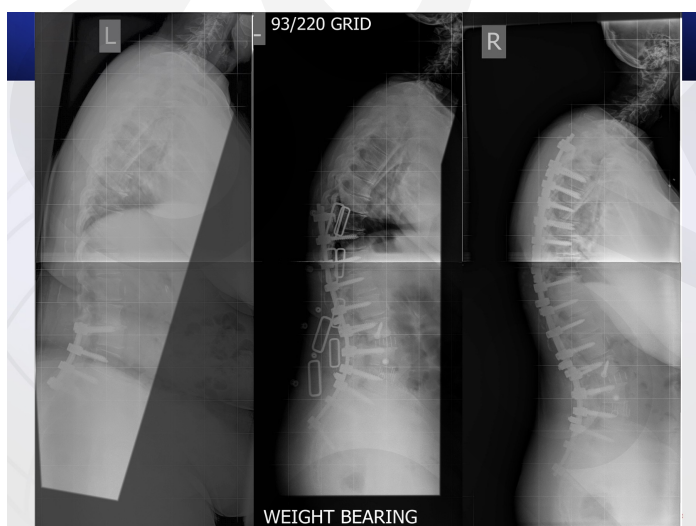
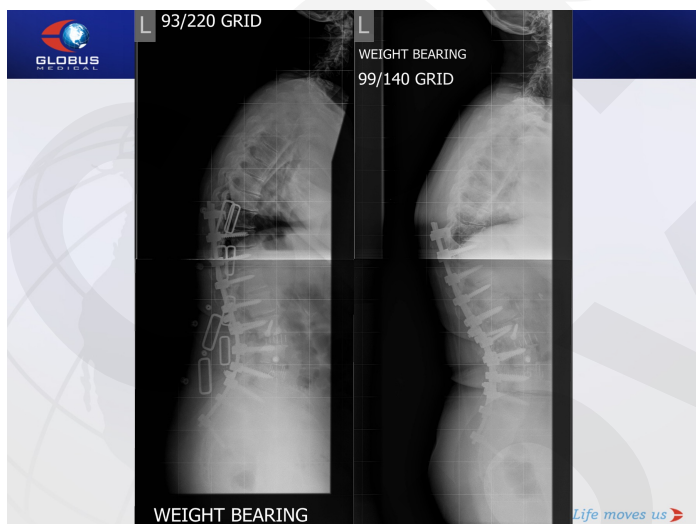
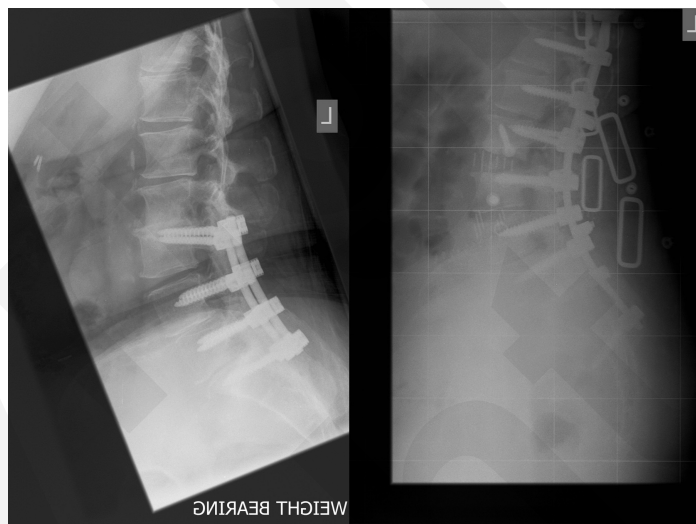
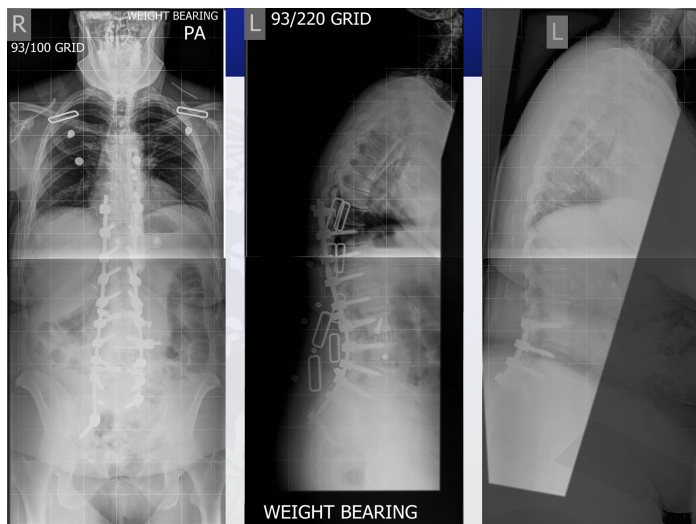


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- Calculated PI to LL mismatch of 40 degrees

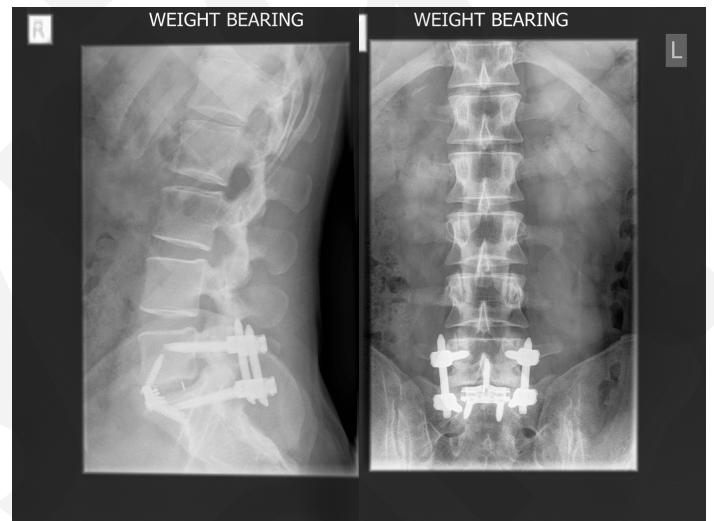
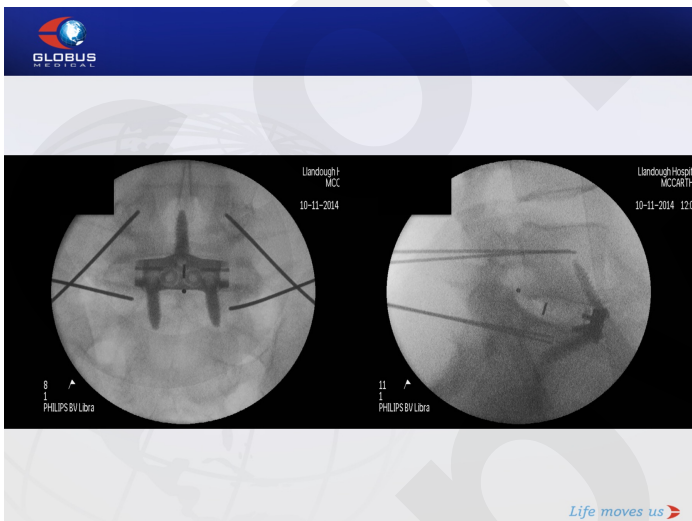
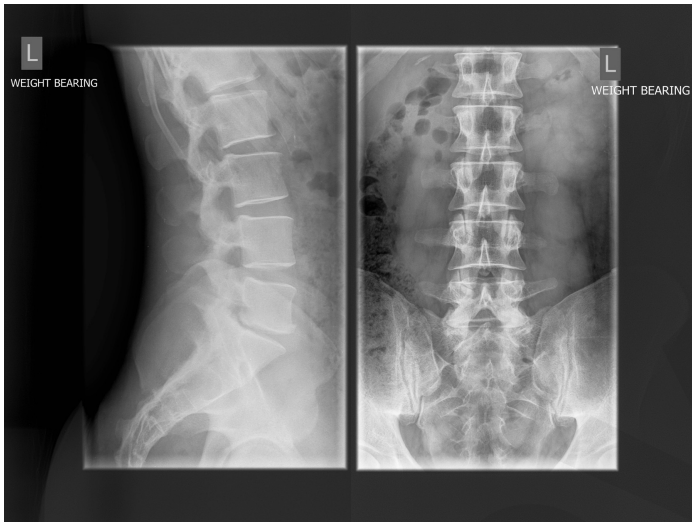
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- 35 year old man
- Worsening low back pain 5 years
- No leg symptoms
- Failed conservative management
- Facet injections temporary relief

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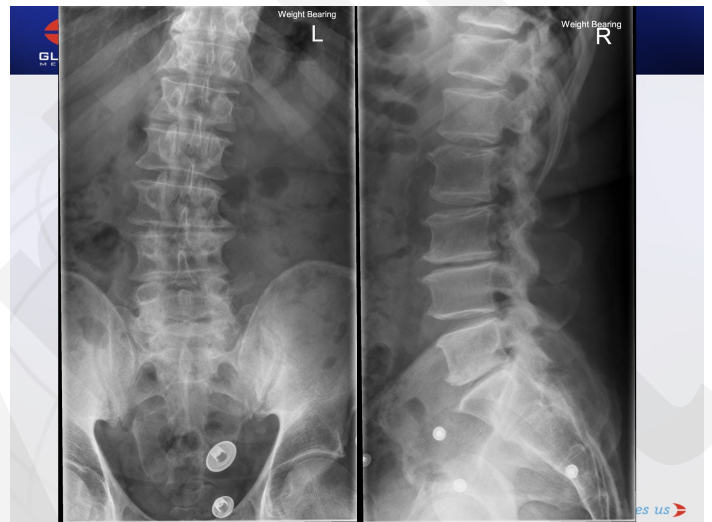


- 30 year old man
- Bilateral severe L5 pain some LBP
- Finished family
- Responded well to root blocks
- Pain keeps coming back and wants an operation

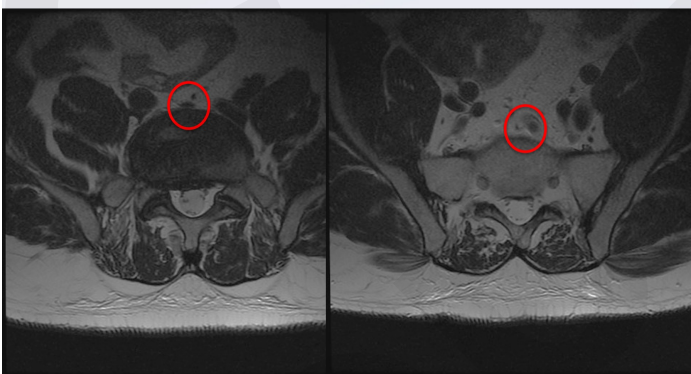


- 50 year old male
- Severe right L5 pain
- Responded well to root block
- Wants a permanent solution

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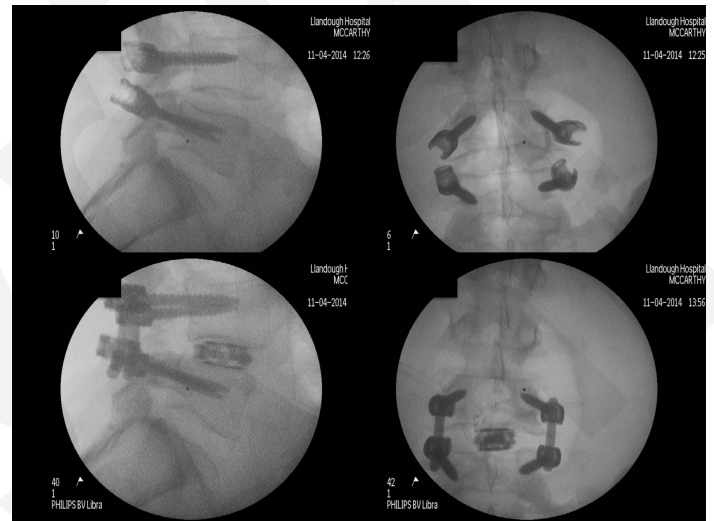
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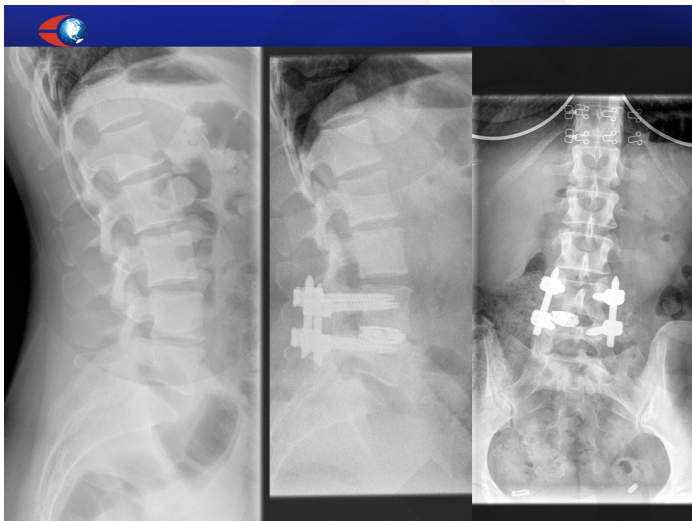
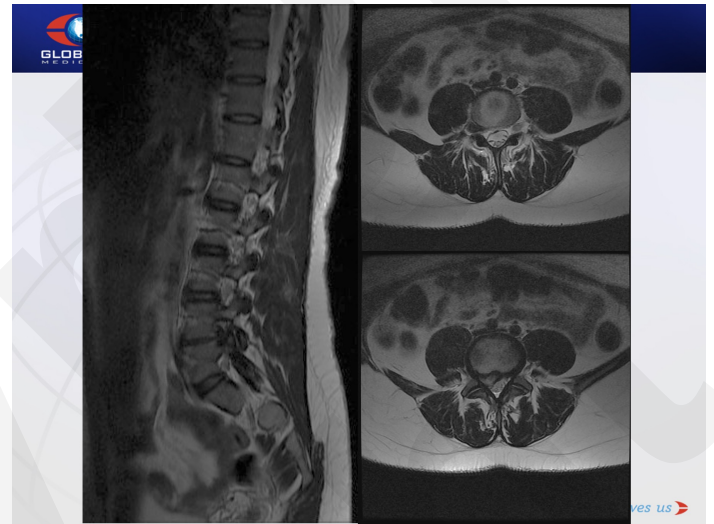
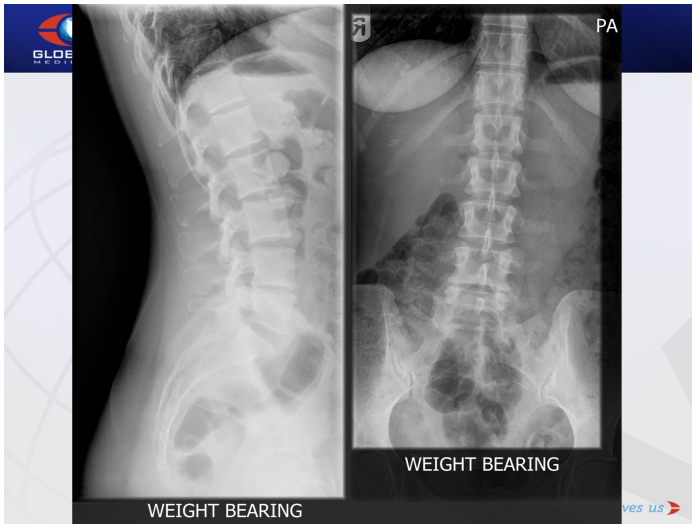
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- 40 year old male
- Low back and bilateral leg pain
- Right L4 pain
- Failed conservative management

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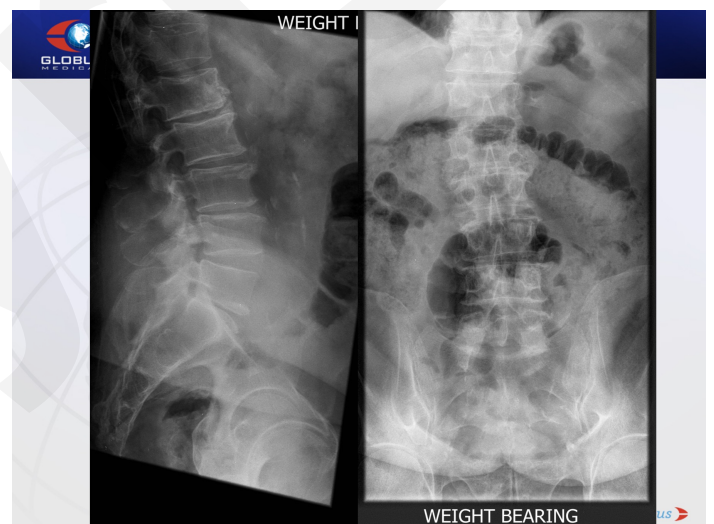


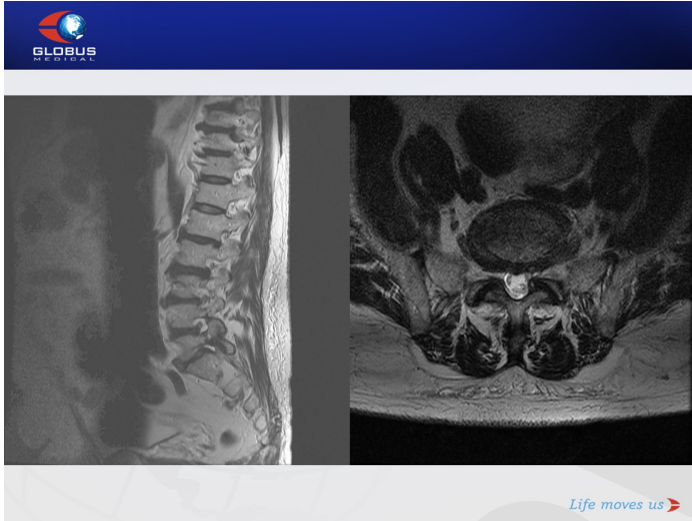
- 40 year old female
- Low back and sudden severe right L4 and 5 pain numbness weakness
- Failed conservative management
- Doesn't want an injection



- 65 year old male
- Ex-miner, poor skin, overweight
- Severe right L5 pain
- Failed conservative management
- Responded well to root block

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- 60 year old man
- Progressive mid lumbar pain
- Some L3 pain
- Exhausted conservative measures

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