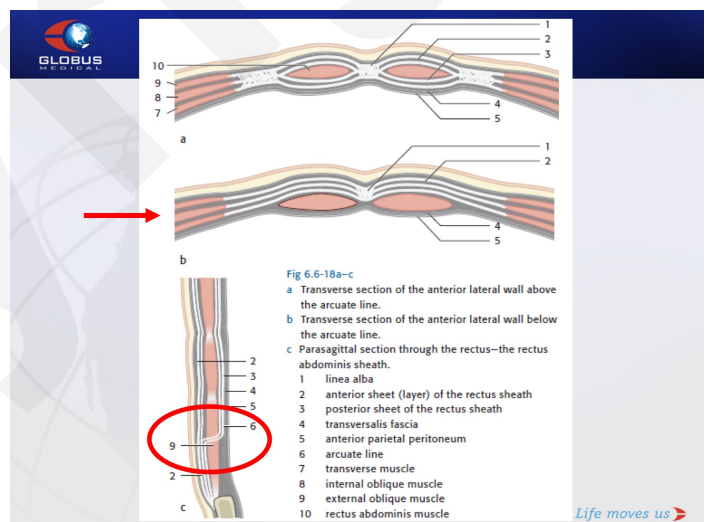
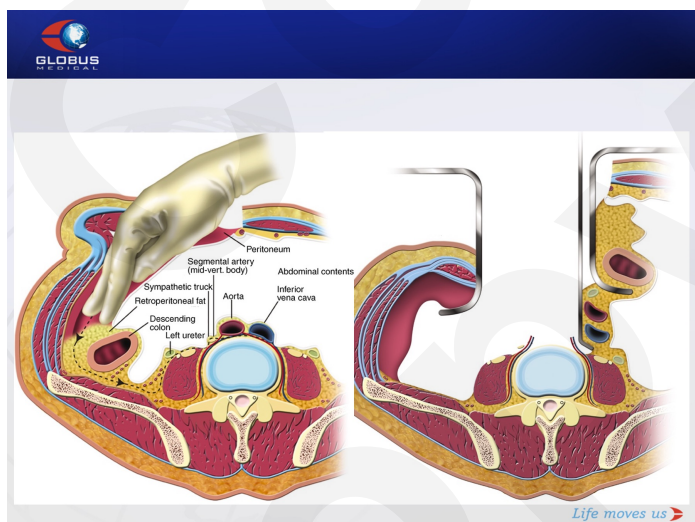
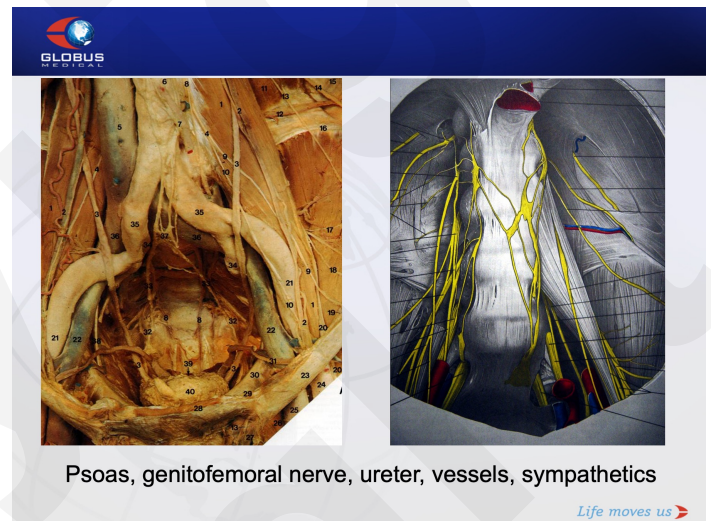
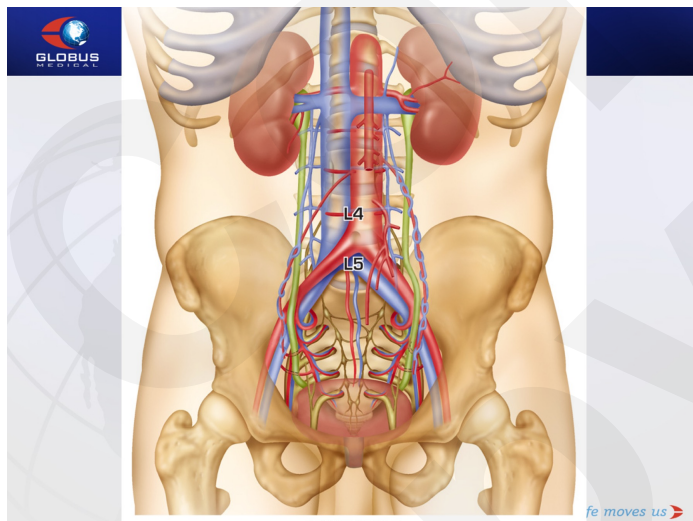
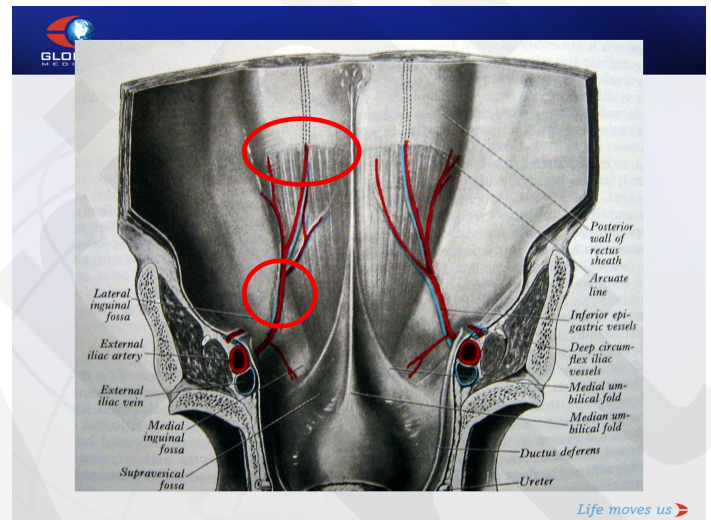
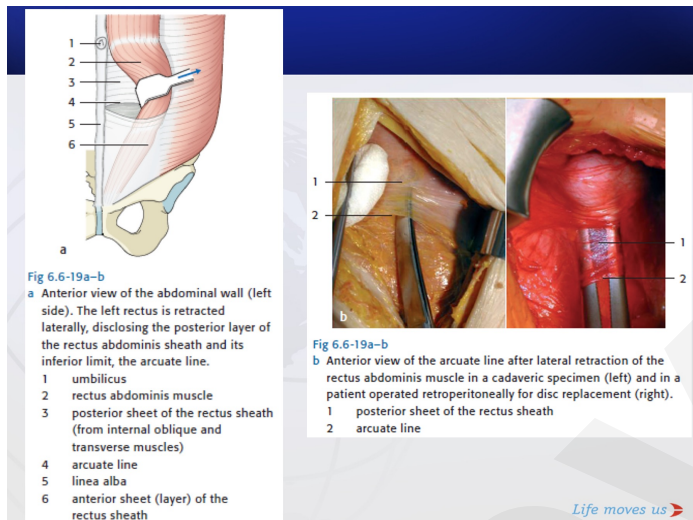




	Advantages	Disadvantages
PLIF	Bilateral access to canal, restores lordosis	Painful, infection, neural / dural injury scarring, limited higher up
Mini Open and MIS PLIF	Less painful, low infection, less blood loss, faster recovery	Fusion?, neural / dural injury scarring, limited higher up
Open TLIF	Access,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





Indications

- Direct Anterior Appr L2/3 – S1
- (DDD)
- SPL
- Prior dorsal surgery
- Deformity

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)

Workup

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

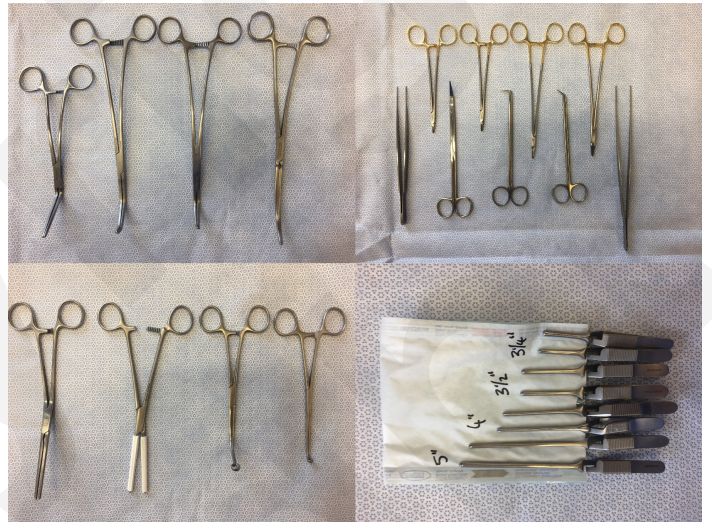
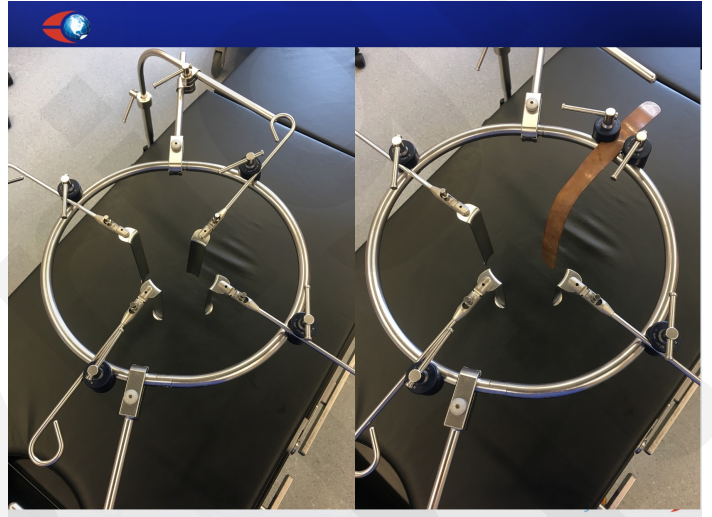
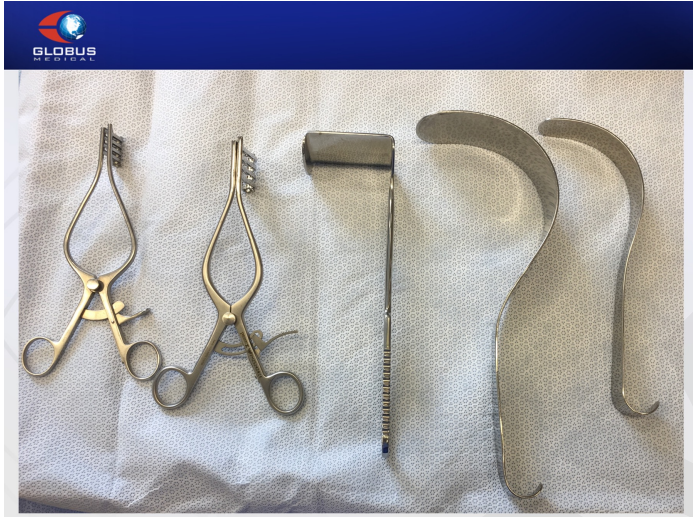
Life moves us

Equipment / OR Set Up

- General Instruments
- Ring retractor
- Vascular set
- Flowseal / Packs
- Implants
- Disc Prep
- (Vascular Surgeon...)

Life moves us

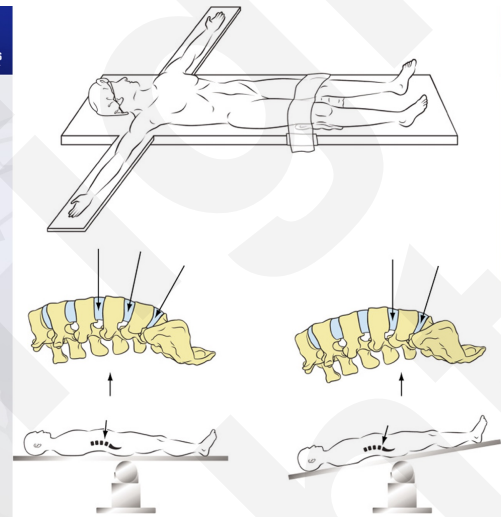




Position

- 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

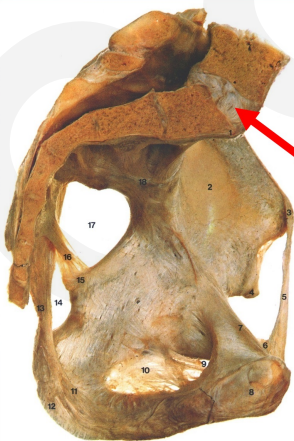
Life moves us ➤



Copyright 2008 by Elsevier Science

moves us ➤

Symphysis Pubis



Life moves us ➤

Incisions

- 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

Retro vs Transperitoneal
Left vs Right Side
Male vs Female
Single vs Multiple levels

Life moves us ➤

Incision Exposure

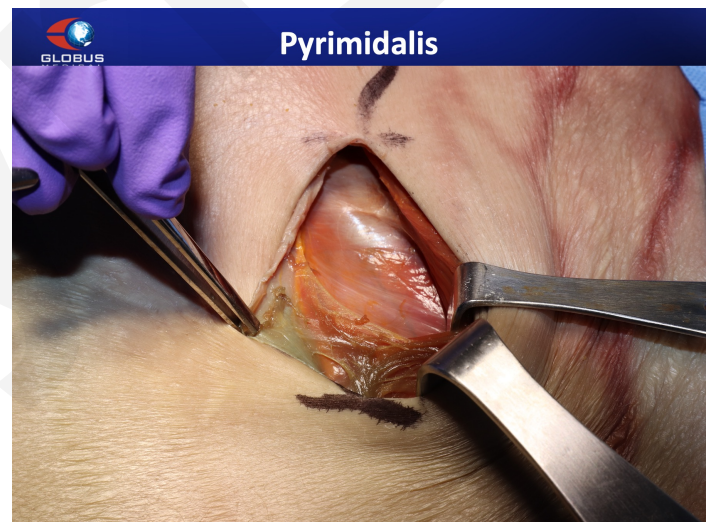
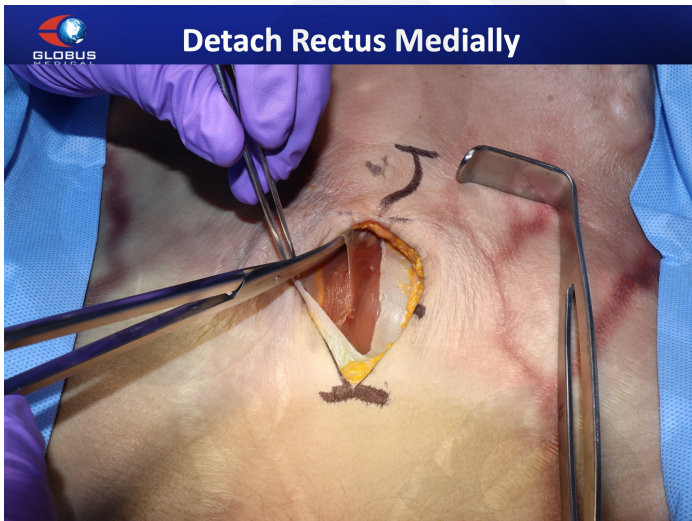
- Left retroperitoneal appr (normally...)
- +/- Gen Surg / Vascular
- Rectus sheath
- Inferior epigastrics
- Peritoneum
- Ilioinguinal / GFN / Psoas
- Ureter / Vessels / Rectum

Life moves us ➤

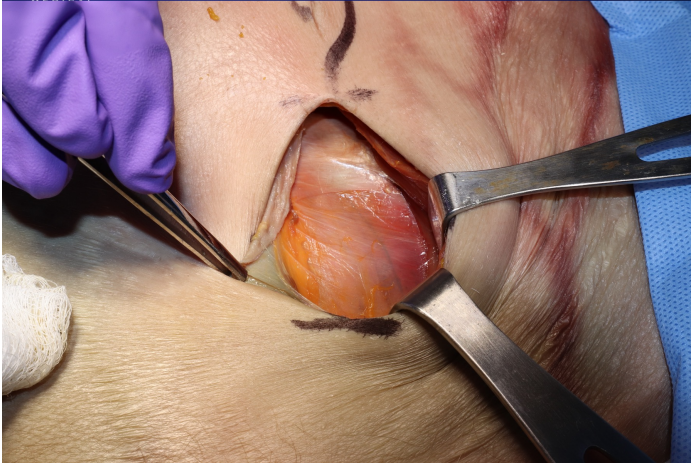
Retraction

- Table mounted ring vs pins
- 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)

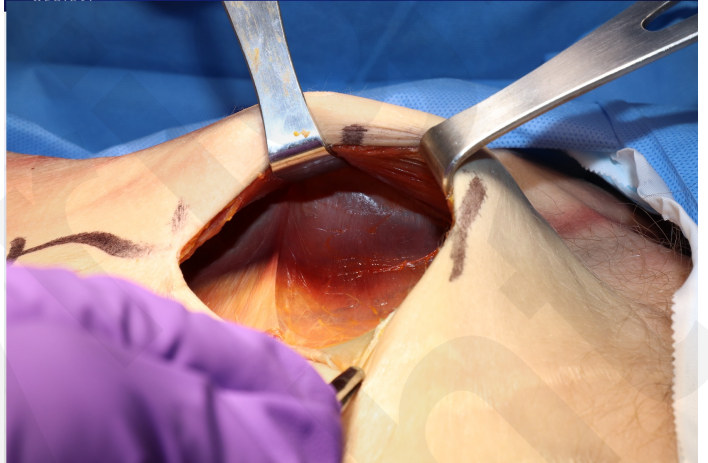
Life moves us ➤



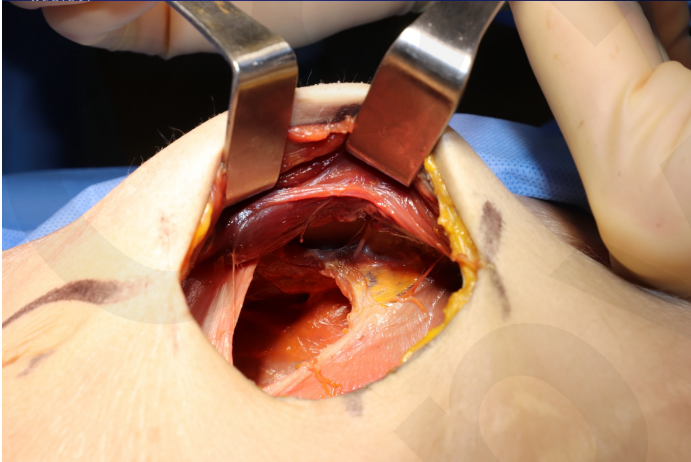
Transversalis / Peritoneum



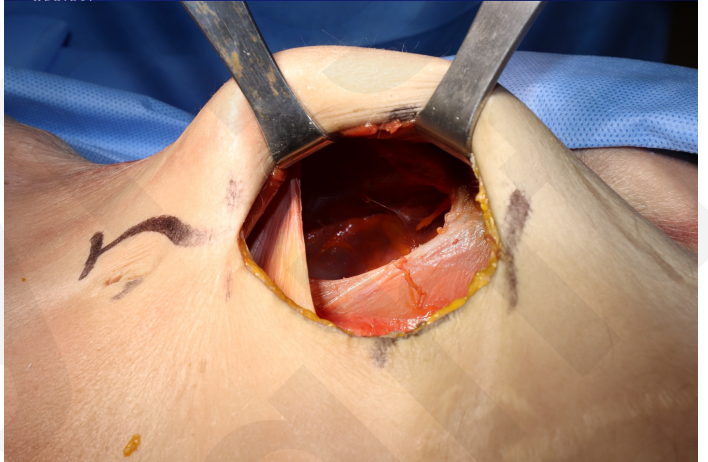
Lateral Dissection



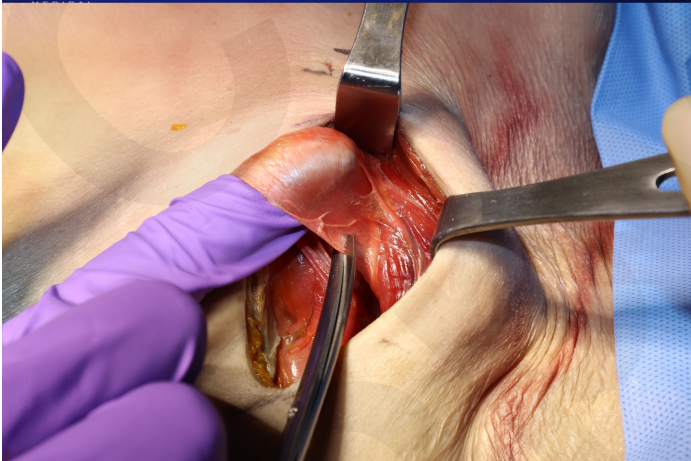
Inf Epigastric / Retroperitoneal Fat

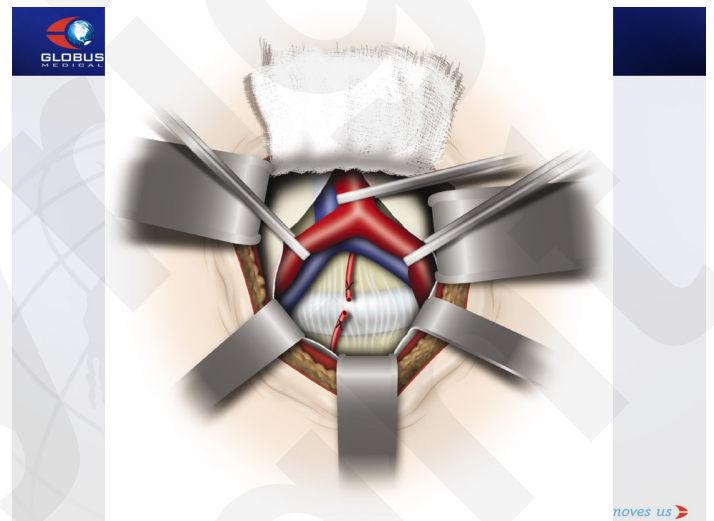
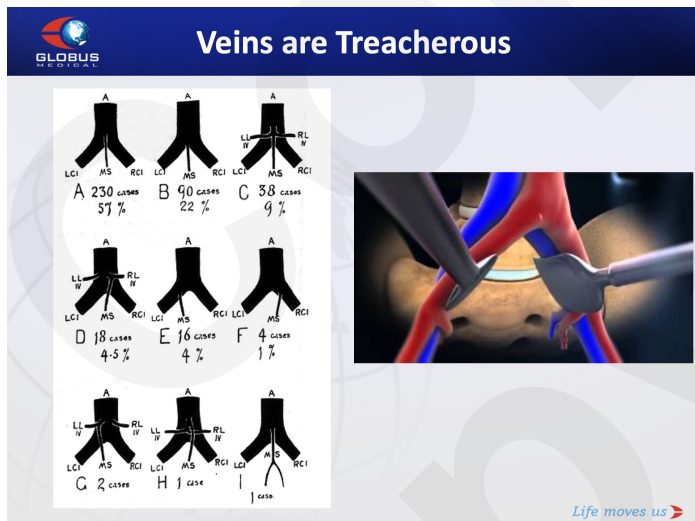
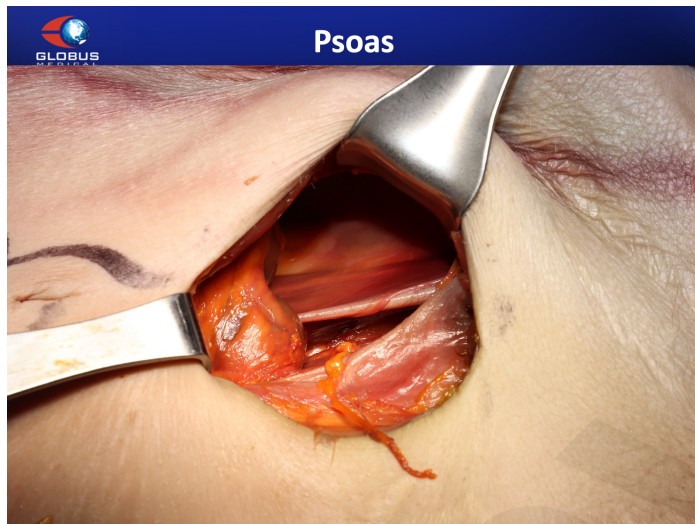


Lateral Abdo Wall / Psoas



Arcuate Line

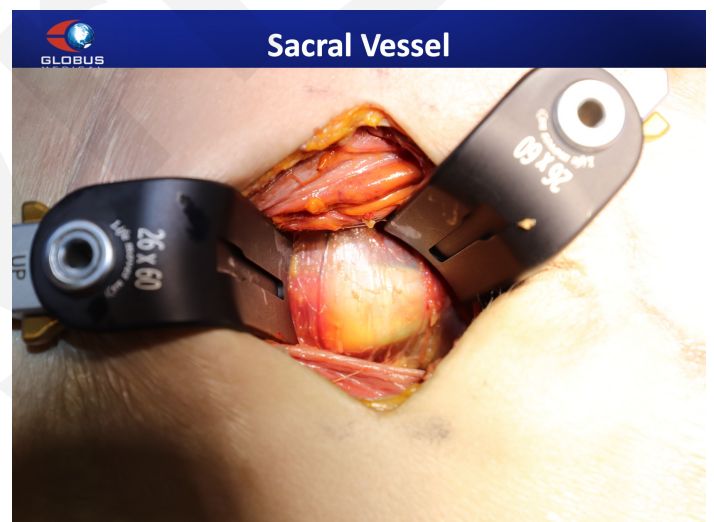


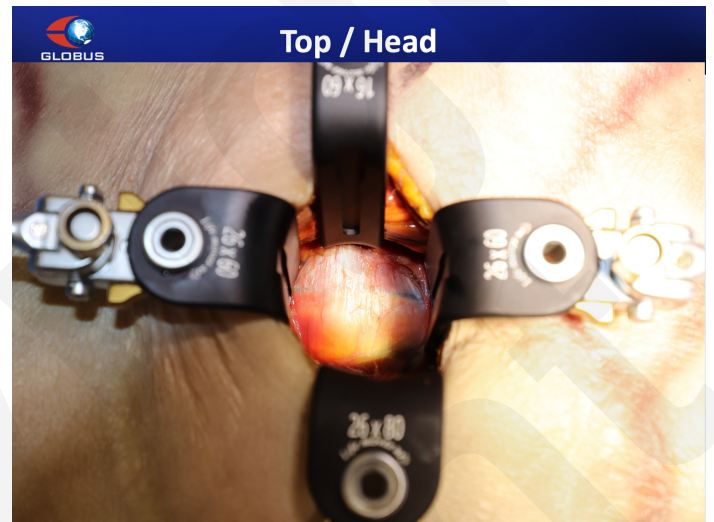
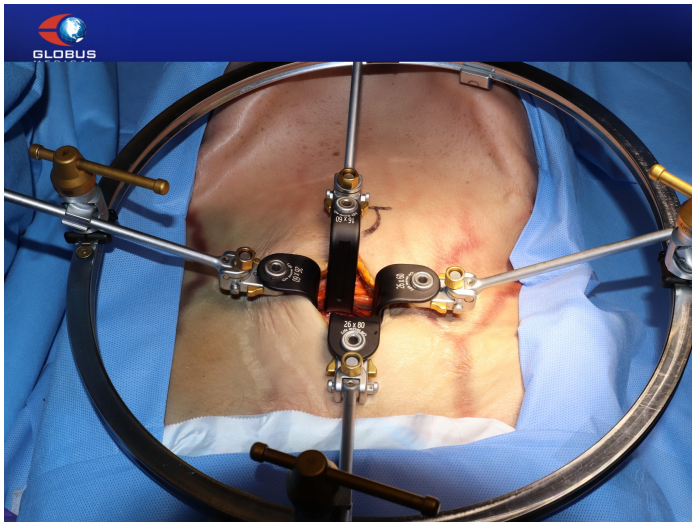


Venous Surgery Principles

- 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

Life moves us





Top / Head

Discectomy

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

Life moves us

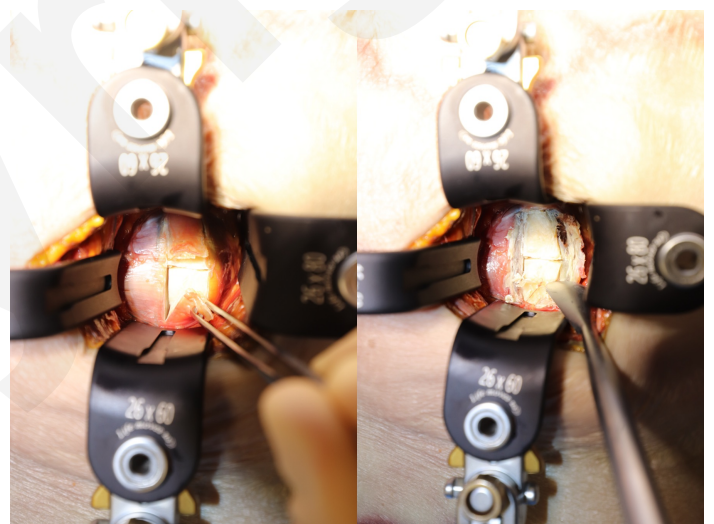
Graft / BMP / Cage

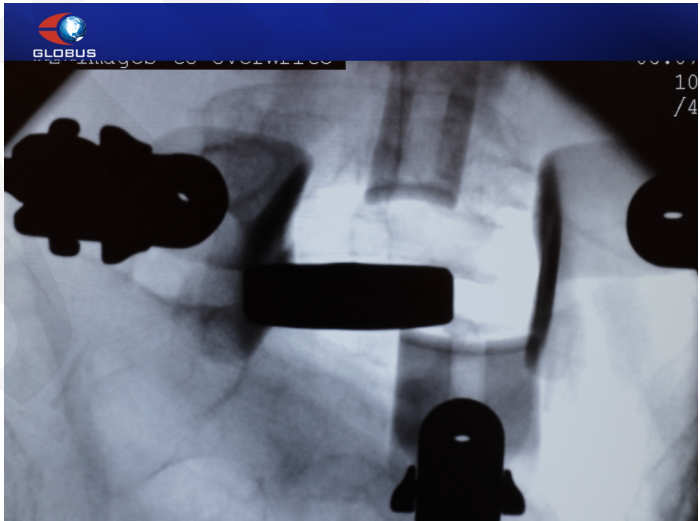
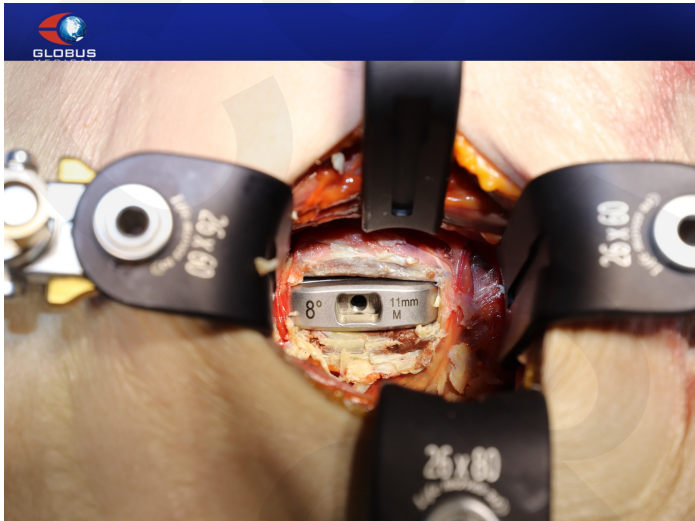
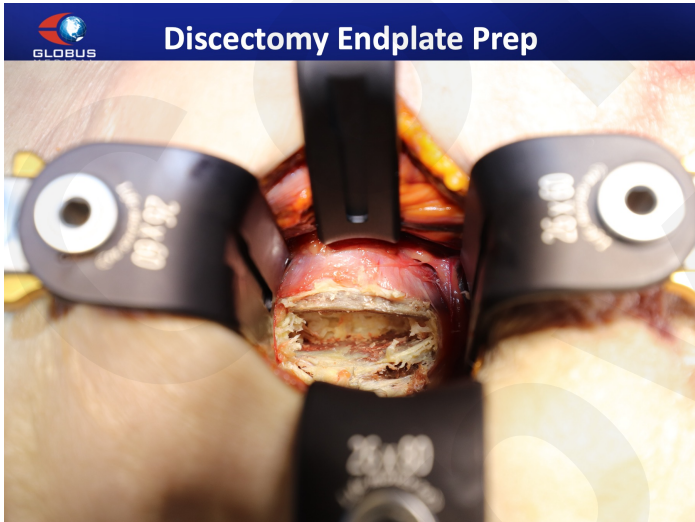
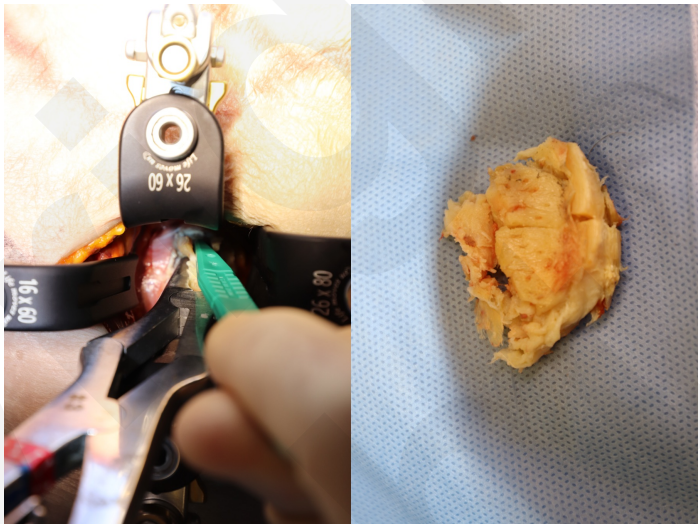
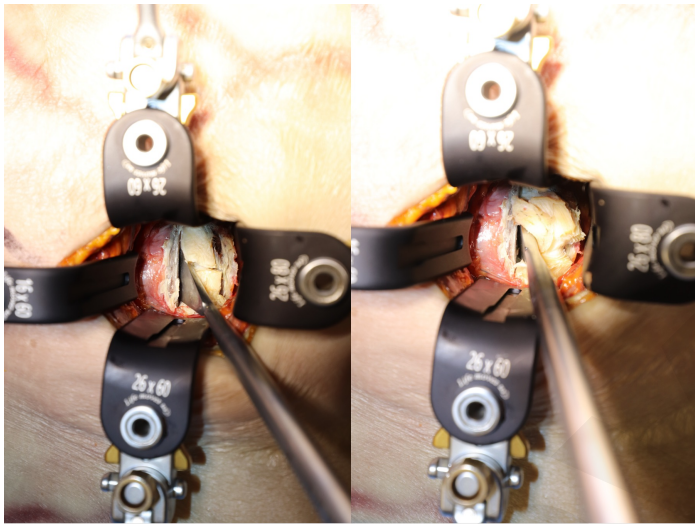
- Crest strut graft
- Cage +/- fixation
- +/- Plate
- +/- Dorsal fixation

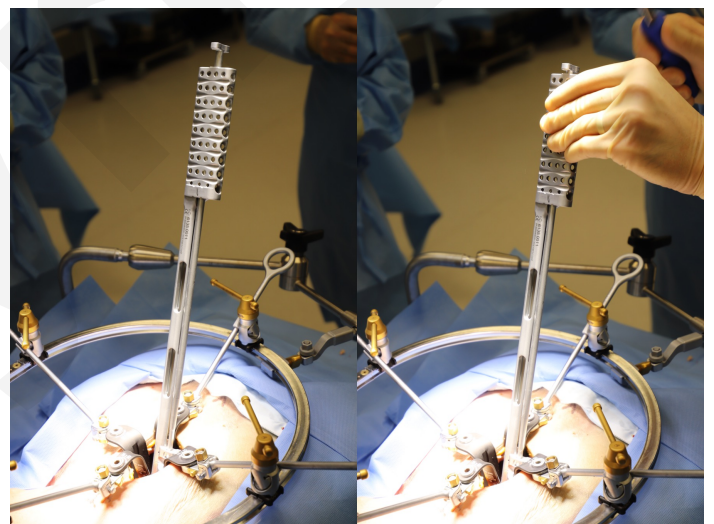
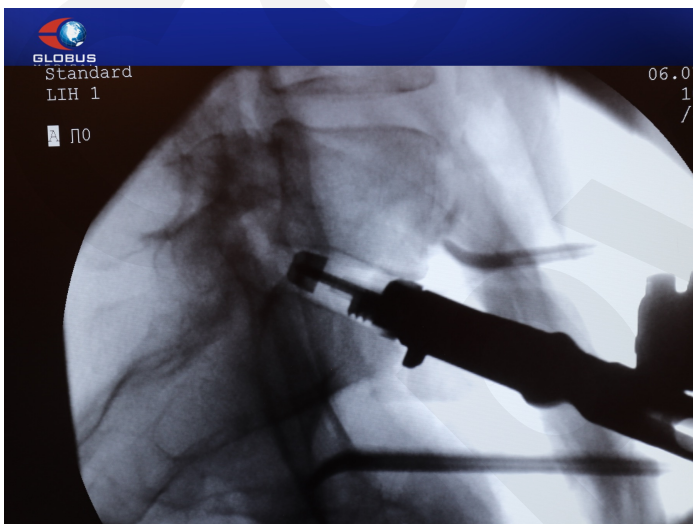
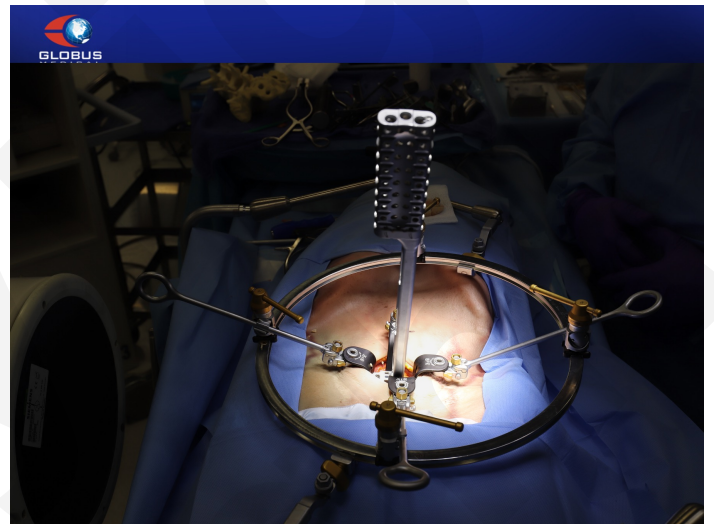
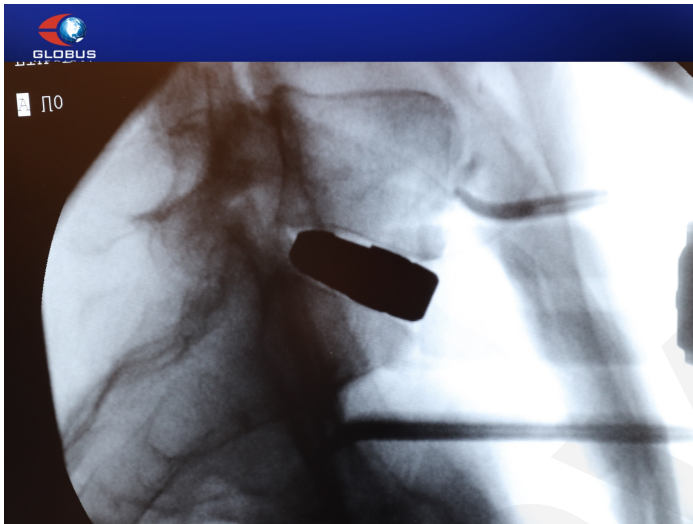
Life moves us

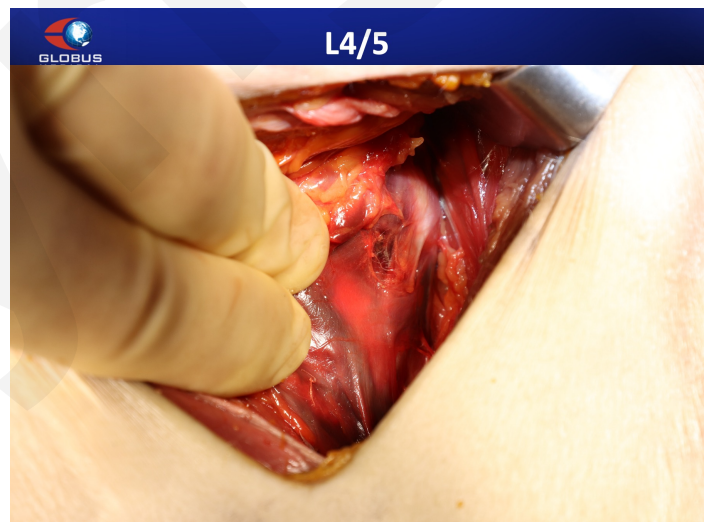
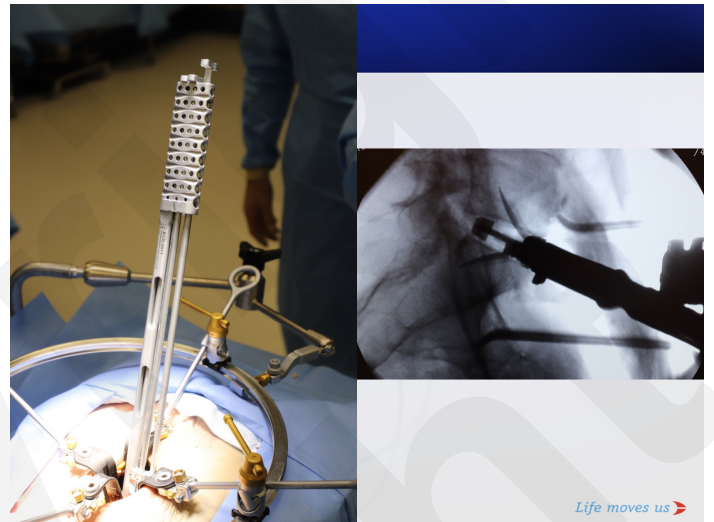
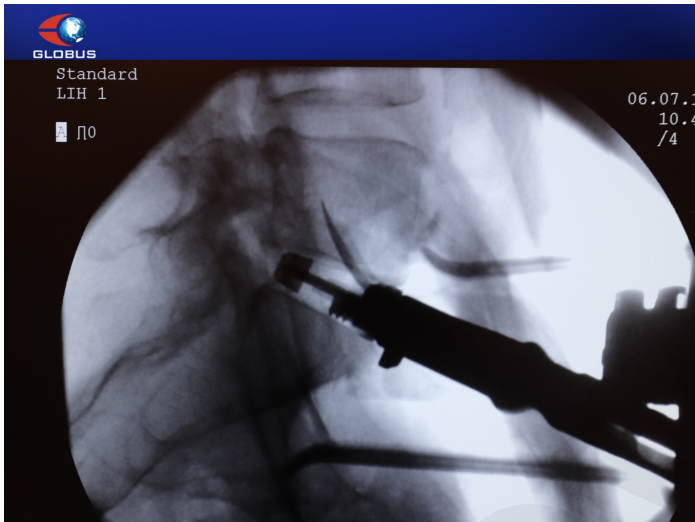


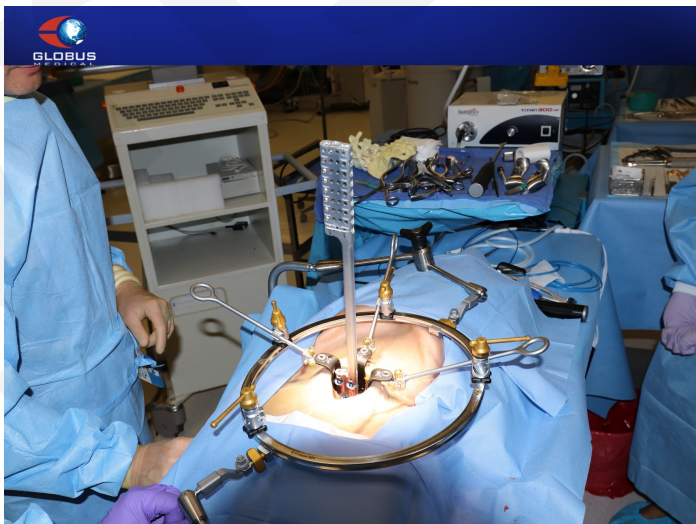
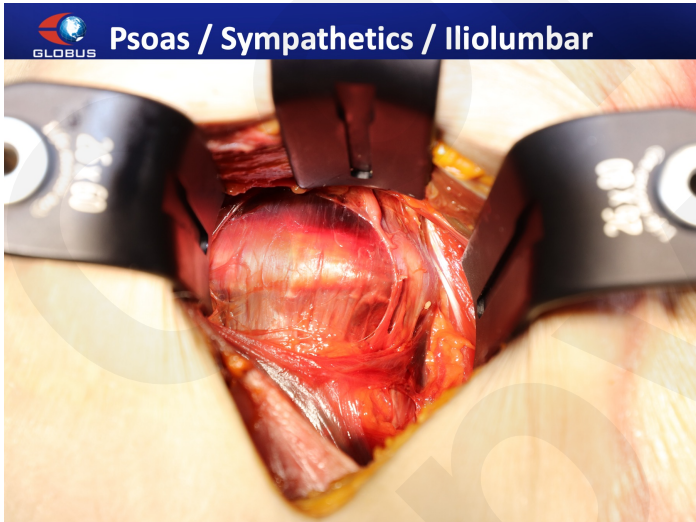
Annulotomy

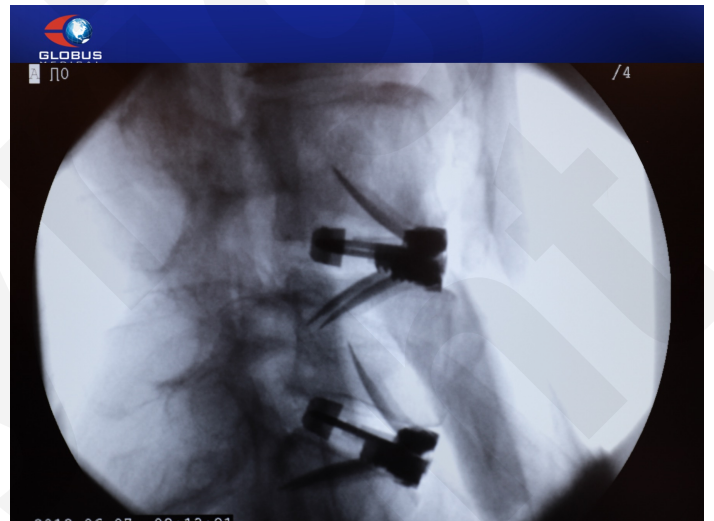
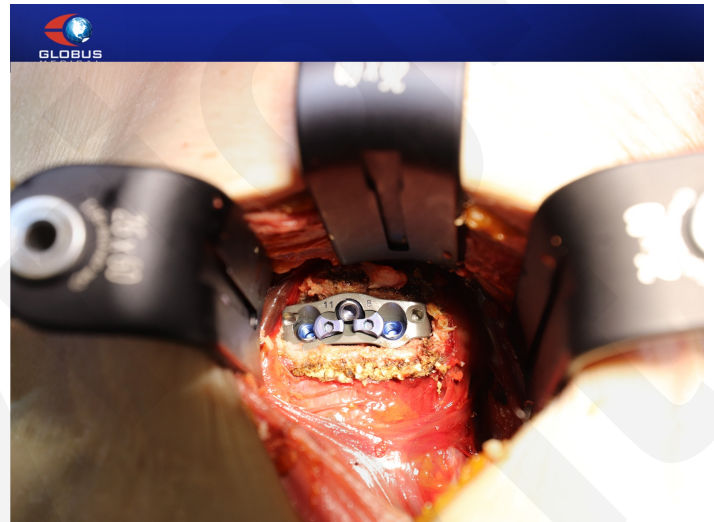
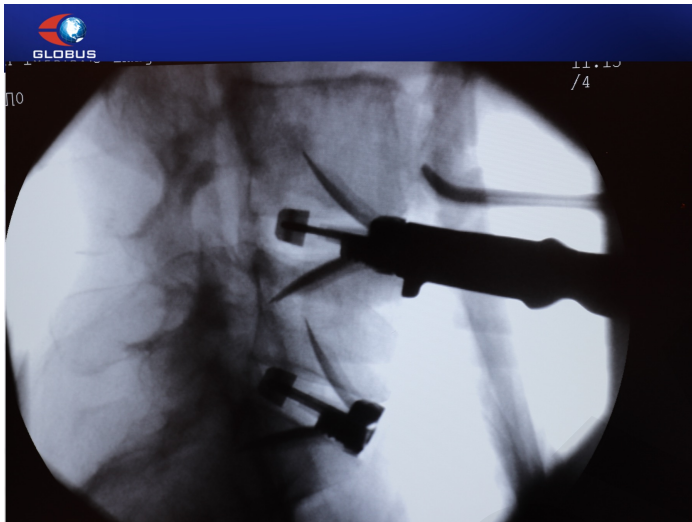












Closure

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

Life moves us ➤

Complications

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

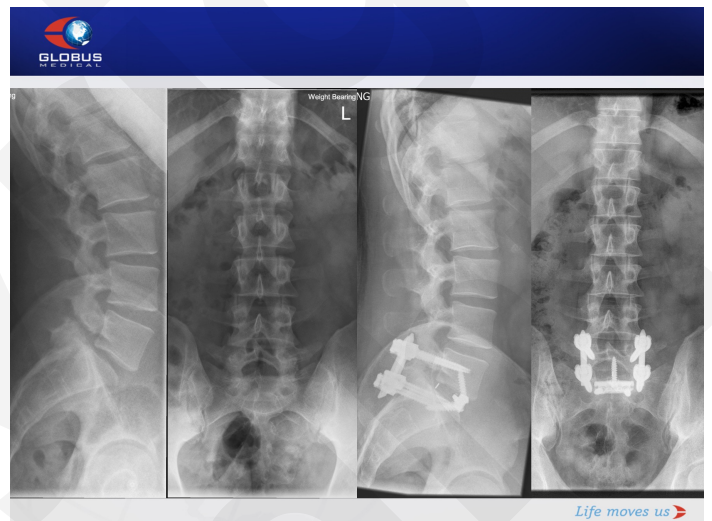
Life moves us ➤

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)

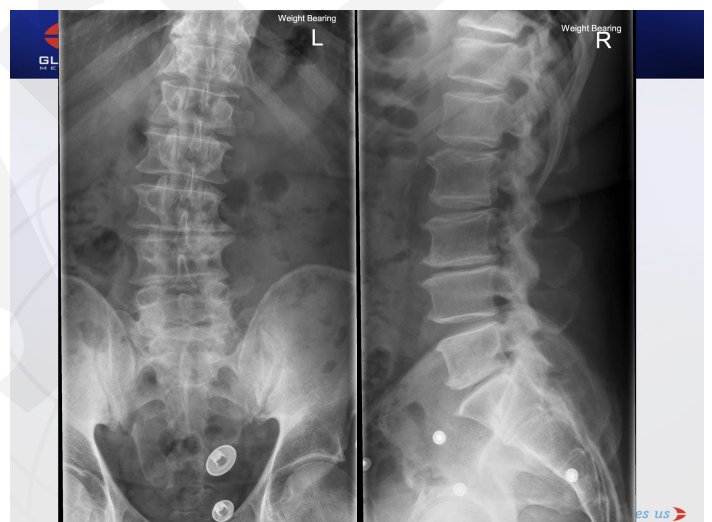
Anatomical!

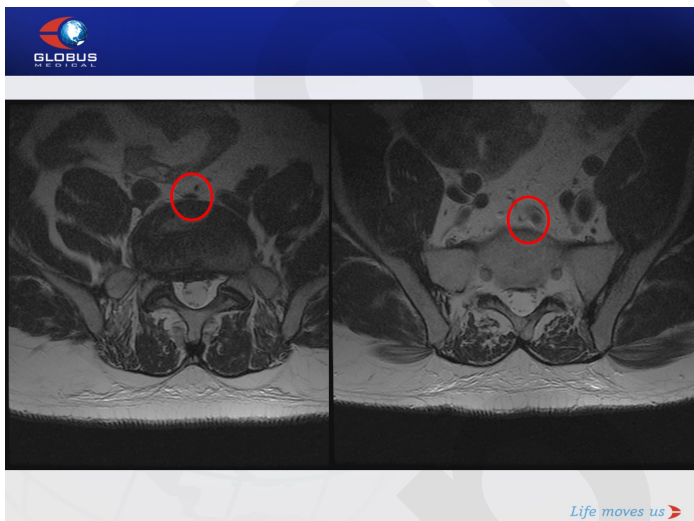


- 30 year old male
- Bilateral severe L5 pain some LBP
- Finished family
- Responded well to root blocks
- Pain keeps coming back and wants an operation



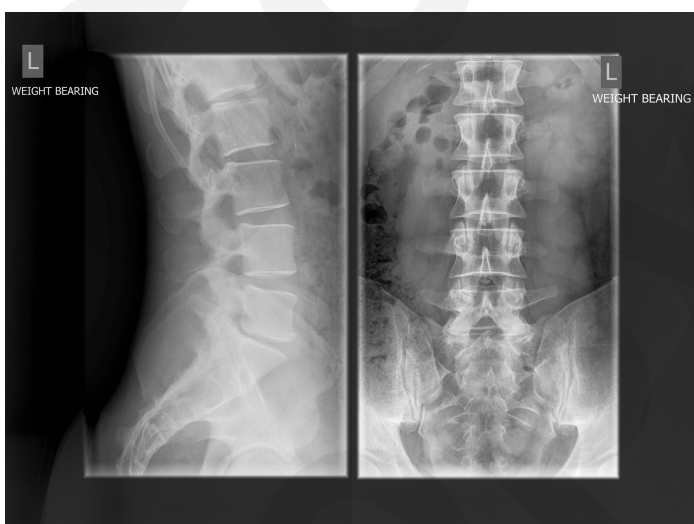
- 50 year old male
- Severe right L5 pain
- Responded well to root block
- Wants a permanent solution

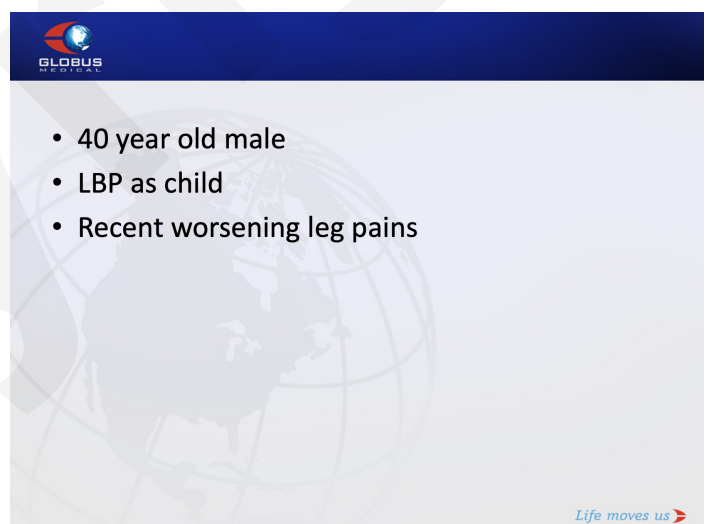
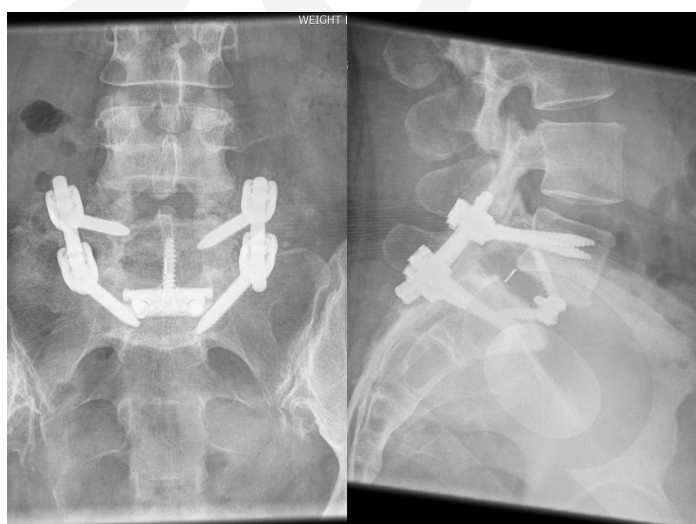
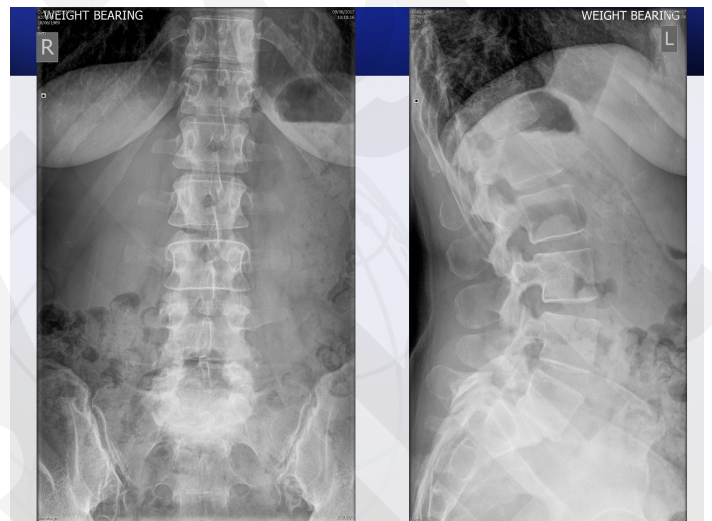
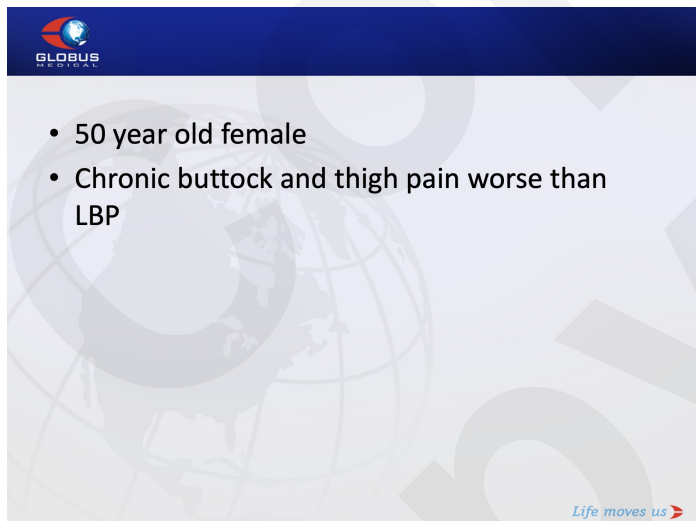
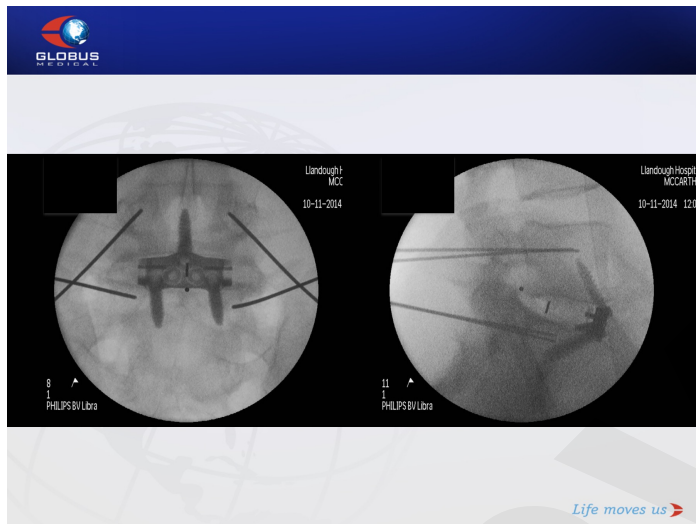


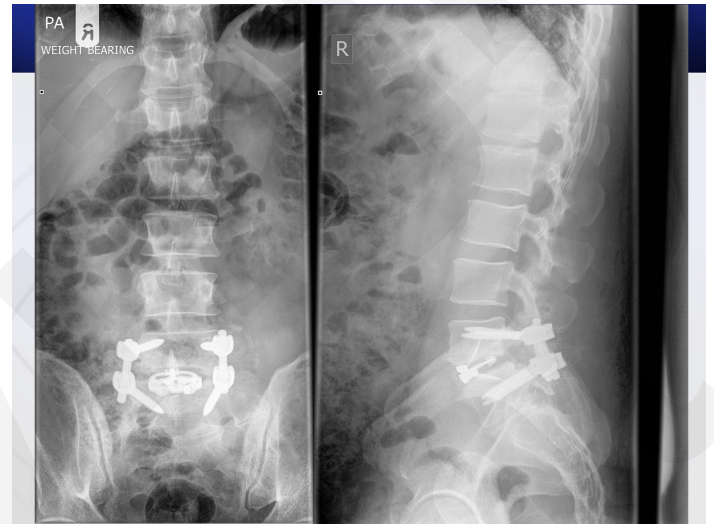
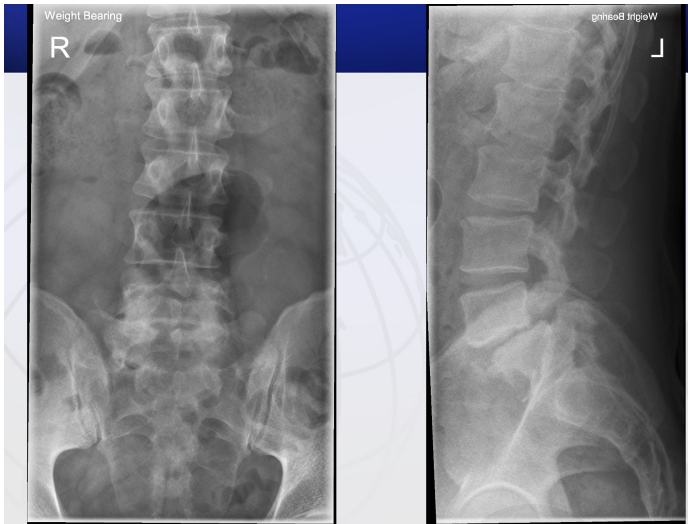


- 35 year old male
- Worsening low back pain 5 years
- No leg symptoms
- Failed conservative management
- Facet injections temporary relief

Life moves us ➤



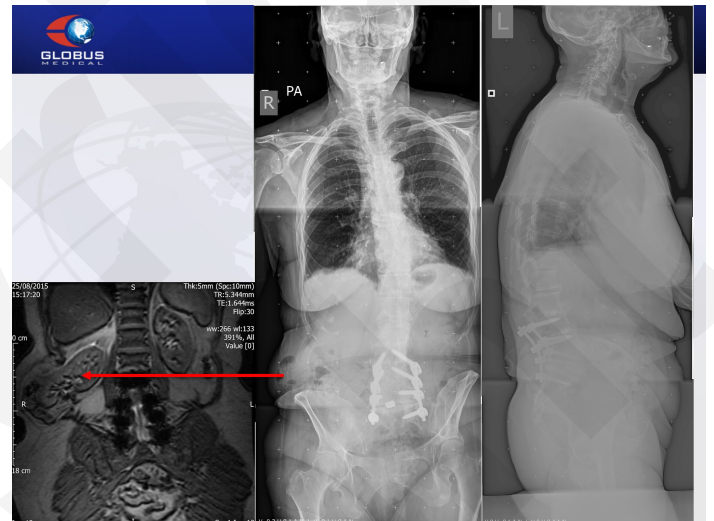


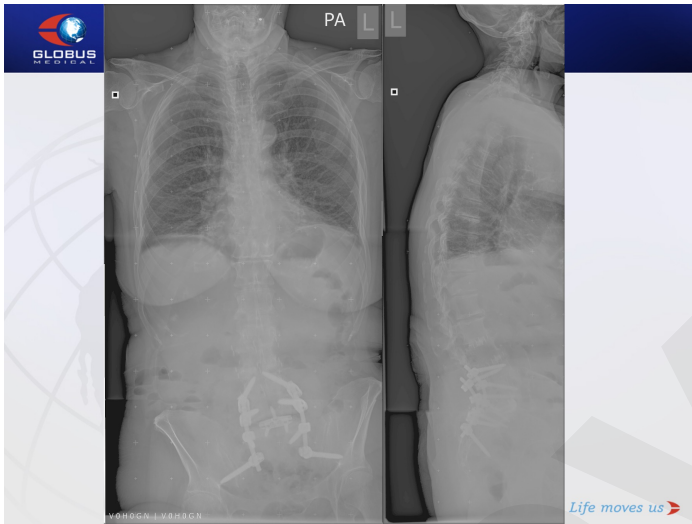


GLOBUS MEDICAL

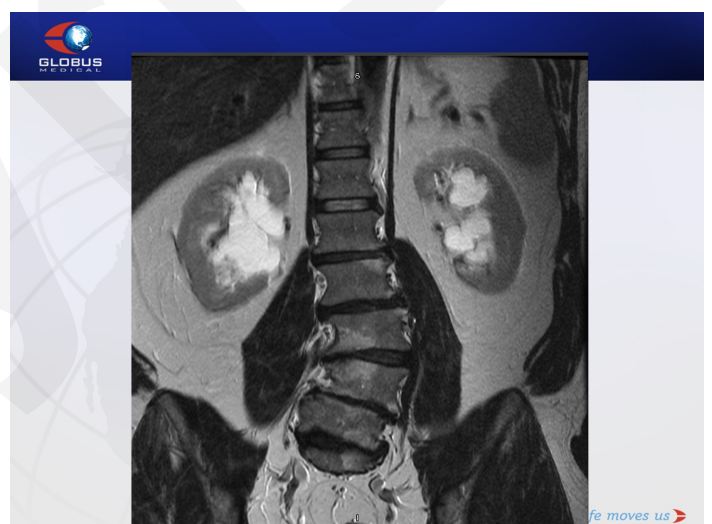
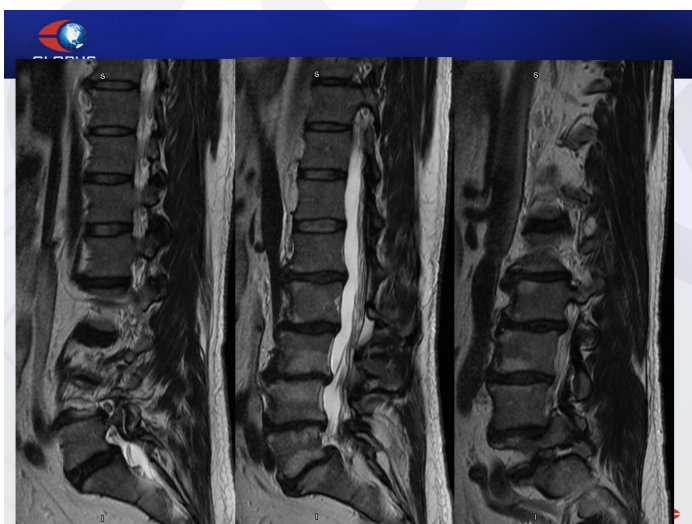
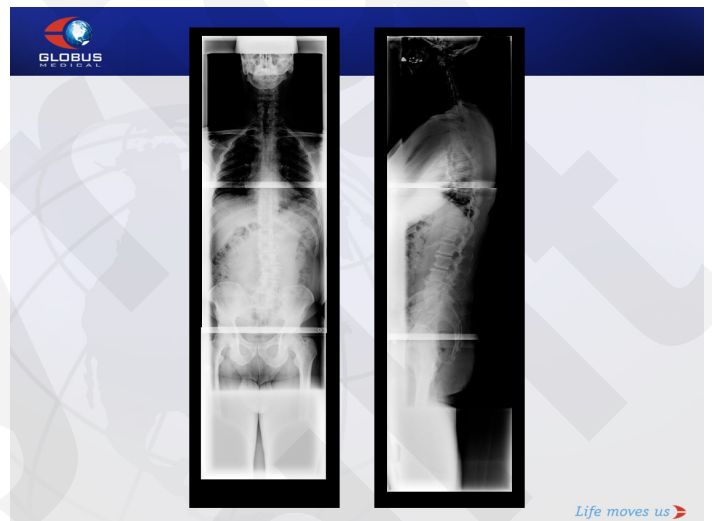
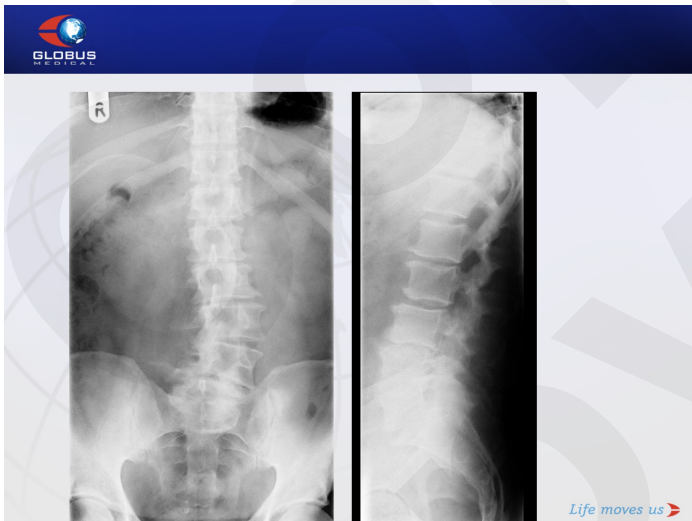
- 70 year old female
- Previous LLIF for LBP and leg pains
- Psuedarthrosis – posterior instrumentation
- Subsequent L5/1 ASD and L5 pain
- TLIF
- No has worsening LBP and L5 pain
- S1 screws loose and L5/1 psuedarthrosis

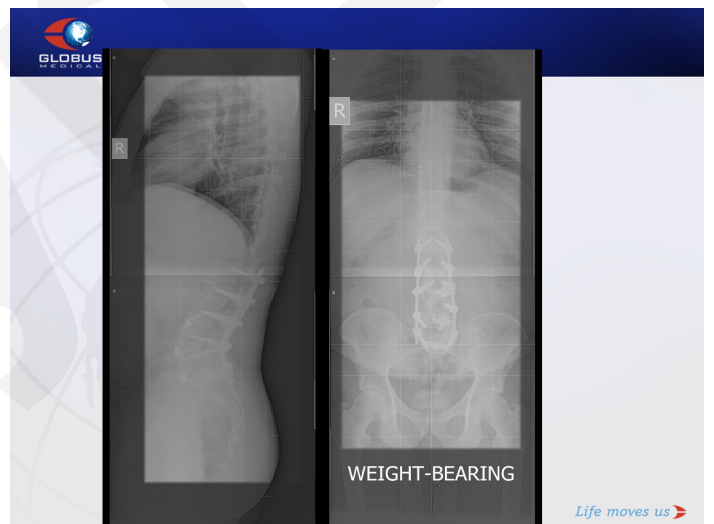
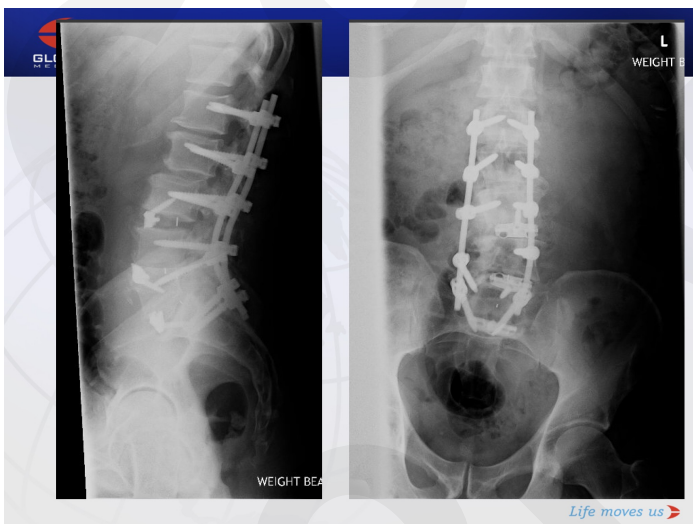
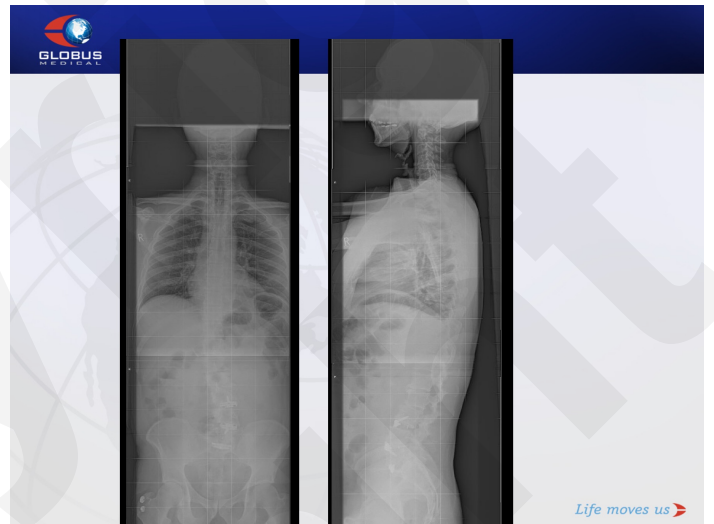
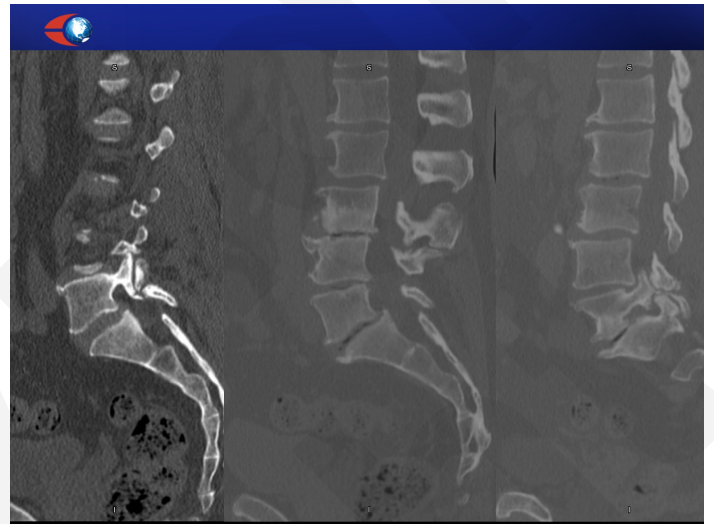
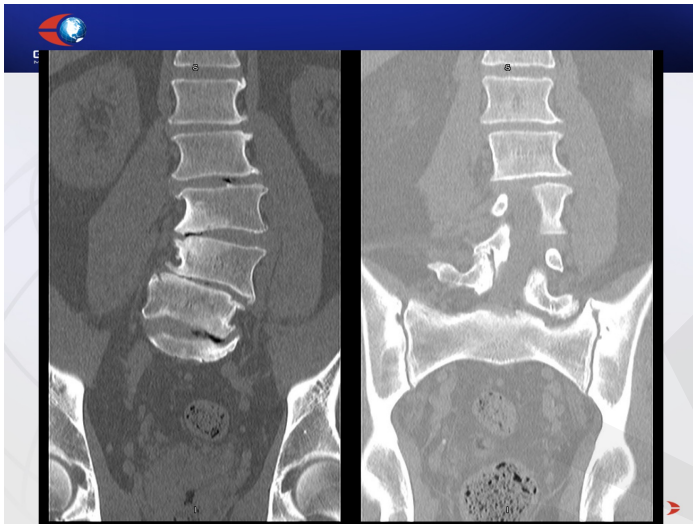
Life moves us

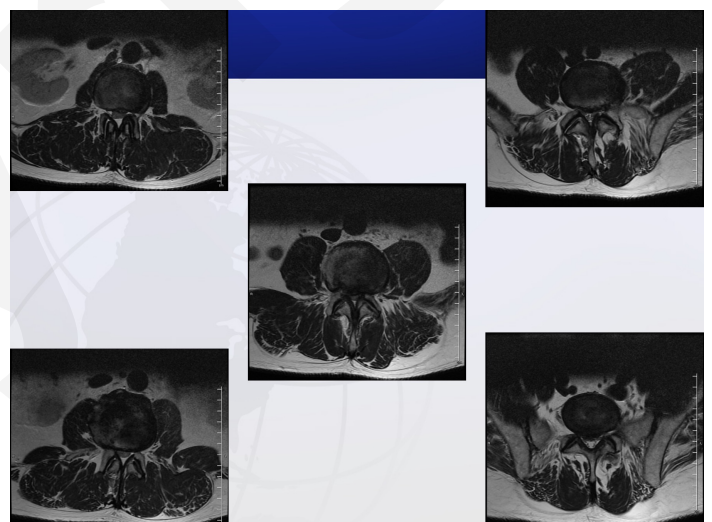
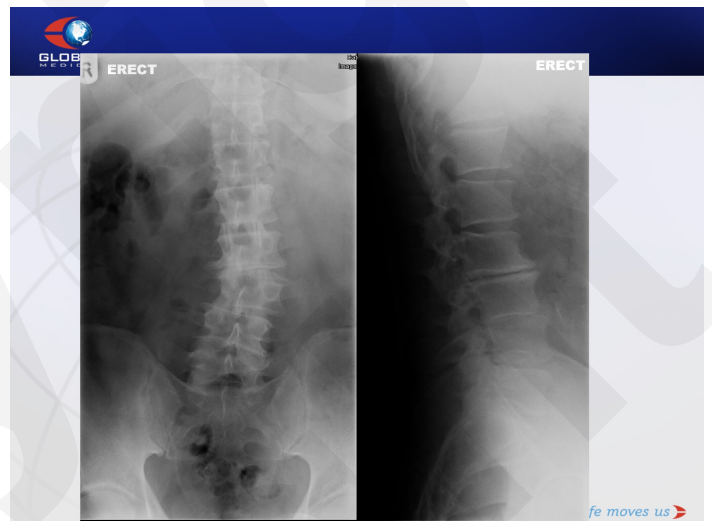
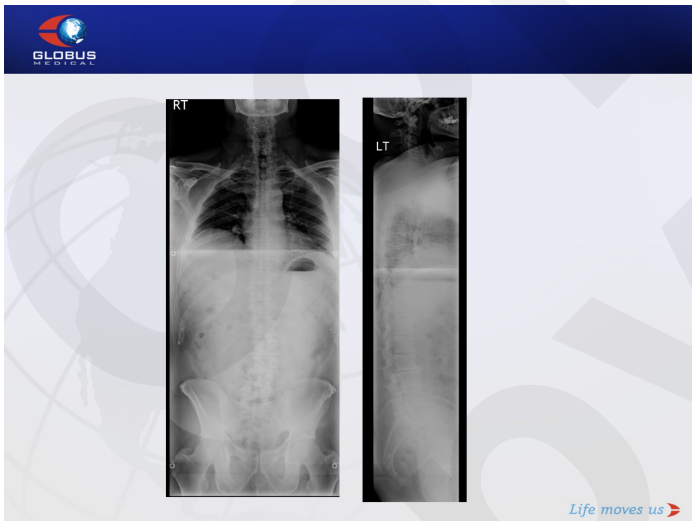
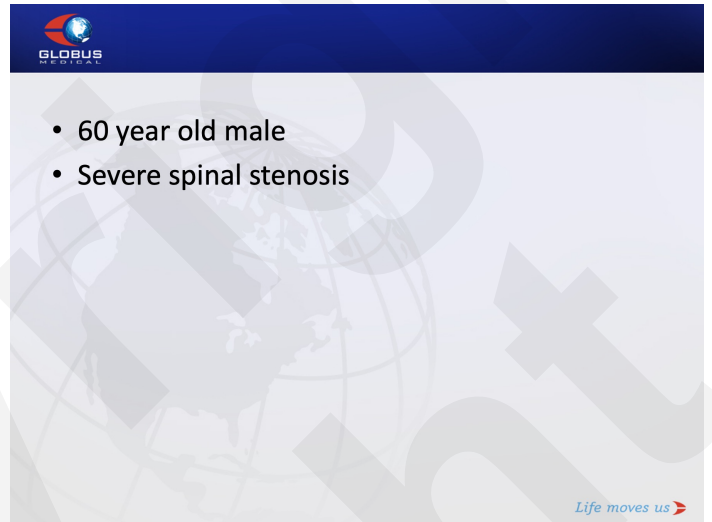
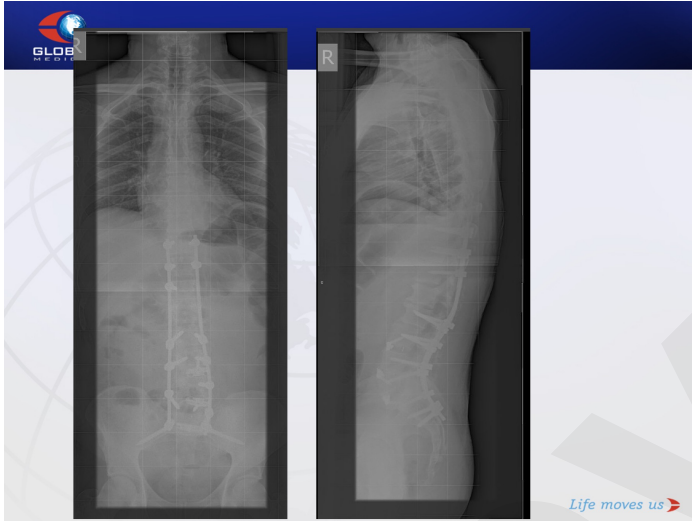




• 60 year old male
 • Severe left L5 pain







www.gapcalculator.com

Measurements

Age

Pelvic Incidence (PI)

Sacral Slope (SS)

L1-S1 Lordosis

L4-S1 Lordosis

Global Tilt (GT)

The Global Alignment and Proportion (GAP) score is a PI-based individualized method of analyzing the sagittal plane that effectively predicts mechanical complications of surgery for adult spinal deformity.

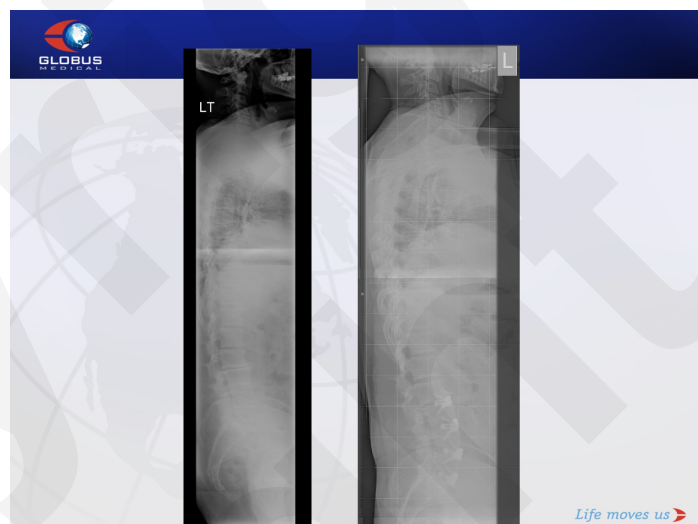
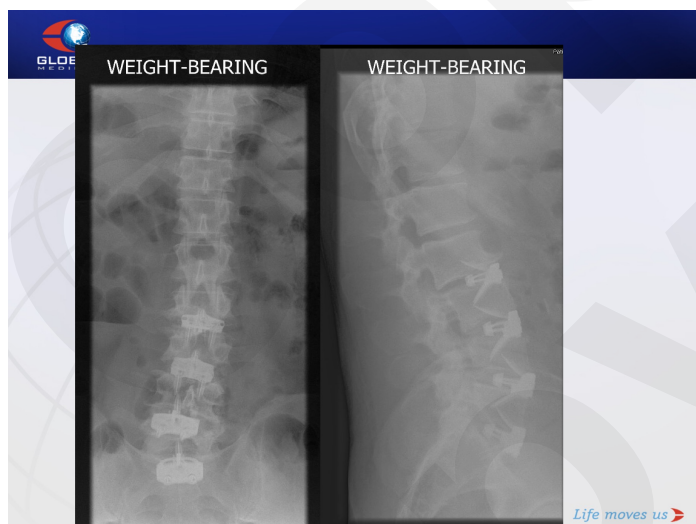
Life moves us

Parameters	Results	Subgroups	Scores	Preoperative Planning		
Age Factor	59		0	Current Angle	Calculated 'Ideal'	Correction Required
RPV	-25.6°	Severe Retroversion	3	SS	17.0°	42.6°
RLL	-47.3°	Severe Hypolordosis	3	L1-S1	17.0°	64.3°
LDI	141%	Hyperlordotic Maldistribution	3	L4-S1	24.0°	39.2°
RSA	27.6°	Severe Positive Malalignment	3	GT	40.0°	12.4°

① GAP Score 12
Severe Disproportion

The GAP score is a continuum of states that provides an individualized indication of pelvic version, magnitude and distribution of lumbar lordosis, and global spinopelvic alignment to assess disproportion compared with the calculated "ideal" for any given subject.

Setting surgical goals in the sagittal plane on the basis of the proportional indices reflected by the GAP score may decrease the rate of mechanical complications. [Fullmed Link](#)



Summary

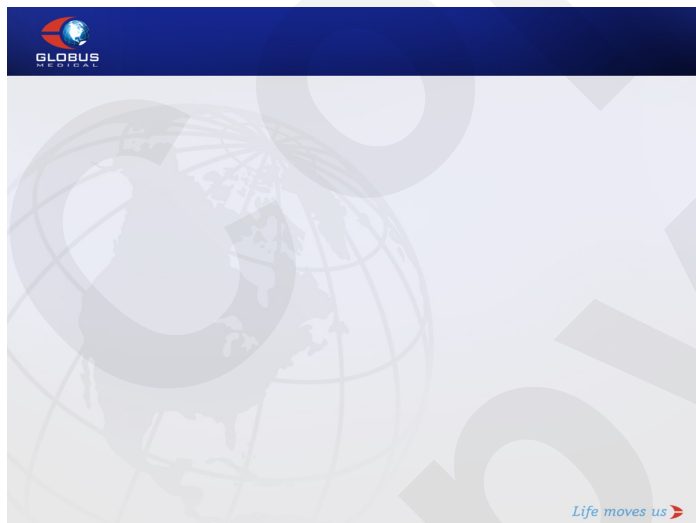
- Although ALIF has access issues it provides:
- Larger stronger implant
- Achieves greater height restoration
- Better disc preparation
- Less subsidence
- No posterior muscle disruption
- Dural tear is rare!

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

Life moves us



Thank you



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

But...

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

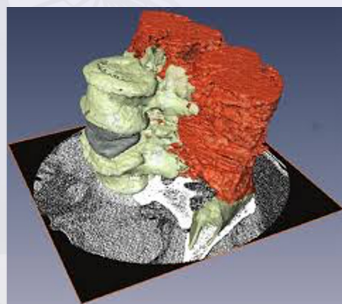
APPS

- Anatomy
- Pathology
- Planning
- Surgery

Recent Topic = Lordosis



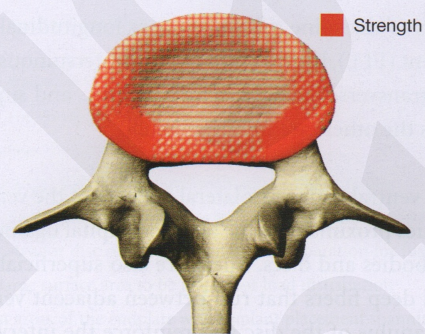
ALIF Advantages – Muscle Sparing



Life moves us ➤



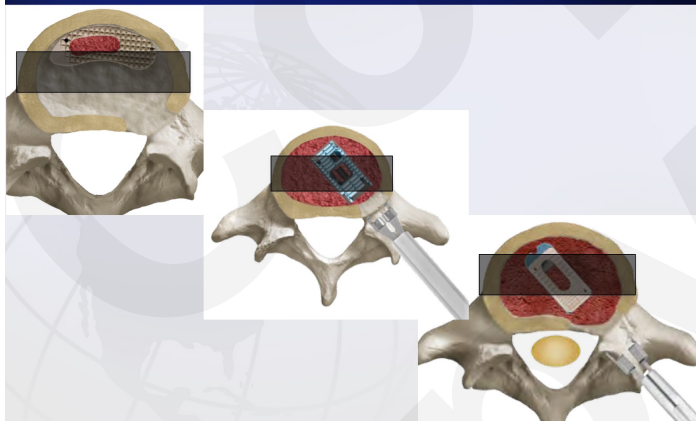
ALIF Advantages - Subsidence



Life moves us ➤



LLIF vs TLIF



Life moves us ➤



ALIF vs TLIF



Life moves us ➤



Less Subsidence

- Less subsidence with ALIF compared to TLIF



Life moves us ➤



ALIF Advantages - Lordosis

Table 2

Comparison of preoperative and postoperative lordosis within groups.

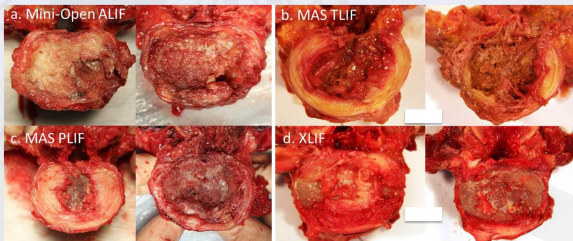
	Operative Level			Region:	
	Pre-oplordosis (mean ± SD)	Post-oplordosis (mean ± SD)	p value	Pre-oplordosis (mean ± SD)	
LLIF	12.1 ± 7.9°	15.3 ± 8.5°	p<0.01	51.5 ± 11.3°	
ALIF	15.8 ± 11.9°	19.6 ± 11.7°	p<0.01	51.6 ± 13.0°	
TLIF	13.0 ± 10.3°	14.9 ± 9.7°	p<0.01	47.2 ± 14.2°	
PSF	14.8 ± 9.6°	15.5 ± 9.7°	p=0.13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

Life moves us ➤



ALIF Advantages – Better Disc Prep

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



Life moves us ➤



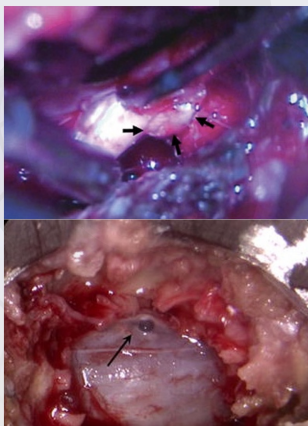
ALIF Advantages - Larger Graft Area

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

Life moves us ➤



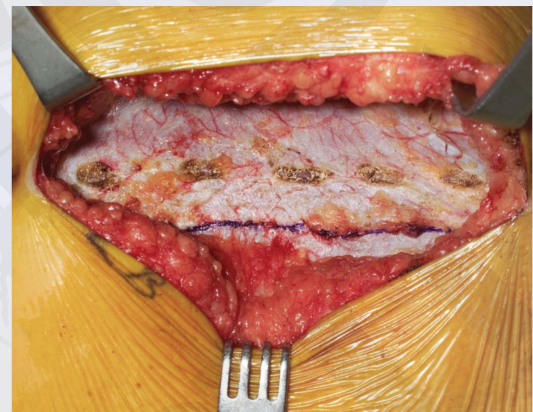
ALIF Advantages – Less Dural Injury



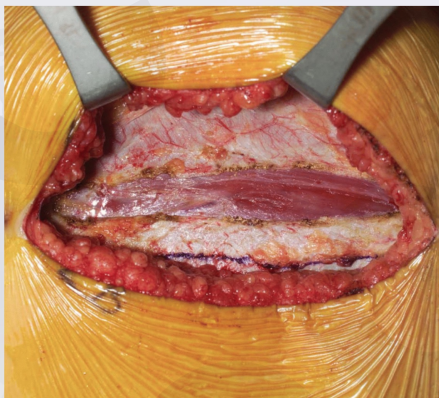
- Doesn't occur in ALIF
- (I've never seen one)



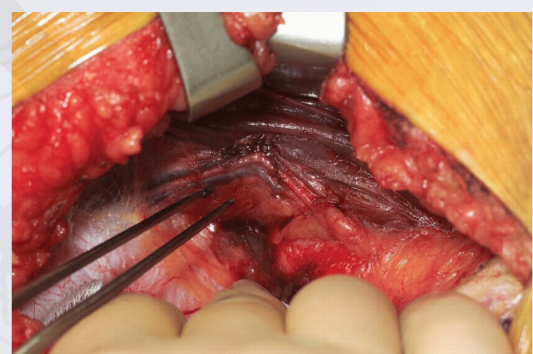
Life moves us ➤



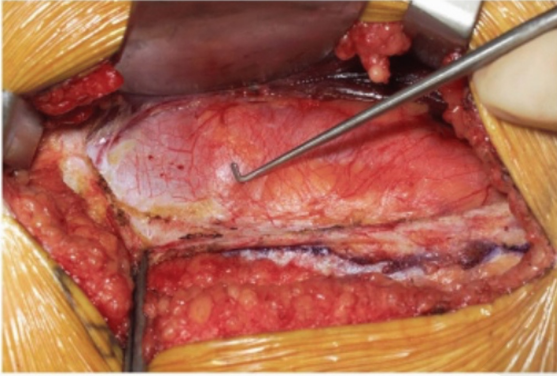
Life moves us ➤



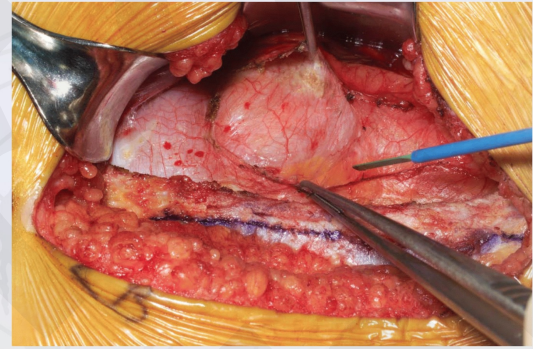
Life moves us ➤



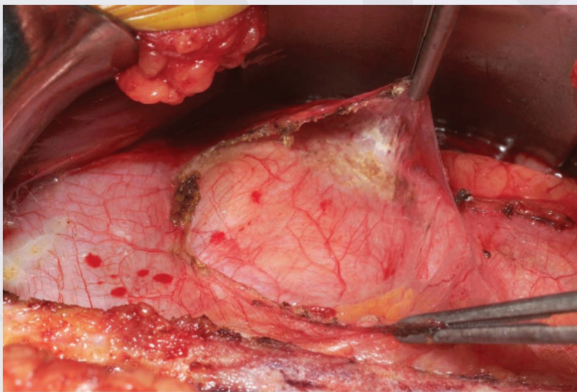
Life moves us ➤



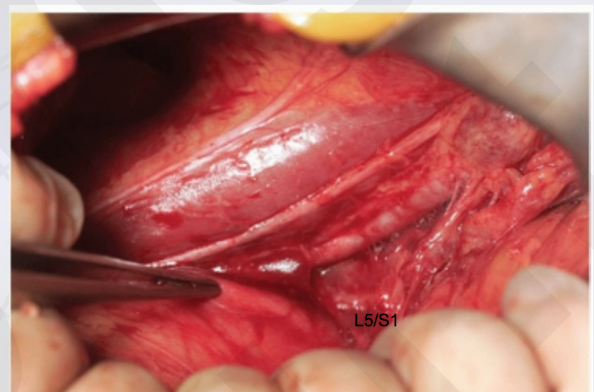
Life moves us ➤



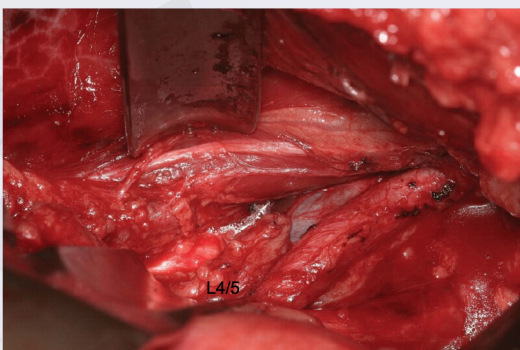
Life moves us ➤



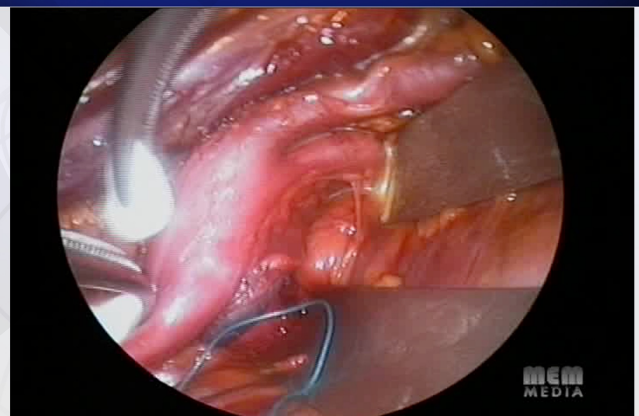
Life moves us ➤



Life moves us ➤



Life moves us ➤



Life moves us ➤

