

Lumbar complications: avoidance & management

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Potential problems

- ∅ Wrong indication

Re-surgence of the anterior approach

- Ø Initially used for Pott's disease and spondylolisthesis in 1930's

Ito JBJS 1934

Mercer Edin Med J 1936

Speed Arch Surg 1938

- Ø Renewed interest due to biomechanical considerations:

- ☀ Graft bed foot-print

- ☀ Restoring height

- Ø Newer technologies:

- ☀ FRA; PEEK cages

- ☀ the stand-alone devices

- ☀ Disc arthroplasty

Indications

- ∅ Address bio-mechanics of the motion segment
- ∅ Anterior load sharing
- ∅ Anterior column deficiencies: infection, tumors

Potential problems

- ∅ Wrong indication

- ∅ **Wrong incision**

Positioning on table



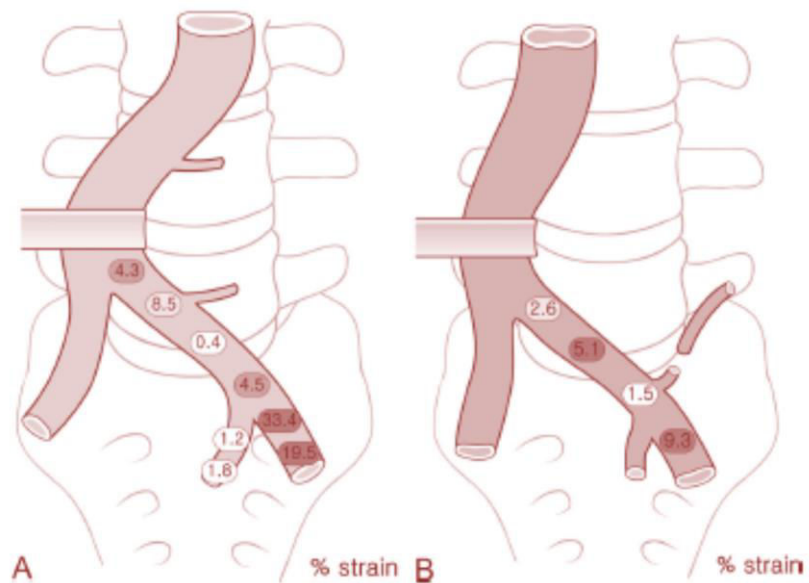


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Changes in Abdominal Vascular Tension Associated With Various Leg Positions in the Anterior Lumbar Approach

Cadaver Study

Moon-Kyu Kim, MD,* Dai-Soon Kwak, PhD,† Sin-Soo Jeun, MD, PhD,‡
Chun-Kun Park, MD, PhD,‡ Sae-Moon Oh, MD, PhD,* Sang-Won Lee, MD, PhD,‡
and Seung-Ho Han, MD, PhD†

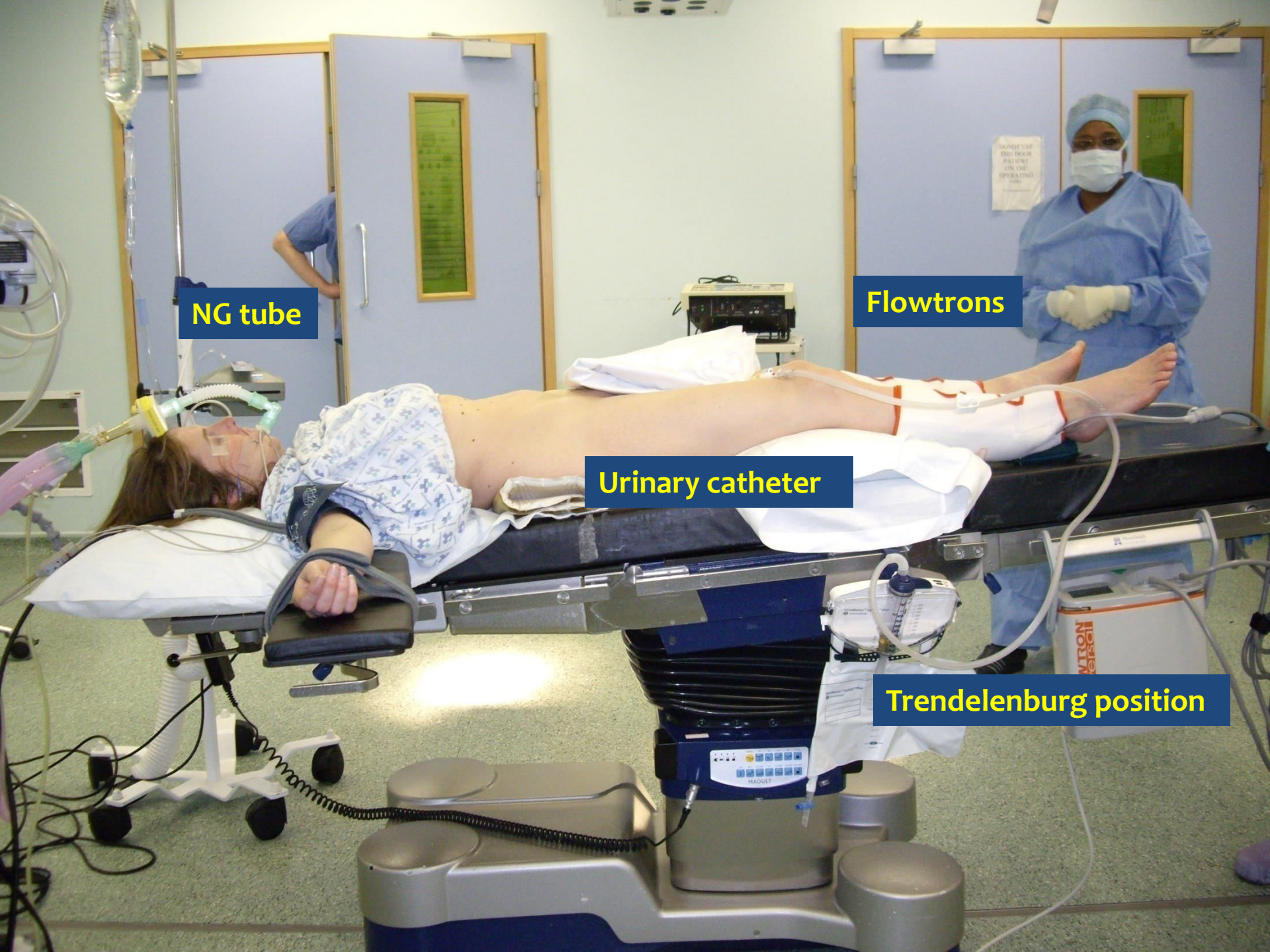


NG tube

Flowtrons

Urinary catheter

Trendelenburg position



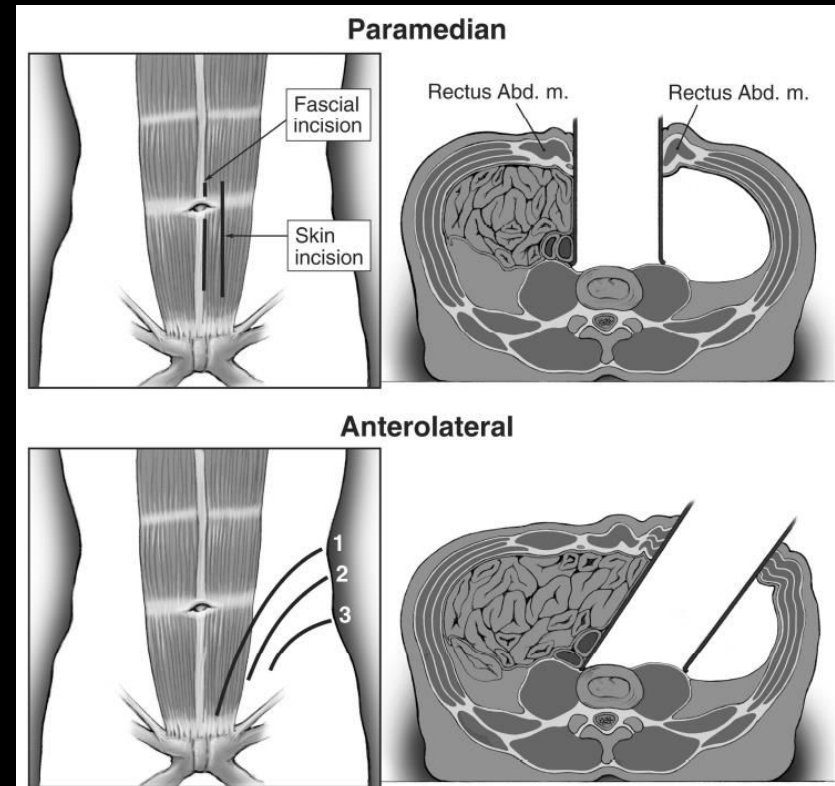
Incisions

- ∅ Plan the incision carefully
- ∅ Frequent error is going high
- ∅ Working up easier than down



Cosmetic issues

- Ø 300 patients; 31 mo FU
- Ø SRS 30 21.5 / 25 (Pm)
 19.4 / 25 (Al)
- Ø Pain (0.001)
- Ø Self image (0.004)
- Ø Activity (0.003)
- Ø Pm: higher QoL; cosmesis



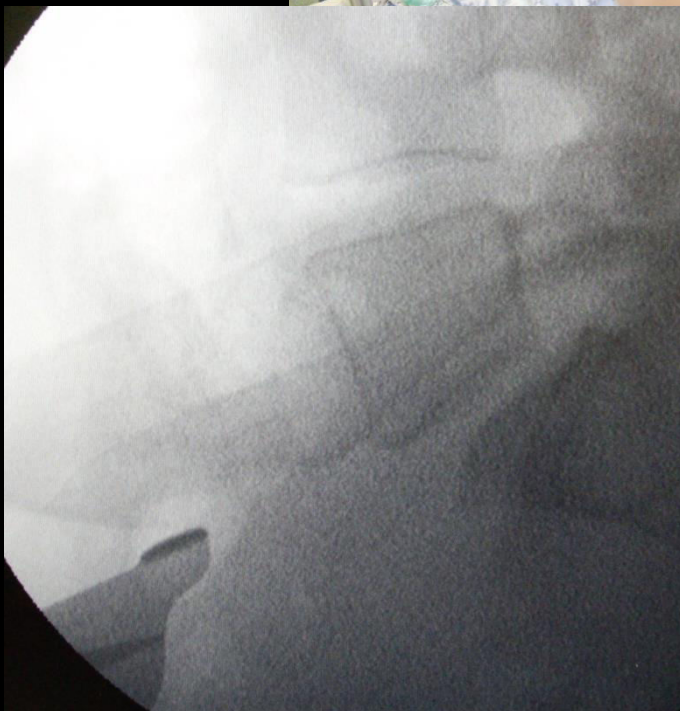
Jagannathan et al
J Neuro Spine Nov 2008

Potential problems

- ∅ Wrong indication
- ∅ Wrong incision
- ∅ **Wrong level**

Wrong level

- ∅ Tendency to be too high
- ∅ Lumbar lordosis
- ∅ Loss of disc height
- ∅ Pre-operative imaging
- ∅ Level check in theatre:
 - ☀ Pre-incision
 - ☀ needle in disc space



Potential problems

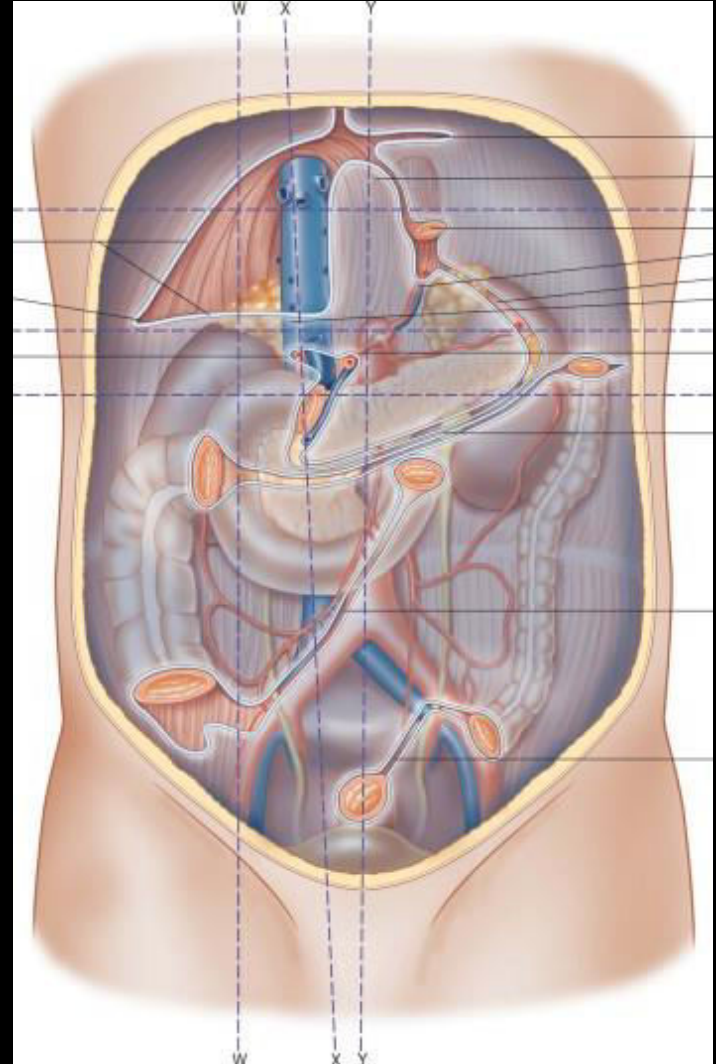
- ∅ Wrong indication
- ∅ Wrong incision
- ∅ Wrong level
- ∅ **Visceral problems**

Visceral problems

- ∅ Peritoneal perforation
- ∅ Urological damage
- ∅ Ventral hernia

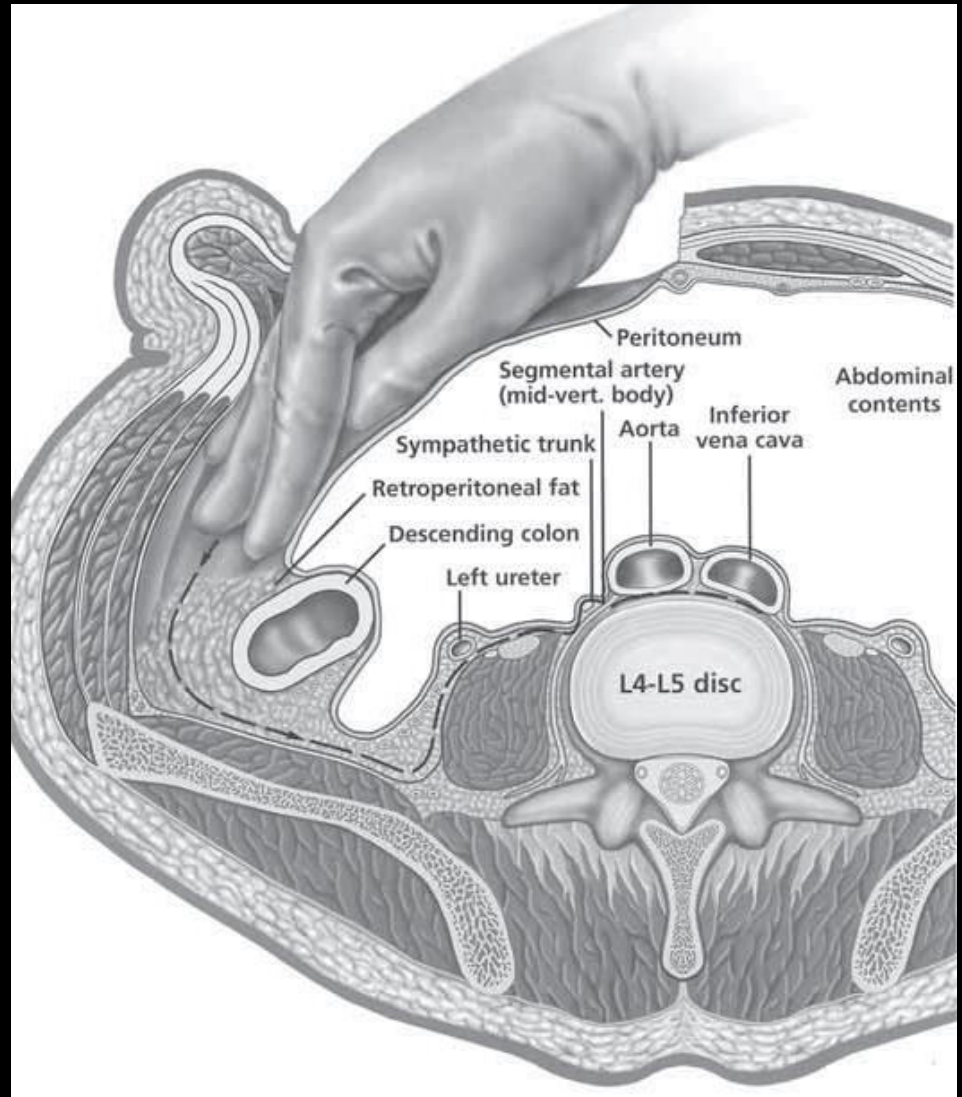
Peritoneal perforation

- ∅ Prior abdominal surgery
- ∅ Post-radiation therapy
- ∅ Old infection with scarring
- ∅ Retro-peritoneal sarcomas
- ∅ If active abscess, use the abscess tract



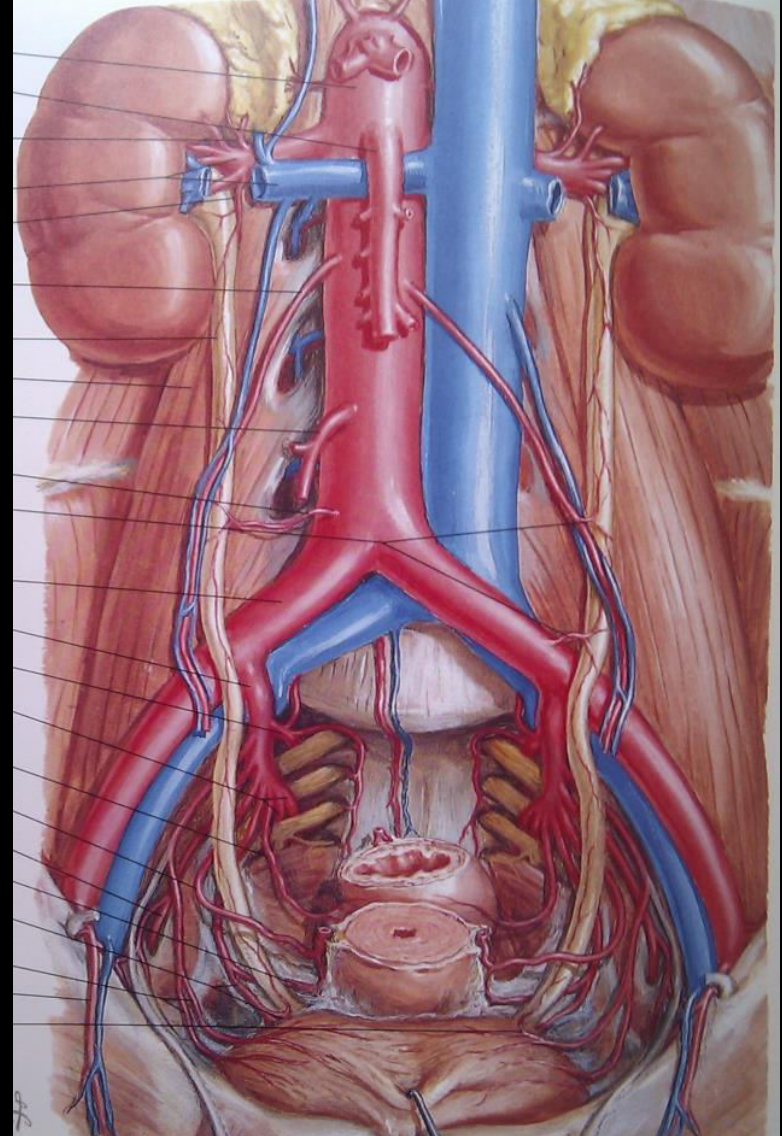
Peritoneal perforation

- ∅ Ensure tubes, positioning before start
- ∅ Blunt dissection for most part
- ∅ Sharp dissection only for adhesions
- ∅ If perforation, identify edges and repair before proceeding (running or purse-string)
- ∅ Check at the end of the procedure
- ∅ Post-op Ileus



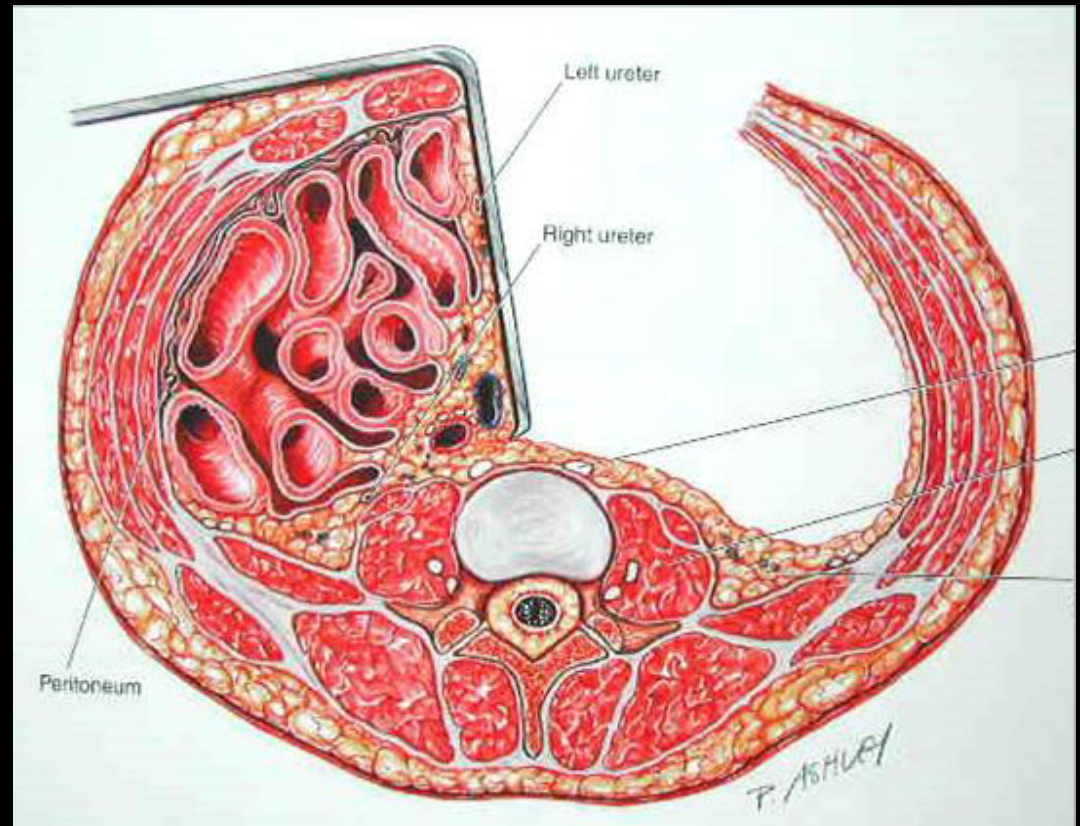
Urological damage

- Ø Retro-peritoneal approach:
ipsilateral ureter reflected with the peritoneum
- Ø Trans-peritoneal approach:
ureters lateral and not seen
- Ø Occasional un-expected sight:
Single large kidney, polycystic, hypdronephrotic kidney
- Ø If dense adhesions, avoid cutting longitudinal structures



Ureteric damage

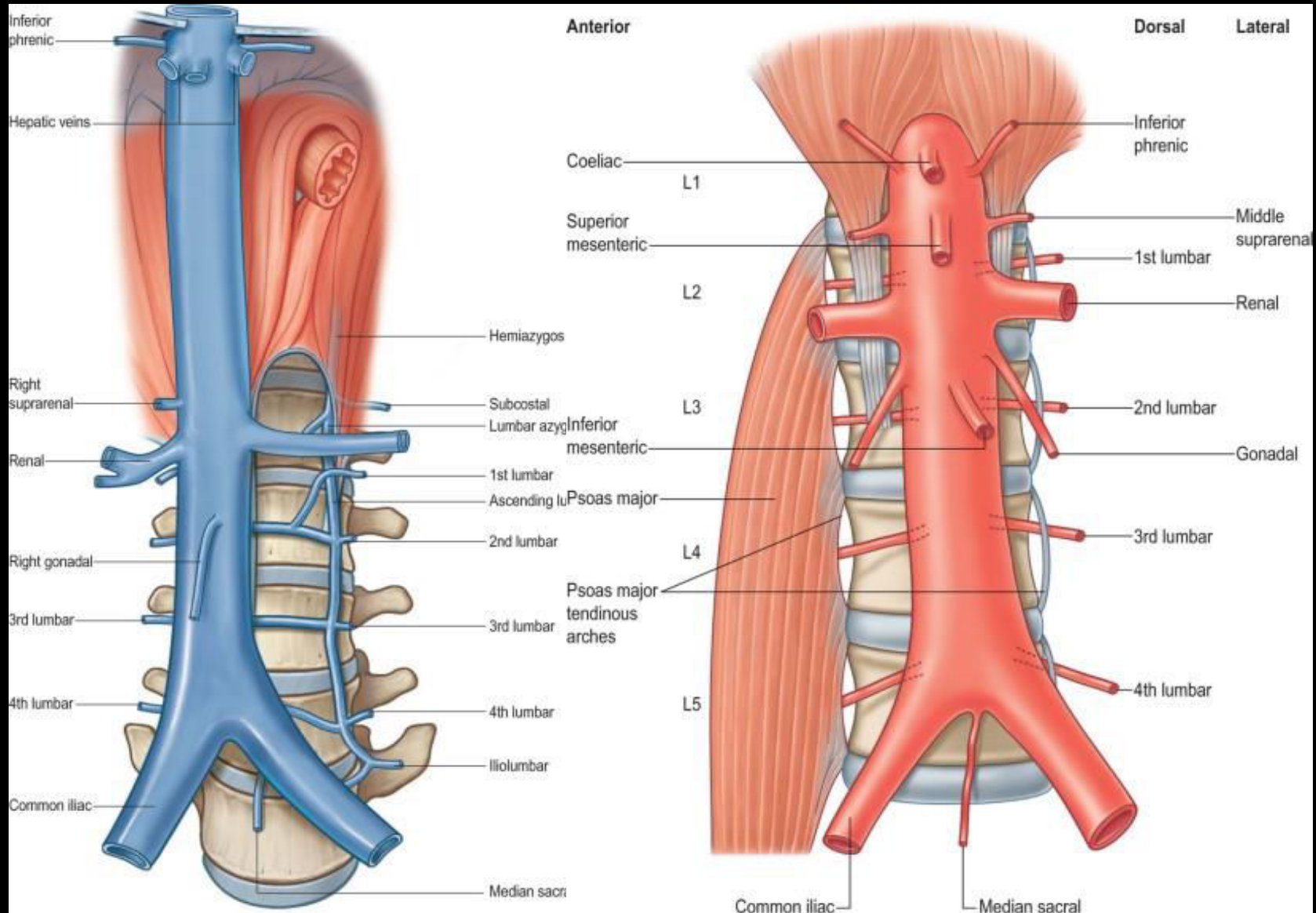
- Ø Identify & Protect
- Ø Post-op:
 - ☀ Tender abdomen,
 - ☀ Low grade fever
 - ☀ Leucocytosis
- Ø CT scan
- Ø SOS to Urologists!!



Potential problems

- ∅ Wrong indication
- ∅ Wrong incision
- ∅ Wrong level
- ∅ Visceral problems
- ∅ **Vascular problems**

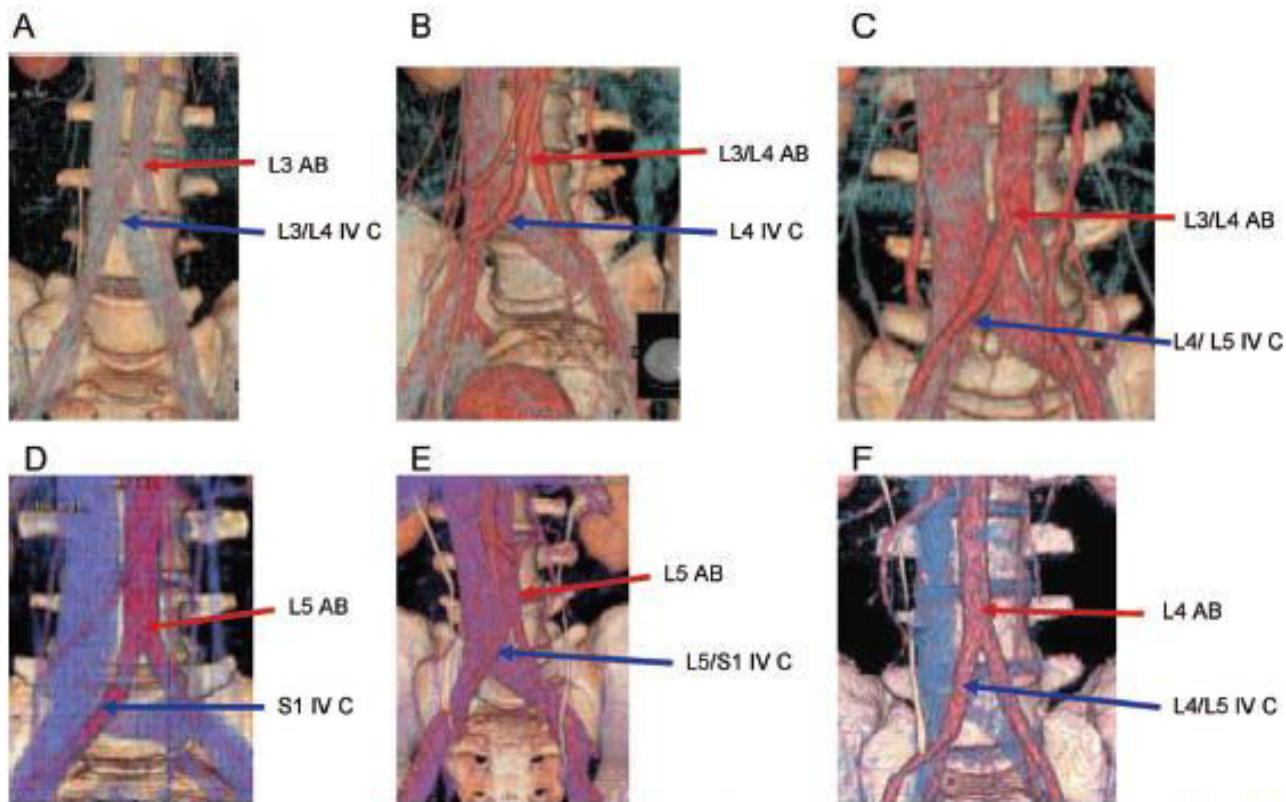
Vascular complications



Pre-operative assessments

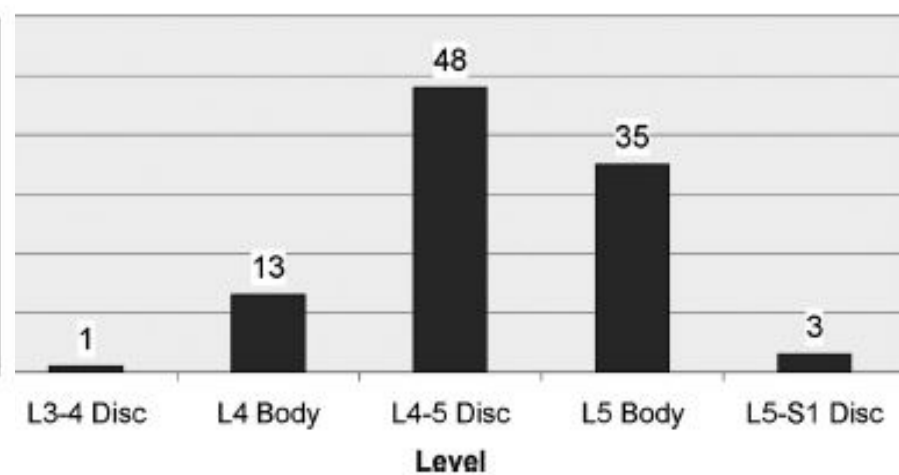
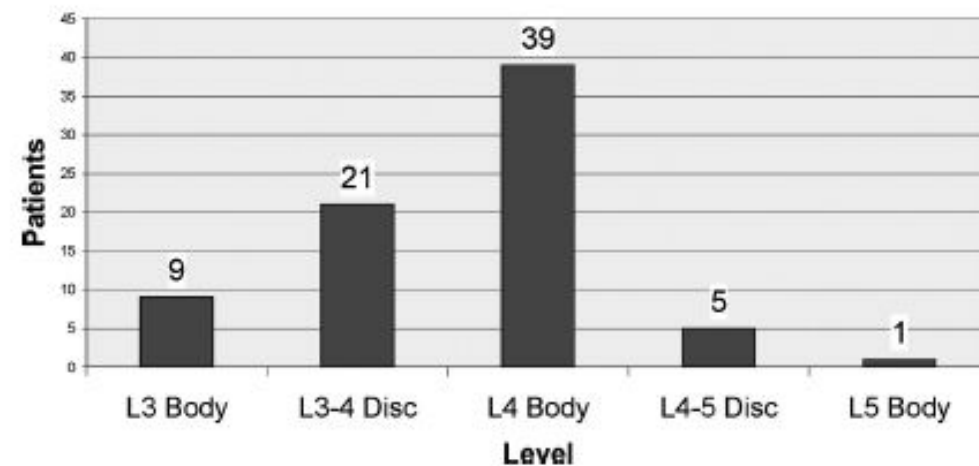
- ∅ CT / CTA / MRI
- ∅ Aneurysms
- ∅ Vessel calcifications
- ∅ Bifurcation levels





Aortic Bifurcation

Level of Vein Confluence



Expect the un-expected anomalies

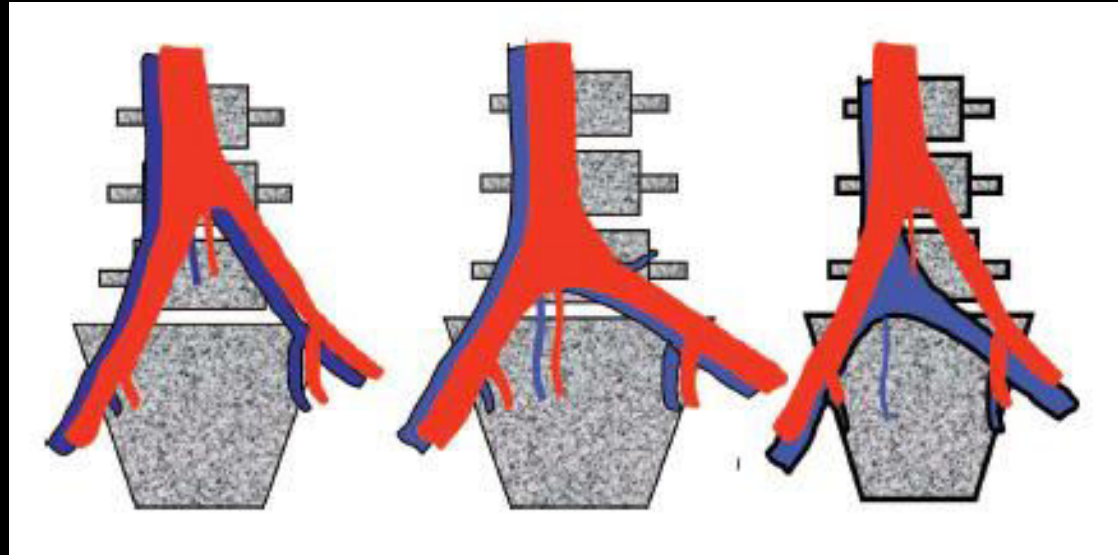
- ∅ Large left Iliac vein
- ∅ Unusual bifurcations
- ∅ Spondylotic claws displacing vessels
- ∅ Old fractures, tumors distorting the anatomy



L5S1

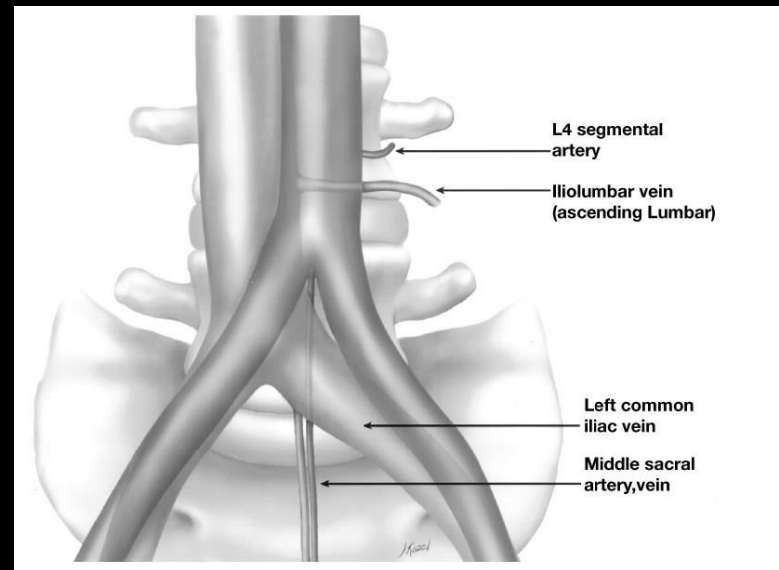
Left Iliac vein:

- ∅ Always identify and retract
- ∅ Flat or bulbous
- ∅ If damaged: proximal & distal control, and repair
- ∅ Avoid diathermy
- ∅ Knife away from the vessels



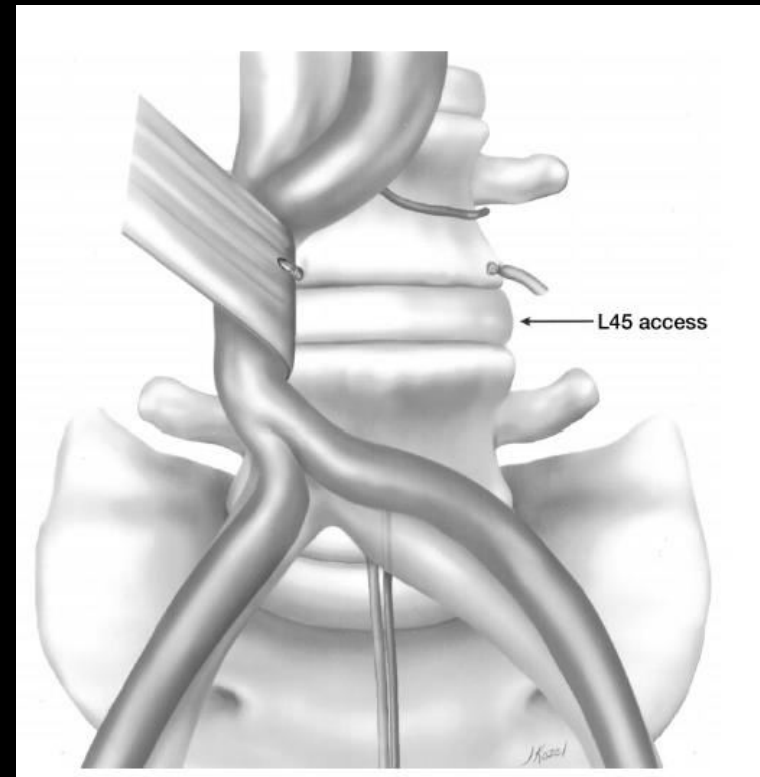
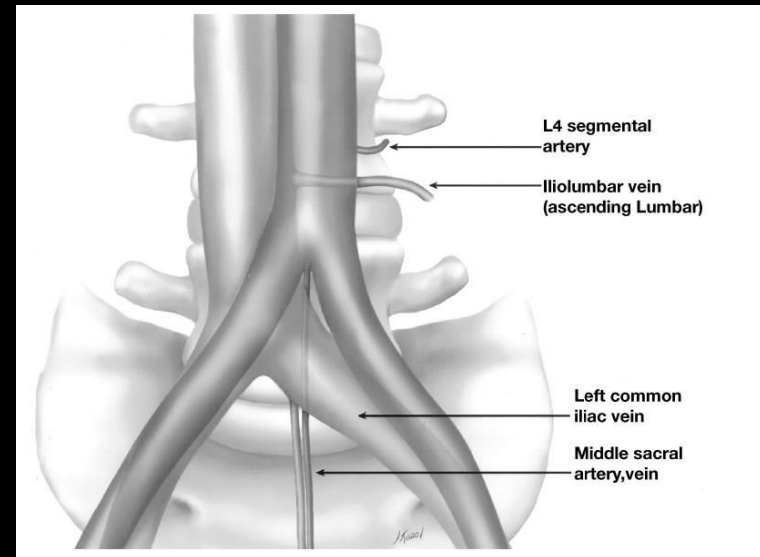
Middle sacral vessels:

- ∅ Branch of left iliac
- ∅ Across L5S1 disc
- ∅ Tie off

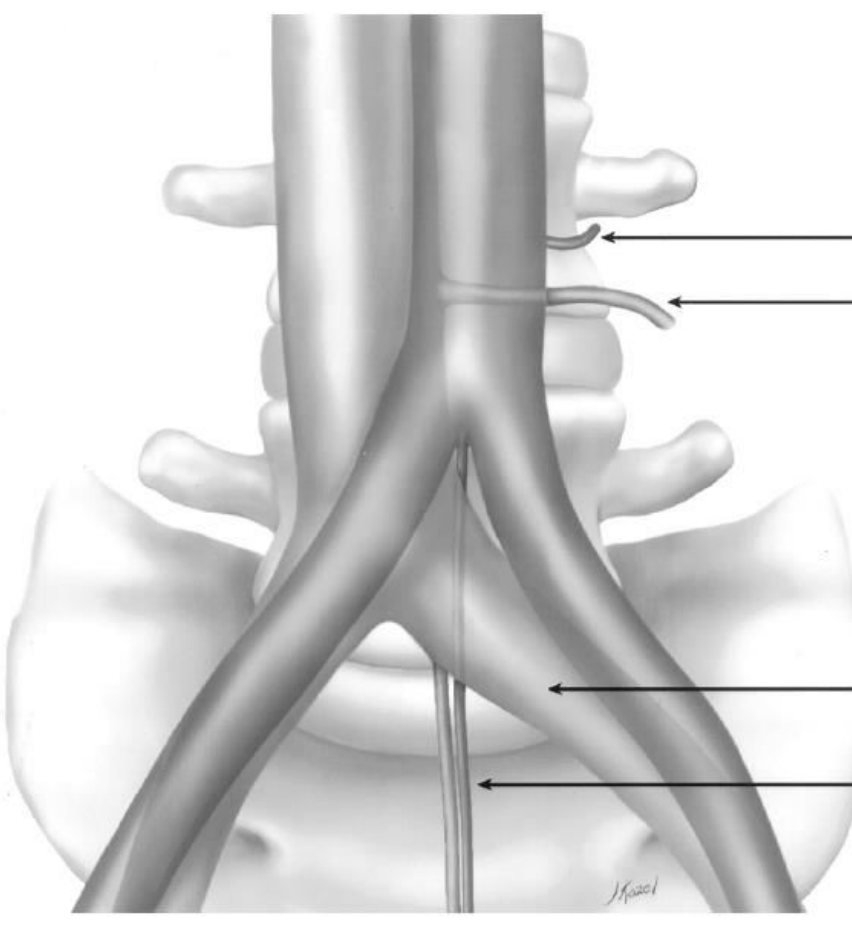


L45

- ∅ Ilio-lumbar veins
- ∅ Left Iliac artery
- ∅ Keep a tab on left leg circulation
- ∅ Assess artery when retractors removed



Ilio-lumbar veins



- ∅ Lower lumbar into CIV
- ∅ Segmental of L5
- ∅ 1 cm diameter, 3 – 4 cm from IVC

⊕ **Tether for L45 approach**

⊕ **Injury catastrophic**



The anatomy of the iliolumbar vein

A CADAVER STUDY

Vinay Jasani, David Jaffray

From the Robert Jones and Agnes Hunt Hospital, Oswestry, England

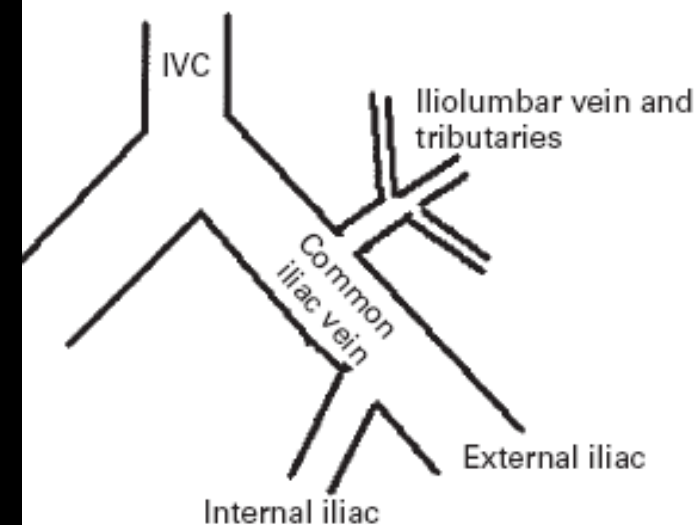


Fig. 1

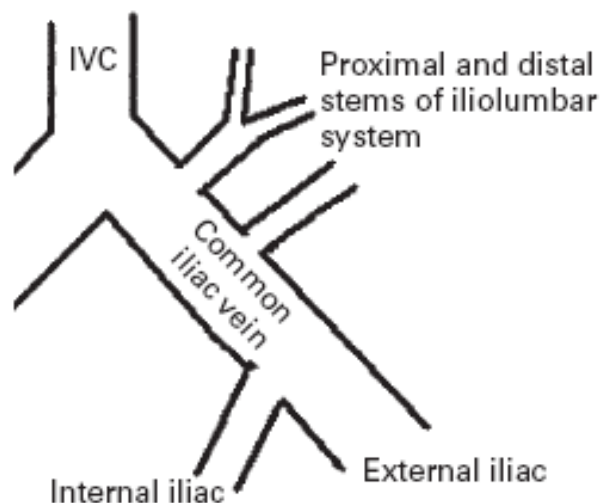


Fig. 2

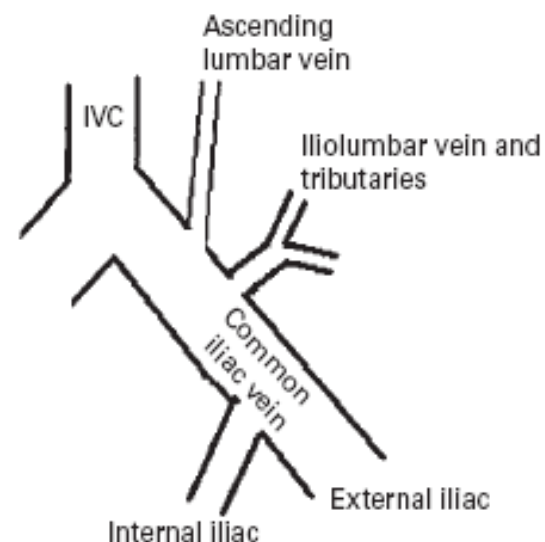
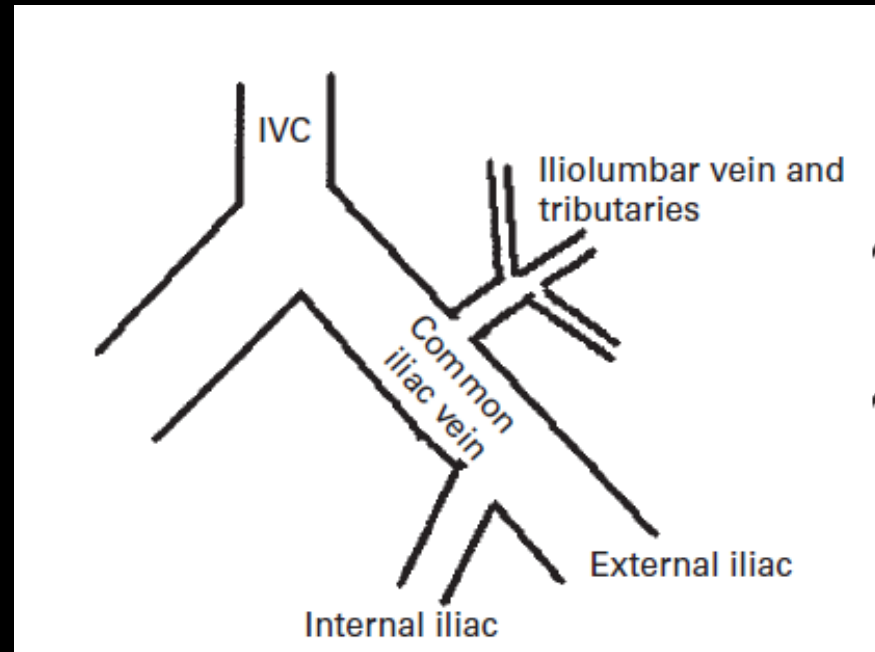
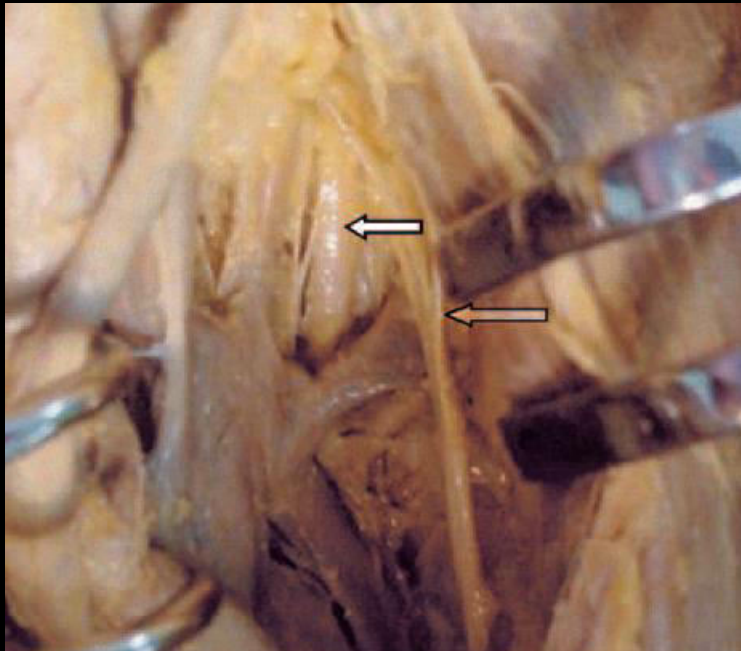


Fig. 3

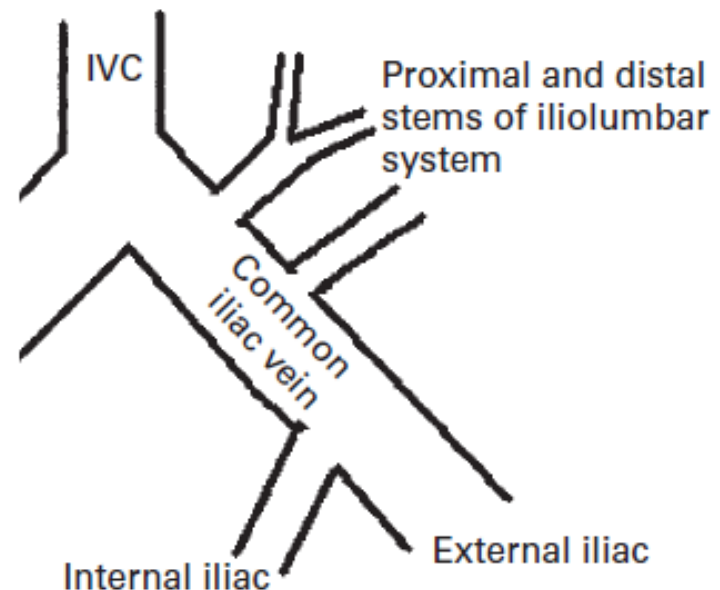
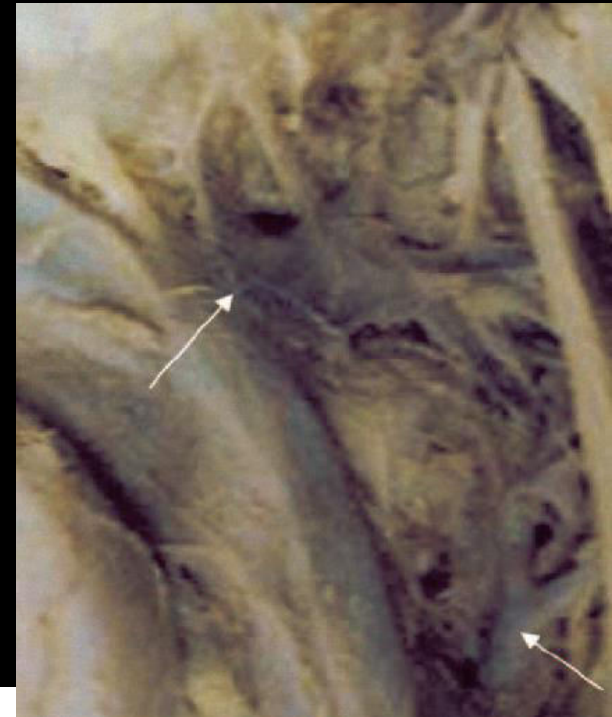
Variant 1

- Ø Single trunk and multiple tributaries
- Ø Mean 3.74 cm from IVC (11 /16)
- Ø Vulnerable



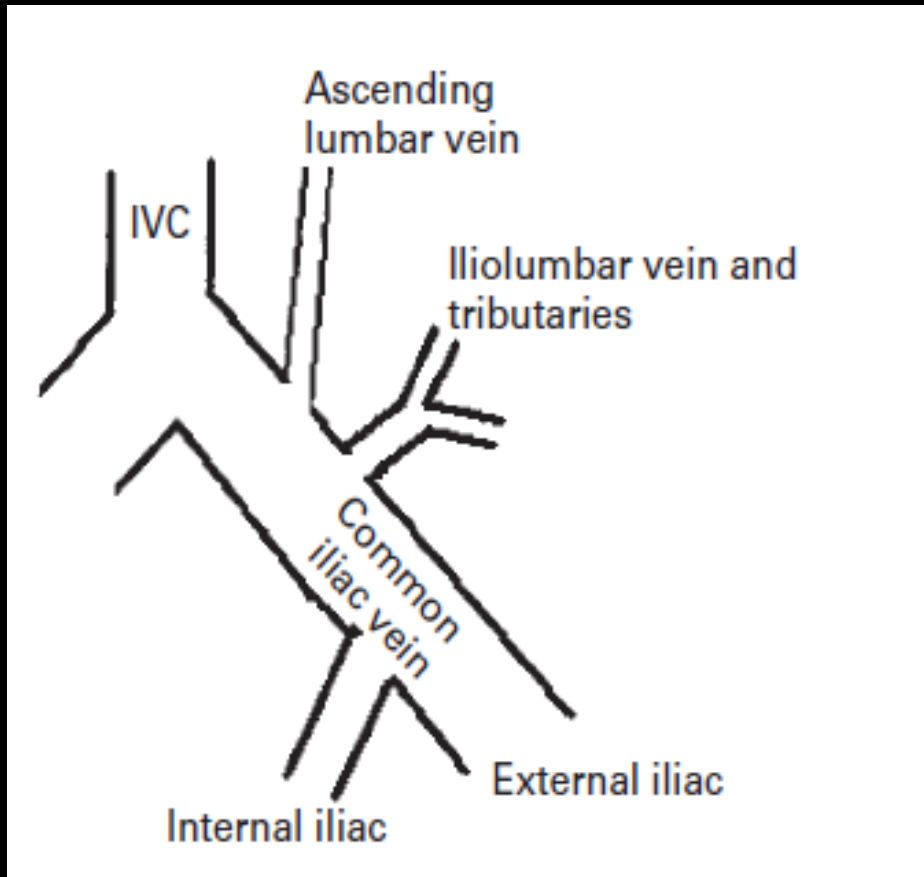
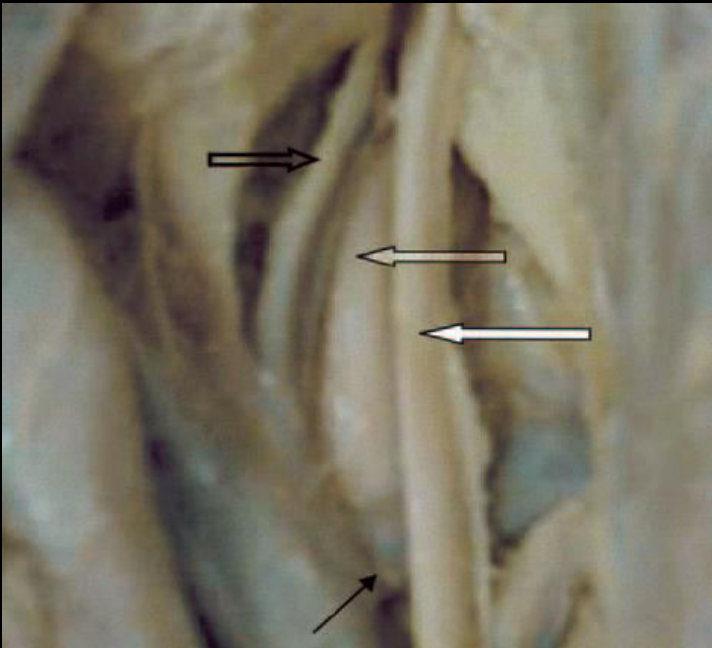
Variant 2

- Ø 2 stems (5 / 11)
- Ø Proximal (2.98 cm) & distal (6.24 cm)
- Ø Mean width 1.07 cm, obliquity 79.54°
- Ø Proximal more vulnerable



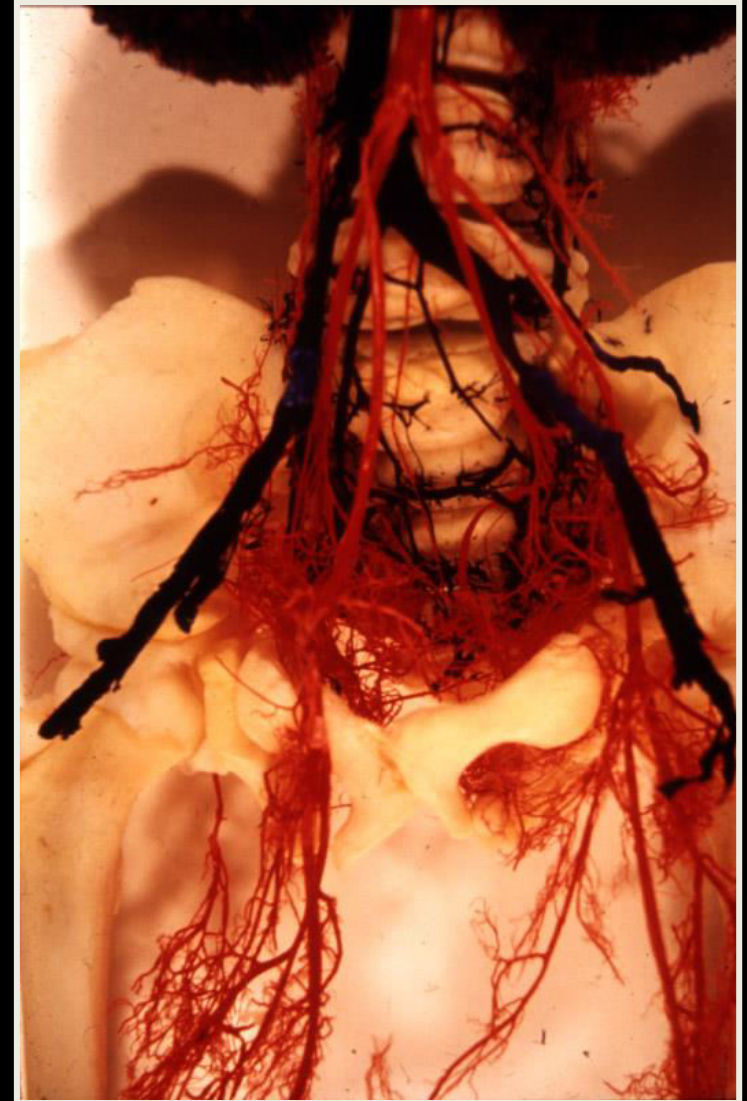
Ascending lumbar vein

- ∅ Separate from ilio-lumbar veins
- ∅ Longitudinal structure
- ∅ Drains into the azygous system



Vascular injury

- Ø Most likely when working on disc
- Ø Retractors placement and removal
- Ø Vessel creeping under the retractors
- Ø Massive haemorrhage
- Ø Thrombosis with over-retraction
- Ø Ligature slippage



Vascular injury

- Ø 212 ALIF (2004 – 2009)
- Ø 5 (2.4%) venous, 1 (0.5%) arterial
- Ø Blood loss \propto Body Mass Index
- Ø Risks: L45; Male
- Ø Aorto-Iliac calcification NOT a risk factor

Incidence of a major vascular injury

Ø 480 patients

Ø Blood loss > 300 ml; transfusion requirement;
vascular reconstruction

Ø 1.9% incidence (83% at L45)

Hamdan et al
J Vasc Surg Sept 2008

Ø 25 / 1315 patients (1.9%)

Brau et al
TSJ 2004

Potential problems

- ∅ Wrong indication
- ∅ Wrong incision
- ∅ Wrong level
- ∅ Visceral problems
- ∅ Vascular problems
- ∅ **Nerve damage**

Neurologic injury

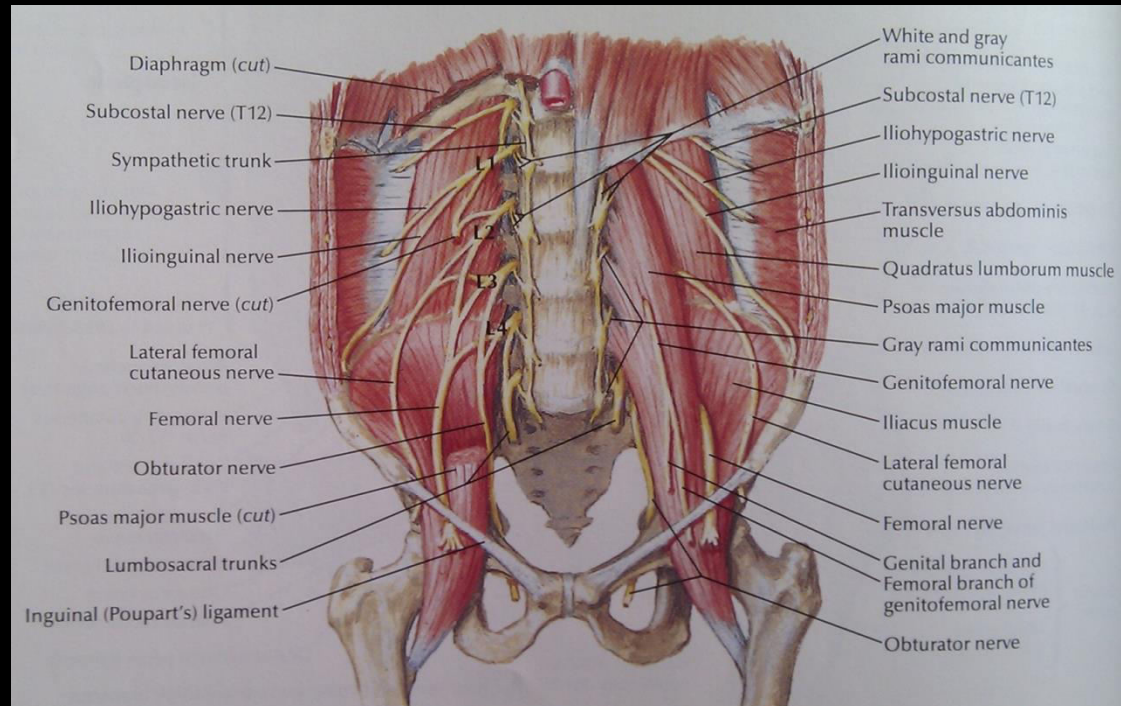
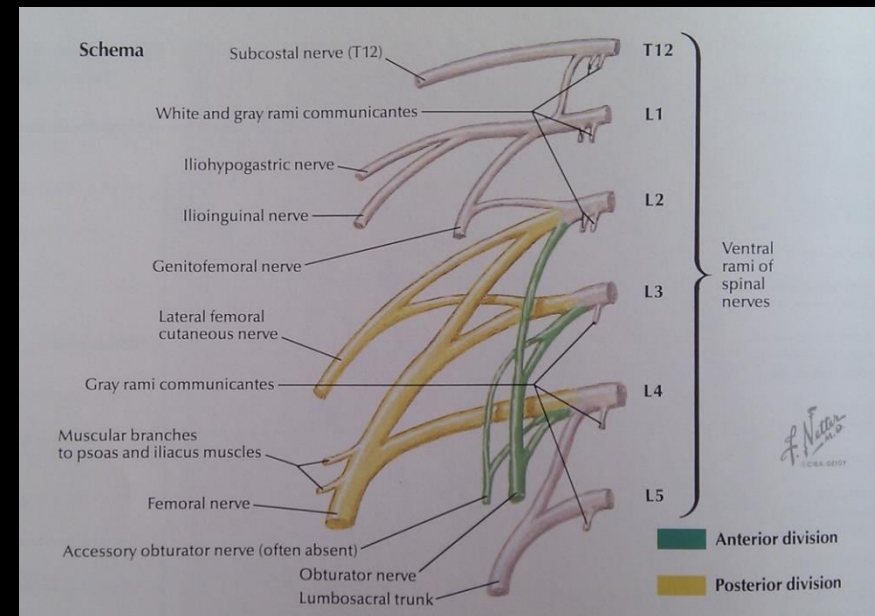
- ∅ Lumbar plexus
- ∅ Autonomic plexus
- ∅ Sexual dysfunction
- ∅ Cauda equina injury

Lumbar plexus

Ø Rare but possible

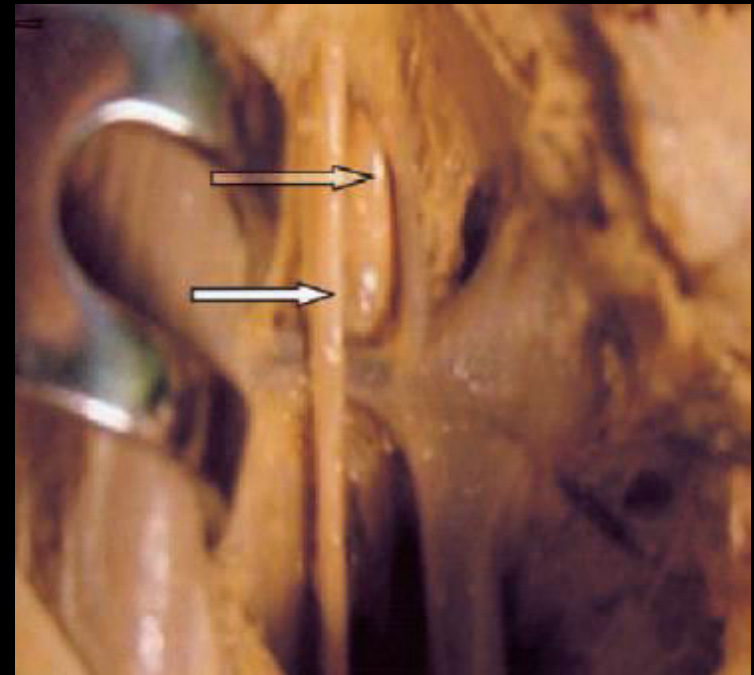
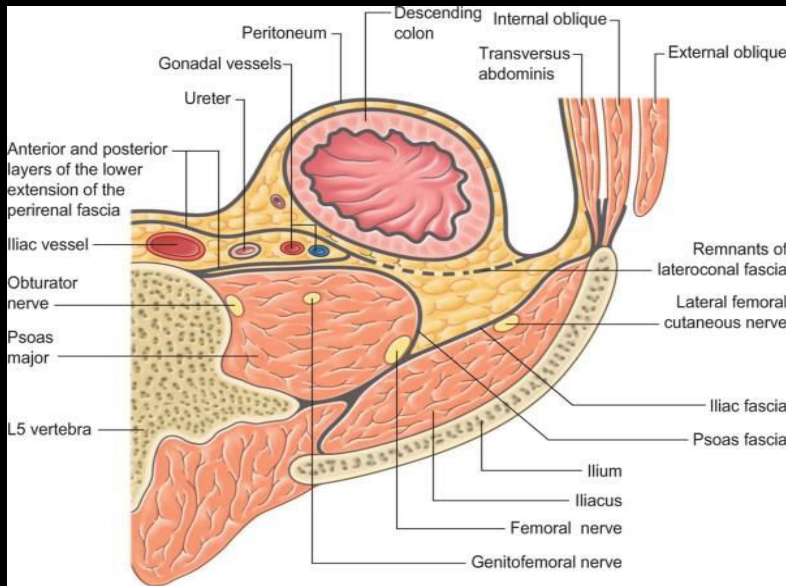
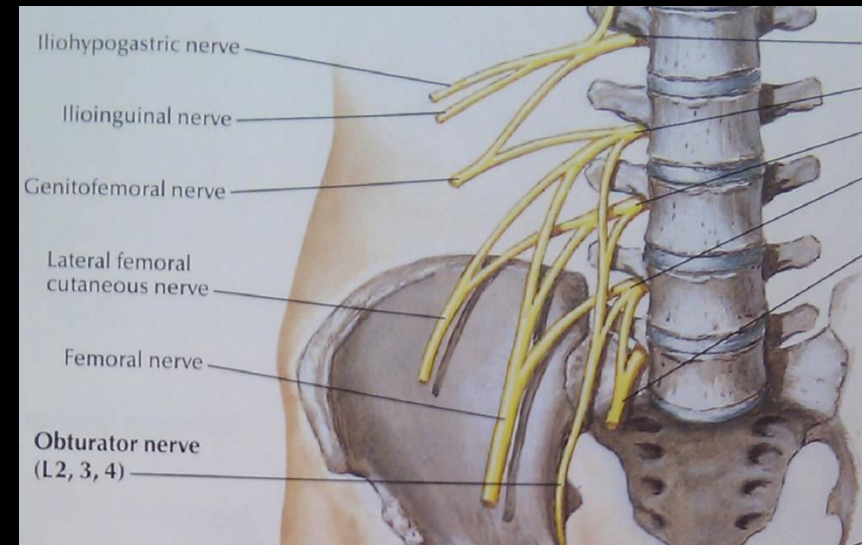
Ø Potentially devastating

Ø Hip flexion relaxes the nerves



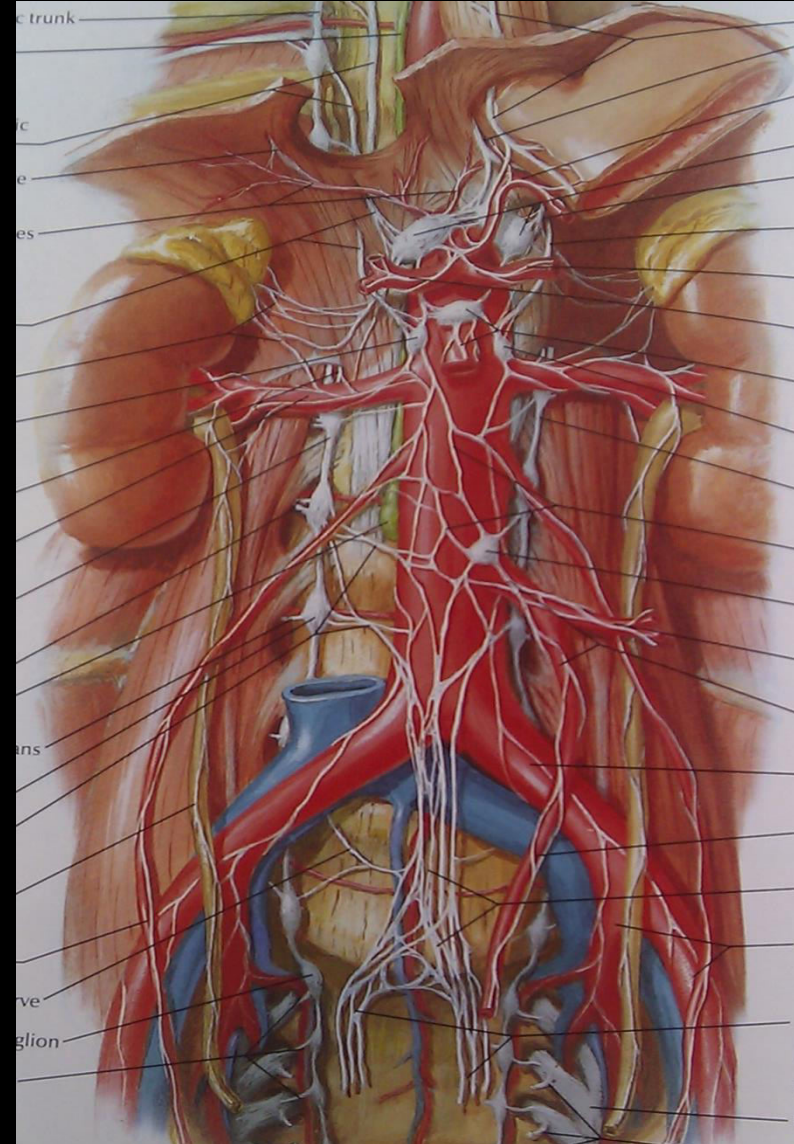
Lumbar plexus

- Ø Avoid continuous retraction
- Ø Avoid retraction on Psoas
- Ø Femoral and obturator nerves 'at risk'



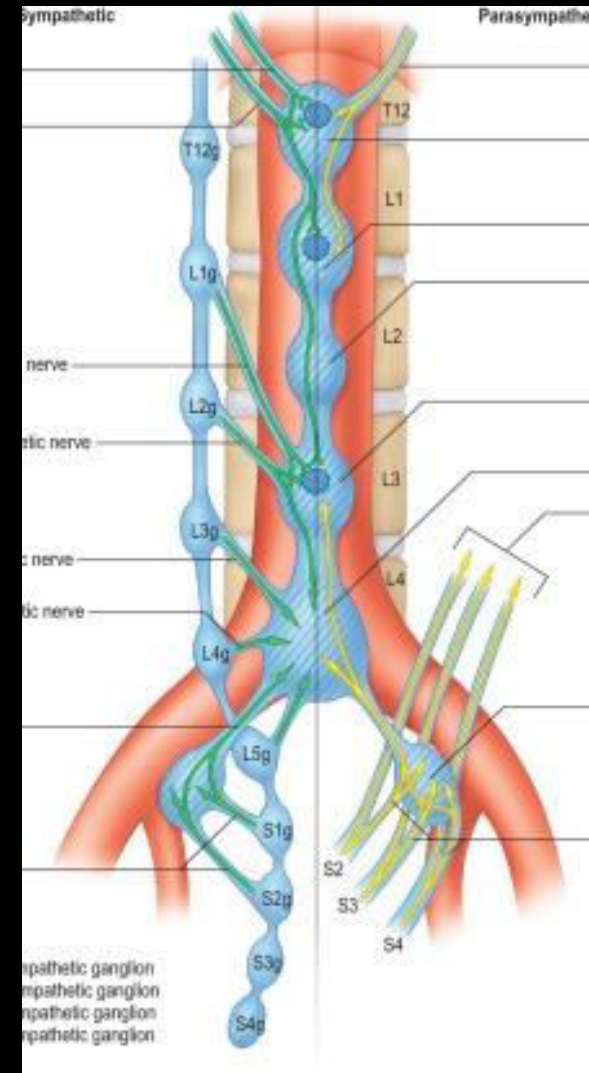
Superior hypogastric plexus

- Ø Pre-aortic sympathetic plexus
- Ø Over the bifurcation into the pelvis
- Ø Rarely an issue above L5



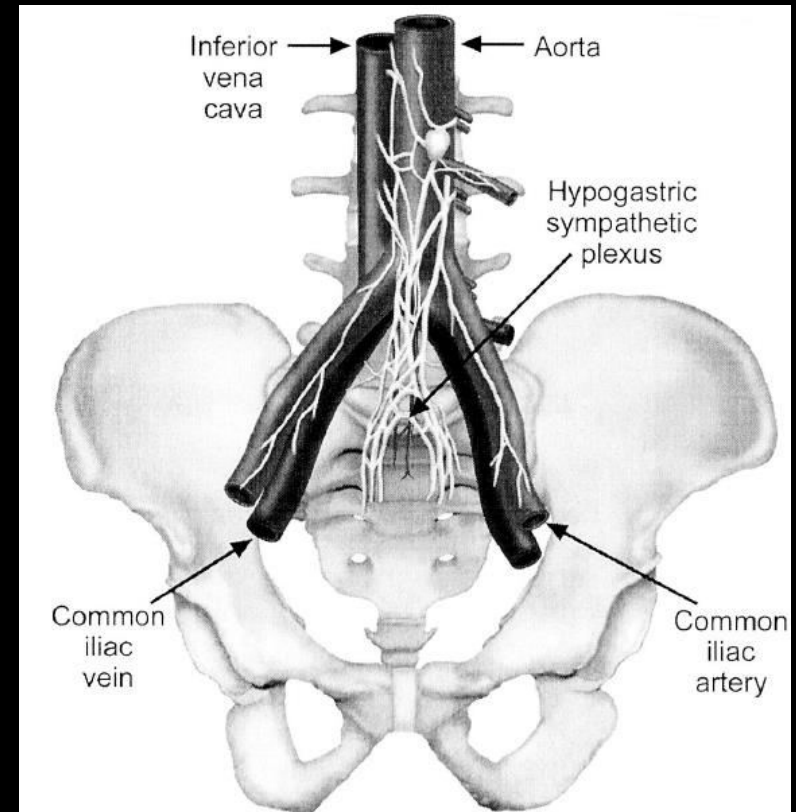
Para-spinous symathetic chain

- ∅ Cut, stretch, boiled, torn
- ∅ Ipsilateral foot vaso-dilates
- ∅ Contra-lateral foot cold
- ∅ Distinguish from arterial injury



Retrograde ejaculation

- Internal vesical sphincteric incompetence
- Flow into 'low pressure' bladder instead of 'high pressure' urethra
- Sterility

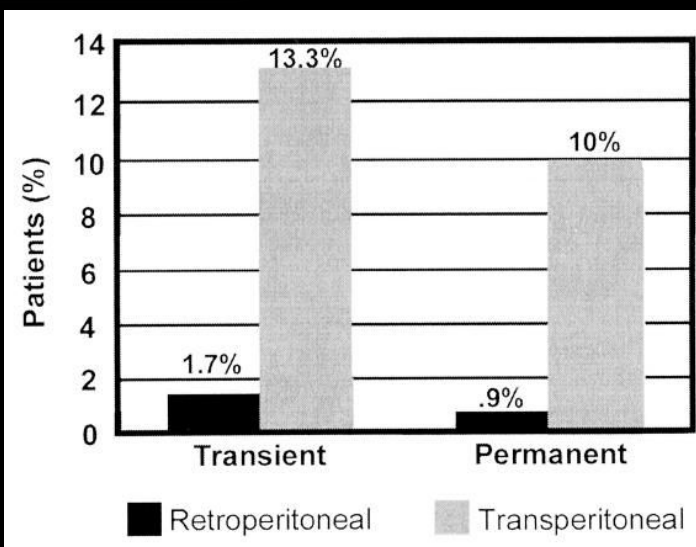


Retrograde Ejaculation After Anterior Lumbar Interbody Fusion

Transperitoneal *Versus* Retroperitoneal Exposure

Rick C. Sasso, MD,* J. Kenneth Burkus, MD,† and Jean-Charles LeHuec, MD,‡

- Ø 146 males over 2 year follow-up
- Ø Retrograde ejaculation 4% (6 / 146)
- Ø 2 resolved at 12 mo
- Ø Retro = 10x safer than trans-peritoneal



Sexual Complications of Anterior Fusion of the Lumbar Spine

JOSEPH C. FLYNN, MD,*† and CHARLES T. PRICE, MD*

- Ø 4500 cases 20 yr experience
- Ø RE 0.42% (25% resolved completely by 2 yrs)
- Ø Not related to approach
- Ø Related to technique

Table 1. Contributing Surgeons

<i>Africa</i>	<i>France</i>
Sacks	Cauchoux
	Merle d'Aubigne
<i>Australia</i>	
Bedbrook	<i>Hong Kong</i>
Beetham	Hodgson
Crock	Leong
Taylor	
Wilson	<i>USA</i>
	Flynn
<i>Belgium</i>	Goldner
Lang	Harmon
Jung	Kotcamp
	Leatherman
<i>England</i>	Stauffer
Freebody	Wiltse

Sexual complications

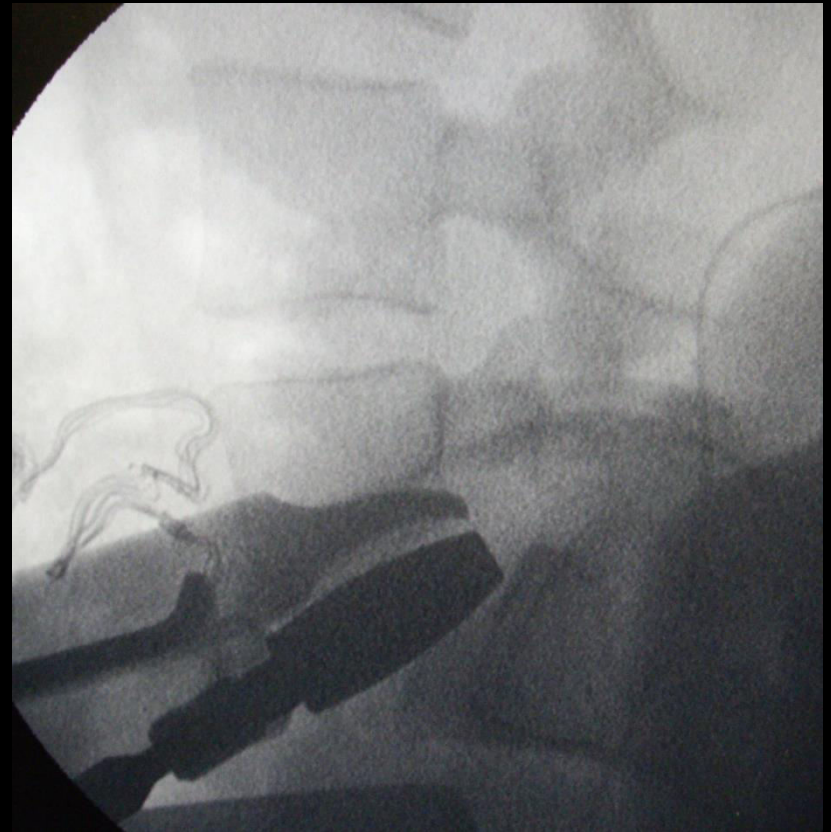
- Ø TDR v PLIF / PLF
- Ø Pre-operatively 34% back pain restricted sex
- Ø Post-operatively better in both groups (improved back pain)
- Ø No difference between 2 groups (RE, erectile)
- Ø Impaired ability to achieve an orgasm:
 - 3% TDR
 - 26% Fusion

Retrograde ejaculation

- ∅ Careful dissection
- ∅ Fine fibers.....gentle sweep
- ∅ Avoid excessive use of the monopolar on the disc surface
- ∅ Over-stated, but caution advised

Cauda Equina damage

- ∅ Disc space penetration
- ∅ Awareness of the working depth
- ∅ Controlled impaction
- ∅ Image intensifier



Potential problems

- ∅ Wrong indication
- ∅ Wrong incision
- ∅ Wrong level
- ∅ Visceral problems
- ∅ Vascular problems
- ∅ Nerve damage
- ∅ **Instrumentation**

Instrumentation

- ∅ Choose implants based on pathology
- ∅ Careful end plate preparation
- ∅ Ensure stability of constructs: cages; plates
- ∅ Suitable graft materials to ensure fusion: BMP, other materials
- ∅ Vertebral body fractures with spacers, finned arthroplasties

Revisions



Access surgeon involvement

- Ø Learning curve to be appreciated by spine surgeons
- Ø Better outcomes when approach by experienced spine surgeon

Holt et al J Spinal Disord Tech Oct 2003
Jarrett et al J Spinal Disord Tech Dec 2009
Smith et al TSJ May 2011

- Ø Vascular surgeon useful for managing major problems

Chiriano et al J Vasc surg July 2009

Work in progress at QMC.....

Access related complications in Anterior Lumbar Surgery performed by Spinal Surgeons

- Ø 167 cases done in Nottingham
- Ø Mean age: 41 years
- Ø Access levels: L2 – S1
- Ø Procedures: ALIF, TDR (tumors excluded)
- Ø Variables: BMI, IDDM, smoking, anterior osteophytes, HT, AS, Venous pathology, previous abdominal surgery, EBL, Retractor time, child-births post-op.

Work in progress.....

Access related complications in Anterior Lumbar Surgery performed by Spinal Surgeons

Complications:

- Ø Venous bleeding 19 / 167 (11%) **major 7 / 167 (4%); minor 12 / 167 (7%)**
- Ø Arterial bleeding 4 / 167 (2%)
- Ø Incidental peritoneal opening 4 / 167 (2%)
- Ø Thrombosis 1 / 167 (0.6%) **Left CIA reconstruction**
- Ø Leg edema 2 / 167 (1.2%)
- Ø Superficial infection 5 / 167 (3%)
- Ø Deep infection 1 / 167 (0.6%)
- Ø Retrograde ejaculation 0
- Ø Post-operative radicular pain 15 / 167 (9%, no long term sequelae)
- Ø Post-operative CES 0

Hot Tips for your early cases

- Ø Don't pick a Kate Moss
- Ø Do some L5S1's first
- Ø Insist on a good retractor system
- Ø Make an incision that is big enough

