



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")

Require Instrumentation
All may require fusion
Instrumentation increases fusion

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Fusion

- **Fusion – think:**
 - α contact surface area ($1/\alpha$ 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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APPS

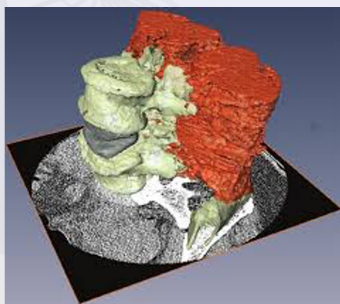
- Anatomy
- Pathology
- Planning
- Surgery

Recent Topic = Lordosis

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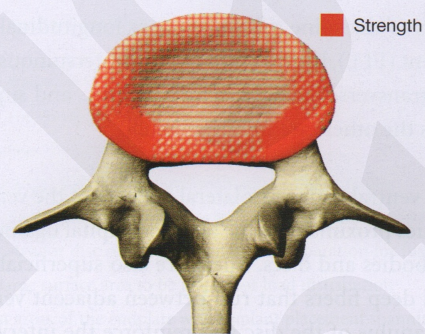
ALIF Advantages – Muscle Sparing



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ALIF Advantages - Subsidence



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LLIF vs TLIF



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ALIF vs TLIF

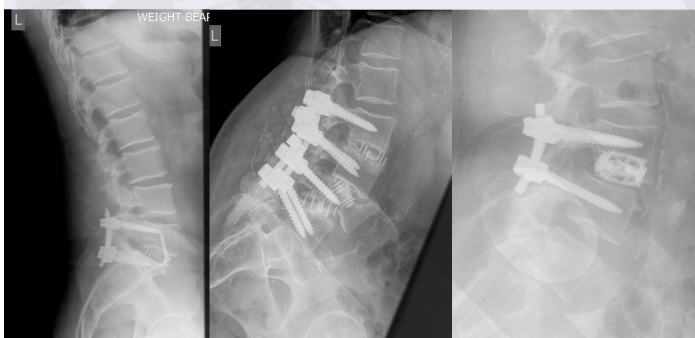


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Less Subsidence

- ALIF less subsidence compared to LLIF TLIF



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ALIF Advantages - Lordosis

Table 2

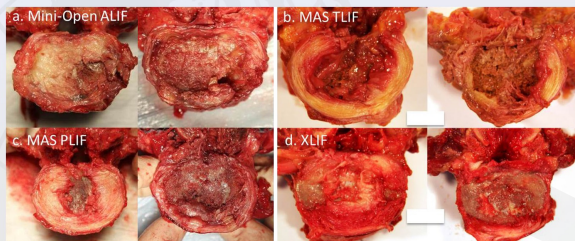
Comparison of preoperative and postoperative lordosis within groups.

	Operative Level			Region:	
	Pre-oplordosis (mean ± SD)	Post-oplordosis (mean ± SD)	p value	Pre-oplordosis (mean ± SD)	
LLIF	12.1 ± 7.9°	15.3 ± 8.5°	p<0.01	51.5 ± 11.3°	
ALIF	15.8 ± 11.9°	19.6 ± 11.7°	p<0.01	51.6 ± 13.0°	
TLIF	13.0 ± 10.3°	14.9 ± 9.7°	p<0.01	47.2 ± 14.2°	
PSF	14.8 ± 9.6°	15.5 ± 9.7°	p=0.13	49.5 ± 15.0°	

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ALIF Advantages – Better Disc Prep

- Better disc space preparation and less violation of end plate with ALIF vs mini TLIF



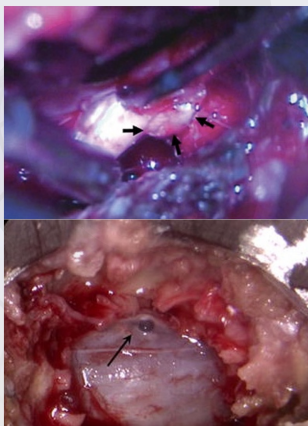
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ALIF Advantages - Larger Graft Area

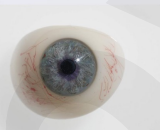
IMPLANT TYPE	HEIGHT (mm)	ANTERO-POSTERIOR (mm)	MEDIO-LATERAL (mm)	LORDOSIS (degrees)
XLIF	8 - 16	18 - 26	45 - 60	0 - 10
ALIF	10 - 20	23 - 30	32 - 42	8 - 12
PLIF, TLIF	6 - 12	22 - 32	8 - 10	0 - 8

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ALIF Advantages – Less Dural Injury



- Doesn't occur in ALIF
- (I've never seen one)



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Surgical Options

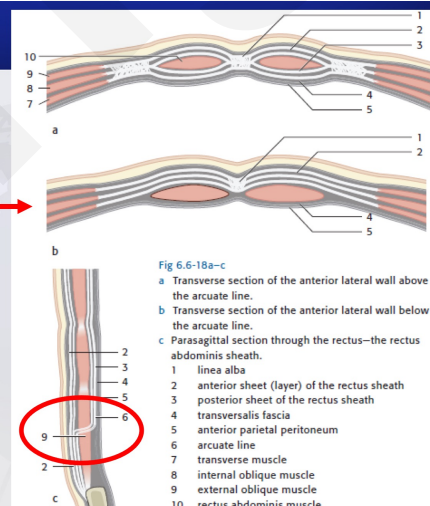
	Advantages	Disadvantages
PLIF	Bilateral access to canal, restores lordosis	Painful, infection, neural / dural injury scarring, limited higher up
Mini Open and MIS PLIF	Less painful, low infection, less blood loss, faster recovery	Fusion?, neural / dural injury scarring, limited higher up
Open TLIF	Access, 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/S??, L5/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

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ALIF Step by Step

- Anatomy
- Indications / Contraindications
- Workup
- Equipment / OR set up
- Positioning
- Technique – step by step
- Complications
- Cases

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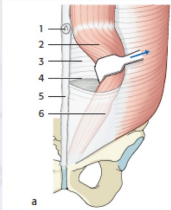


Fig 6.6-19a-b
a Anterior view of the abdominal wall (left side). The left rectus is retracted laterally, disclosing the posterior layer of the rectus abdominis sheath and its inferior limit, the arcuate line.
1 umbilicus
2 rectus abdominis muscle
3 posterior sheet of the rectus sheath (from internal oblique and transverse muscles)
4 arcuate line
5 linea alba
6 anterior sheet (layer) of the rectus sheath

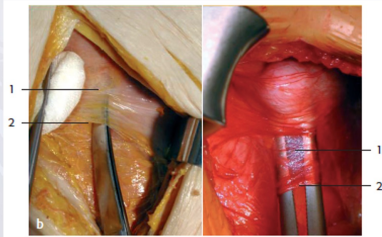
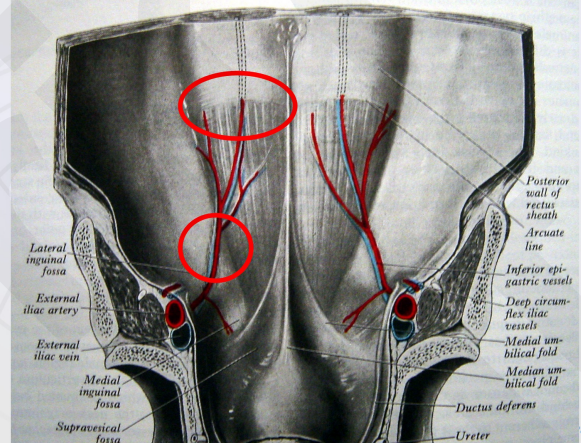
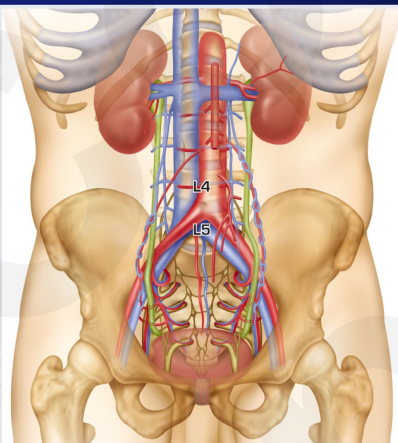


Fig 6.6-19a-b
b Anterior view of the arcuate line after lateral retraction of the rectus abdominis muscle in a cadaveric specimen (left) and in a patient operated retroperitoneally for disc replacement (right).
1 posterior sheet of the rectus sheath
2 arcuate line

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Indications

- (DDD)
- SPL
- Prior dorsal surgery
- Deformity

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Contraindications

- Absolute
 - Advanced osteoporosis unable to support
- Relative
 - Neuro compression requires direct decompression
 - Prior ant surgery
 - Severe vessel disease
 - Infection
 - Tumour
 - Aneurysm
 - GU anomaly
 - Medically unfit
 - (Males – retrograde ejac risk)

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Workup

- Wt loss / physio core / stop smoking
- Hutton's test
- Erect XR
- Supine MRI
- Prior injections etc
- +/- CTA
- (Discogram)

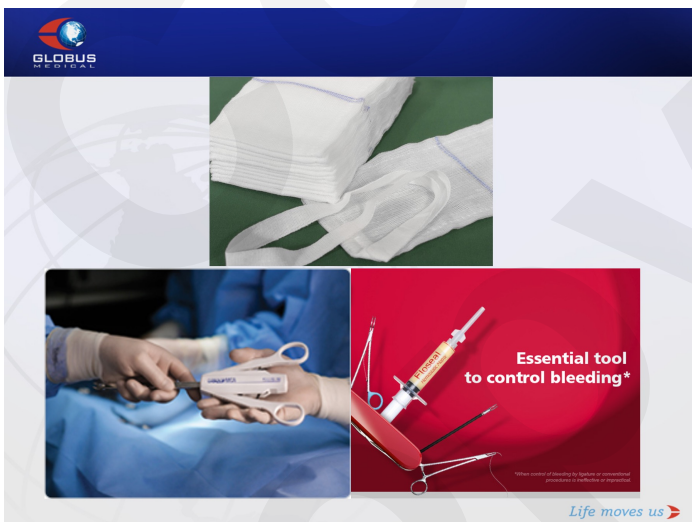
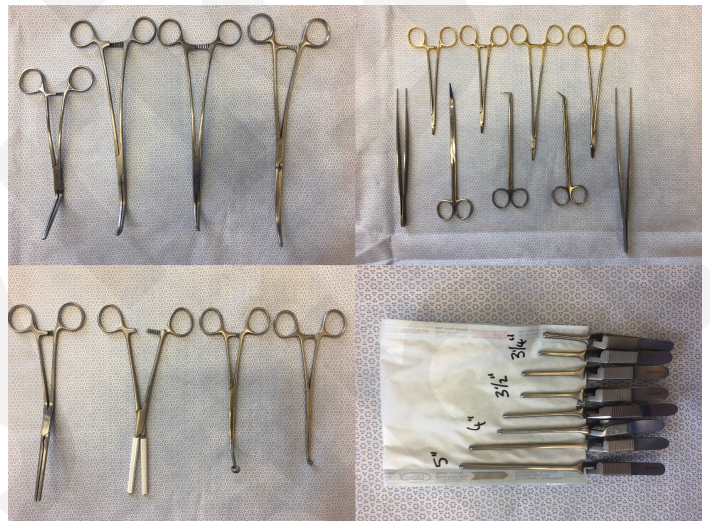
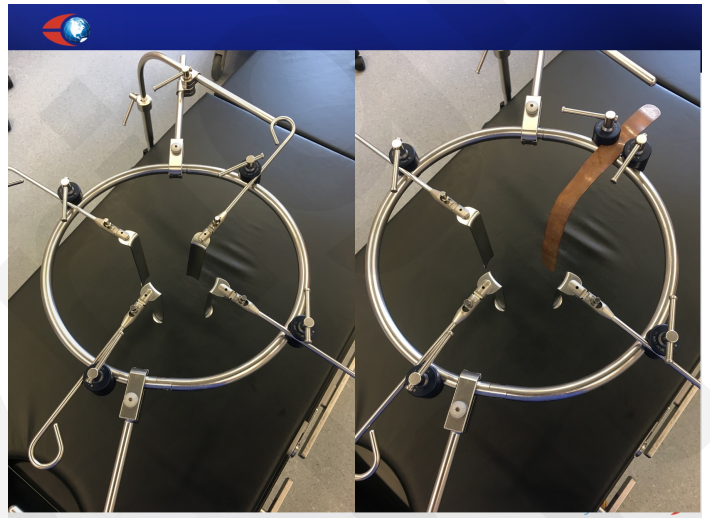
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Equipment / OR Set Up

- General instruments
- Ring retractor
- Vascular set
- Flowseal / Clips / Sutures / Packs
- Implants (!)
- Disc prep
- Bone graft

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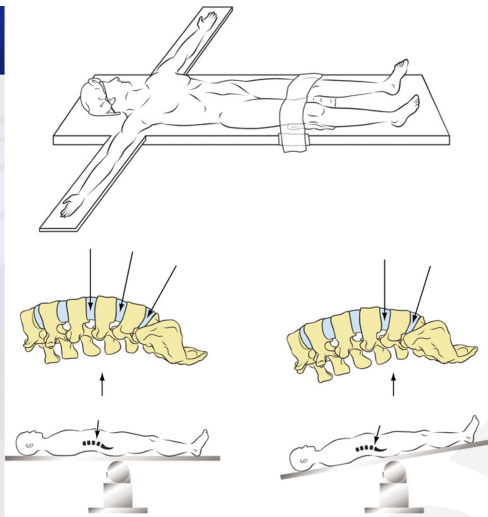




Position

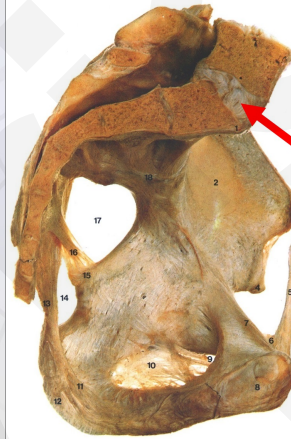
- Supine
- **IV access**
- **Catheter**
- Pressure areas
- TEDS / pumps / pillow under calves (not fossa)
- +/- tilt / pad under left hip
- Table access of AP and Lat XR

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Symphysis Pubis



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Incisions

Retro vs Transperitoneal
Male vs Female
Single vs Multiple levels

- Midline longitudinal
 - Can be extended
 - Difficult retroperitoneal retraction
- Paramedian longitudinal
 - Can be extended
 - Easier retroperitoneal access
 - Denervation
- Paramedian transverse
 - Cannot be easily extended
 - Easier retroperitoneal access

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Incision Exposure

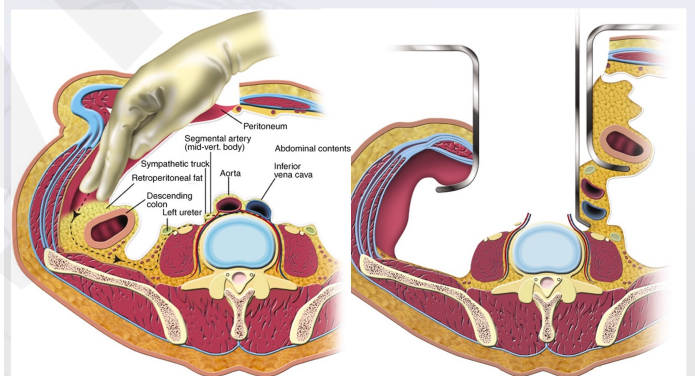
- Left retroperitoneal appr N
- +/- Gen Surg / Vascular
- Rectus sheath
- Inferior epigastrics
- Peritoneum
- Iliioinguinal / GFN / Psoas
- Ureter / Vessels / Rectum

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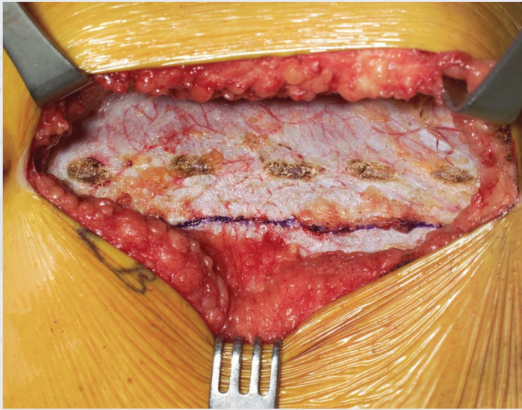
Incision Exposure

- Combination sharp / blunt dissection
- Peanuts / Swabs sticks
- Langenbech / Morris / Diva then Ring Retractor

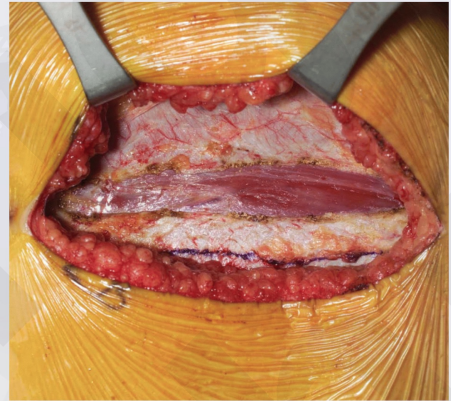
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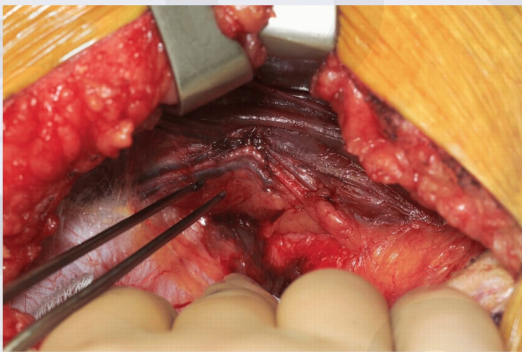
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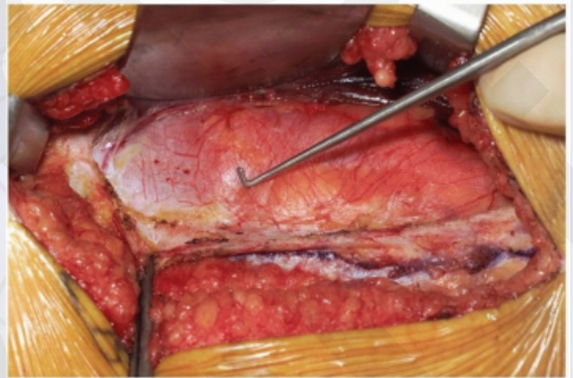
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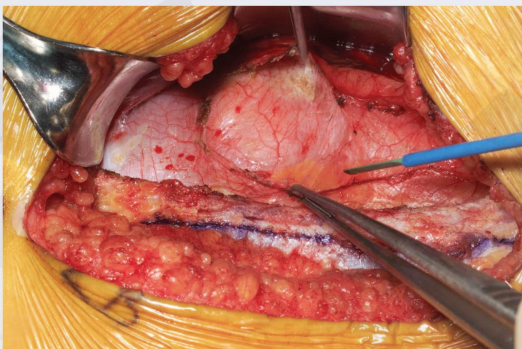
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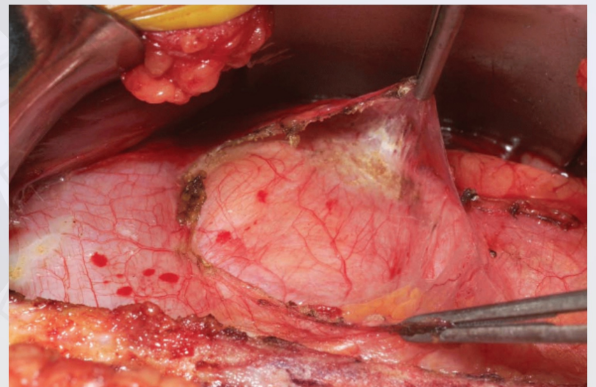
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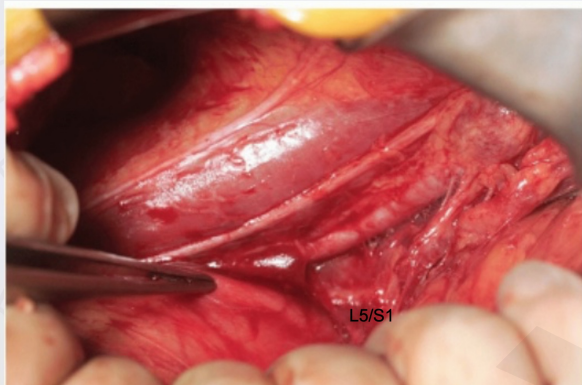
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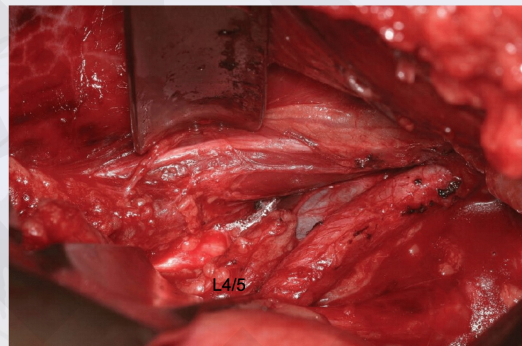
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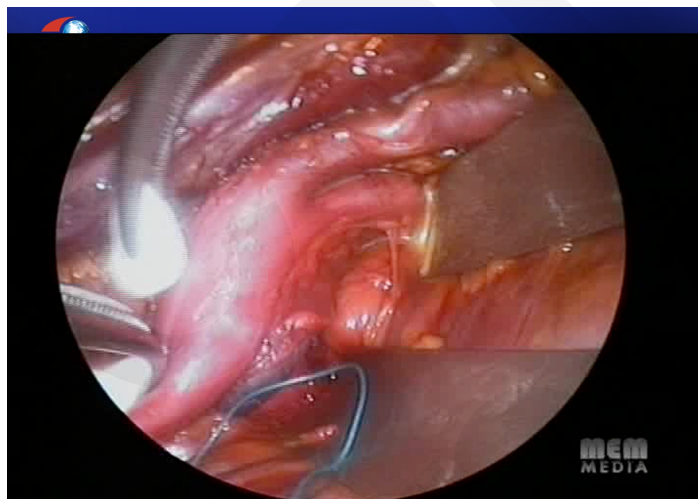
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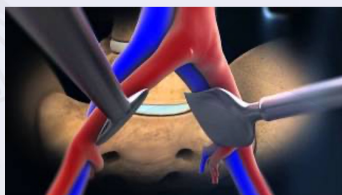
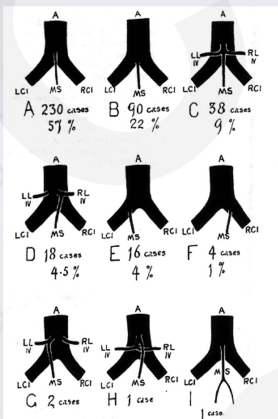
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Retraction

- Table mounted ring vs pins / humans
- Avoid XS retraction
- L4/5 mobilise iliacs, identify +/- ligate left iliolumbar vein and segmentals (and at L3/4)
- Should not have to mobilise IVC
- L2/3 difficult due to renal vessels (lat appr)

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Veins are Treacherous

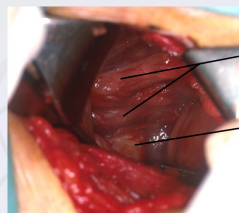


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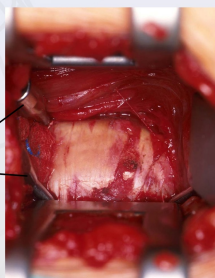
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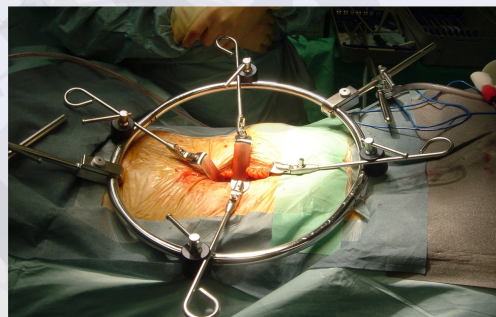
Iliac vessels

L5/S1 disc

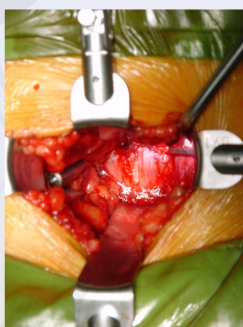
The use of short pins improves access to the disc



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Anterior longitudinal ligament overlying vertebral body L4

Ligated segmental artery and vein

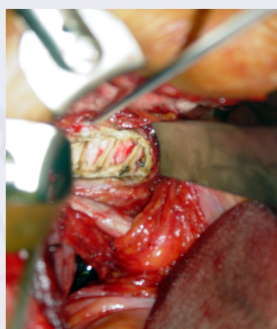
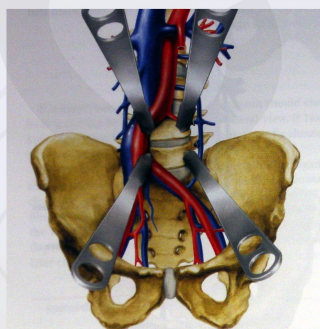
Retractor holding back Ao, IVC, and ureter

Left ascending lumbar vein

Ligated iliolumbar vein

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Venous Surgery Principles

- Consider Lahey clip and Lahey dabs [peanuts]
- Tie in continuity
- Use double ties
- Consider transfixion
- Think ahead – would exposure allow recovery from large bleed?
- Initial control by direct pressure
- Isolate with “swabs on sticks”
- Pressure against vertebral body
- Repair with vascular suture 5/0 prolene
- Thumb tack bailout

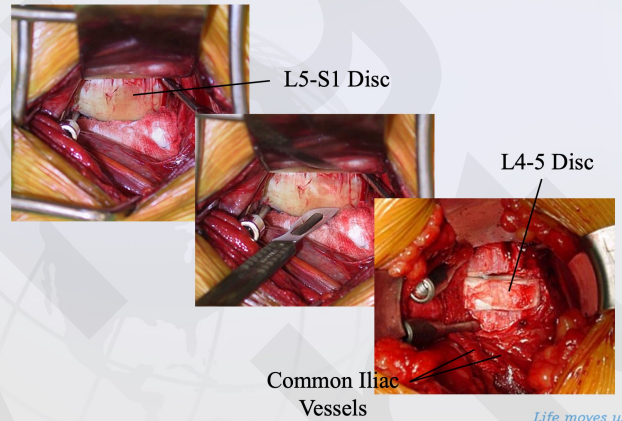


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Discectomy

- Avoid monopolar over discs (autonomics)
- Annulotomy window
- Endplates
- Sharp Cobb
- Rangeurs / curettes
- Back to PLL
- Distract space +/- reduce

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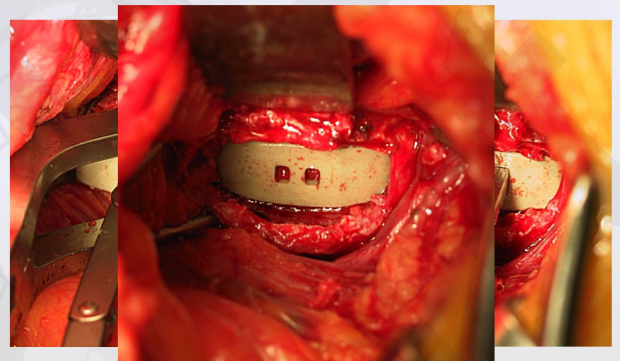


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Graft / BMP / Cage

- Crest strut graft
- Cage +/- fixation
- +/- Plate
- +/- Dorsal fixation

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Closure

- Restore BP – check for bleeding
- Remove retractors one at a time
- Check vessels / ureter / peritoneum
- Remove all swabs!
- Reattach arcuate if divided
- Check inferior epigastrics under rectus
- Close rectus sheath properly

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Complications

- Approach
 - Hernia, bowel / vessel / ureter injury, DVT, retrograde ejaculation, urinary retention, pseudo obstruction large bowel
- Neurologic
 - Rare - GFN / II nerve injury, dura...
- Graft site
 - Haematoma / infection crest, donor site pain
- Fusion
 - Psuedarthrosis, collapse, displacement

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Table 2 Complications of Anterior Spine Exposure

Spine Anatomical Region	Complications
Thoracic	Pulmonary (atelectasis, pneumonia, respiratory insufficiency) Technical (hemothorax, pneumothorax, pleural effusion, infection, wound disruption) Chylothorax Spinal cord ischemia Miscellaneous (cardiopulmonary, stroke, ileus, urinary tract infection, renal failure)
Lumbar	Vascular Arterial injury (thrombosis, hemorrhage) Venous injury (hemorrhage, thrombosis) Neurogenic (retrograde ejaculation, groin nerve injury, warm leg) Wound problems (infection, disruption, hernia, muscle denervation) Ureteral injury Miscellaneous (cardiopulmonary, stroke, ileus, urinary tract infection, renal failure)

Anatomical!

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

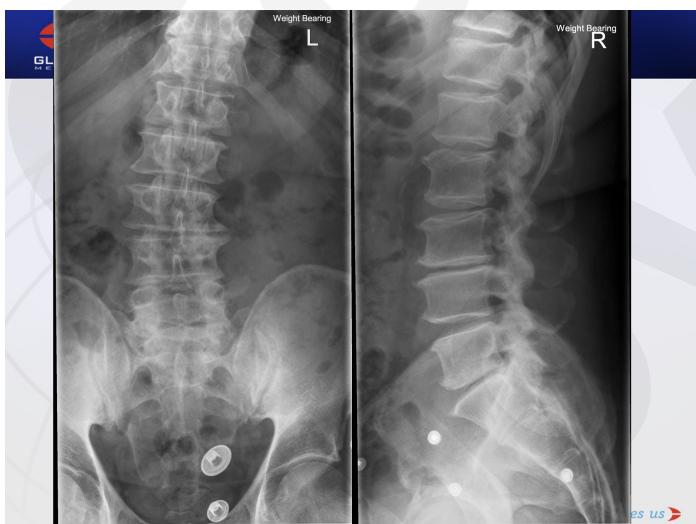
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- 50 year old male
- Severe right L5 pain
- Responded well to root block
- Wants a permanent solution

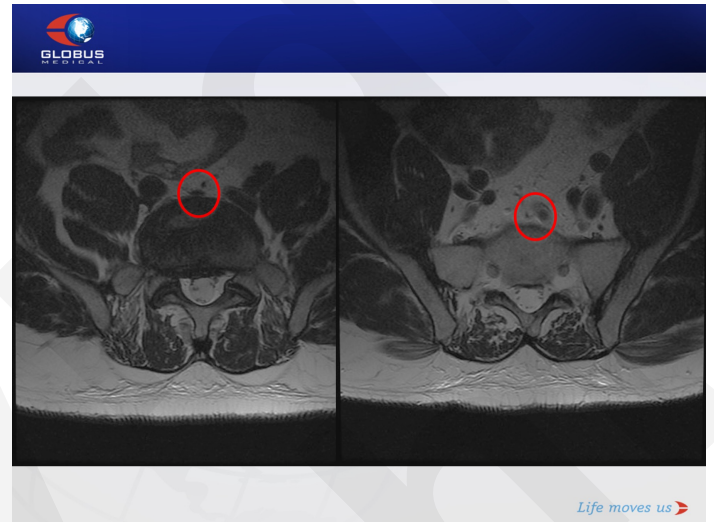
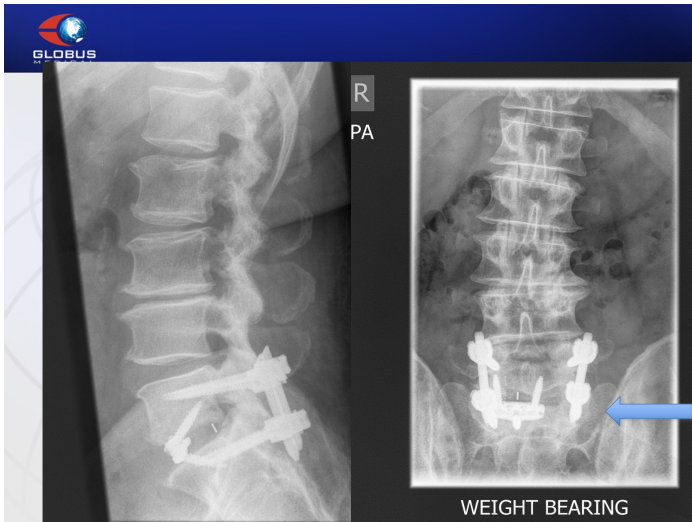
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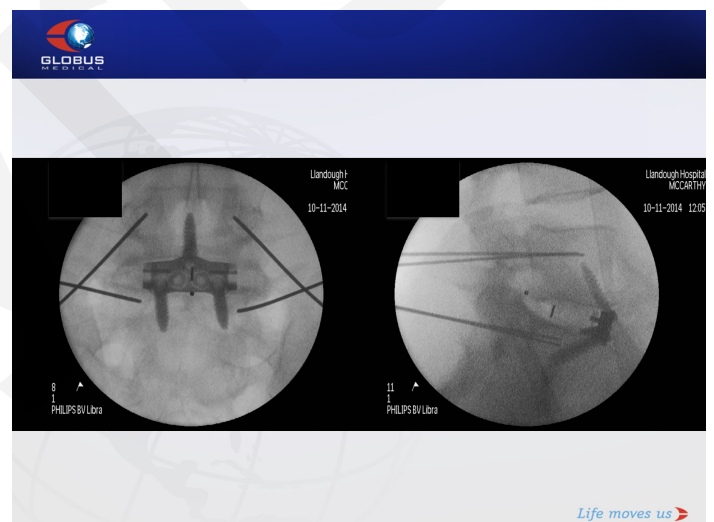
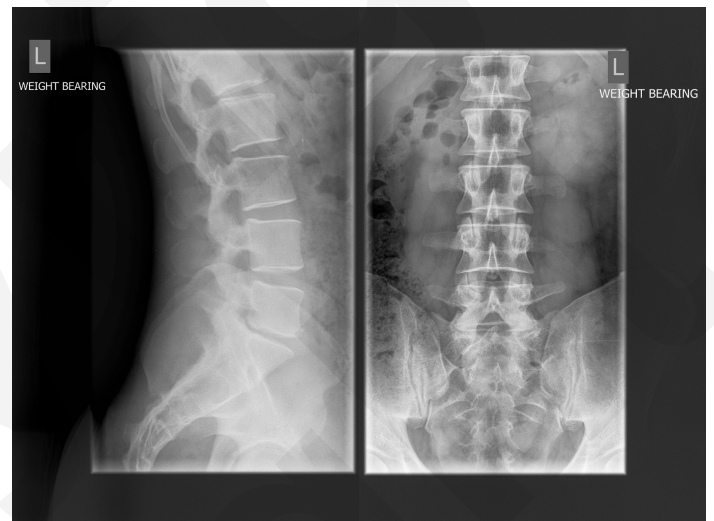
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- 35 year old male
- Worsening low back pain 5 years
- No leg symptoms
- Failed conservative management
- Facet injections temporary relief

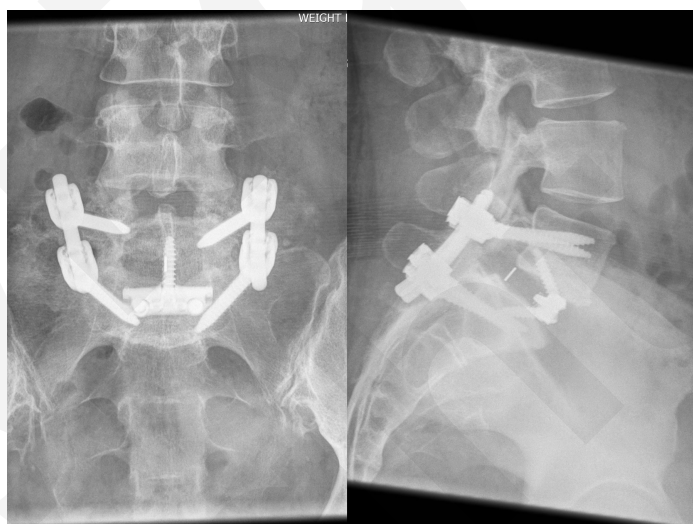
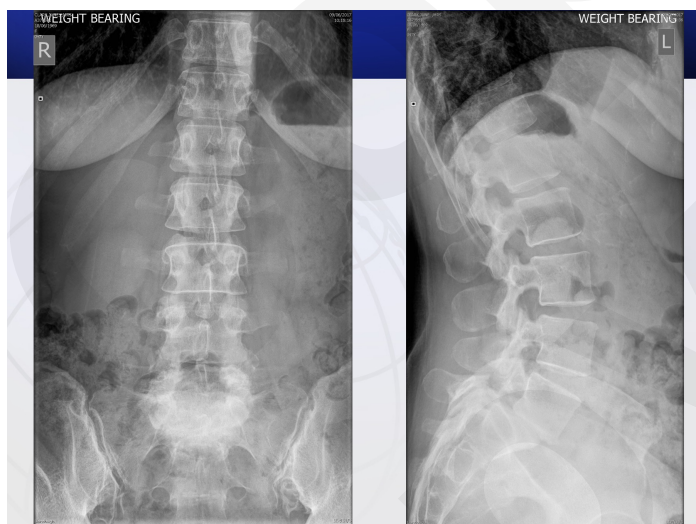




GLOBUS MEDICAL

- 50 year old female
- Chronic buttock and thigh pain worse than LBP

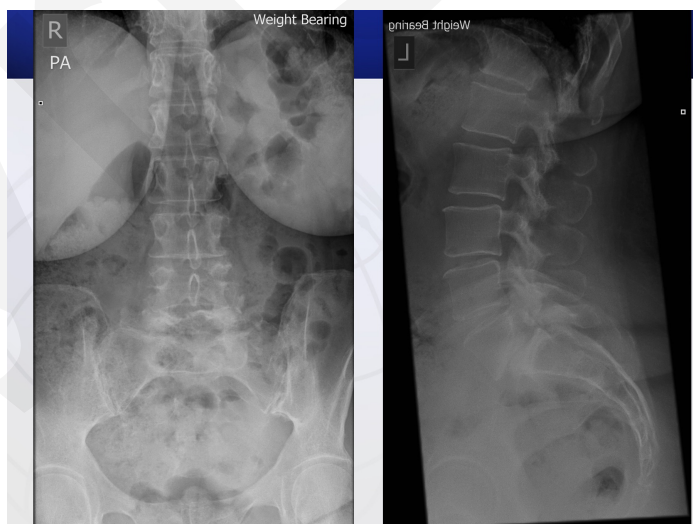
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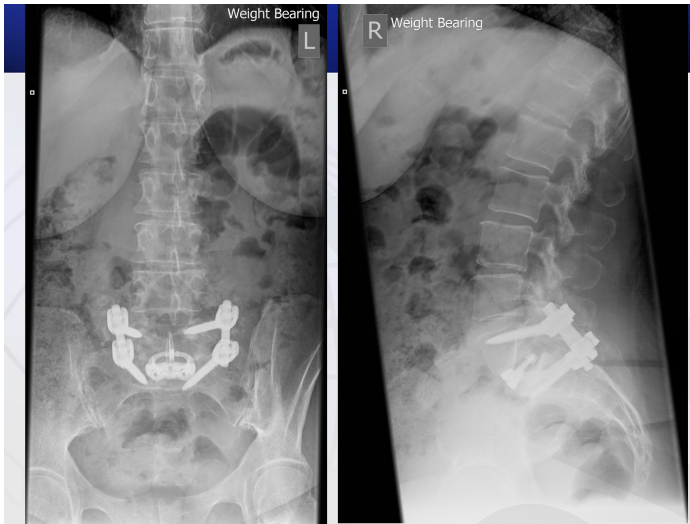


GLOBUS MEDICAL

- Another 50 year old female
- Worsening bilateral leg and low back pain

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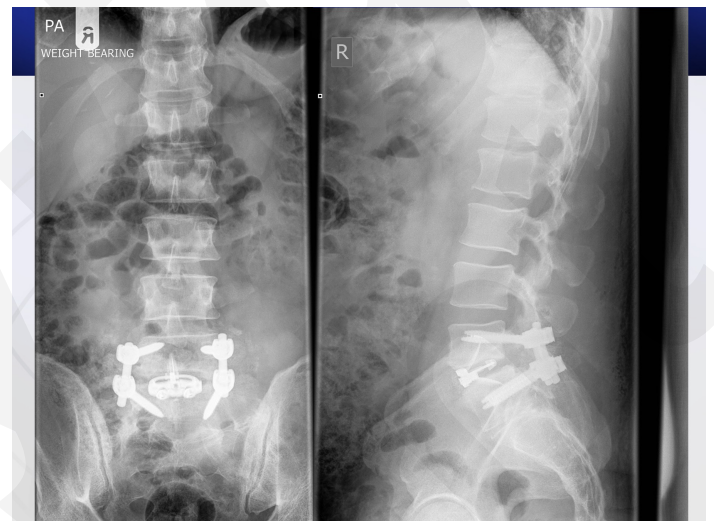
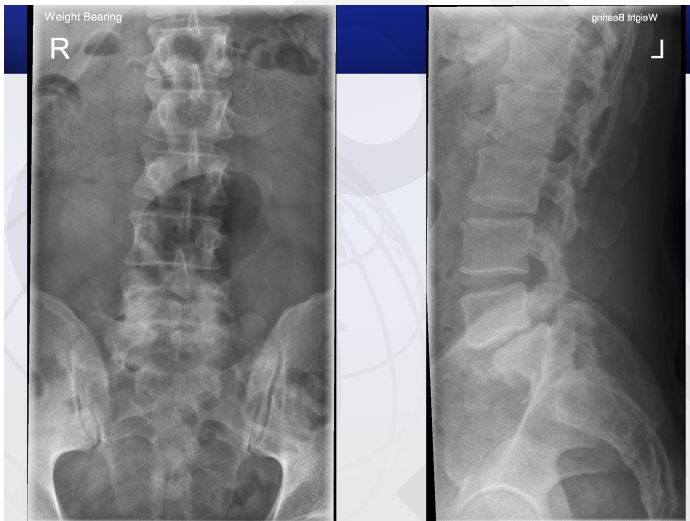




GLOBUS MEDICAL

- 40 year old male
- LBP as child
- Recent worsening leg pains

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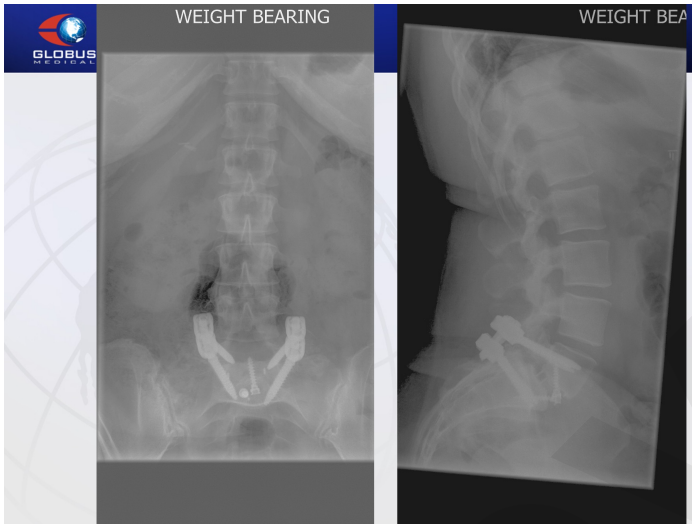


GLOBUS MEDICAL

- 35 year old female
- PLF decompression for leg pains
- Unable to TLIF at op
- Ongoing leg pain post op

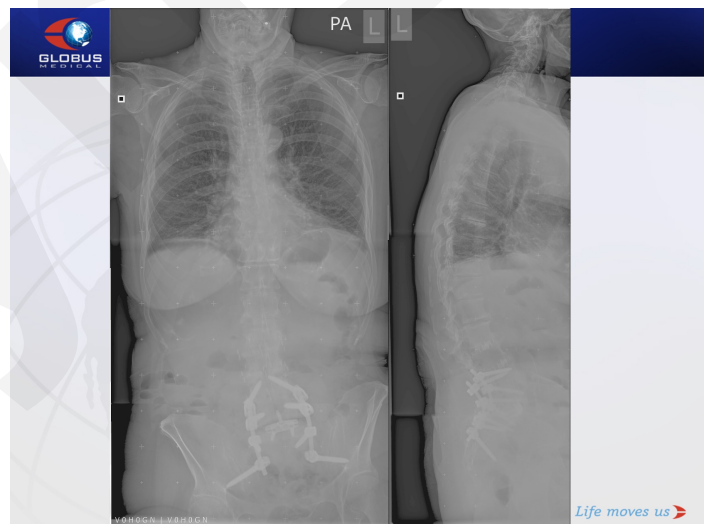
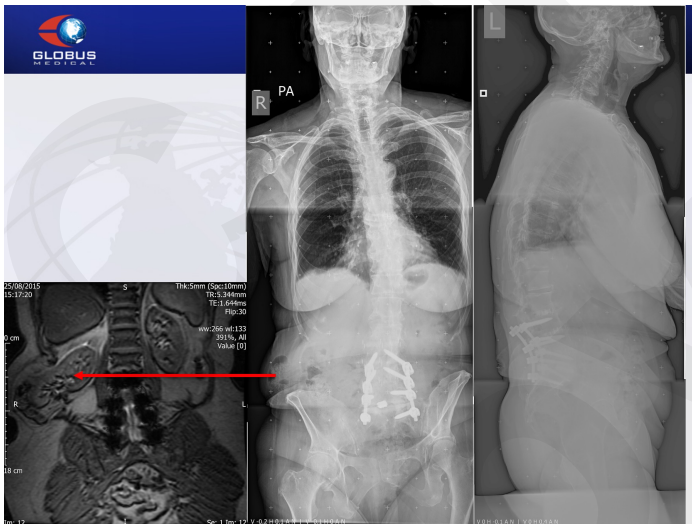
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- 70 year old female
- Previous LLIF for LBP and leg pains
- Psuedarthrosis – posterior instrumentation
- Subsequent L5/1 ASD and L5 pain
- TLIF
- No has worsening LBP and L5 pain
- S1 screws loose and L5/1 psuedarthrosis

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- Although ALIF has access issues it provides:
- Larger stronger implant
- Achieves greater height restoration
- Better disc preparation
- Less subsidence
- No posterior muscle disruption
- Dural tear is rare!

"I prepare less,
tear the dura
and my implant
is smaller"



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Thank you

