



Introduction to Groin Ultrasound

BMUS Study Day
University College Dublin

Saturday October 19th, 2024

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Financial Disclosures

- Sadly none 😞

Disclaimer

- I'm not an abdominal radiologist or US guru
- I got (under duress) roped into giving a talk on hernia's about 5 or 6 years ago.
- I get asked to give this now because no one else will take it on.
- It's an insurmountable task to get this across in 20 minutes

Take Home Point

You cannot consider your examination complete unless you've identified the relevant anatomical landmark and interrogated at that site.

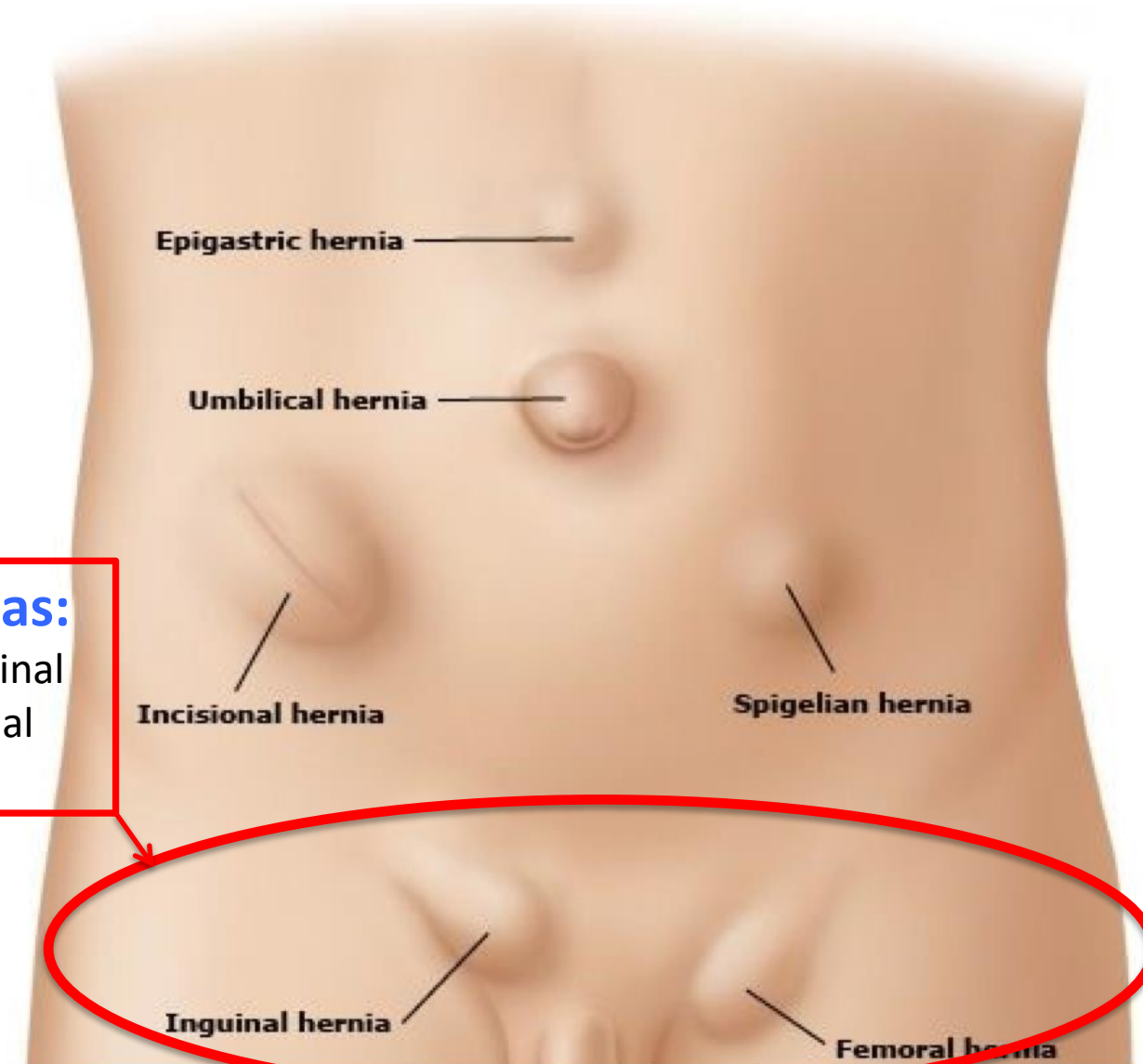
Layout

- Anatomy
- Anatomy
- Anatomy
- How Anatomy will make technique easier

Section One

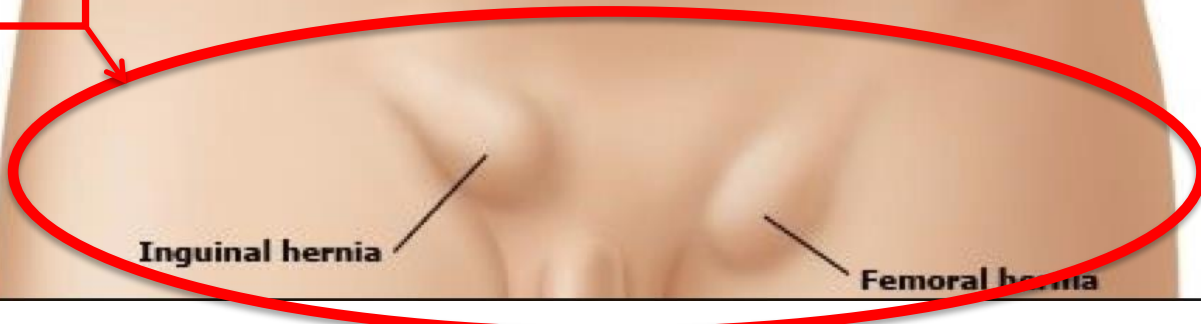
Ultrasound Assessment of Abdominal Hernias

Hernia Types



Groin Hernias:

- Indirect inguinal
- Direct inguinal
- Femoral



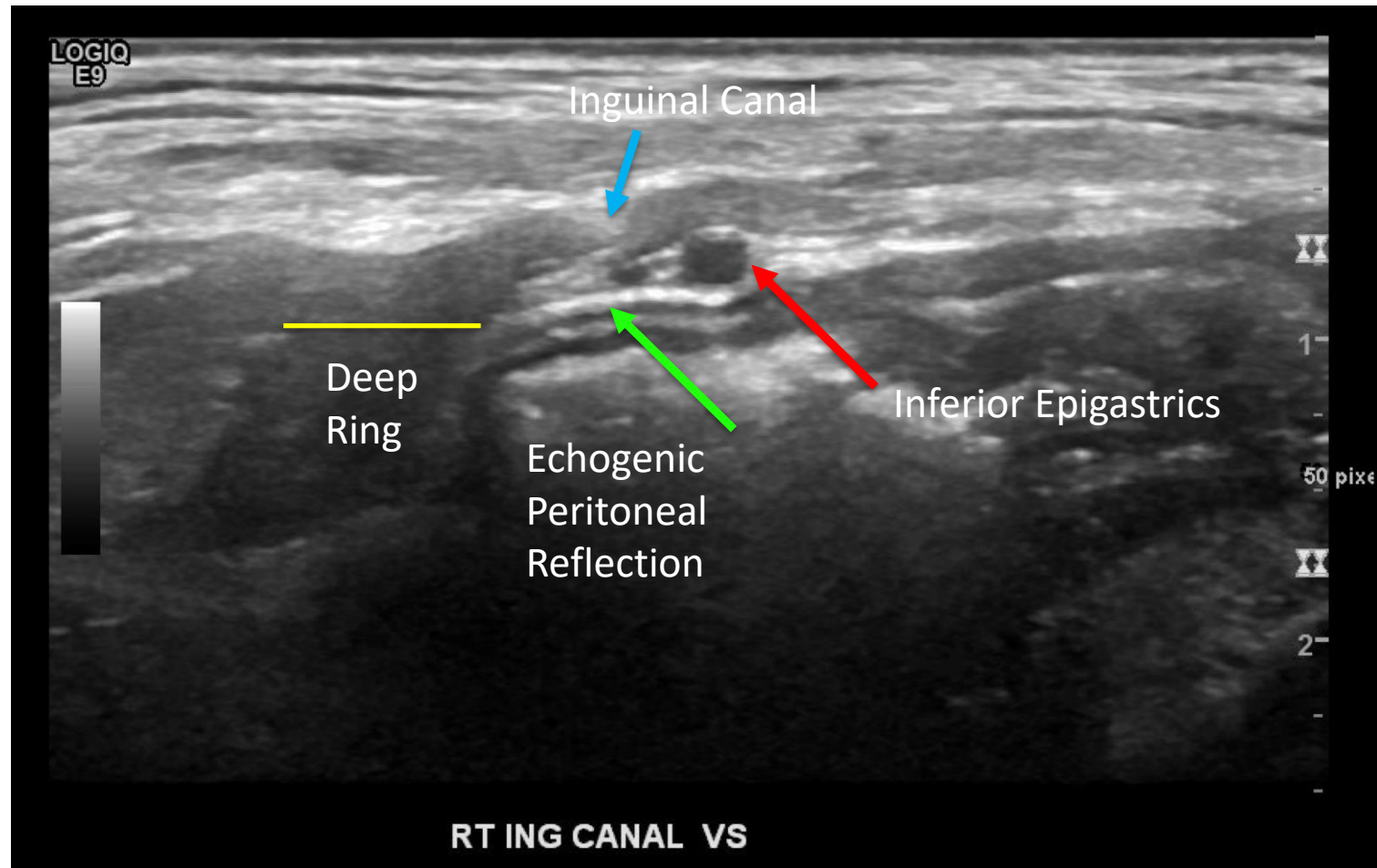
Anatomical Landmarks are Key

- Putting a probe on the inguinal region/groin and hoping to see a hernia is inefficient – particularly in challenging patients (body habitus, poor mobility etc)
- The weak points where hernia's occur are **predictable** (albeit hard to find at first).
- Being clear on the anatomy allows for a structured, focused and *complete* examination.

Technique comes down to generating
this image...



Technique comes down to generating this image...

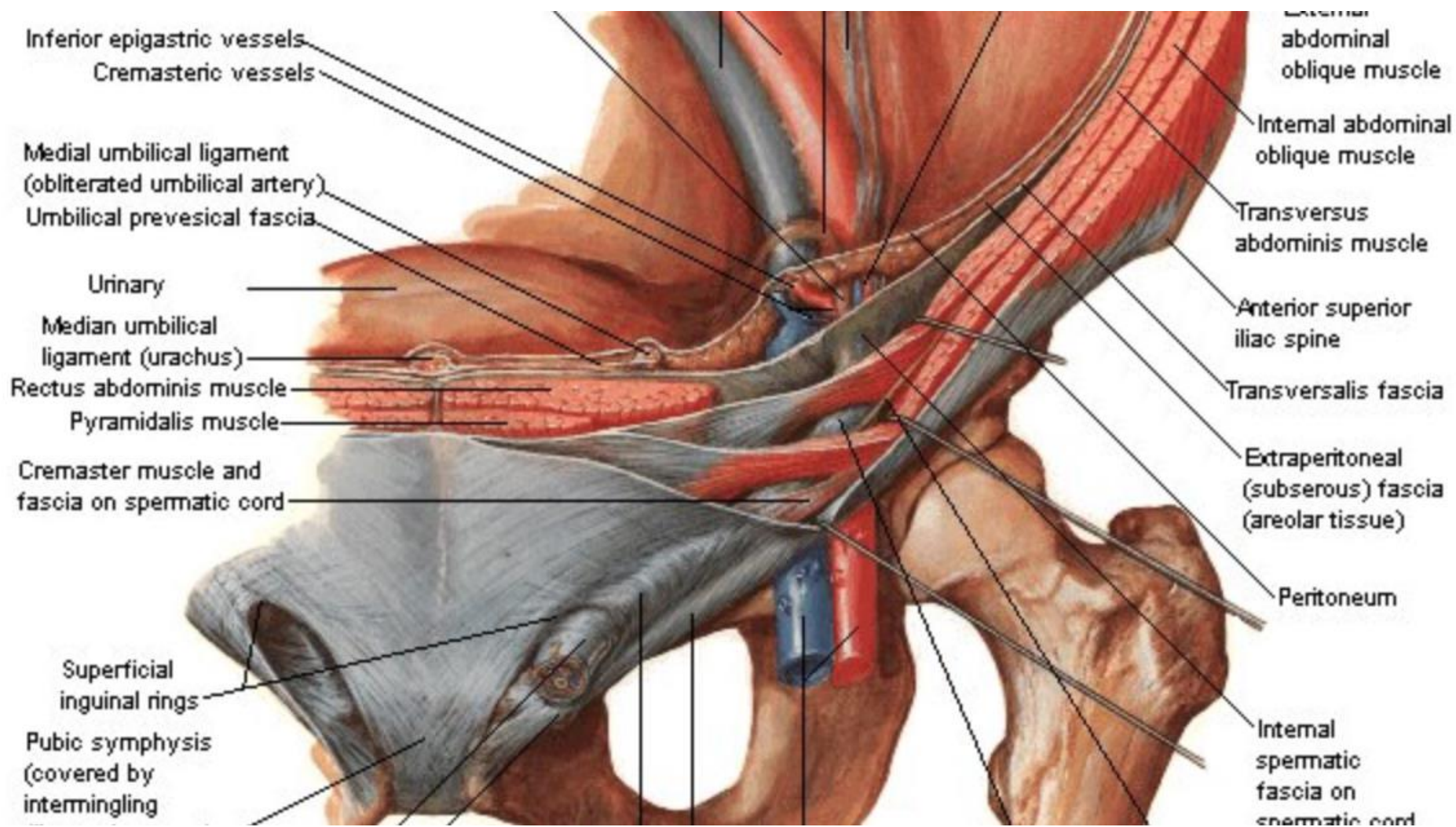


Easier said than done as it's fleeting!



Groin Hernia Anatomy

Finding the deep inguinal ring is central to working out all the groin hernia anatomy.



Inferior epigastric vessels

Cremasteric vessels

Medial umbilical ligament
(obliterated umbilical artery)

Umbilical prevesical fascia

Urinary

Median umbilical
ligament (urachus)

Rectus abdominis muscle

Pyramidalis muscle

Cremaster muscle and
fascia on spermatic cord

Superficial
inguinal rings

Pubic symphysis
(covered by
intermingling)

External
abdominal
oblique muscle

Internal abdominal
oblique muscle

Transversus
abdominis muscle

Anterior superior
iliac spine

Transversalis fascia

Extraperitoneal
(subserous) fascia
(areolar tissue)

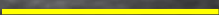
Peritoneum

Internal
spermatic
fascia on
spermatic cord



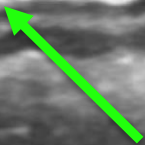
LOGIQ
E9

Inguinal Canal

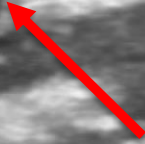


Deep
Ring

Echogenic
Peritoneal
Reflection



Inferior Epigastrics



1-

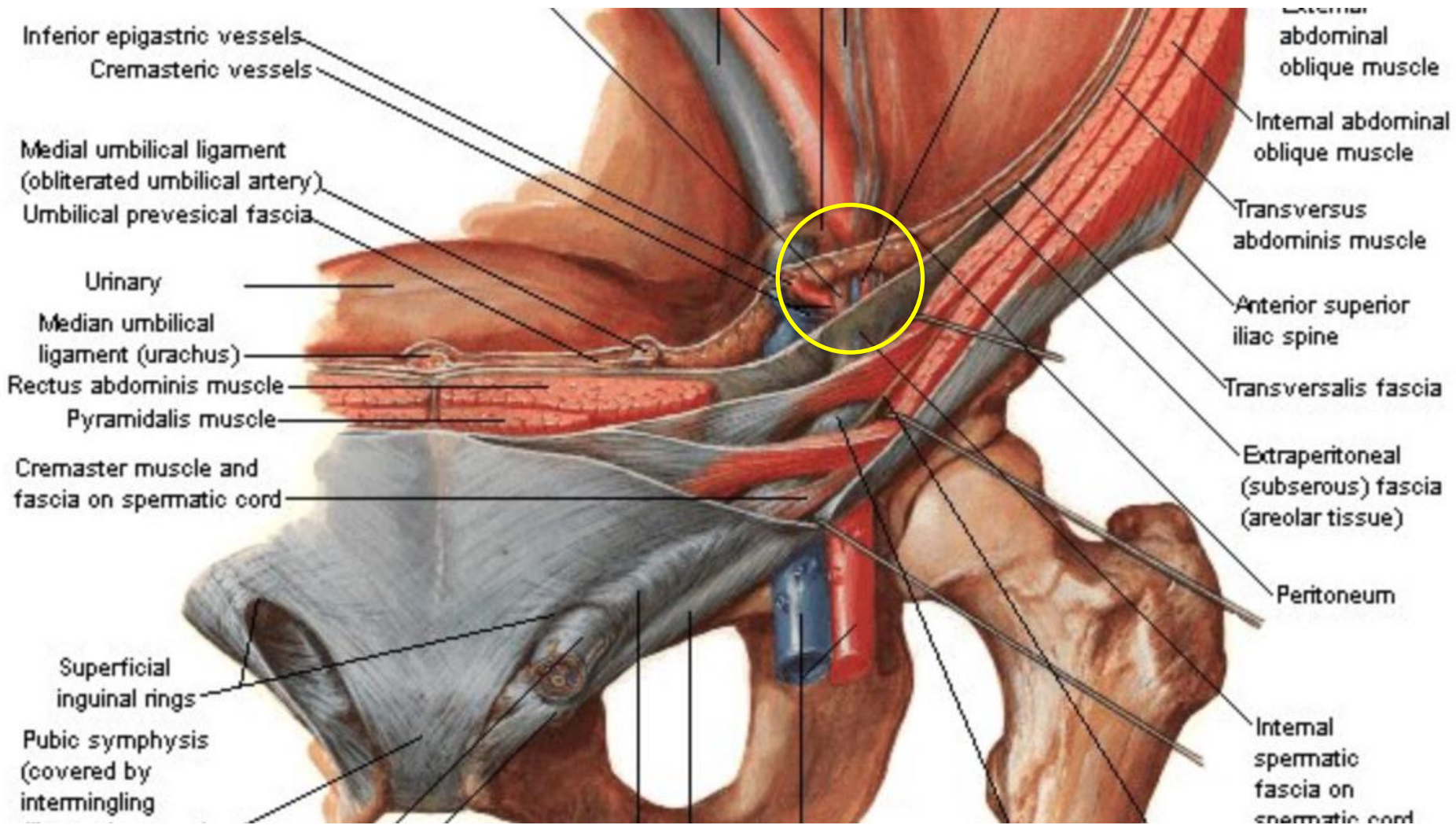
50 pixe

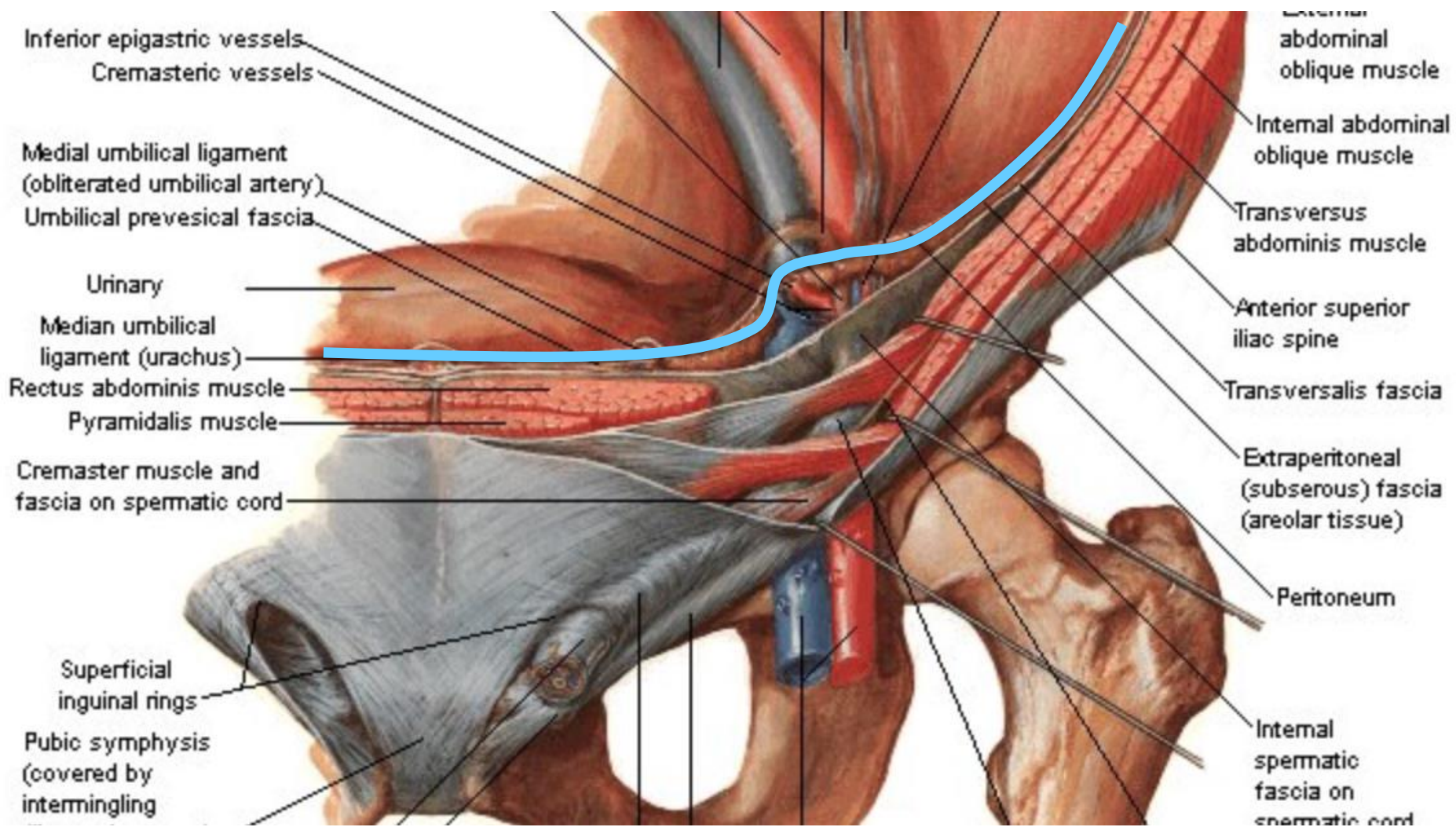


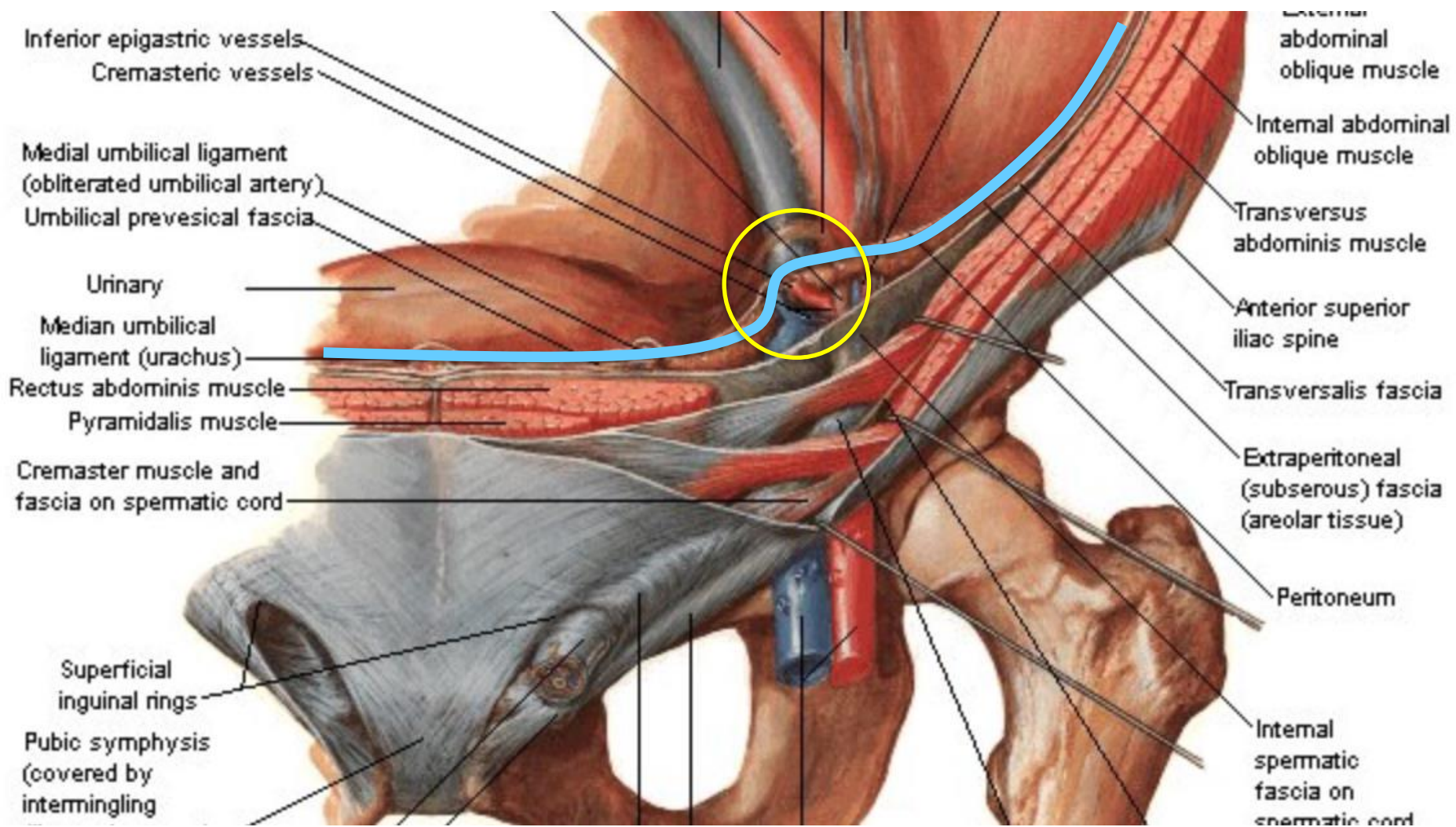
2-

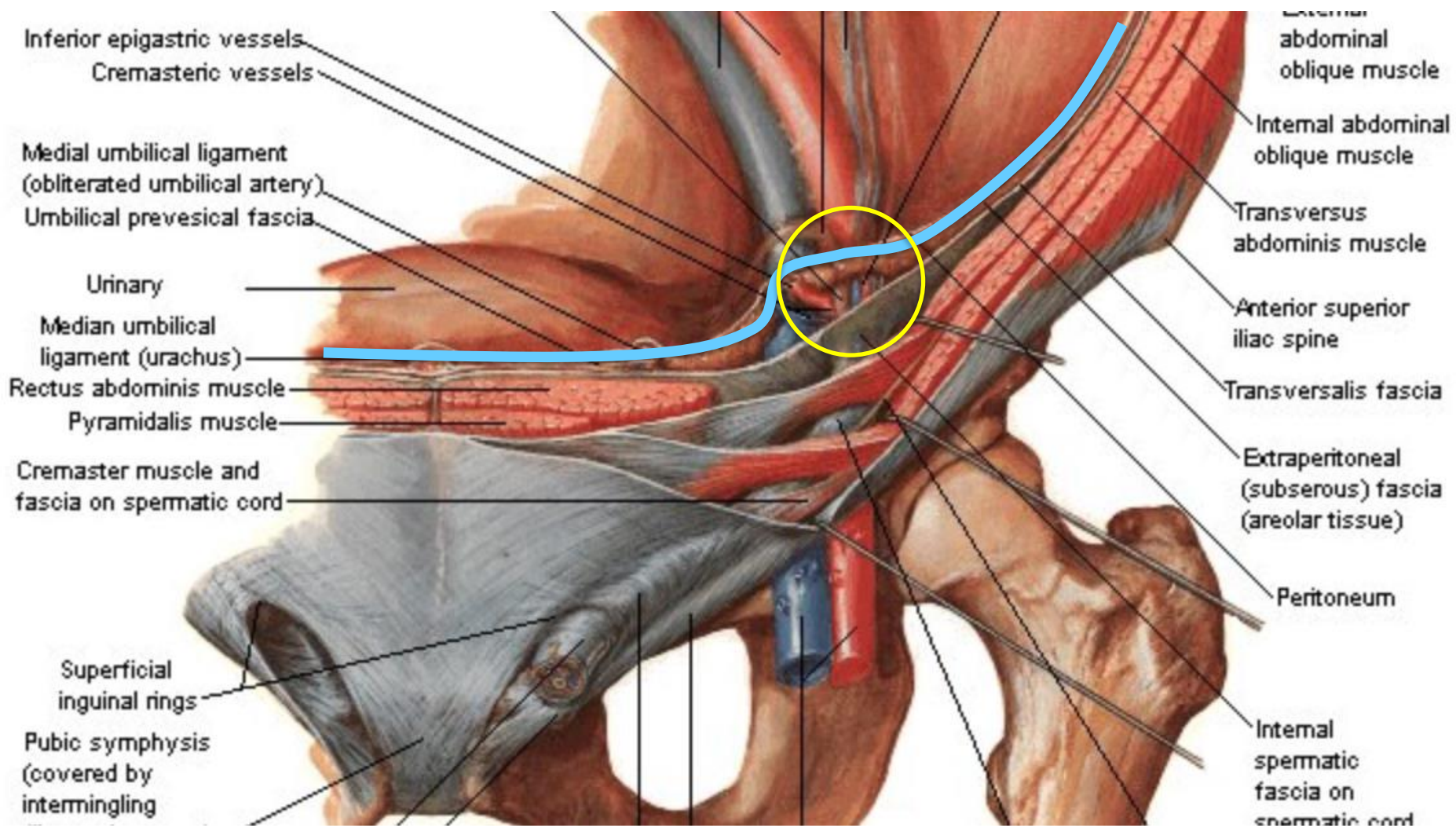
RT ING CANAL VS

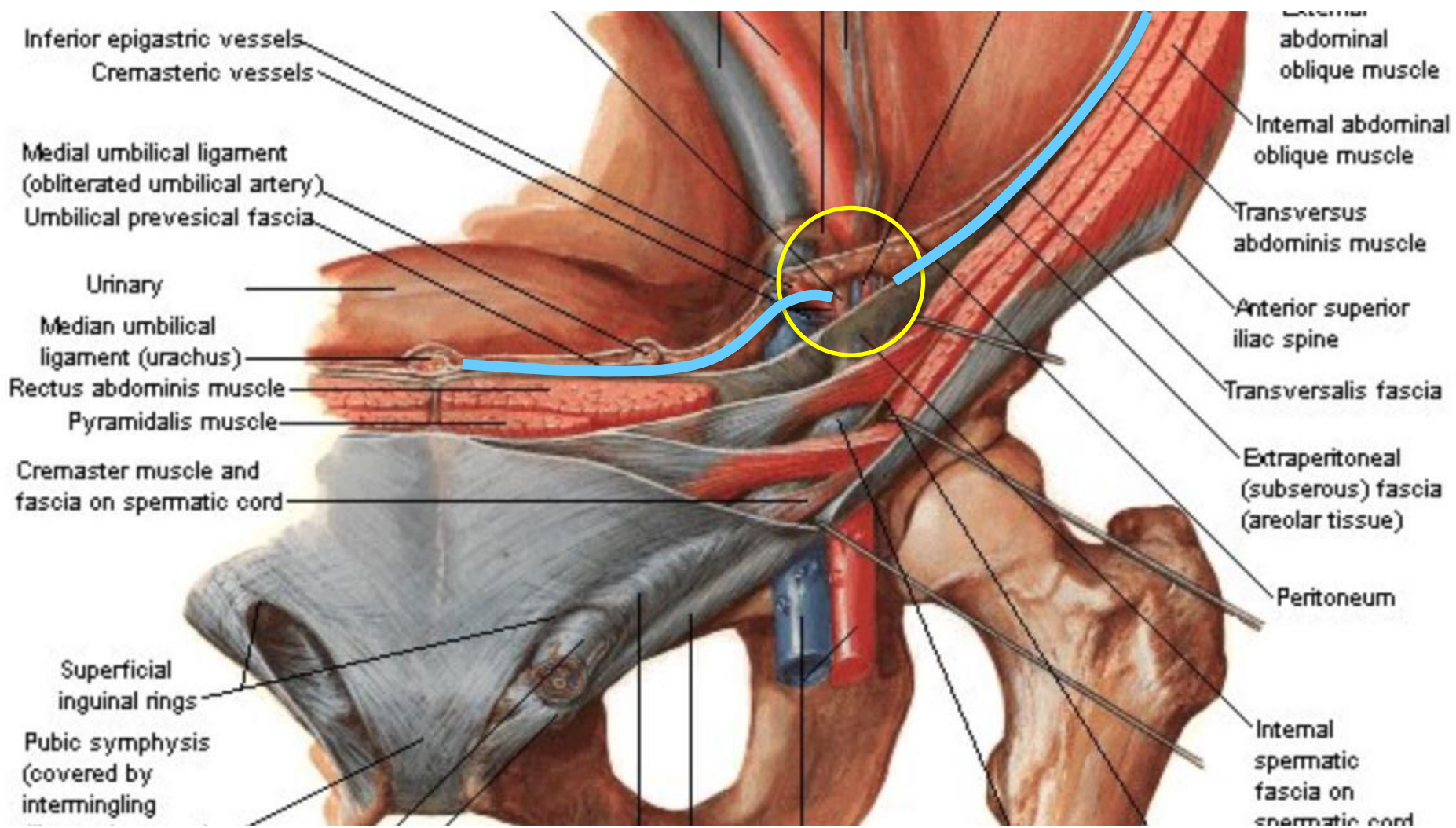
Deep Inguinal Ring



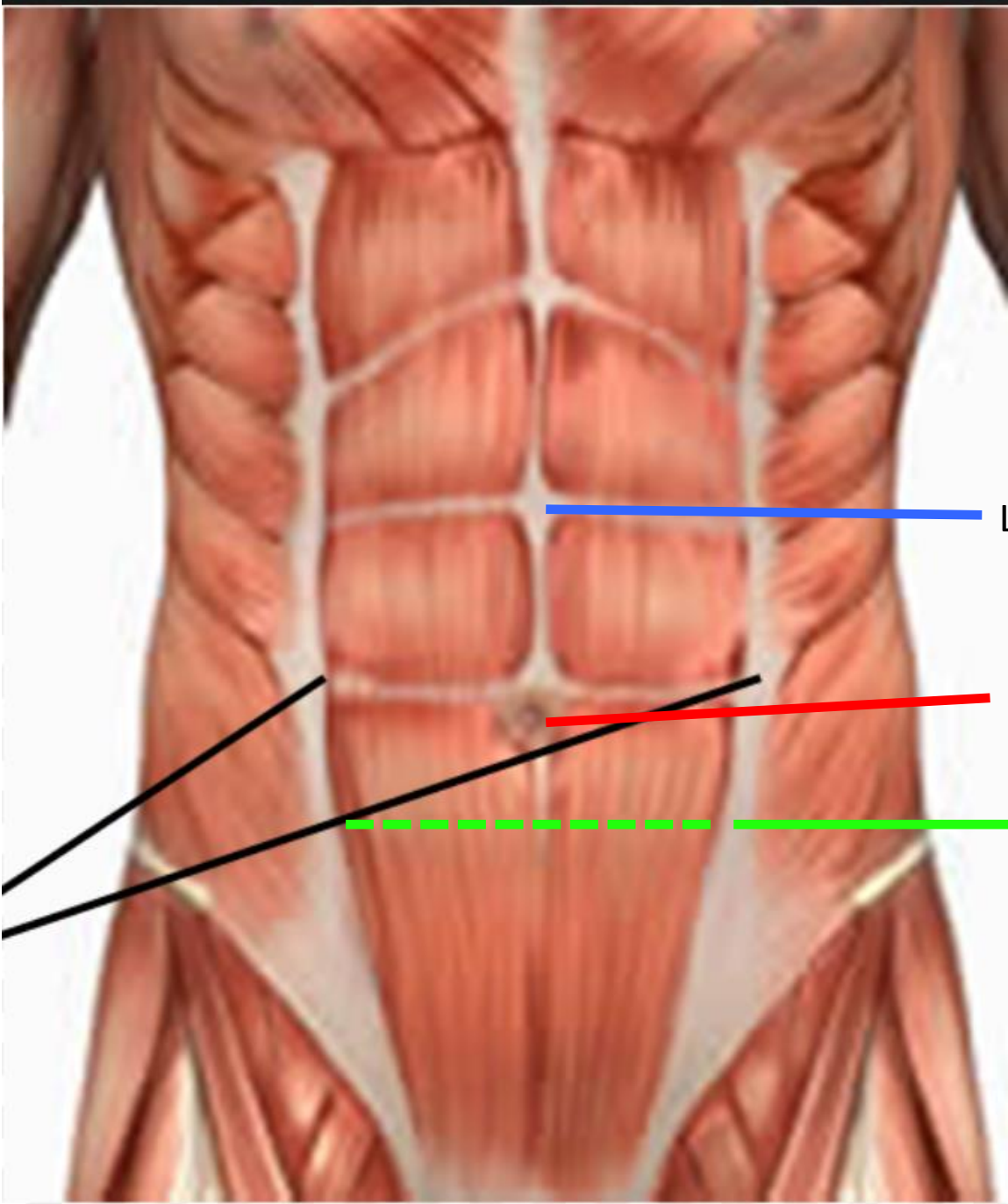








Abdominal Wall Anatomy



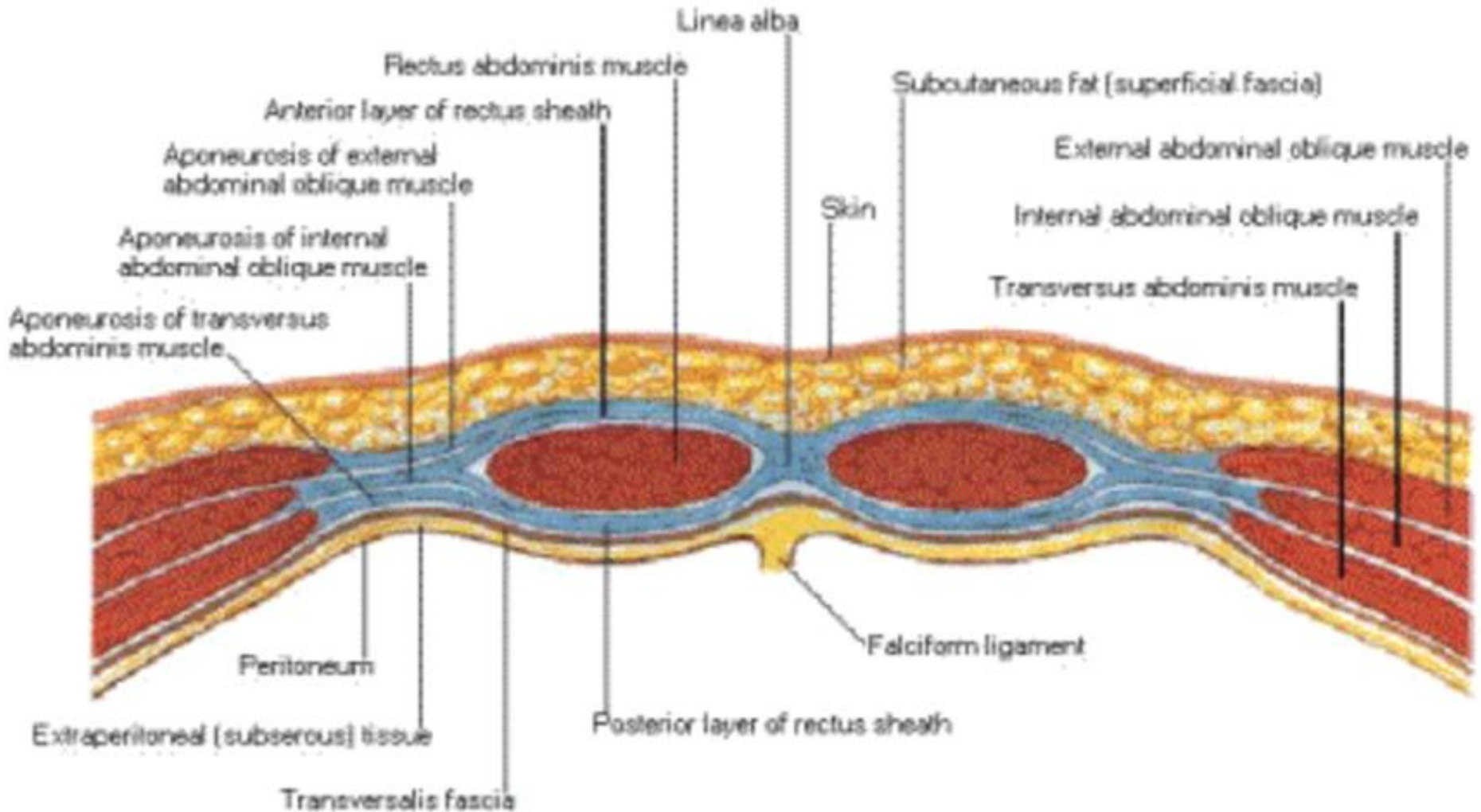
Linea Alba

Umbilicus

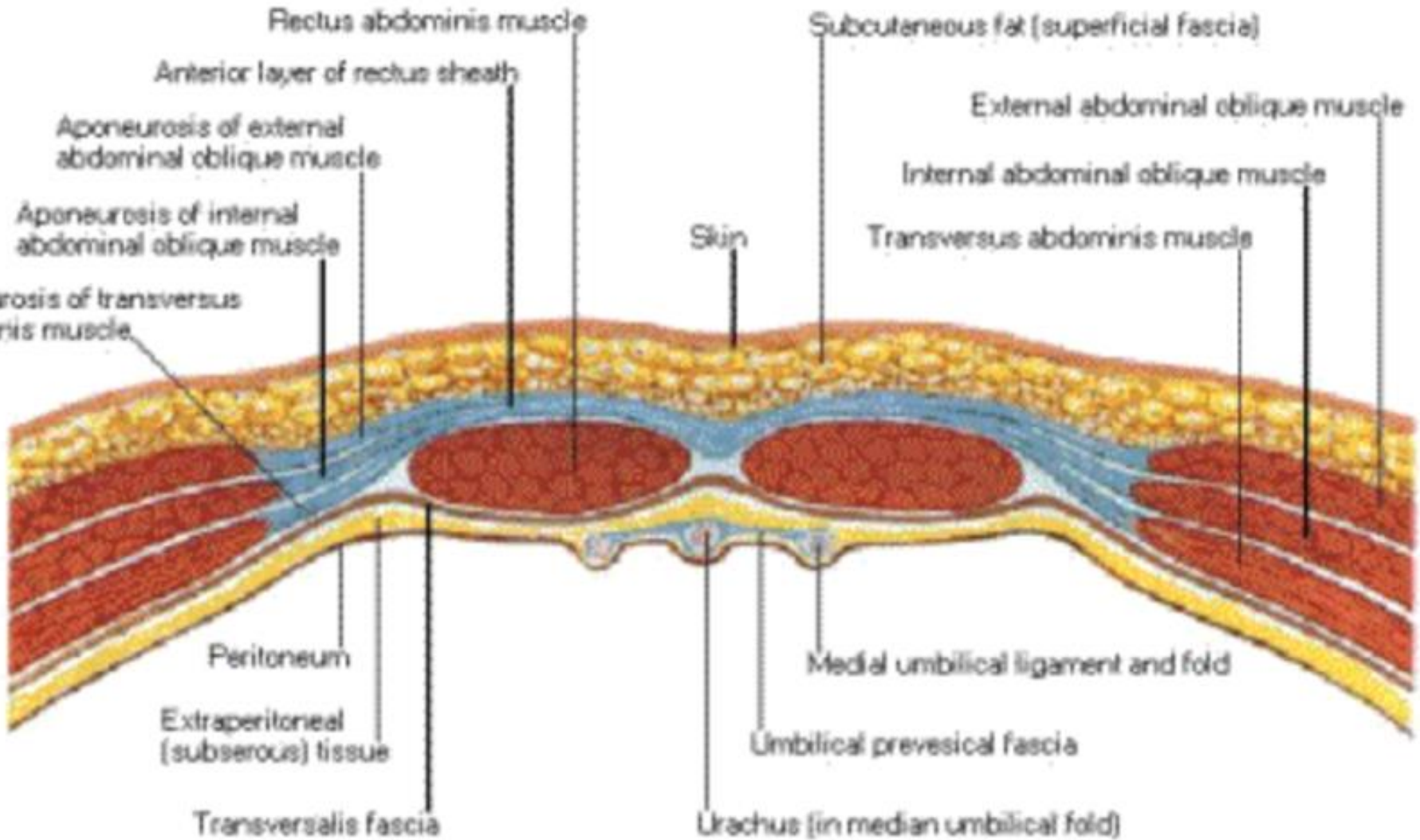
Arcuate Line

Linea Semilunaris

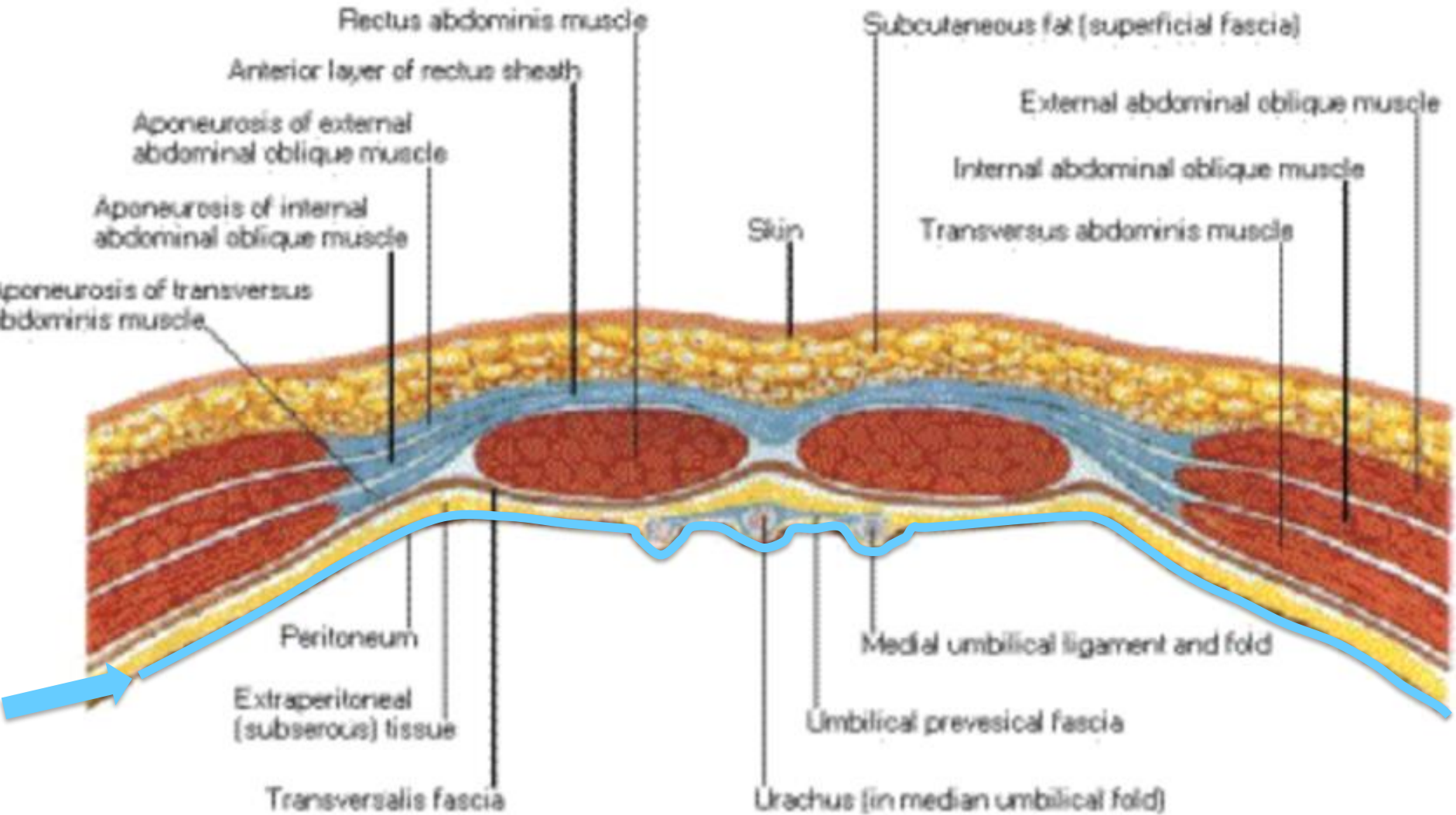
Abdominal Wall Above Arcuate Line



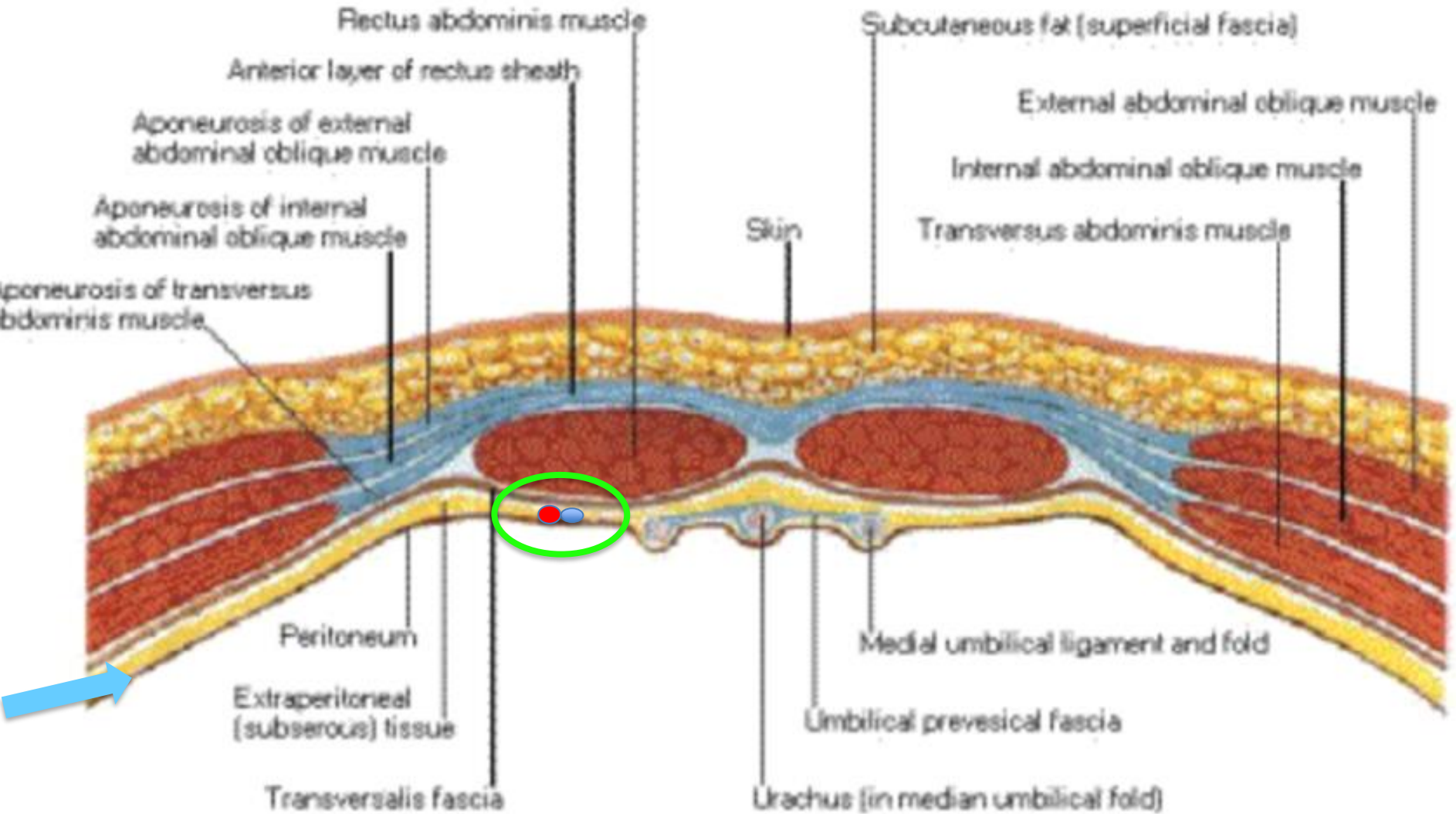
Abdominal Wall Below Arcuate Line



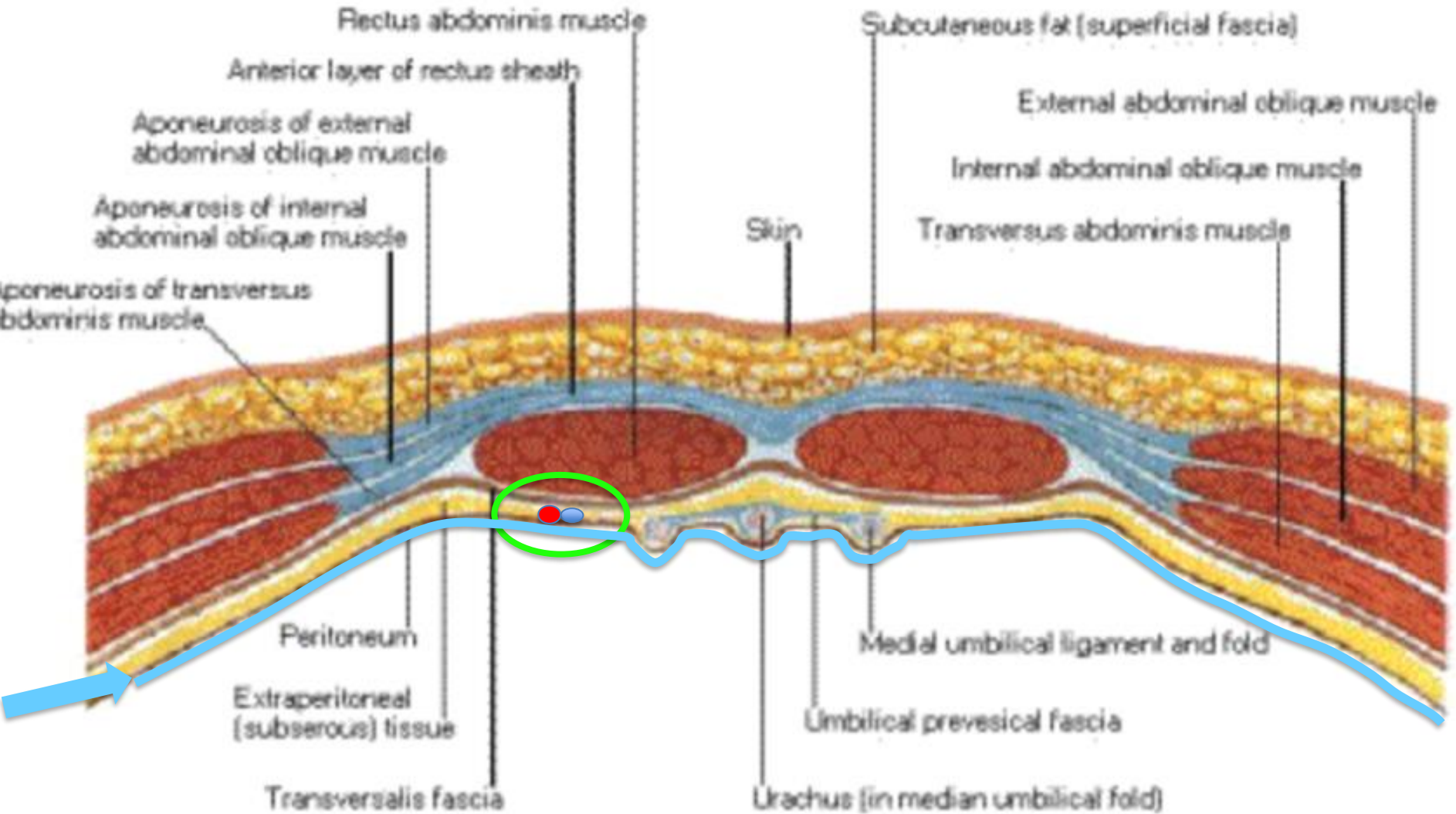
Abdominal Wall Below Arcuate Line

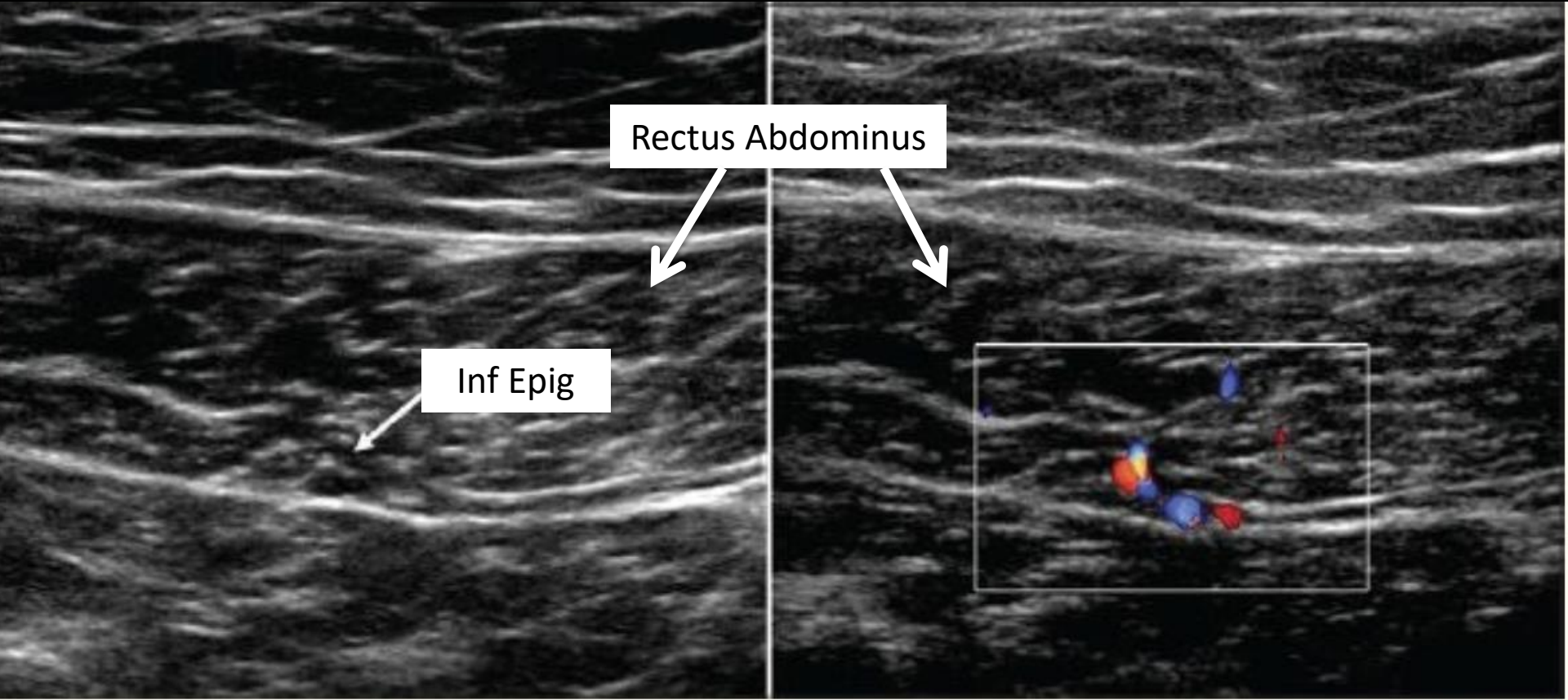


Abdominal Wall Below Arcuate Line



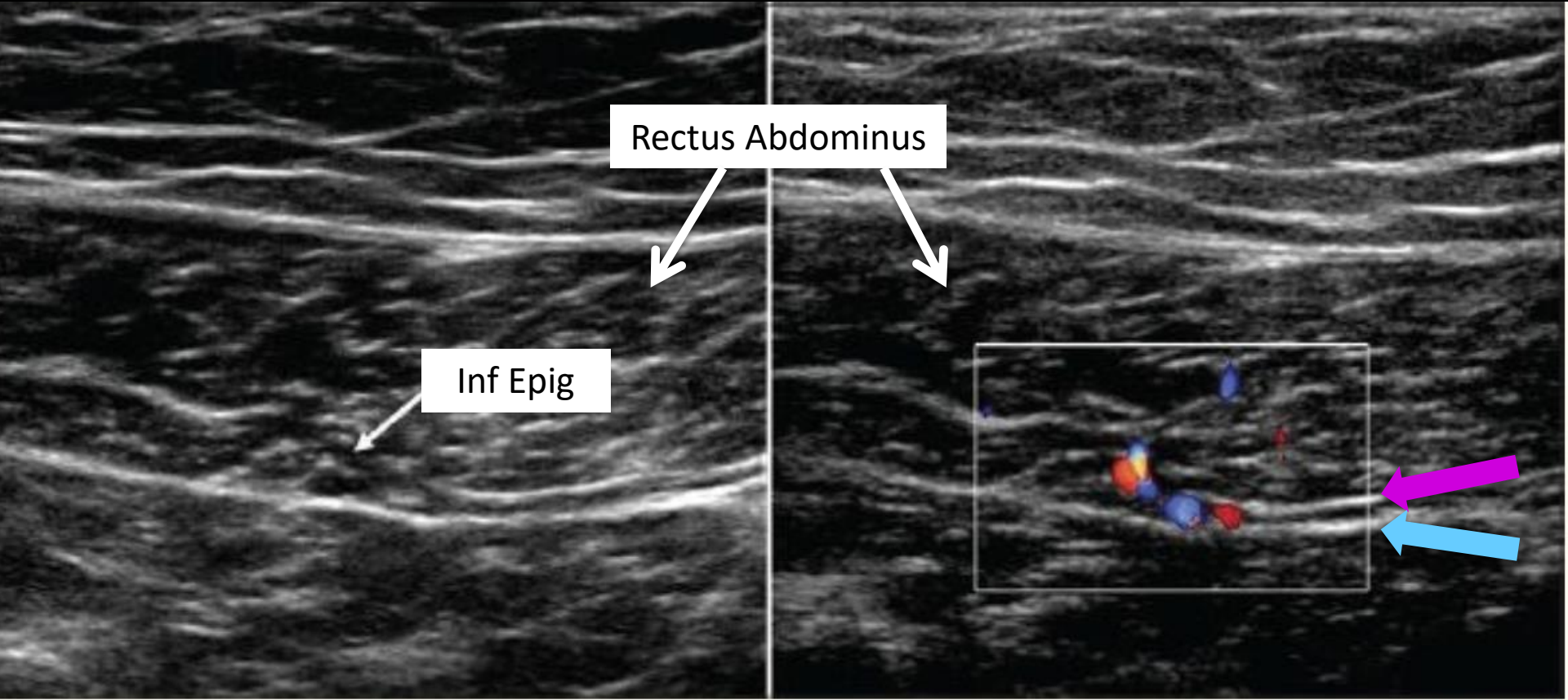
Abdominal Wall Below Arcuate Line





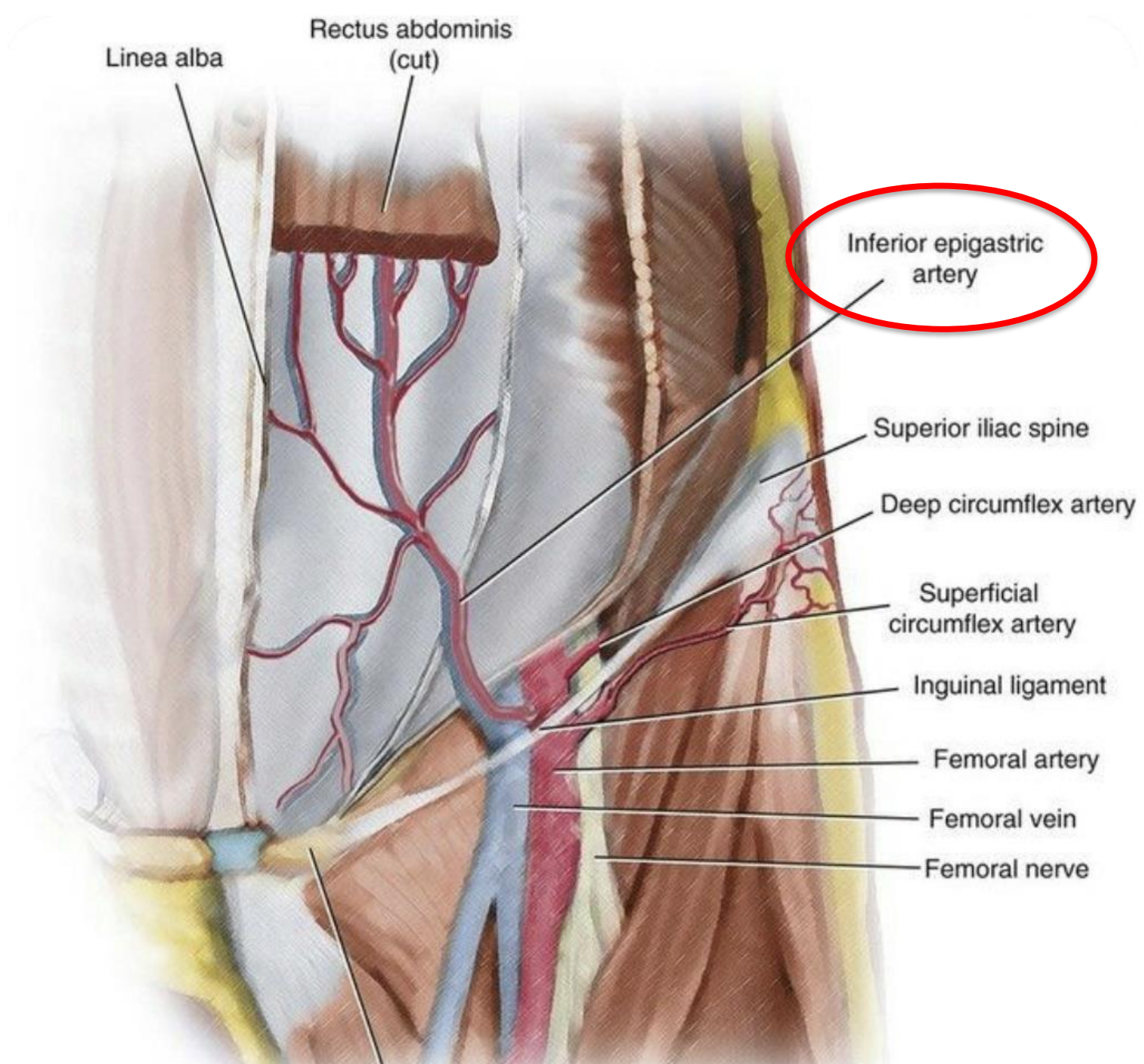
Rectus Abdominus

Inf Epig



Rectus Abdominus

Inf Epig



Linea alba

Rectus abdominis
(cut)

Inferior epigastric
artery

Superior iliac spine

Deep circumflex artery

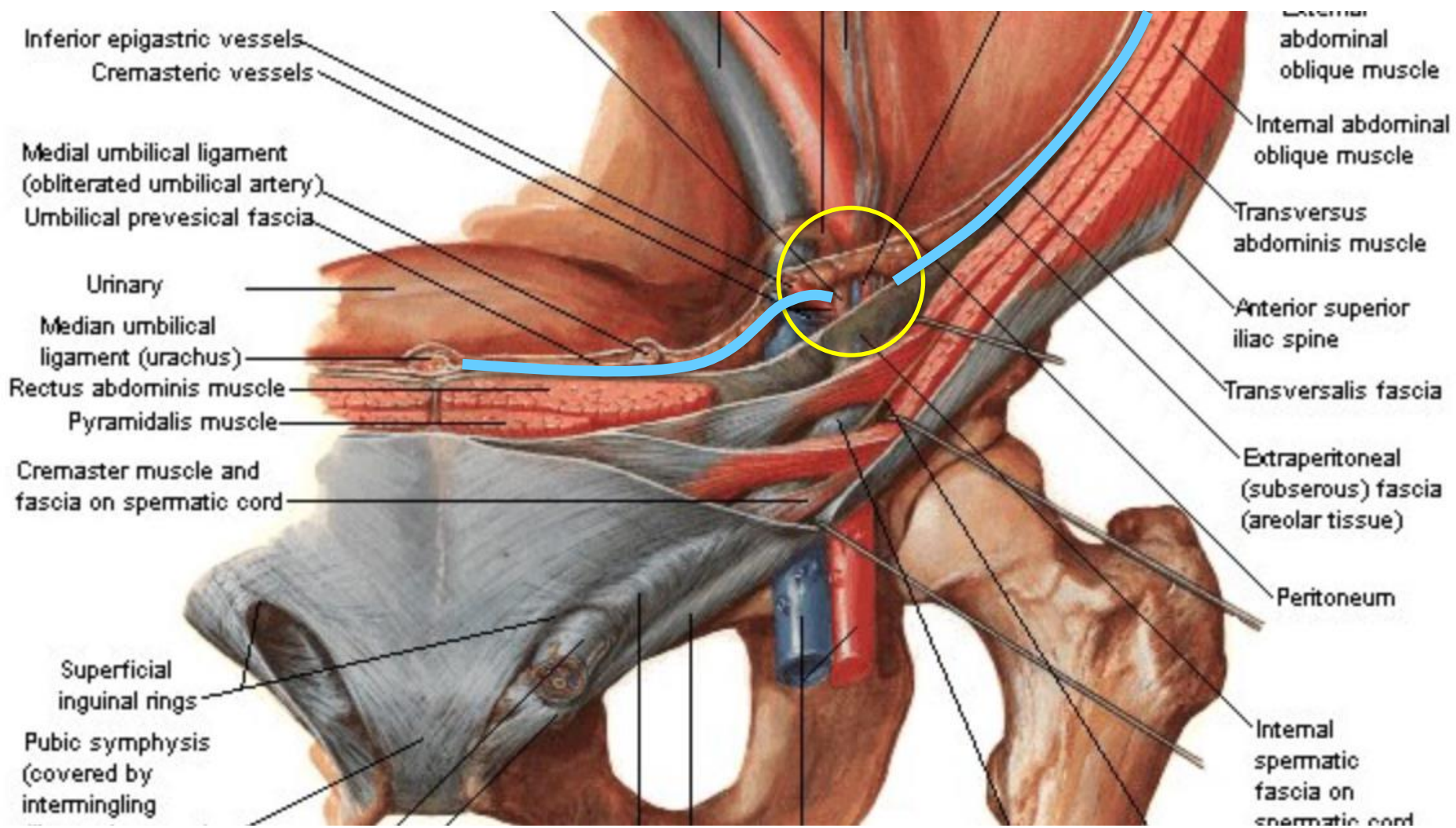
Superficial
circumflex artery

Inguinal ligament

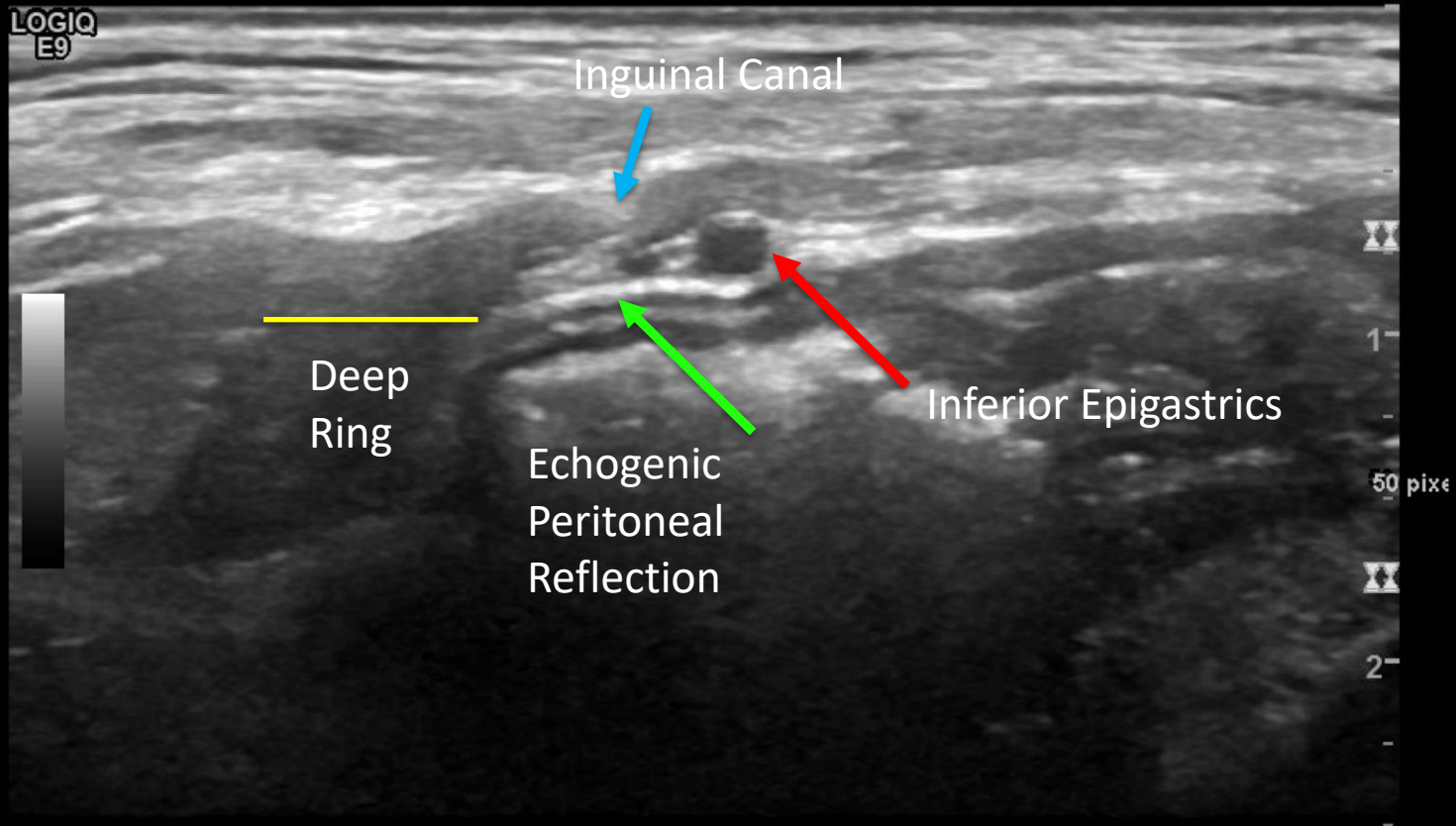
Femoral artery

Femoral vein

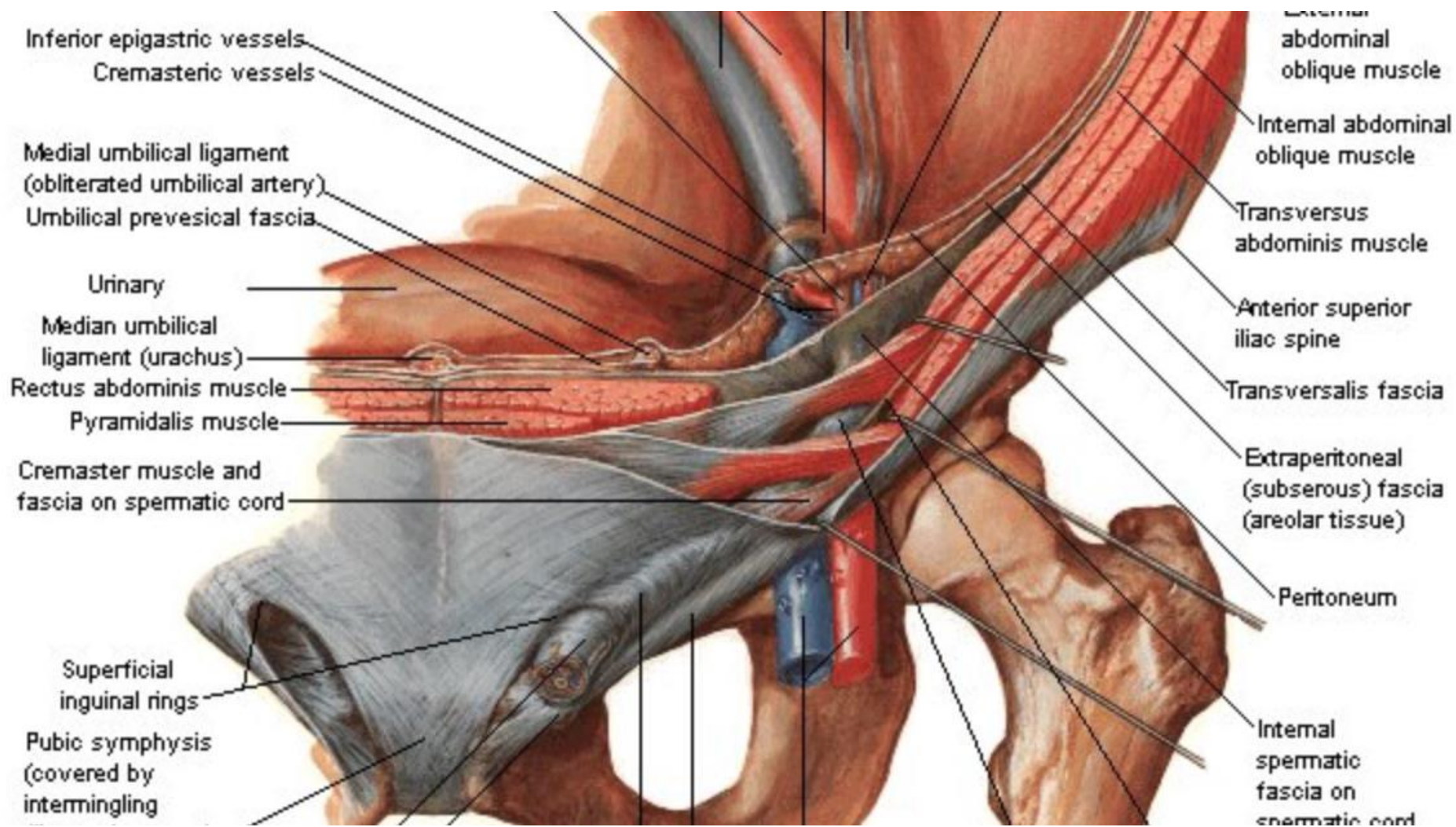
Femoral nerve

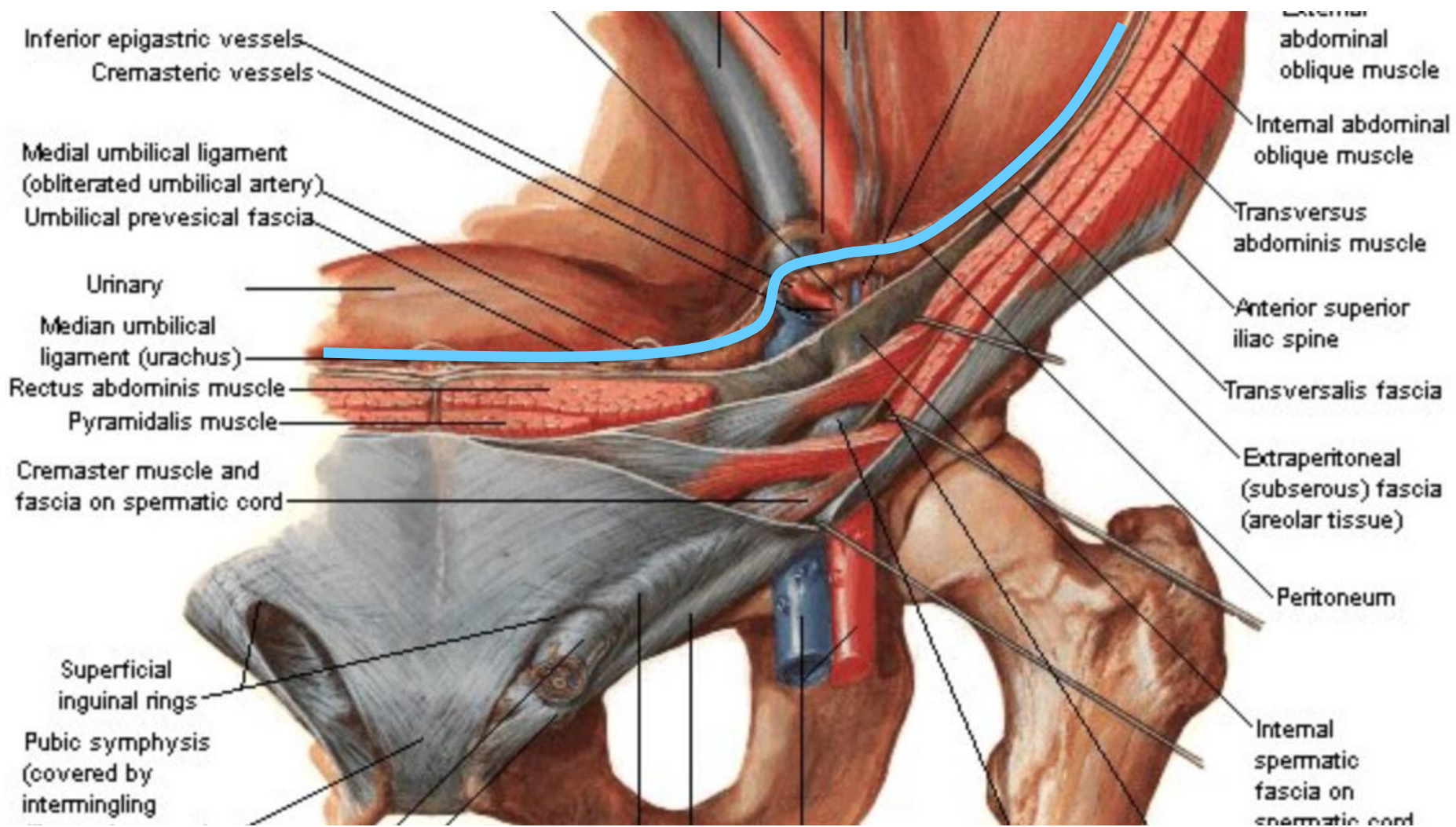


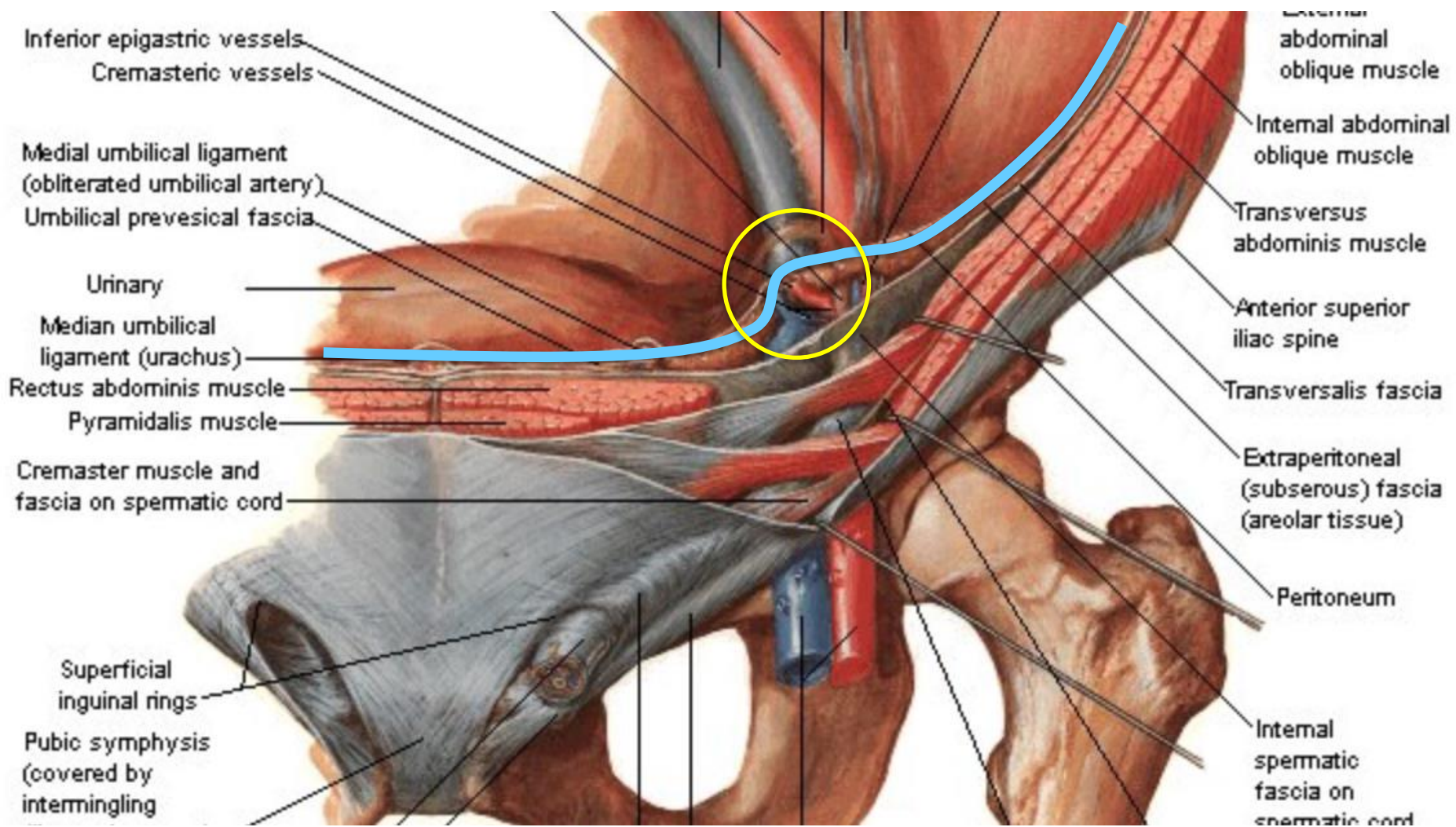
Losing the echogenic line in the groin helps us identify the Deep Inguinal Ring

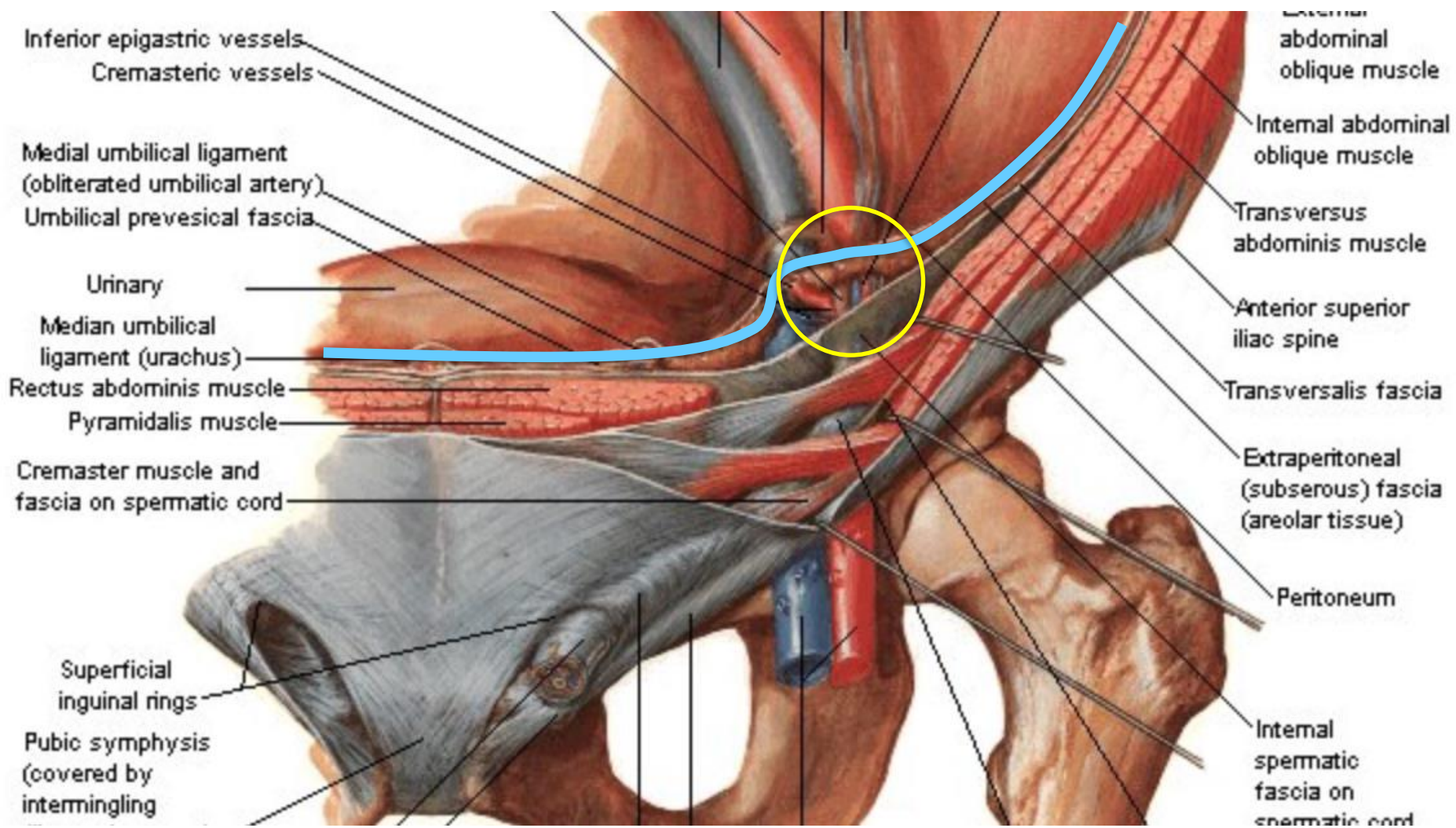


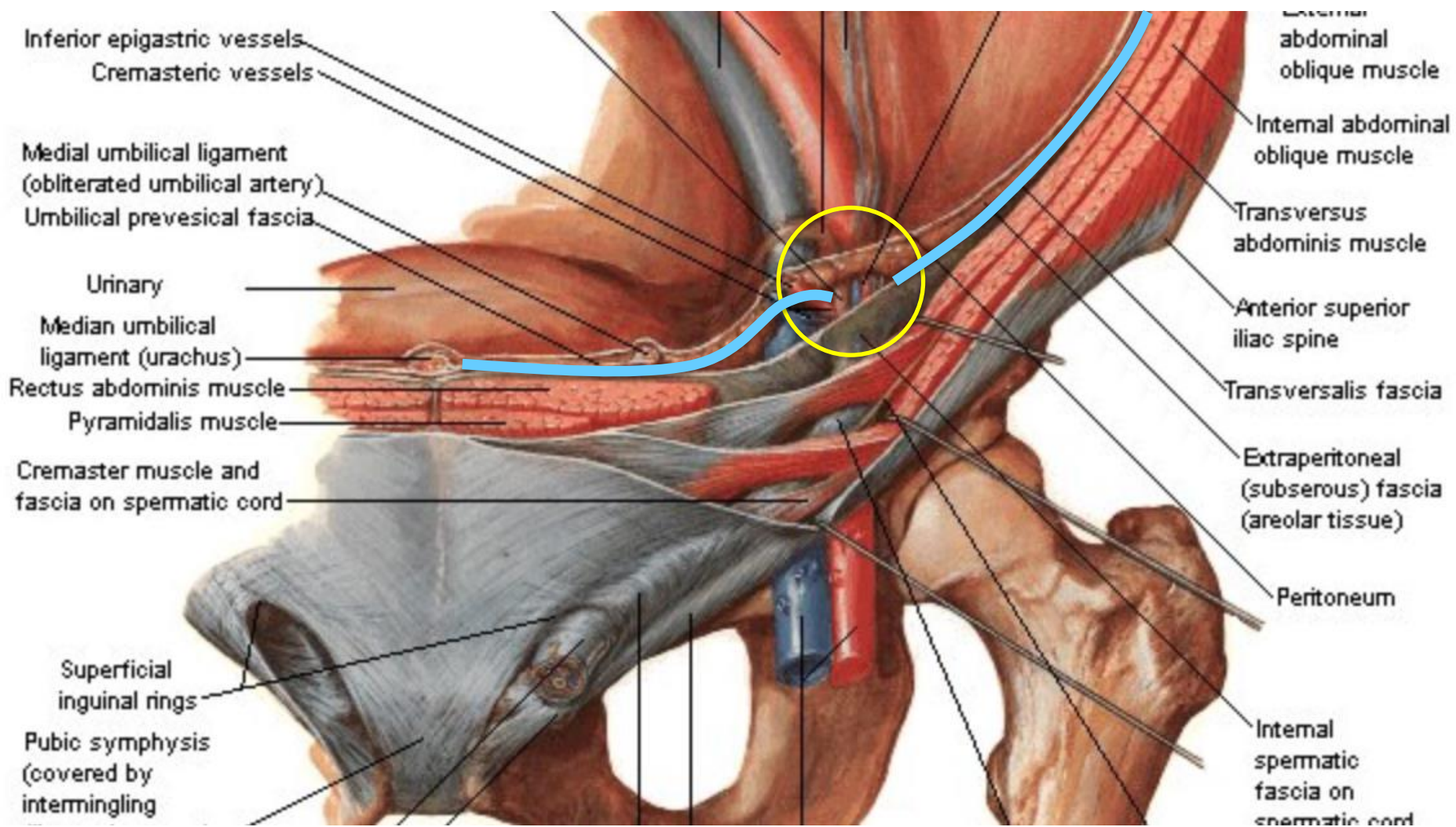
RT ING CANAL VS



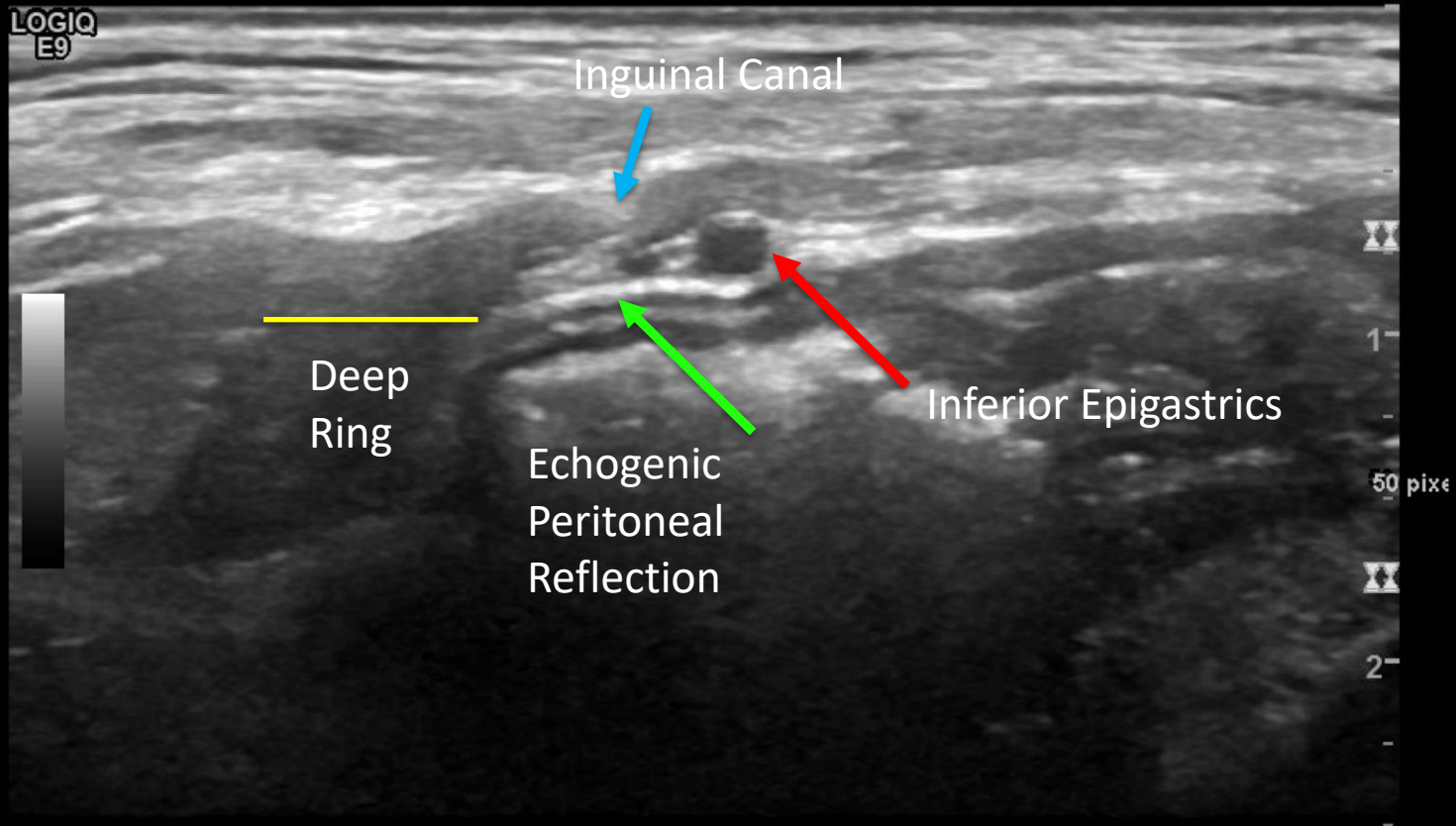






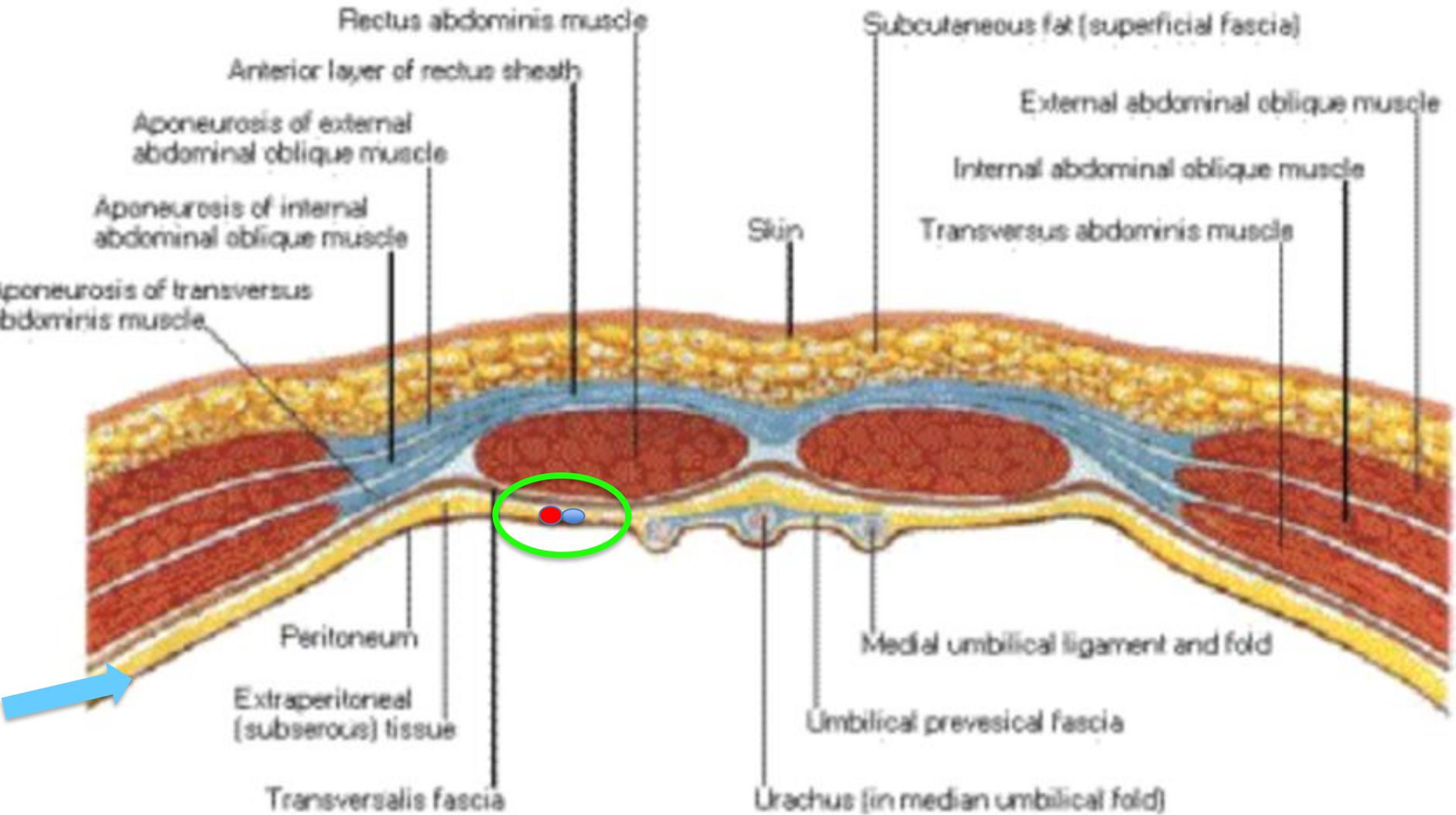


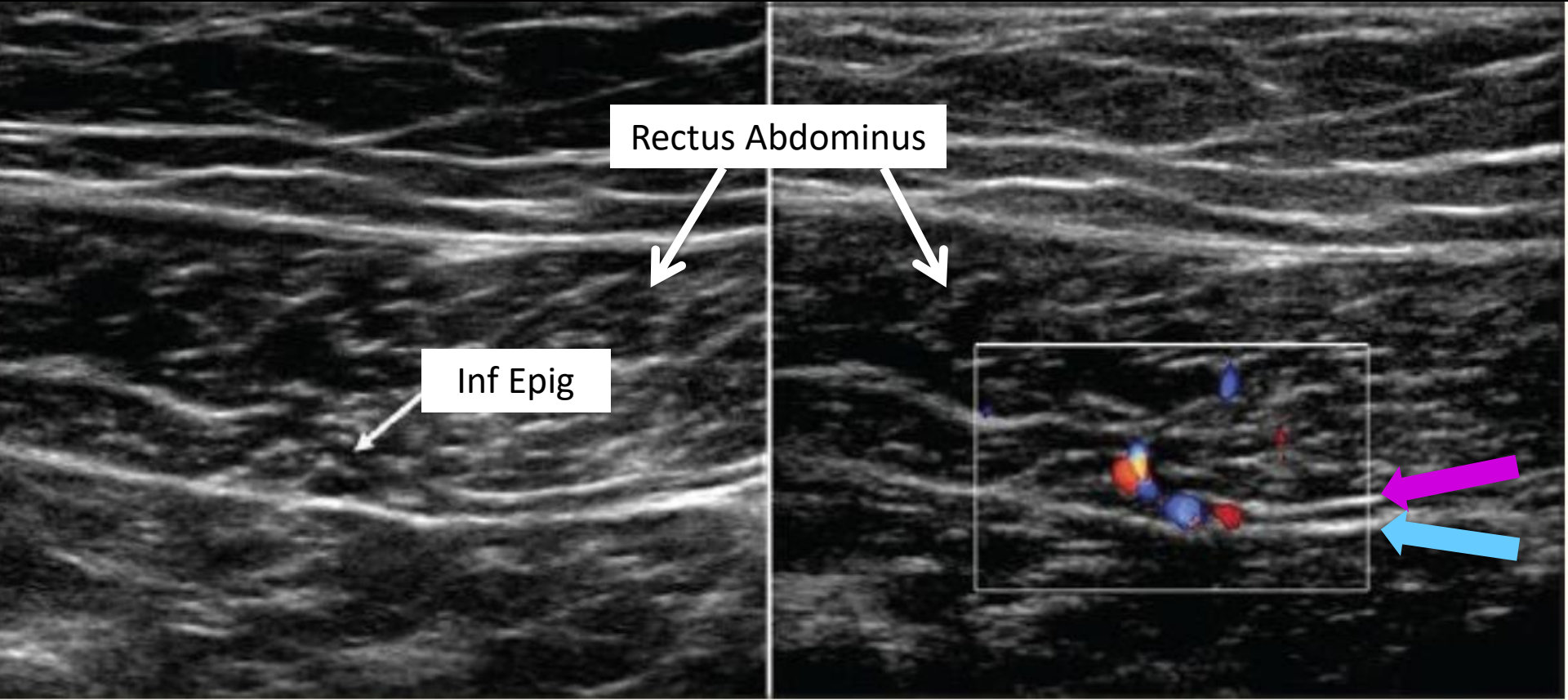
Losing the echogenic line in the groin helps us identify the Deep Inguinal Ring



Finding the Deep Inguinal Ring

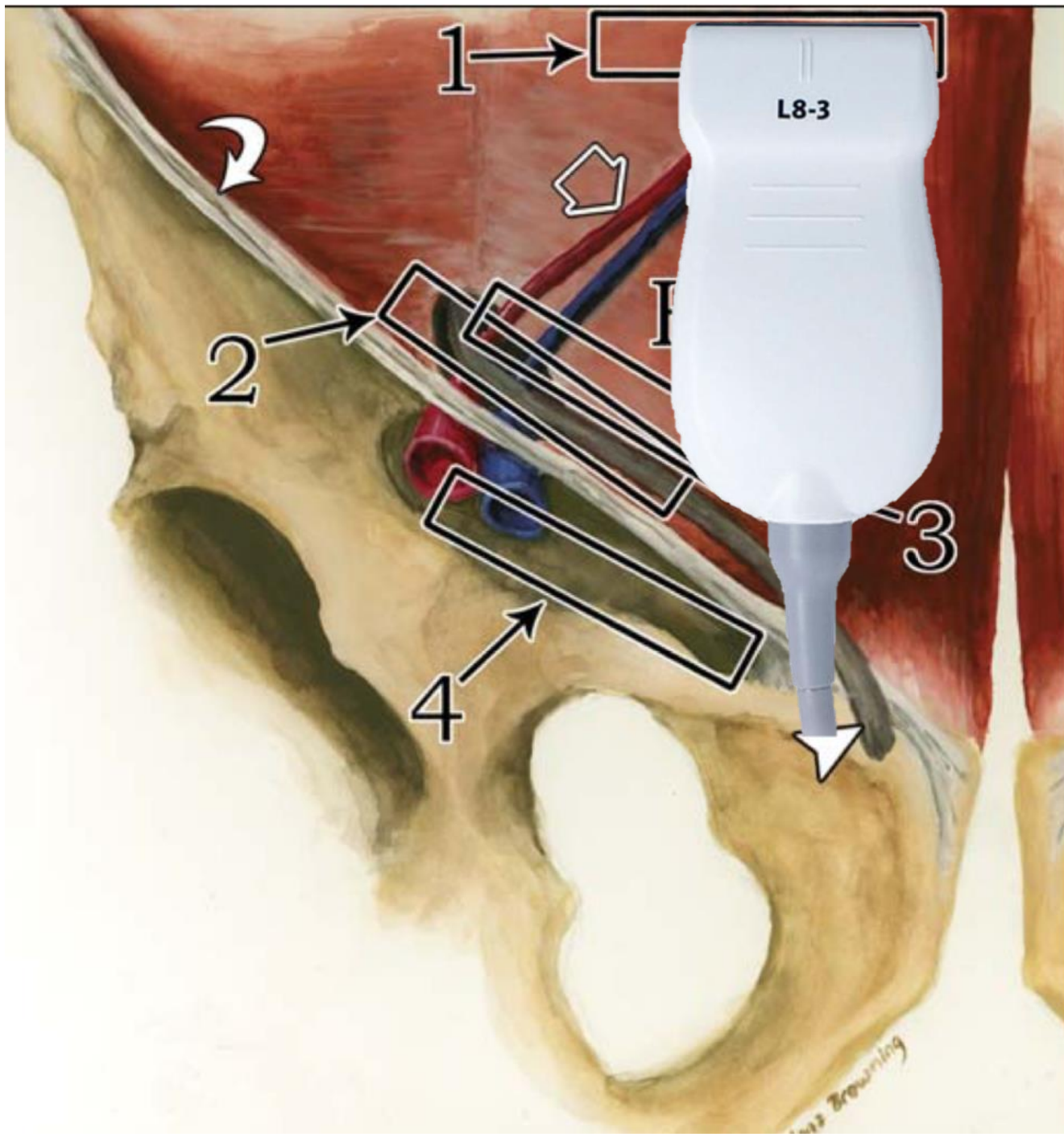
Abdominal Wall Below Arcuate Line

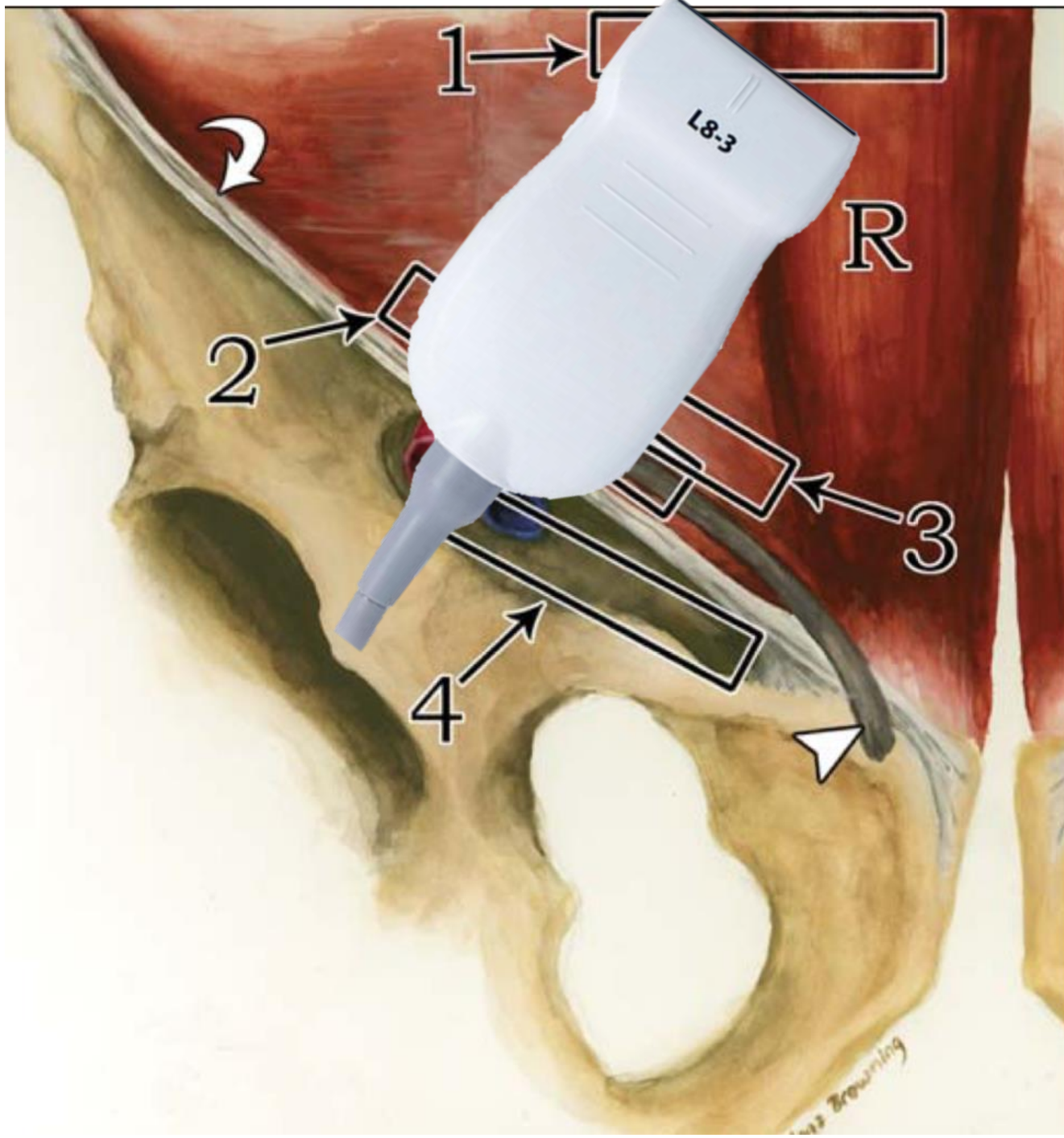


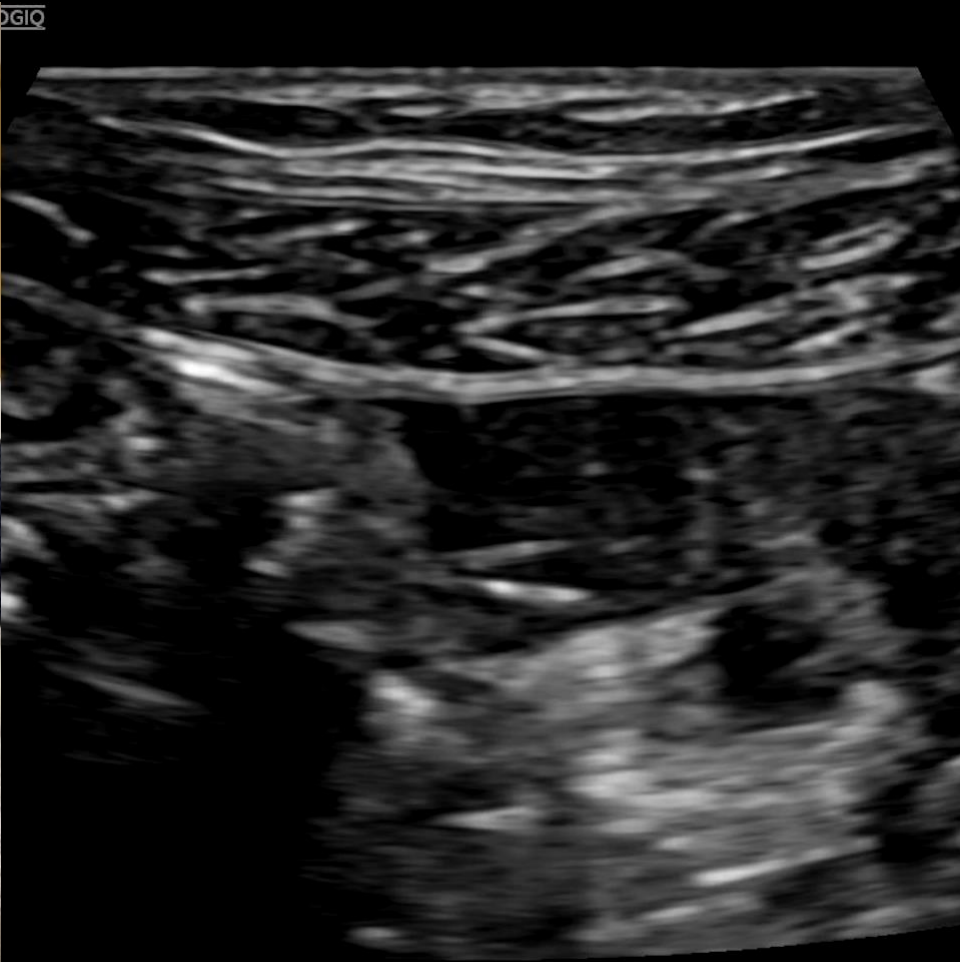


Rectus Abdominus

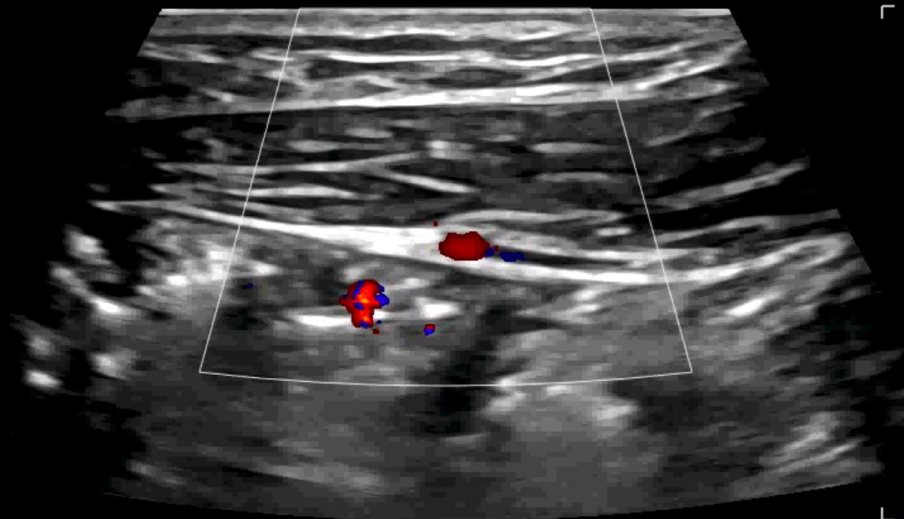
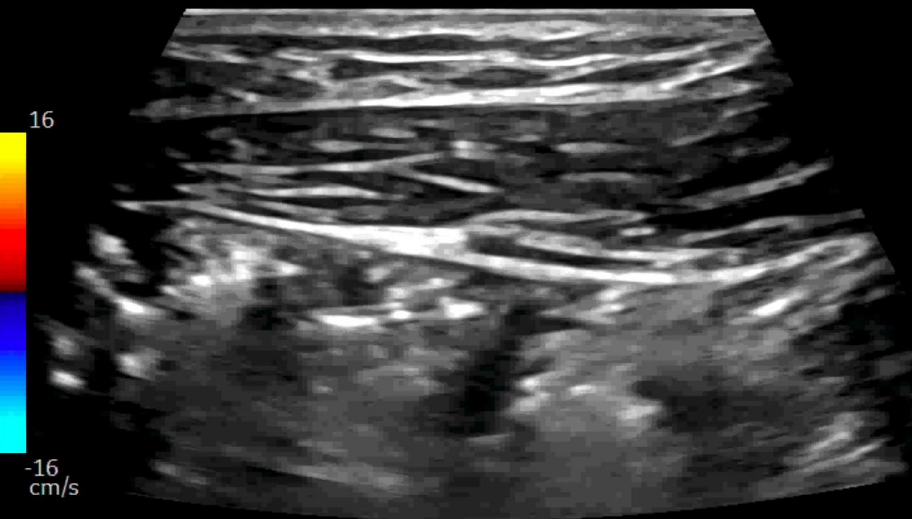
Inf Epig



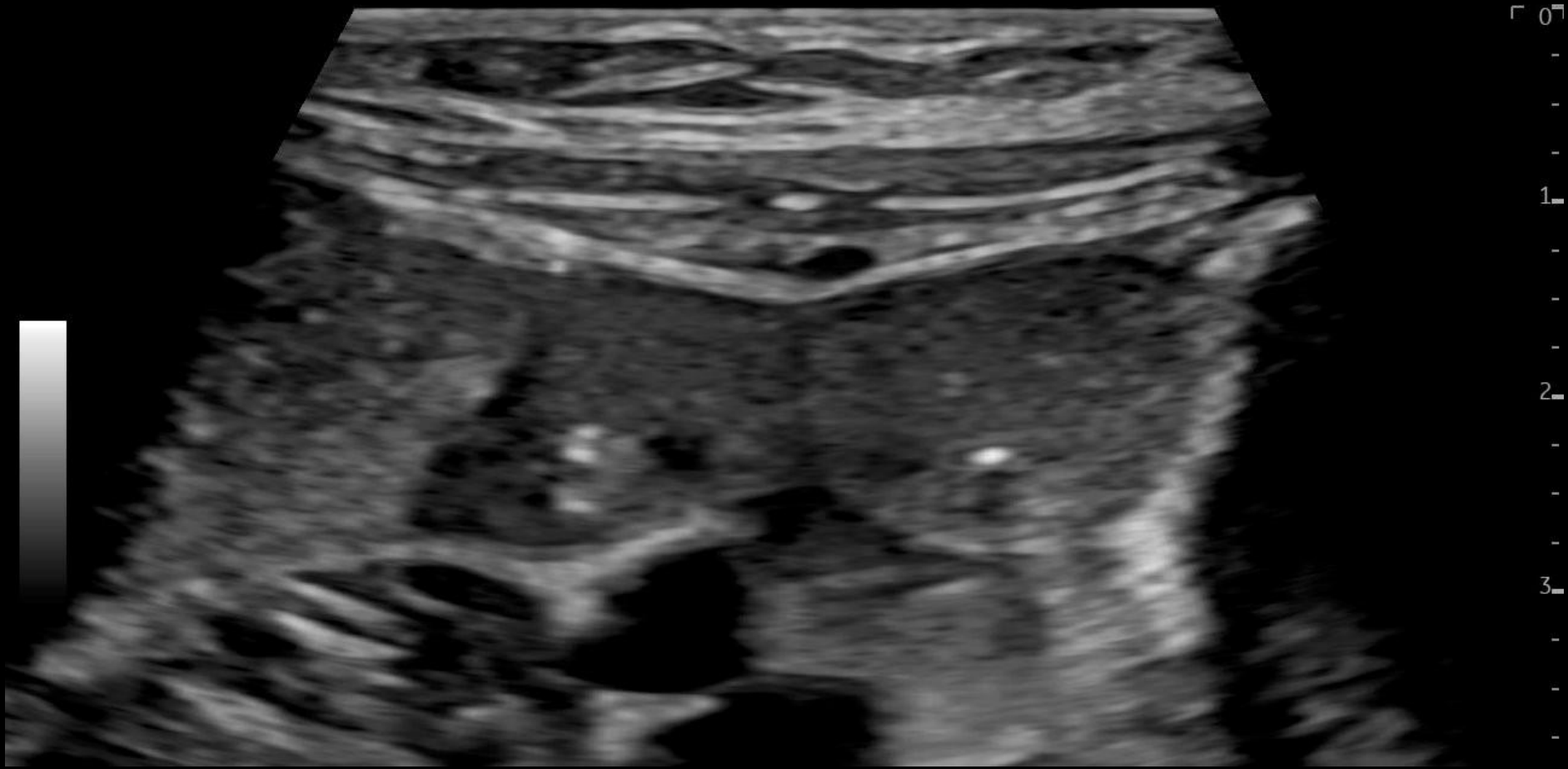




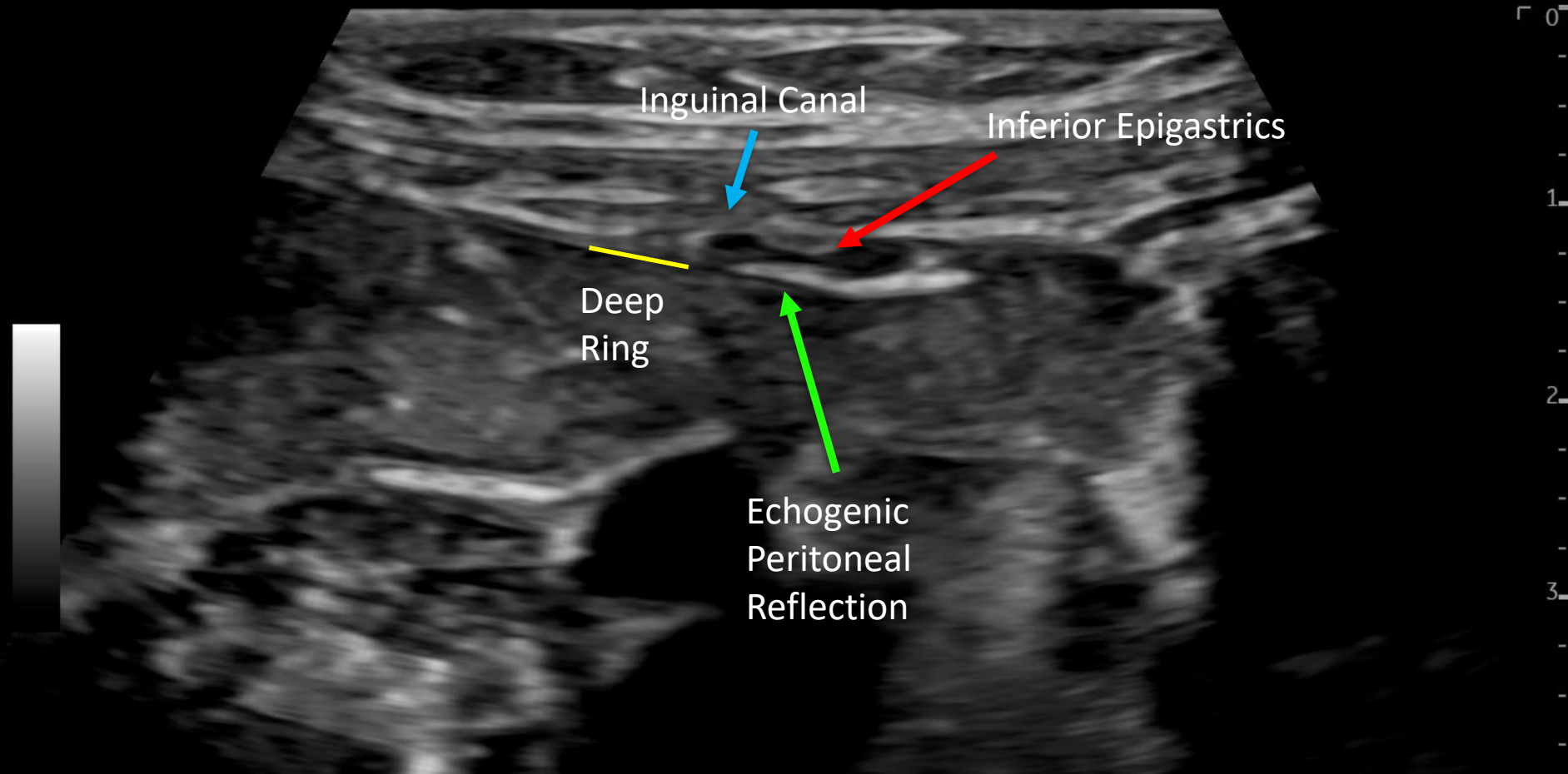
LOGIO



LOGIQ

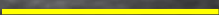


LOGIQ



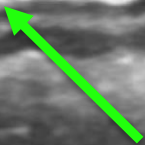
LOGIQ
E9

Inguinal Canal

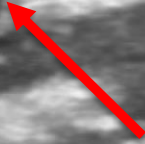


Deep
Ring

Echogenic
Peritoneal
Reflection



Inferior Epigastrics



1-

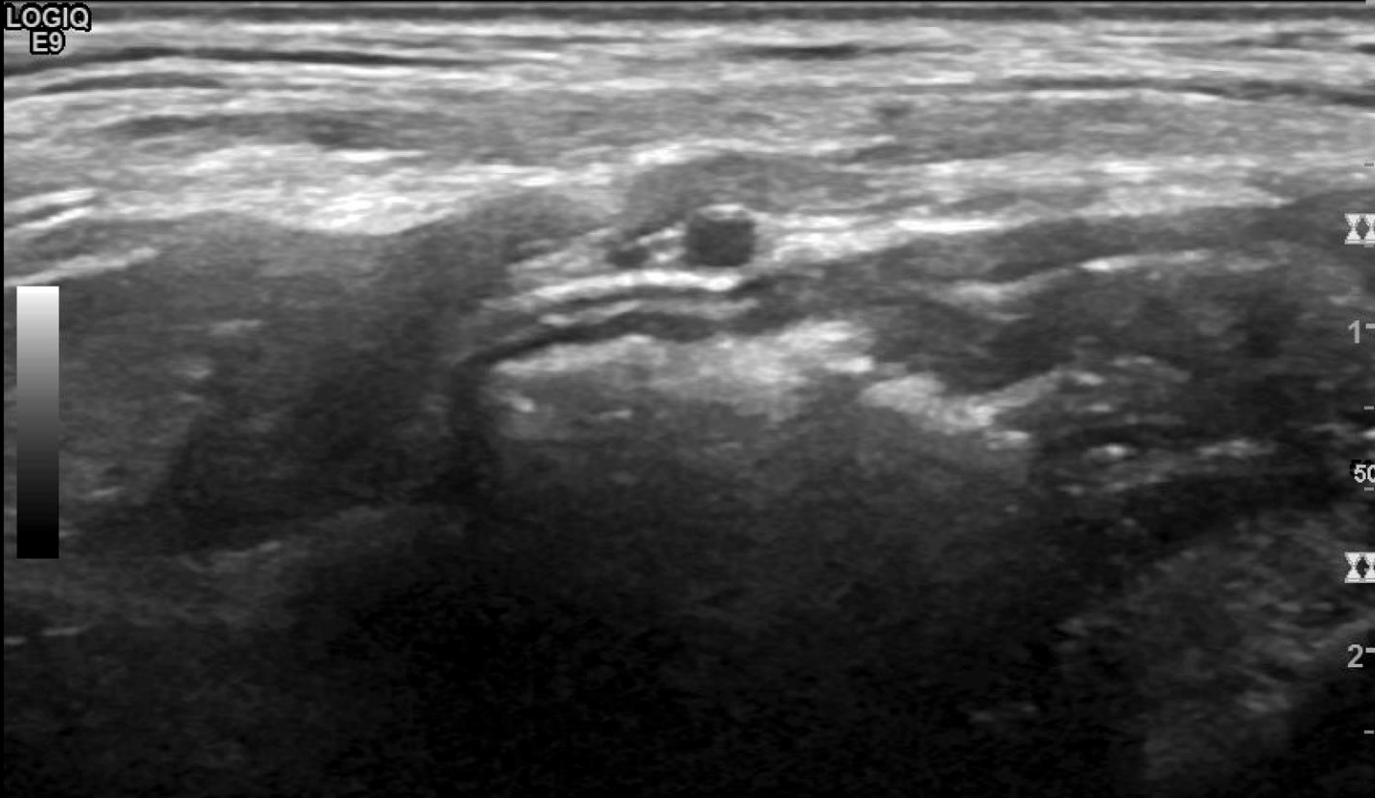
50 pixels



2-

RT ING CANAL VS

LOGIQ
E9

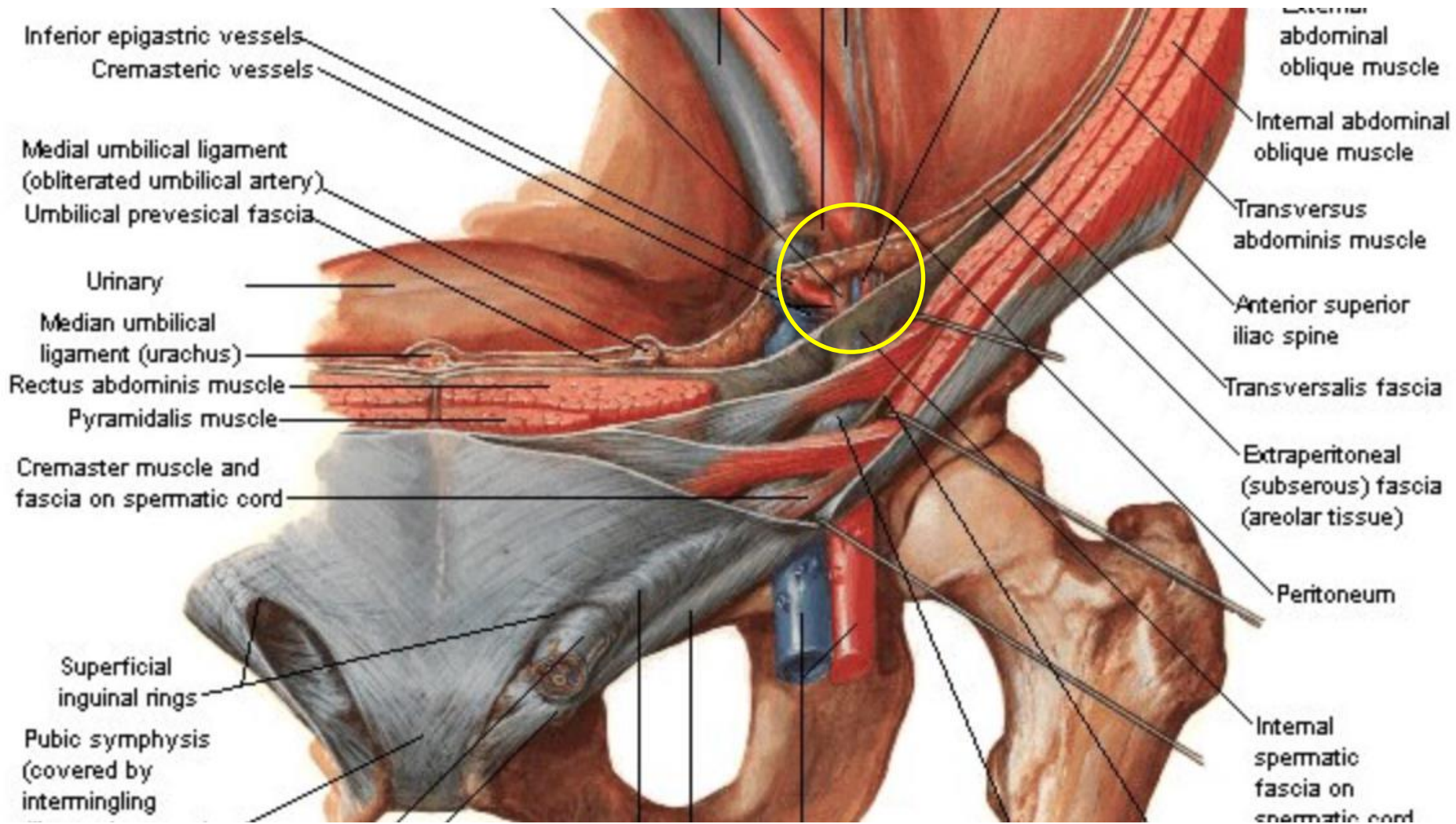


RT ING CANAL VS

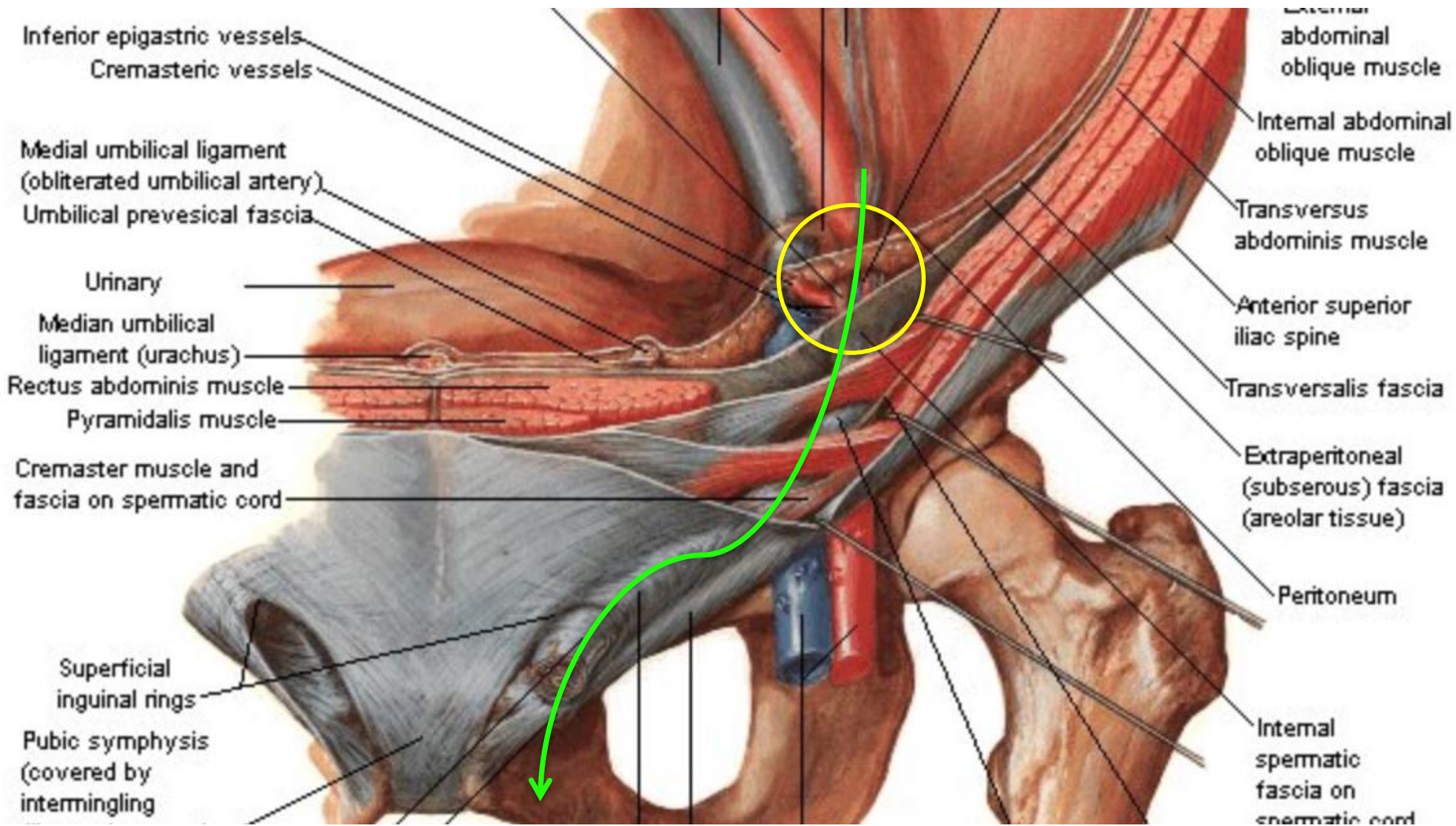
When you find the deep ring, you can assess for indirect inguinal hernias

Indirect Inguinal Hernia's

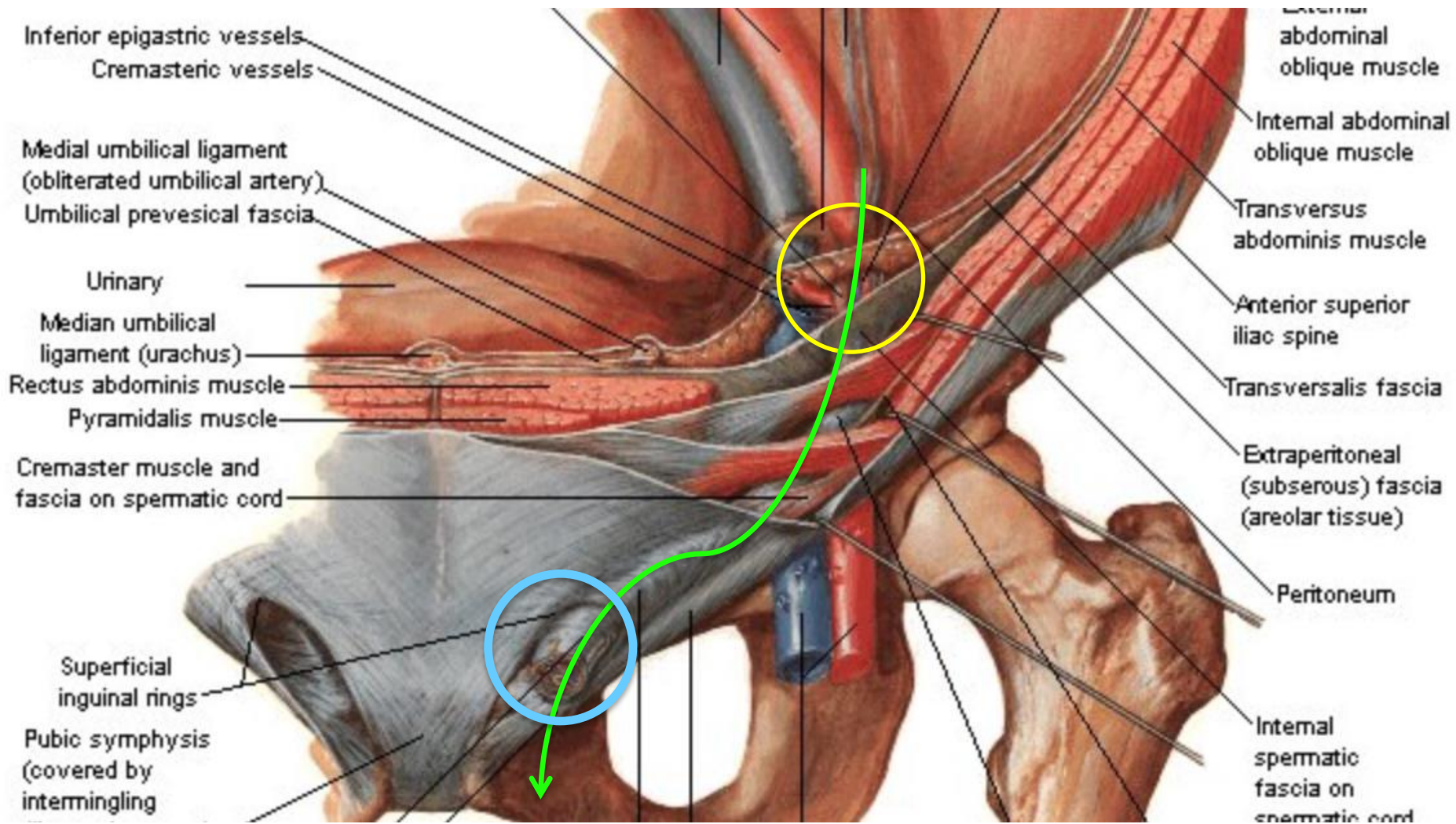
They go through the deep Inguinal Ring

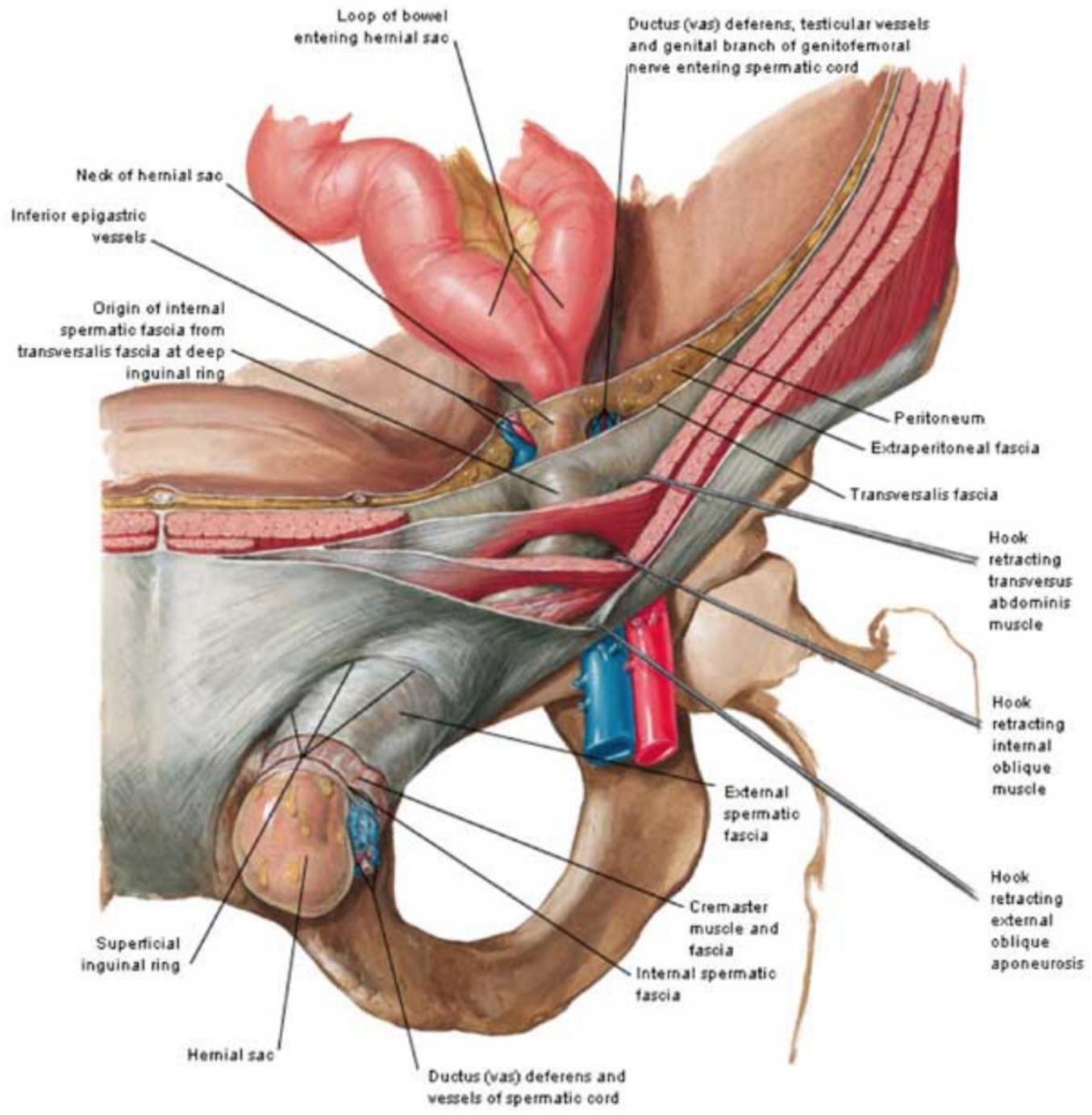


May lie within the Inguinal Canal



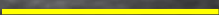
May pass through Superficial Inguinal Ring





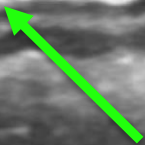
LOGIQ
E9

Inguinal Canal

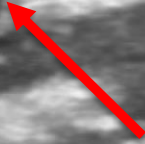


Deep
Ring

Echogenic
Peritoneal
Reflection



Inferior Epigastrics



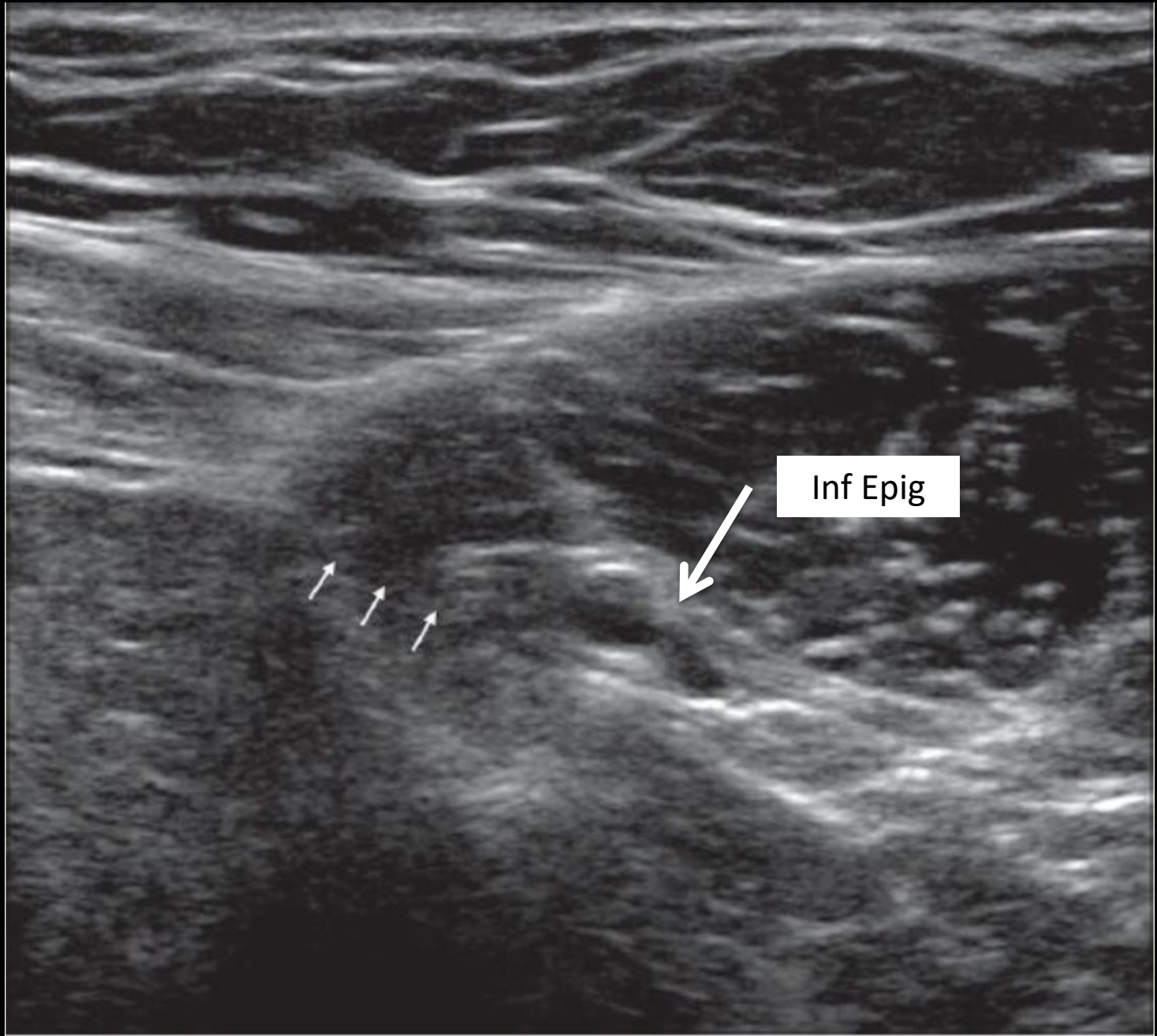
1-

50 pixe



2-

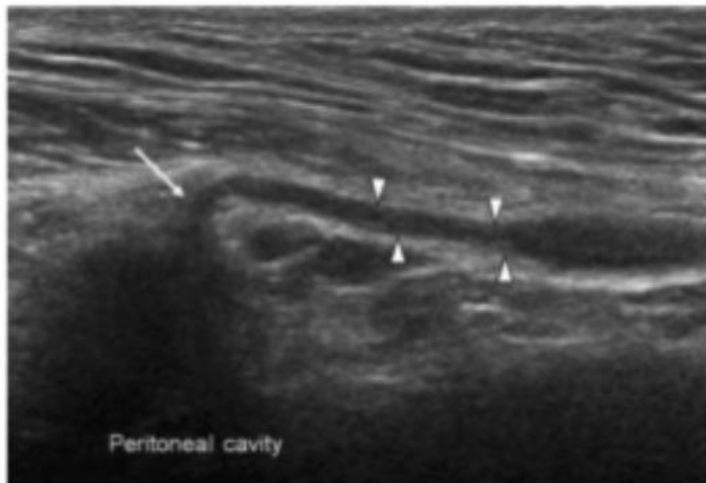
RT ING CANAL VS



Inf Epig

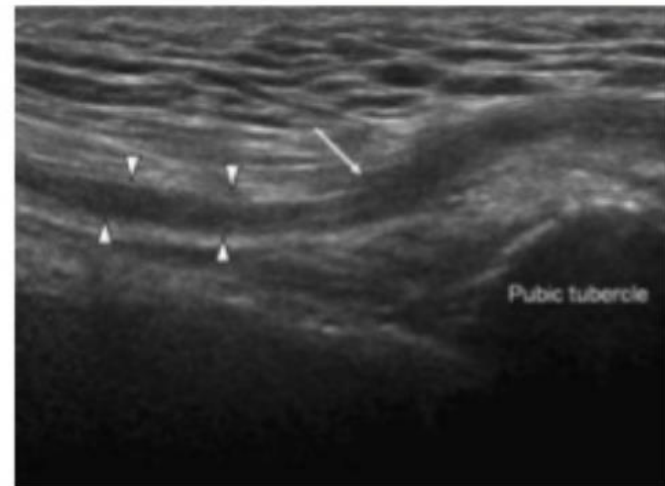
Deep Ring and Inguinal Canal

Deep inguinal ring



Spermatic cord (arrowheads) passes through deep inguinal ring (arrow), lateral to inferior epigastric vessels

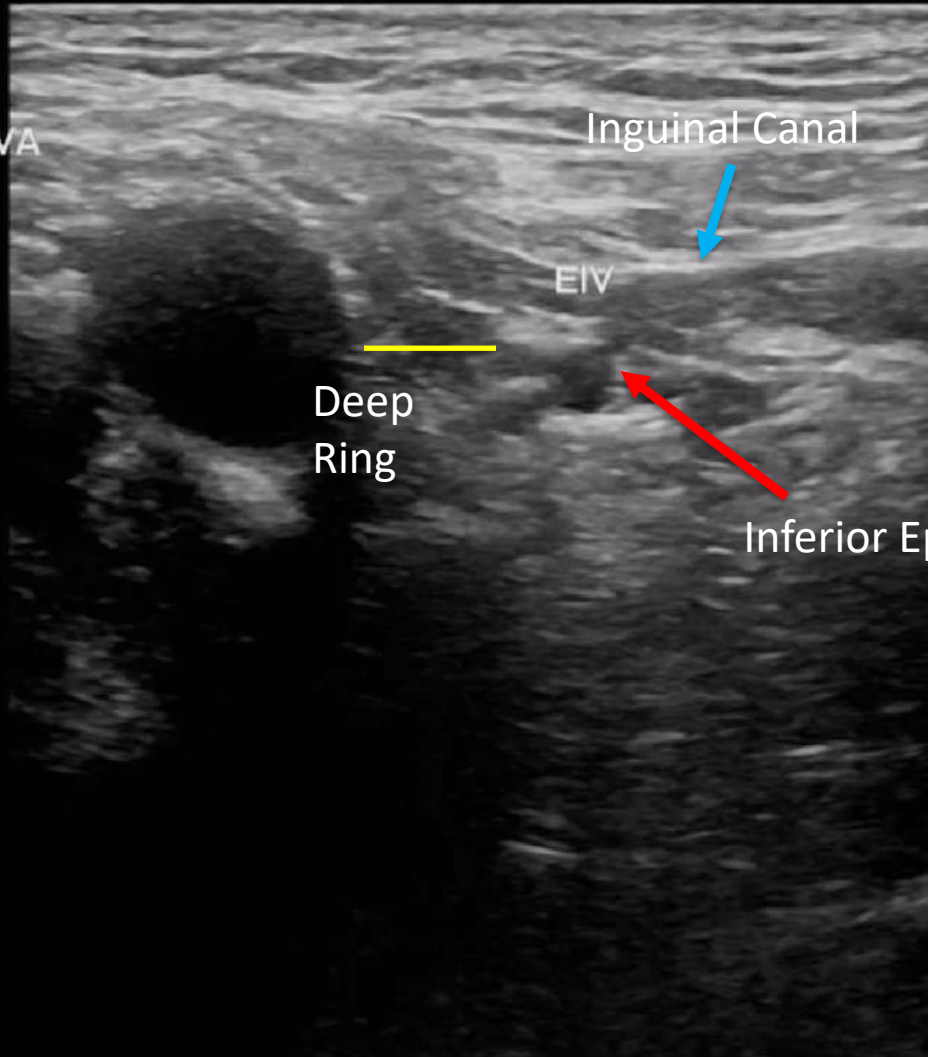
Superficial inguinal ring



Spermatic cord (arrowheads) in inguinal canal extending through superficial inguinal ring (arrow)

LOGIQ

RIGHT GROIN
W/VALSALVA



Inguinal Canal

EIV

Deep
Ring

Inferior Epigastrics

0
-
-
-
2
-
-
-
4
-
-
L



LOGIQ

RIGHT GROIN
W/VALSALVA



EIV

Inferior Epigastrics

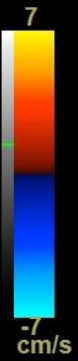
0

2

4

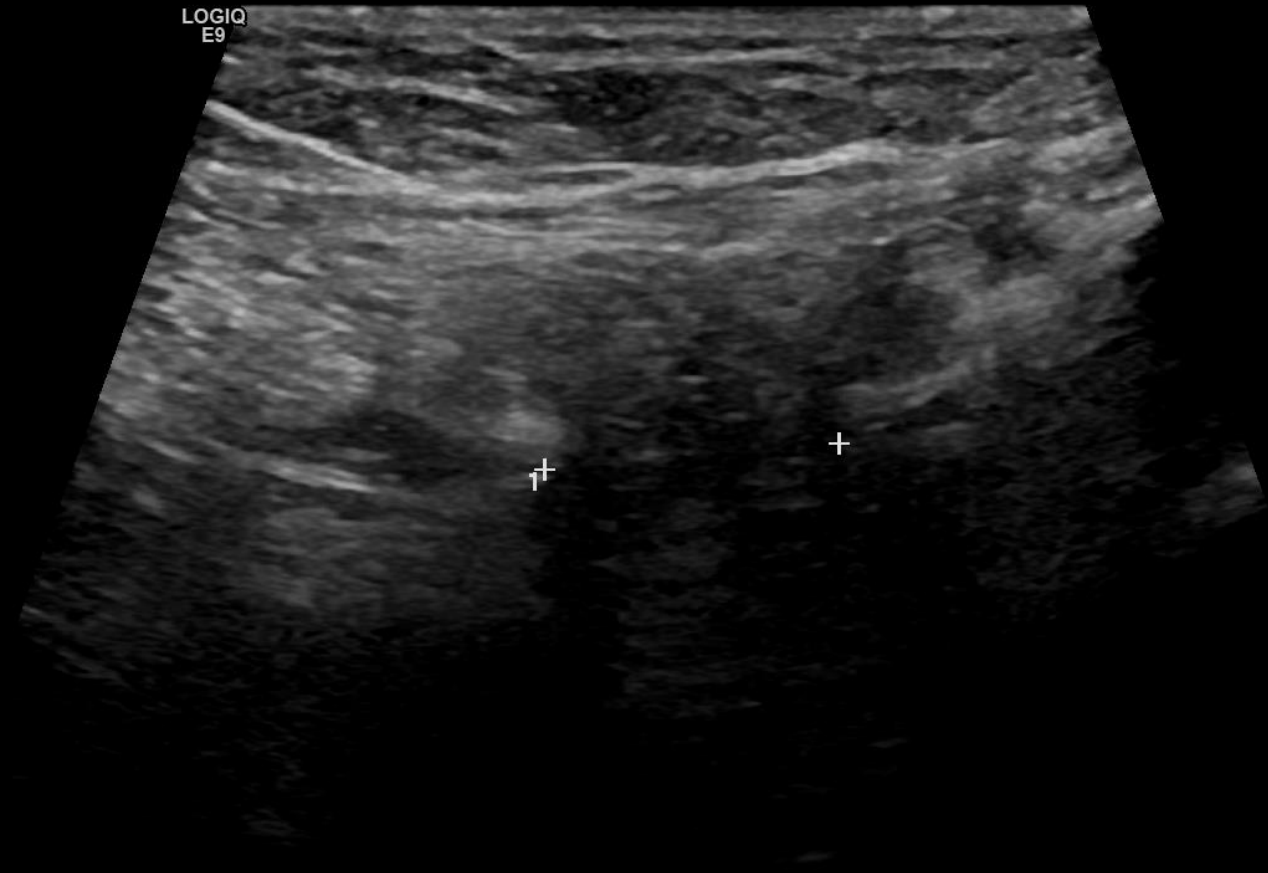
L

LOGIQ
E9



-	CHI	
-	Frq	9.0
-	Gn	42
-	D	4.5
-	AO%	100
-		
	CF	
1-	Frq	5.0
-	Gn	18.0
-	L/A	3/6
-	PRF	1.0
-	WF	103
-	S/P	4/16
2-	AO%	100
-		
-		
-		
3-		
-		
-		
-		
4-		
-		
-		

LOGIQ
E9



- CHI
- Frq 9.0
- Gn 42
- S/A 2/2
- Map A/0
- D 4.5
DR 69
1- AO% 100

XX

2-

XX

3-

4-



1 L 15.45 mm

LOGIQ
E9



- CHI
Frq 9.0
- Gn 42
- S/A 2/2
- Map A/0
- D 4.5
DR 69
1- AO% 100

-



2-



3-

4-

1 L 24.15 mm

LOGIQ
E9



1'

2'

3'

4'

5'

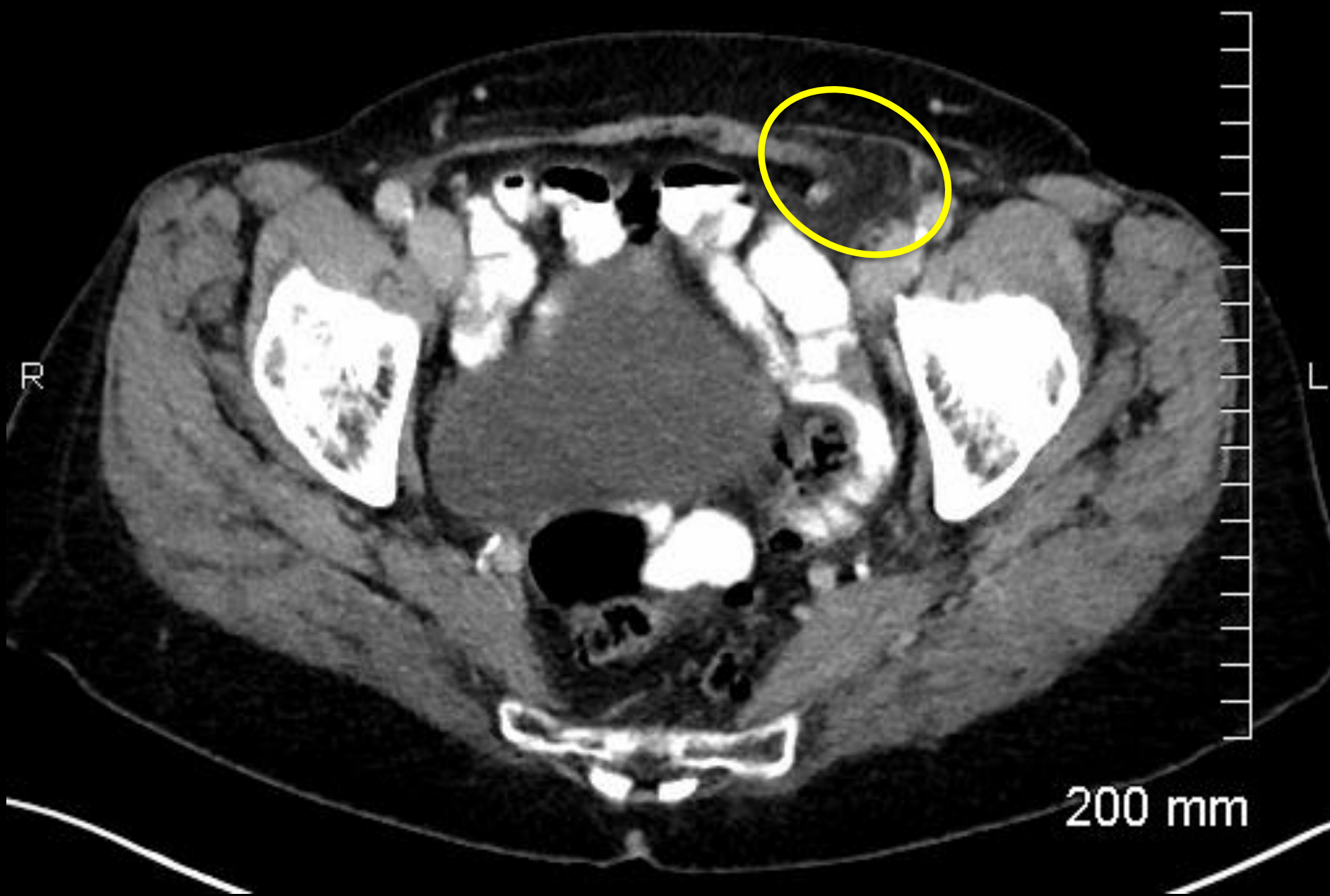
6'

7'

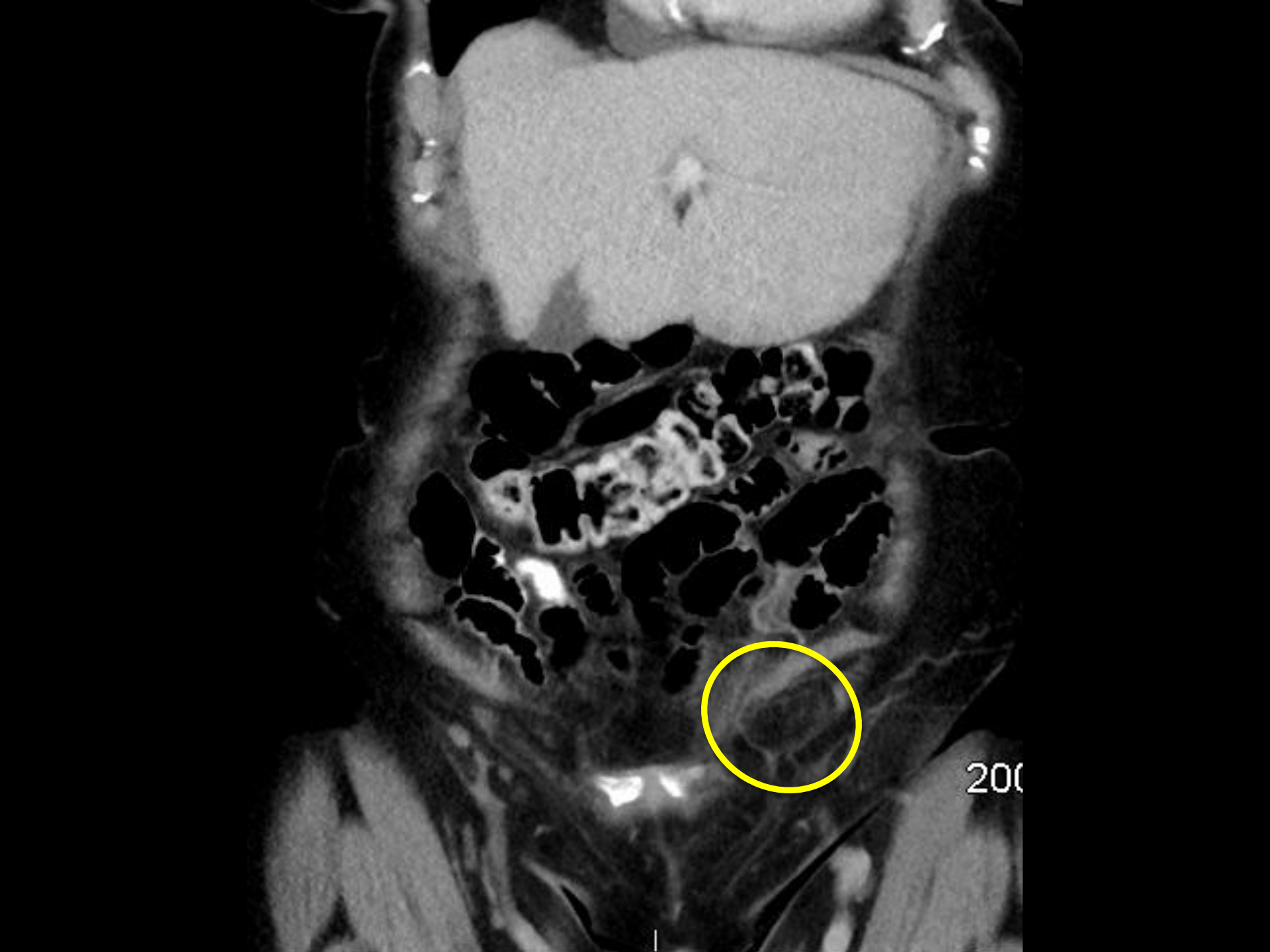
8'

9'

10'



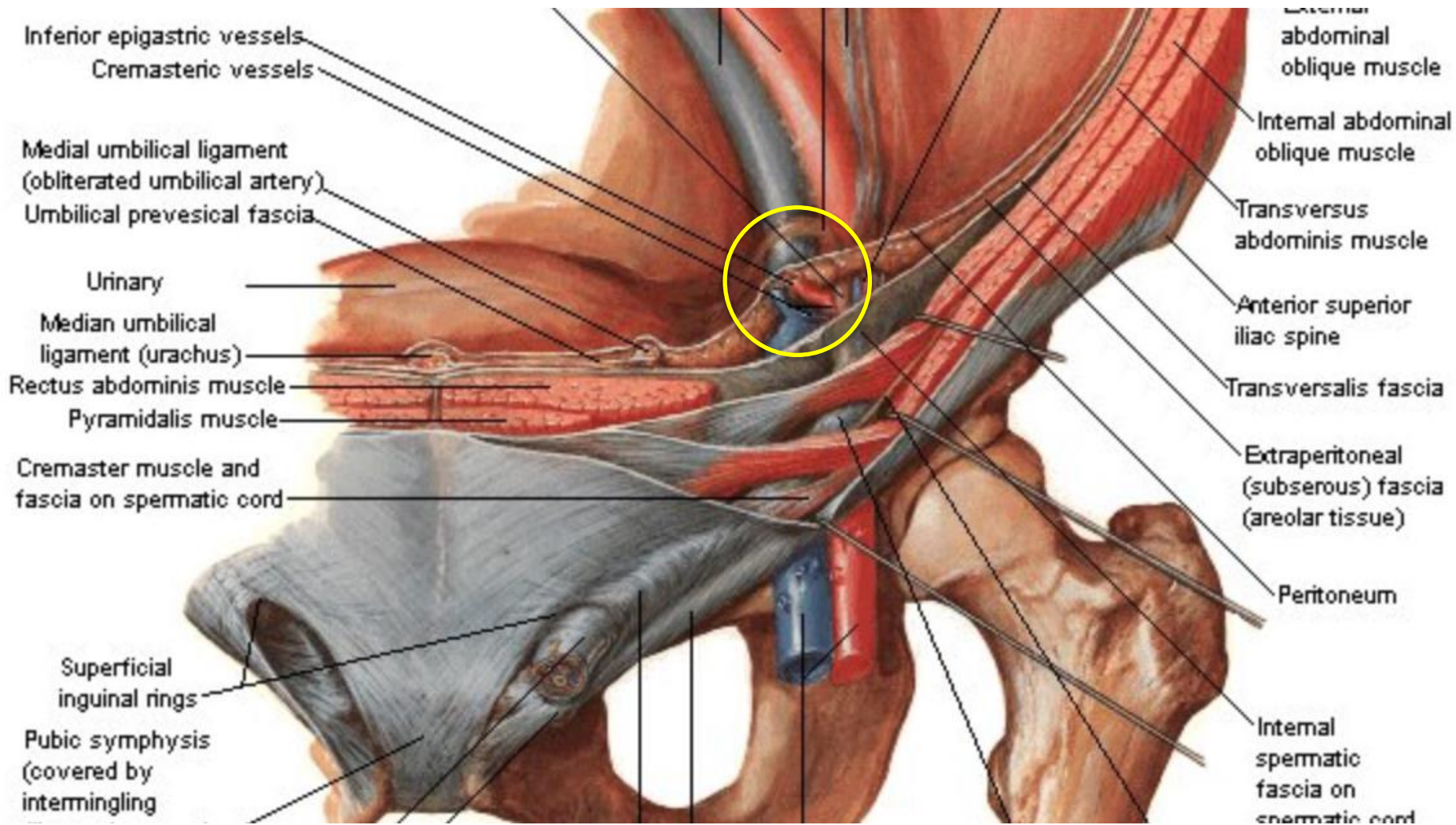
200 mm



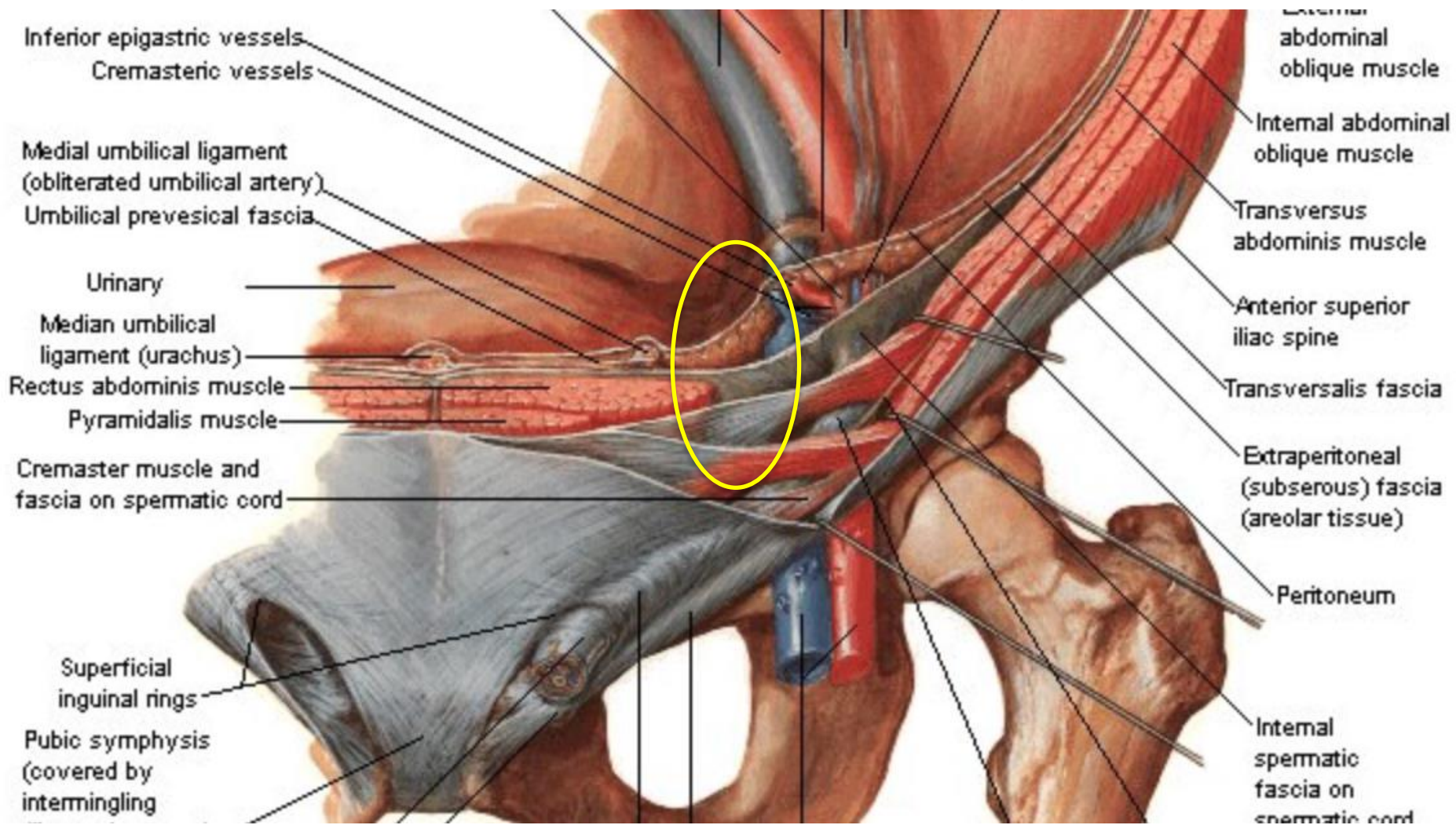
200

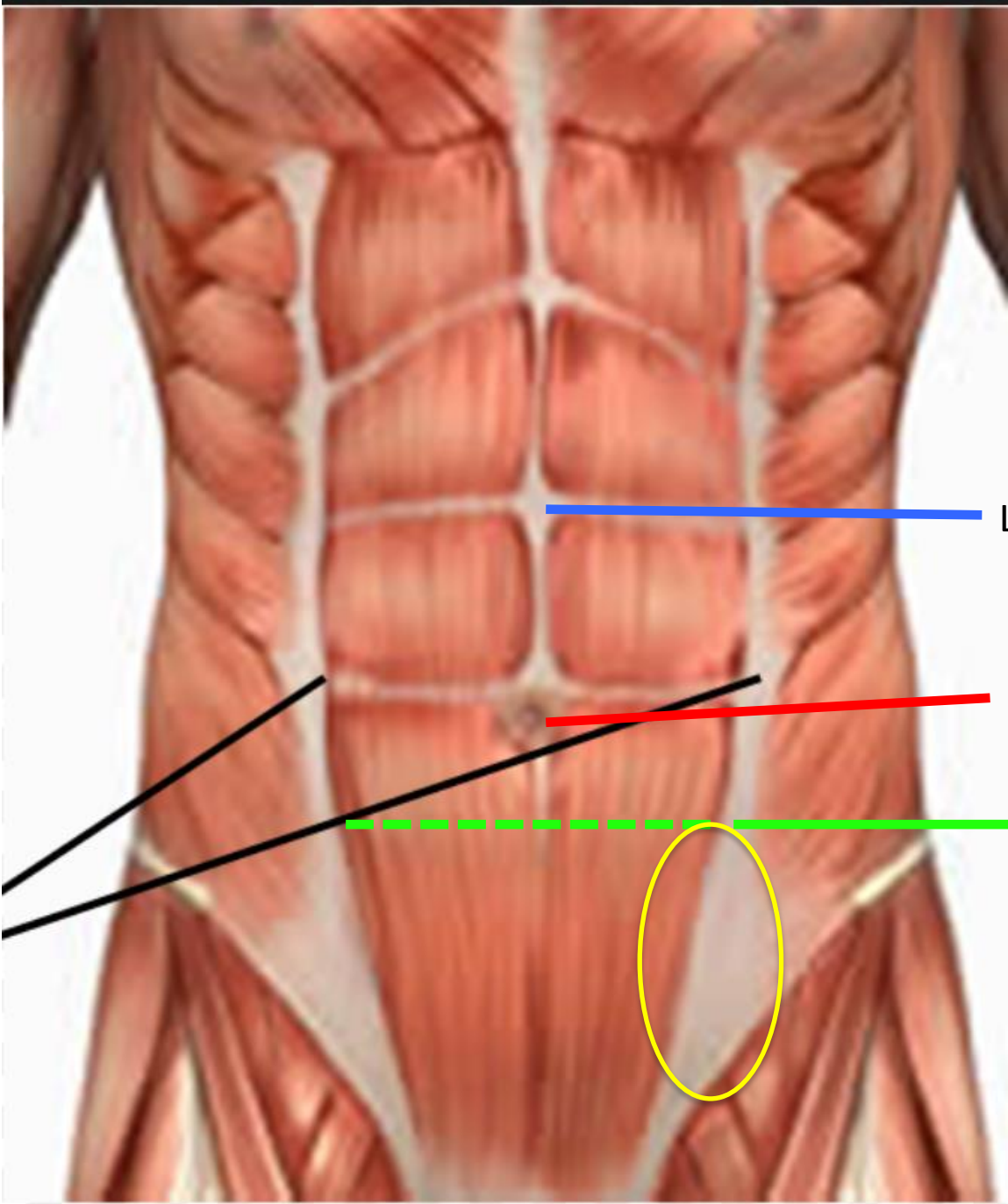
Direct Inguinal Hernia's

Now we look for Direct Inguinal Hernias



Hesselbach's Triangle





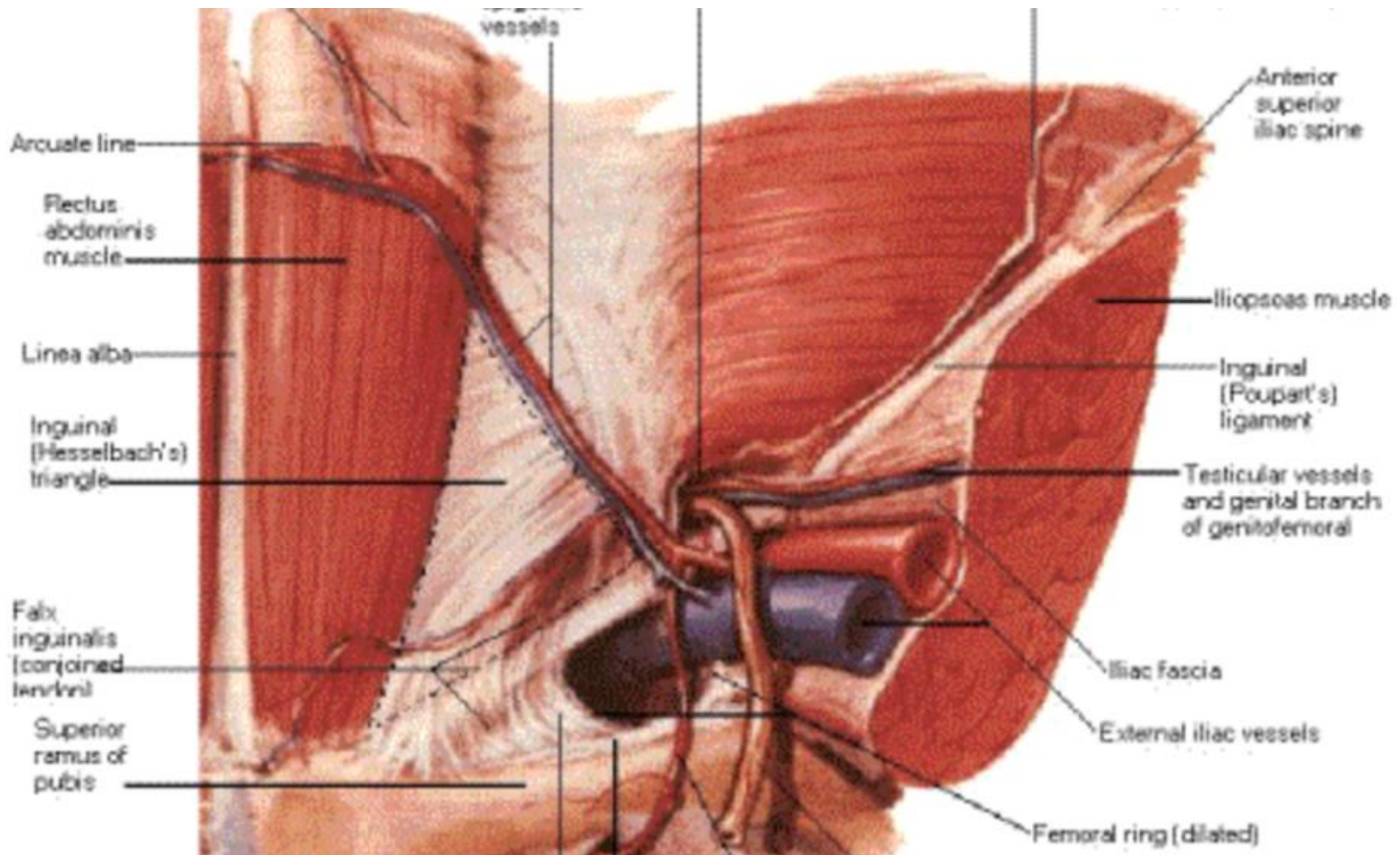
Linea Alba

Umbilicus

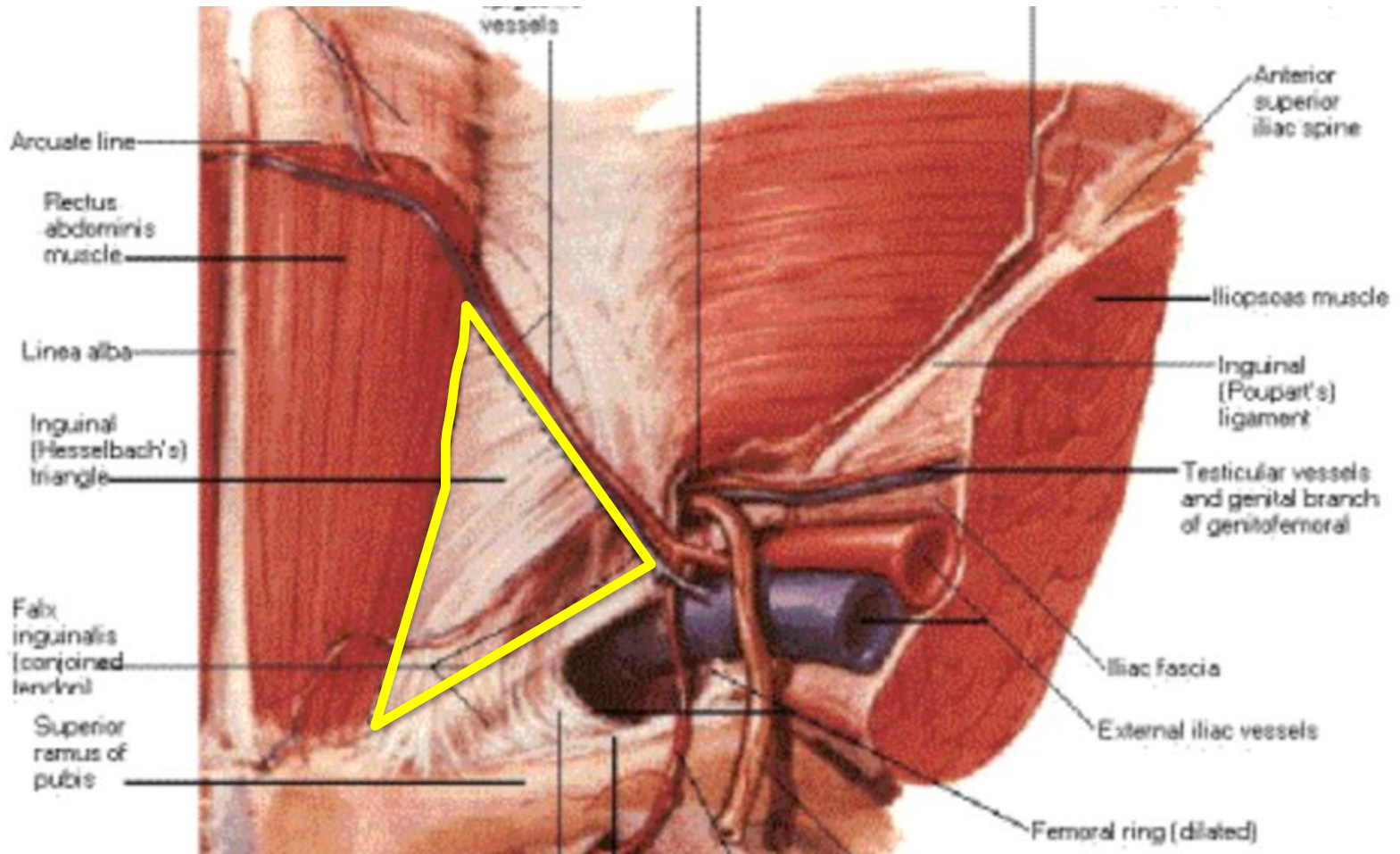
Arcuate Line

Linea Semilunaris

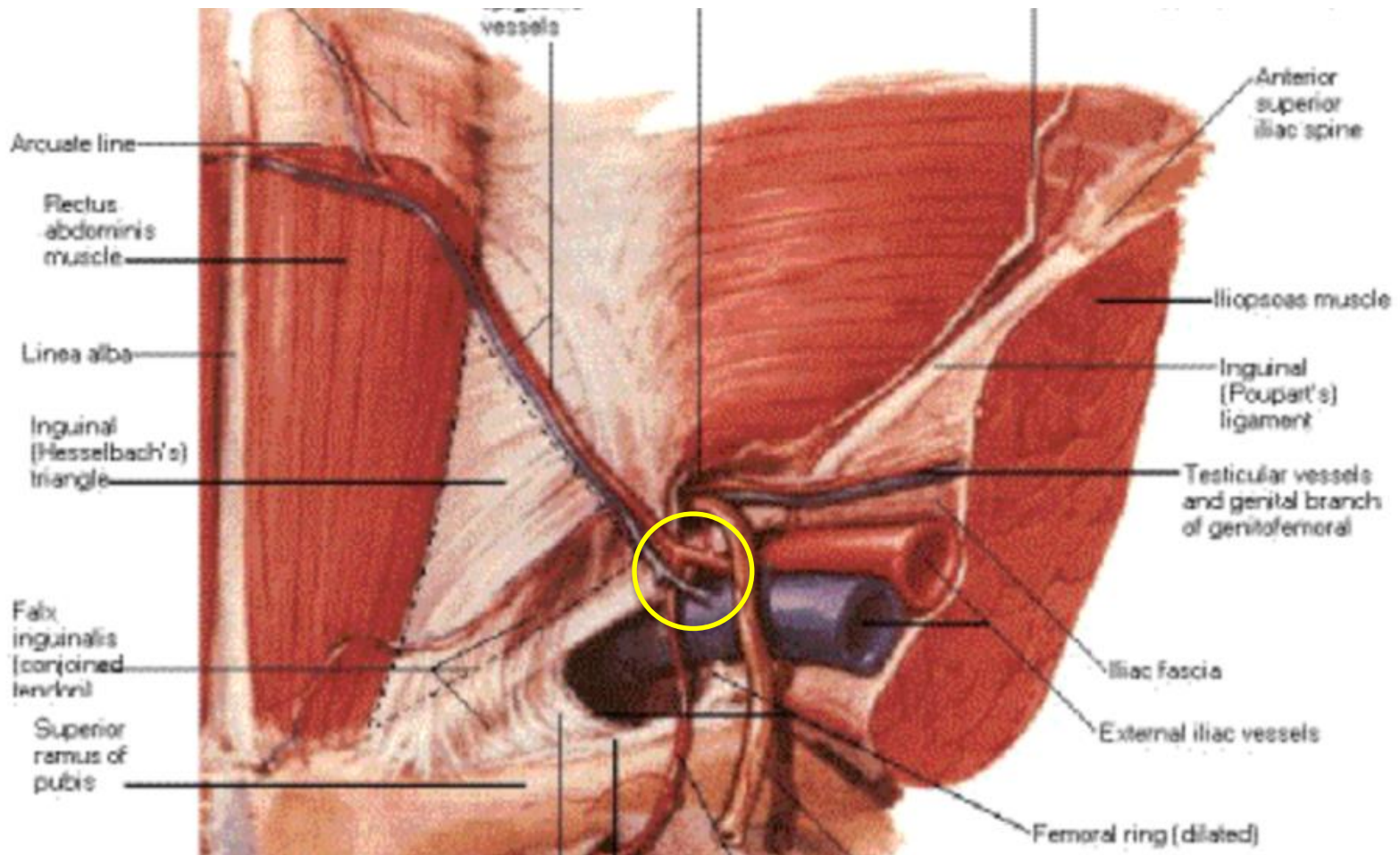
View from the inside looking out



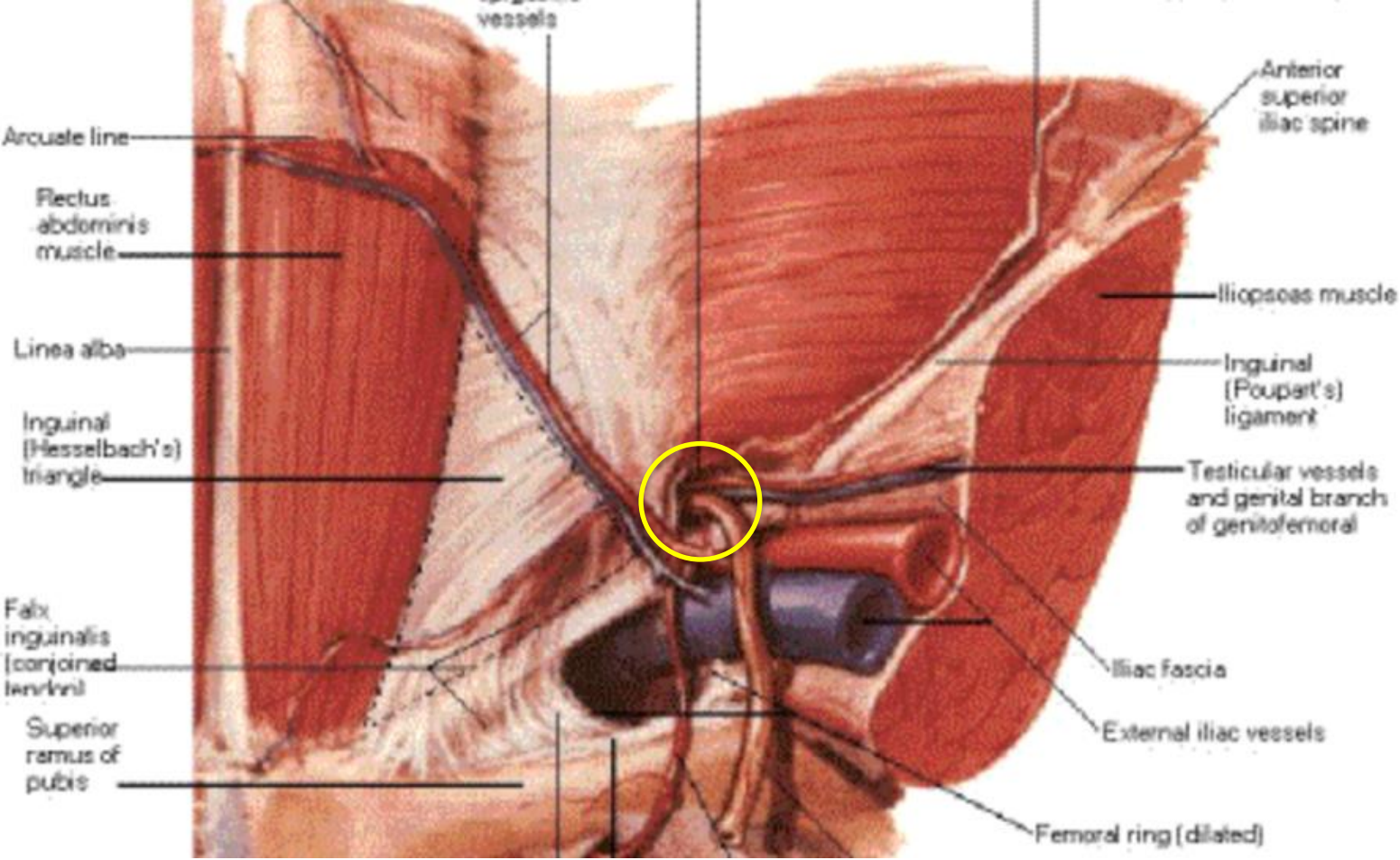
View from the inside looking out

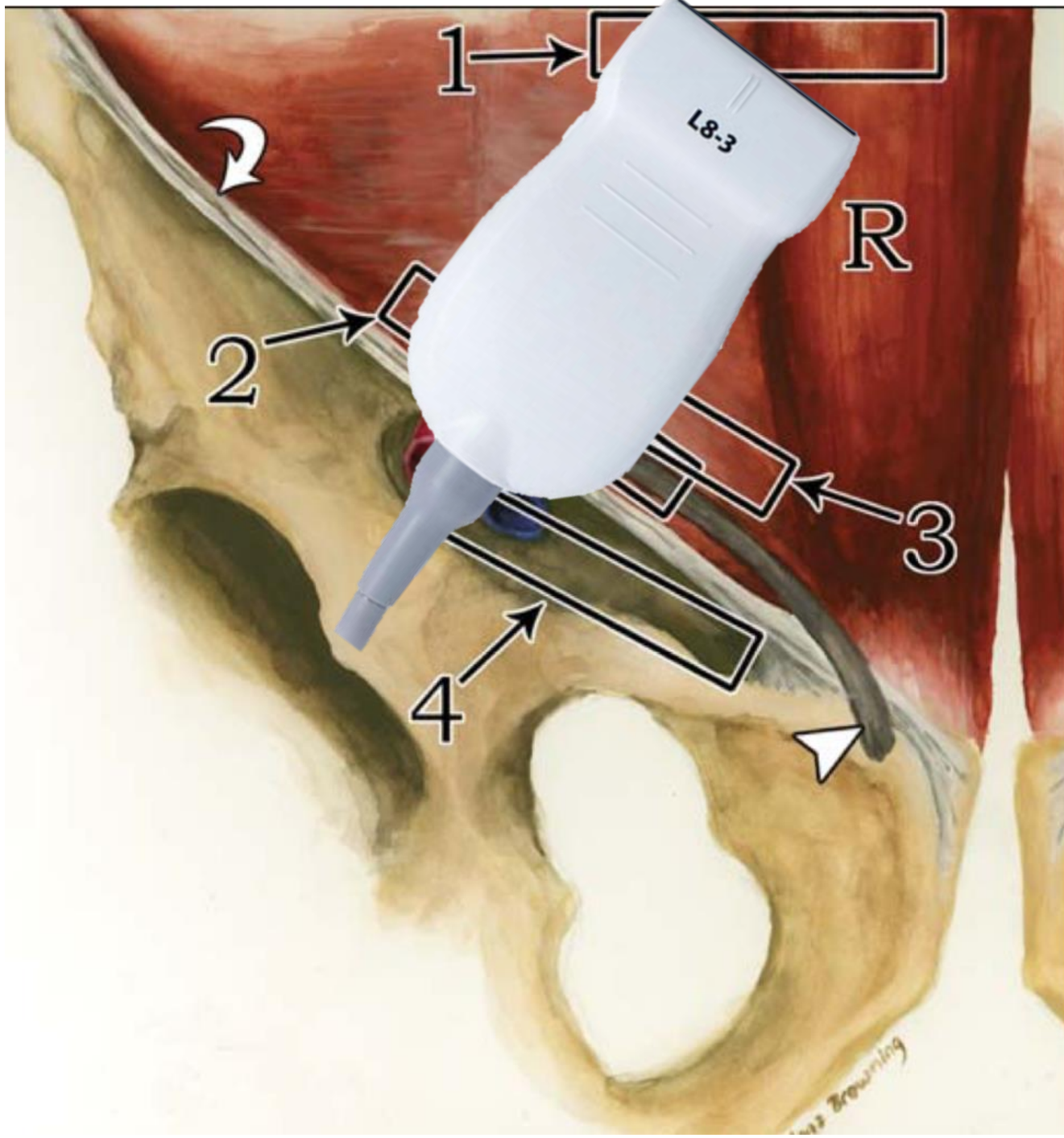


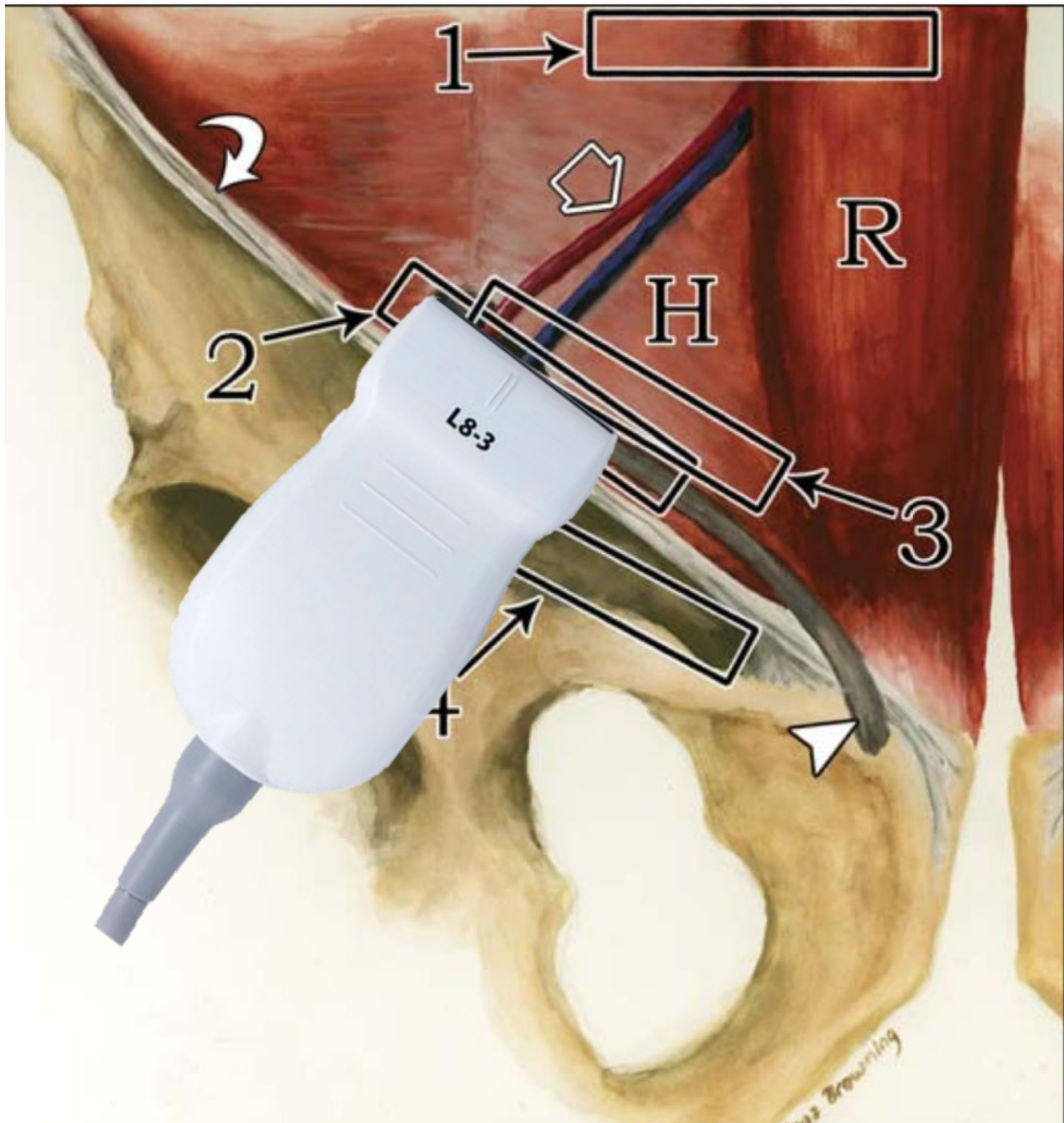
View from the inside looking out

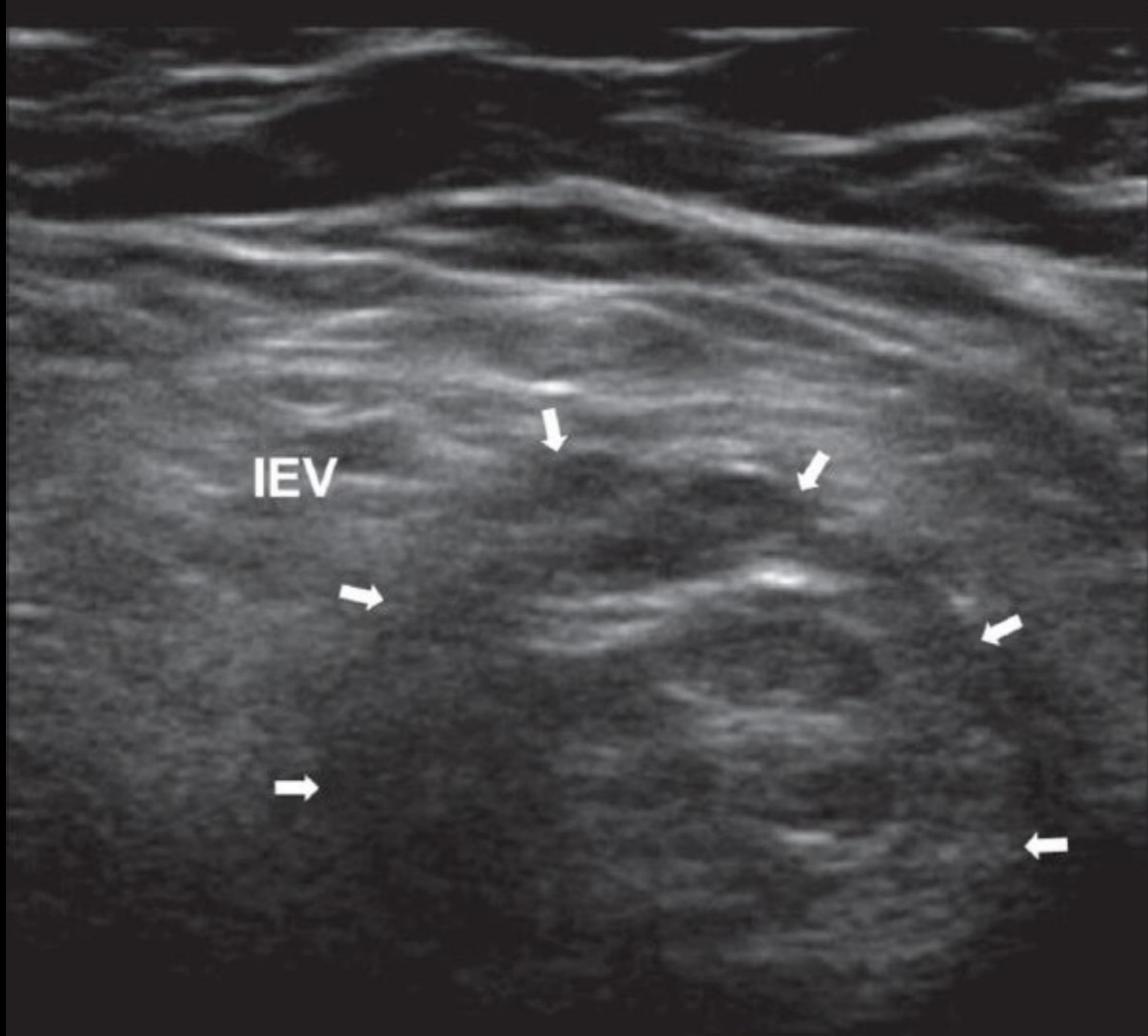


View from the inside looking out

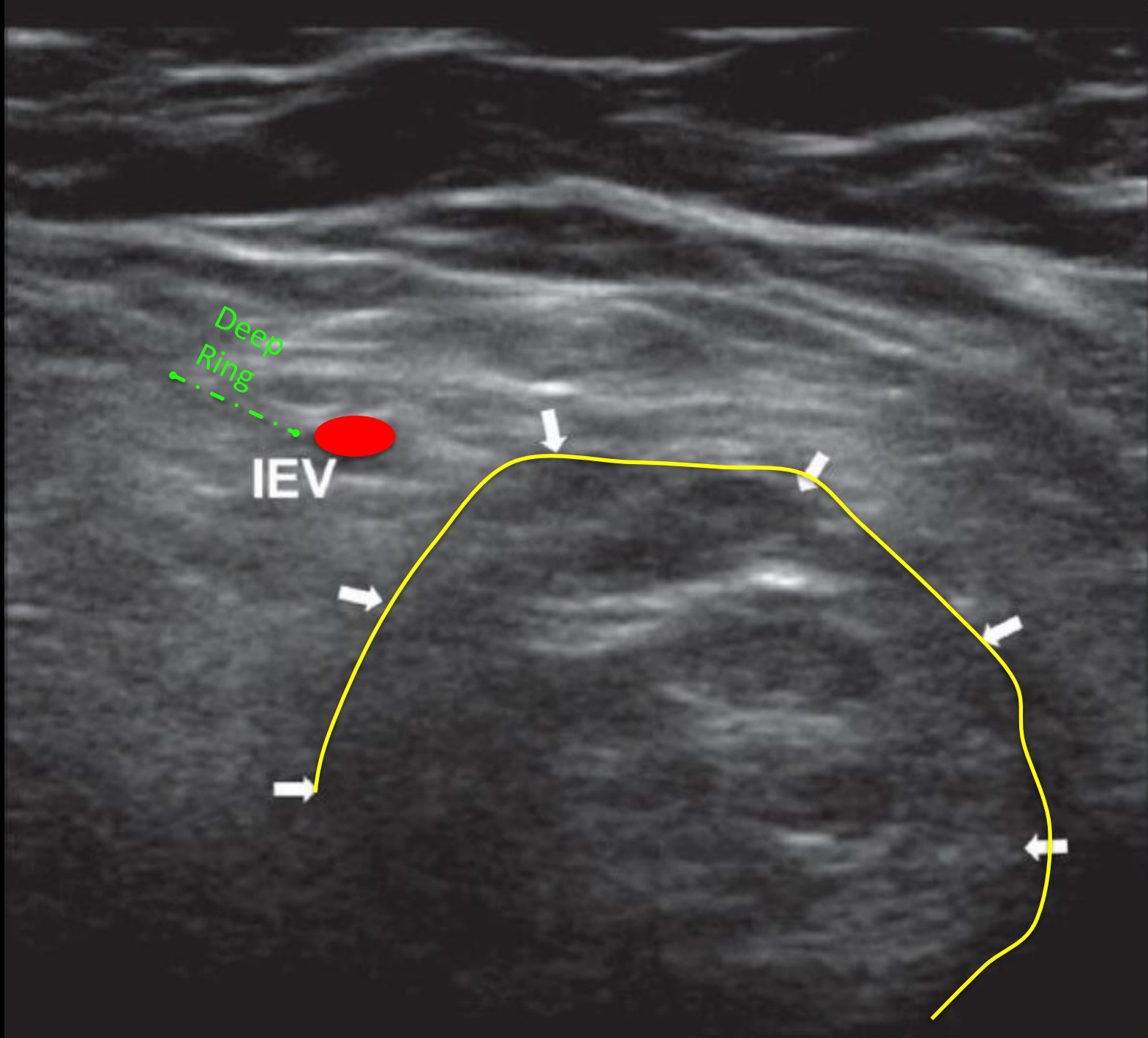






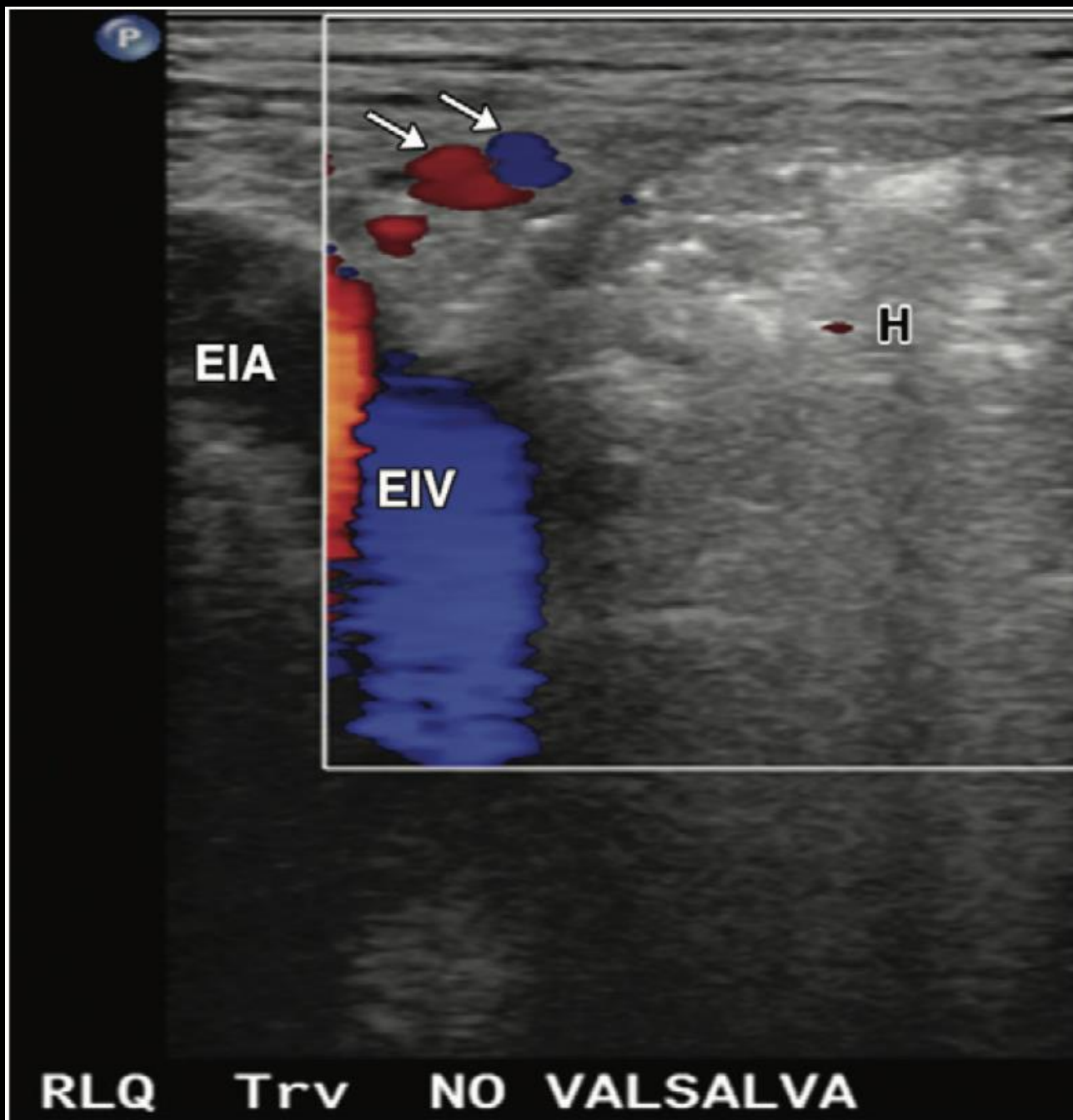


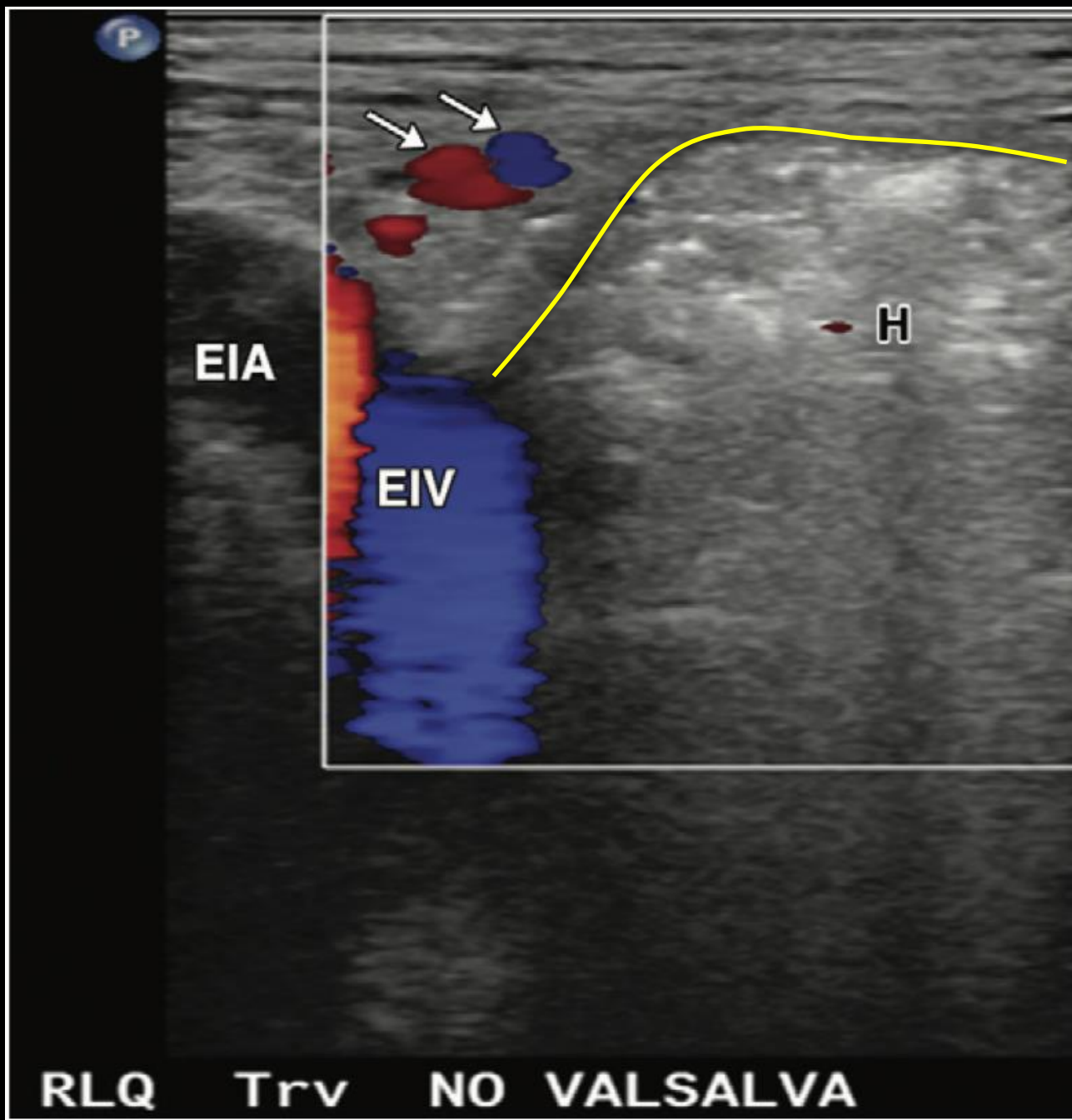
IEV

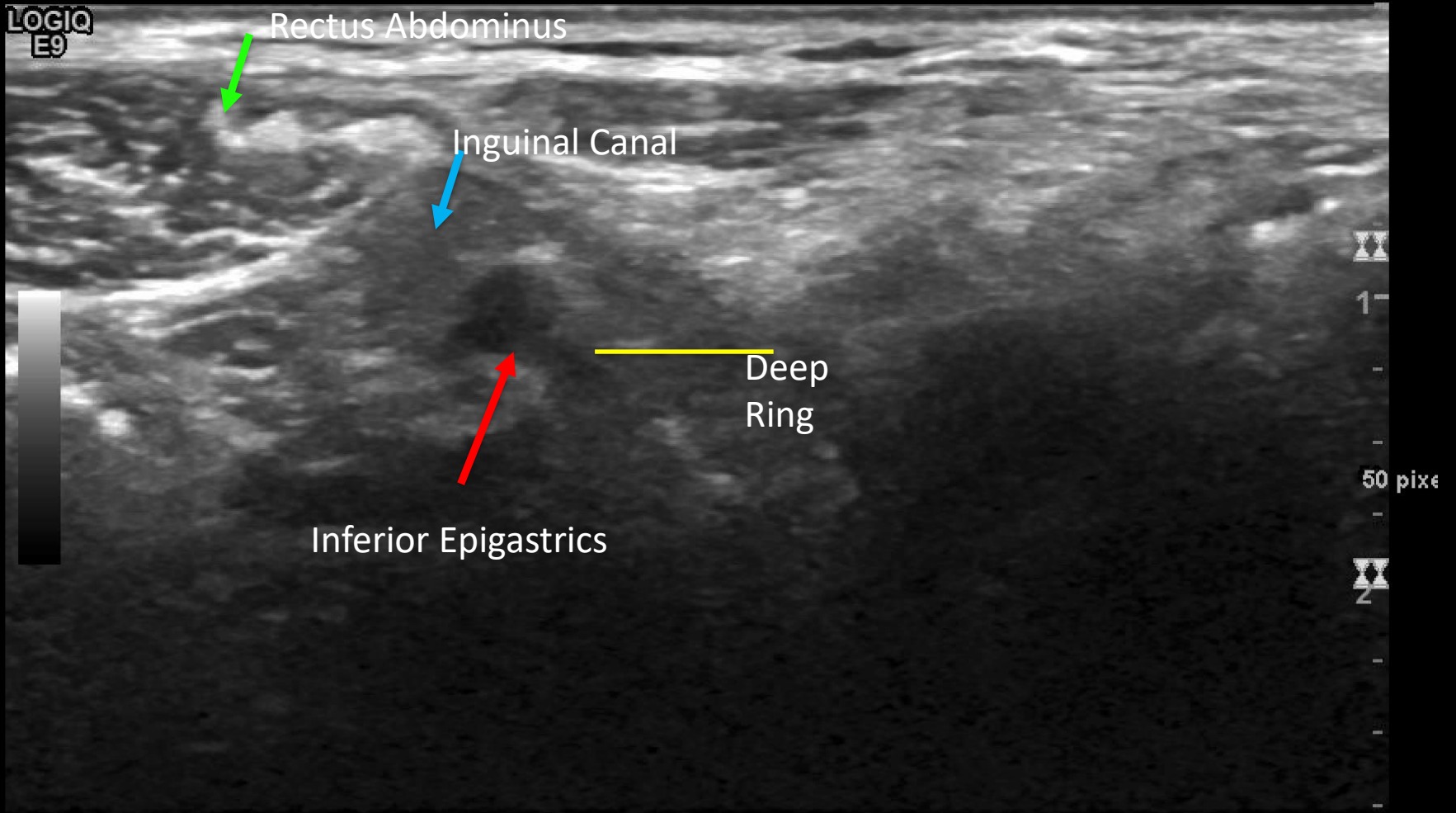


Deep
Ring

IEV

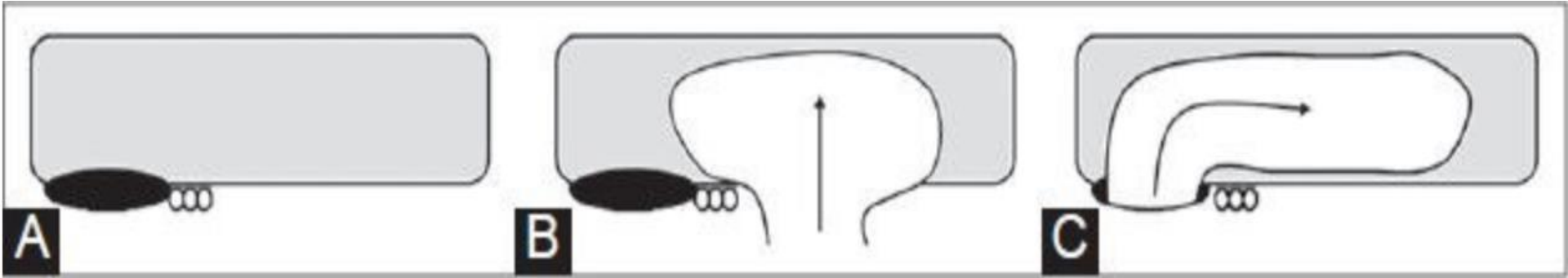


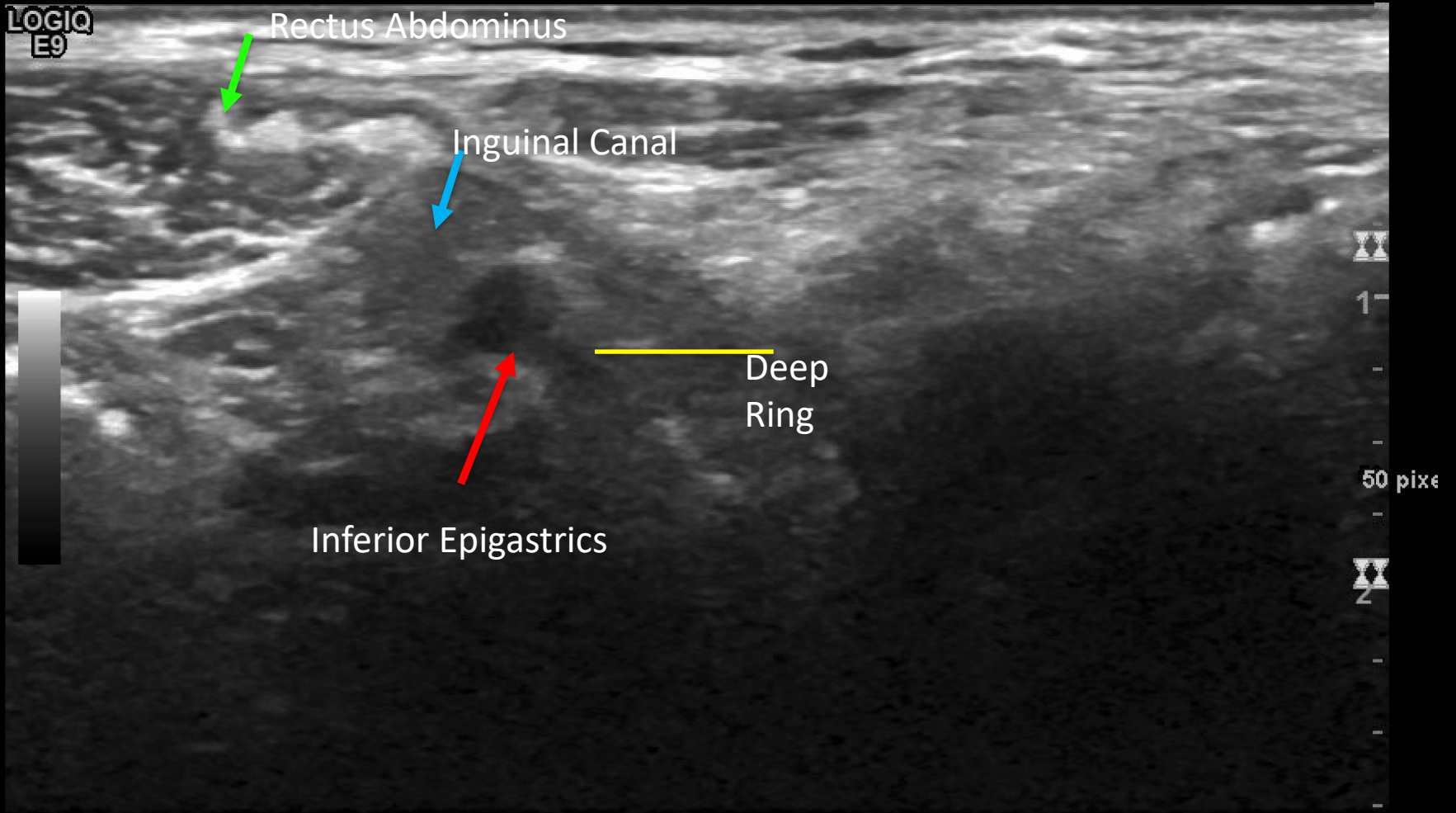




LEFT ING CANAL VS

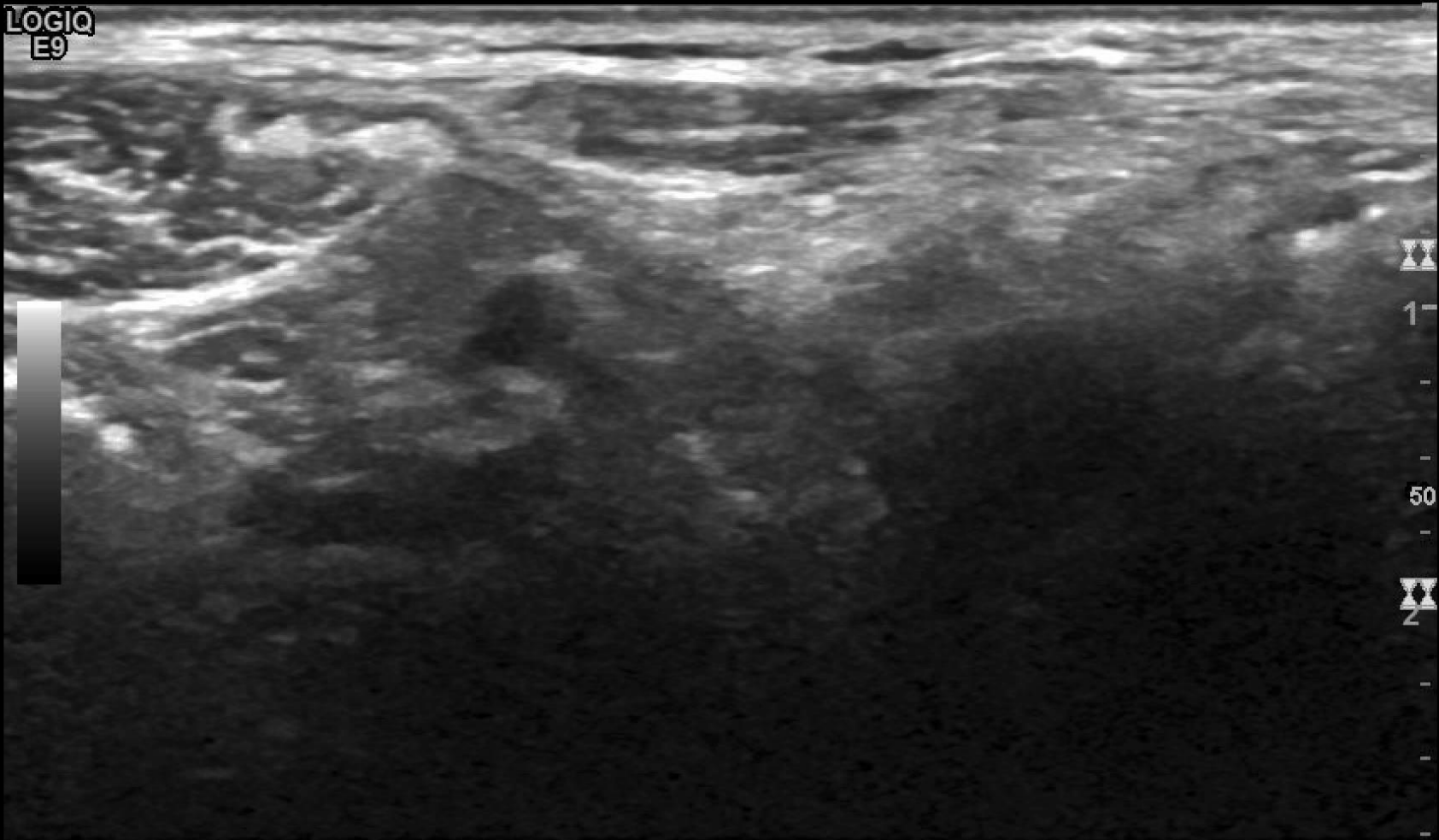
Direct vs Indirect Inguinal Hernias





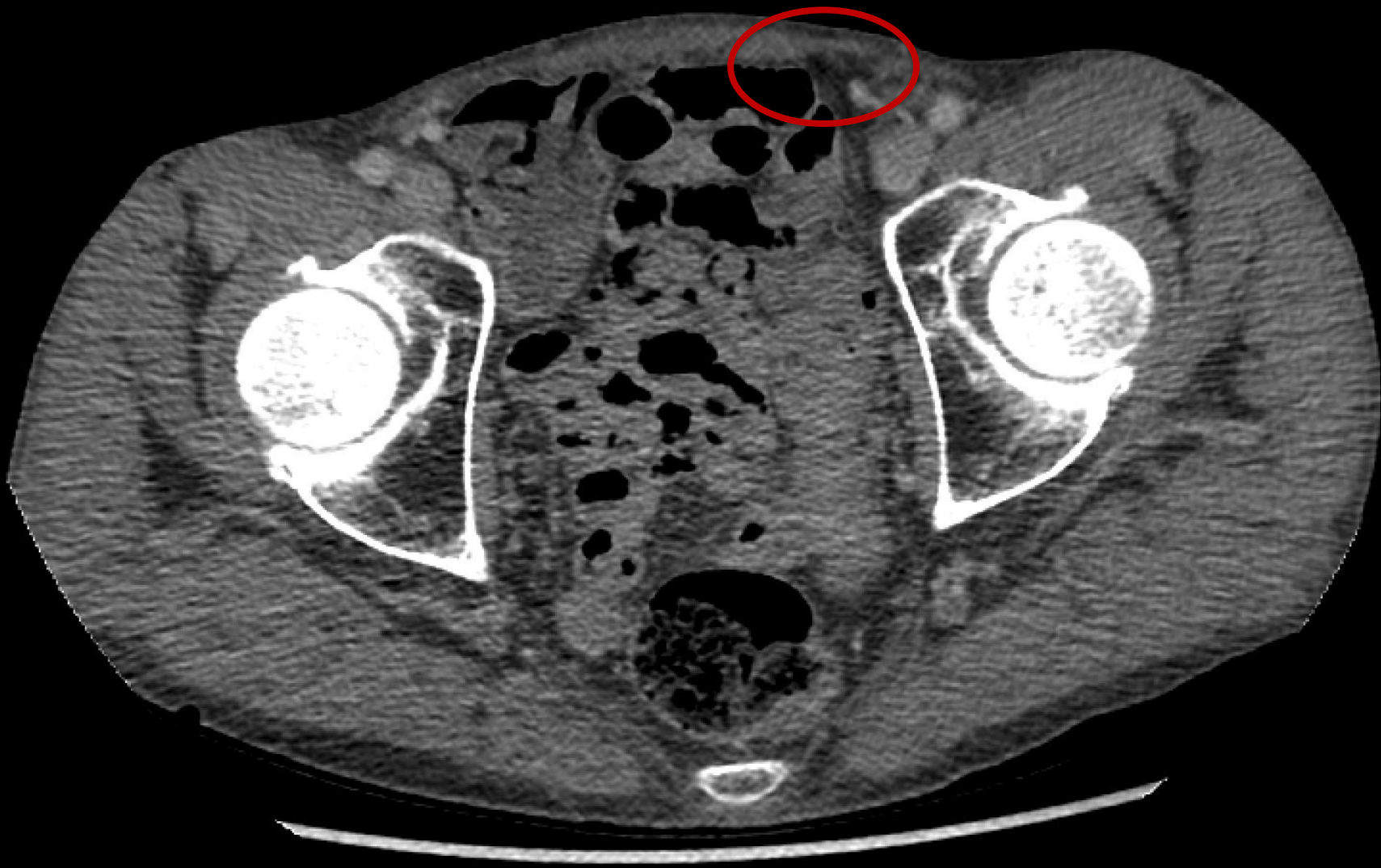
LEFT ING CANAL VS

LOGIQ
E9

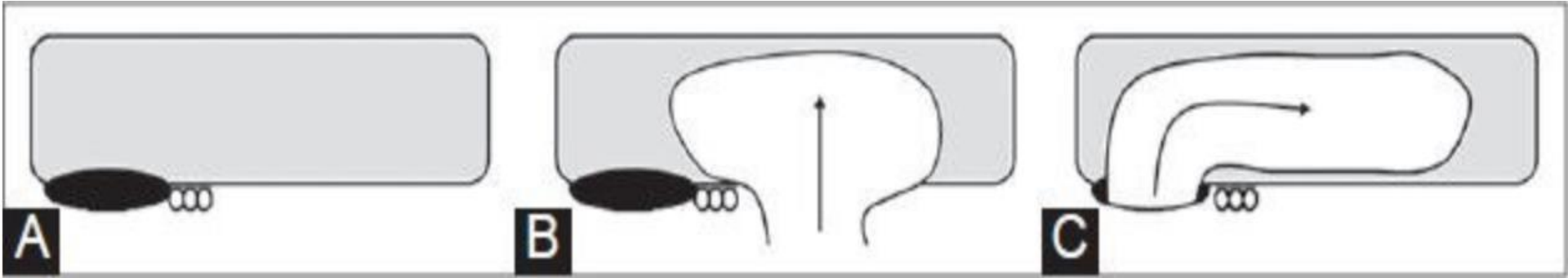


LEFT ING CANAL VS



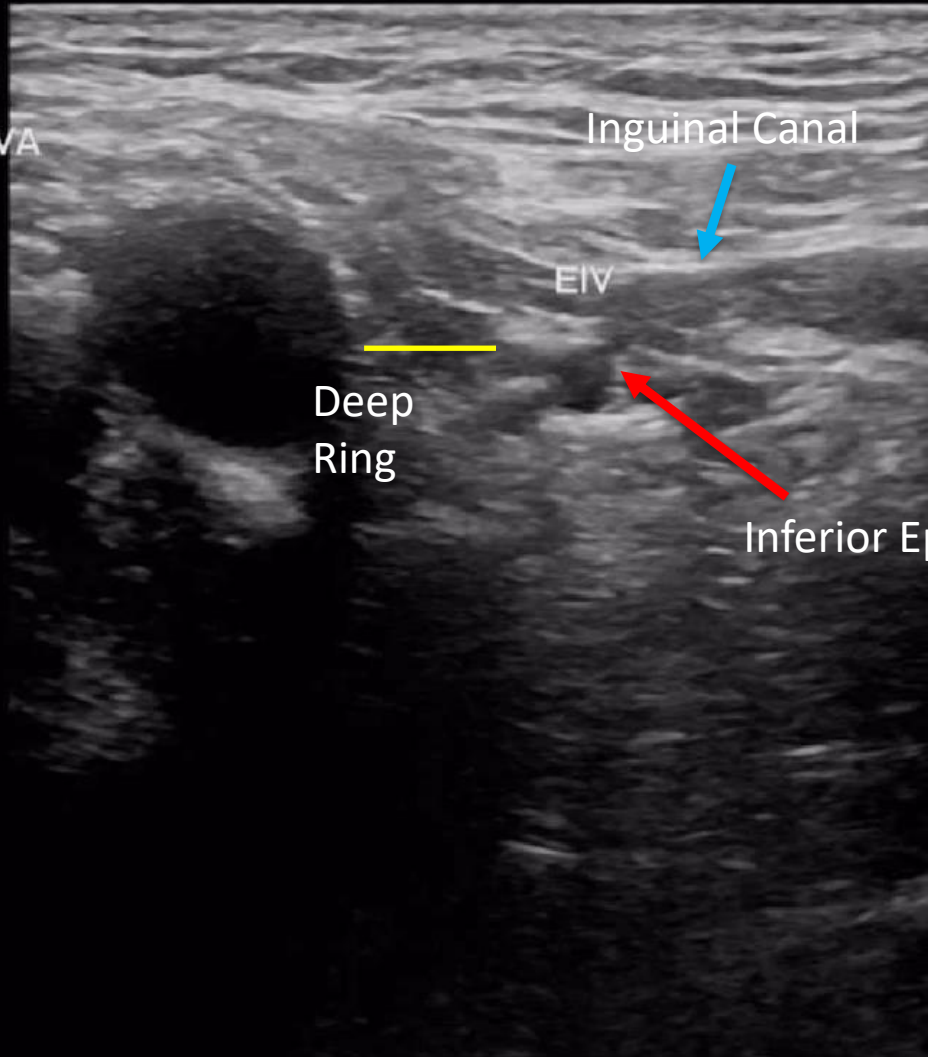


Direct vs Indirect Inguinal Hernias



LOGIQ

RIGHT GROIN
W/VALSALVA



Inguinal Canal

EIV

Deep
Ring

Inferior Epigastrics

07

2

4

L

LOGIQ

RIGHT GROIN
W/VALSALVA



R 07

-

-

-

2

-

-

-

-

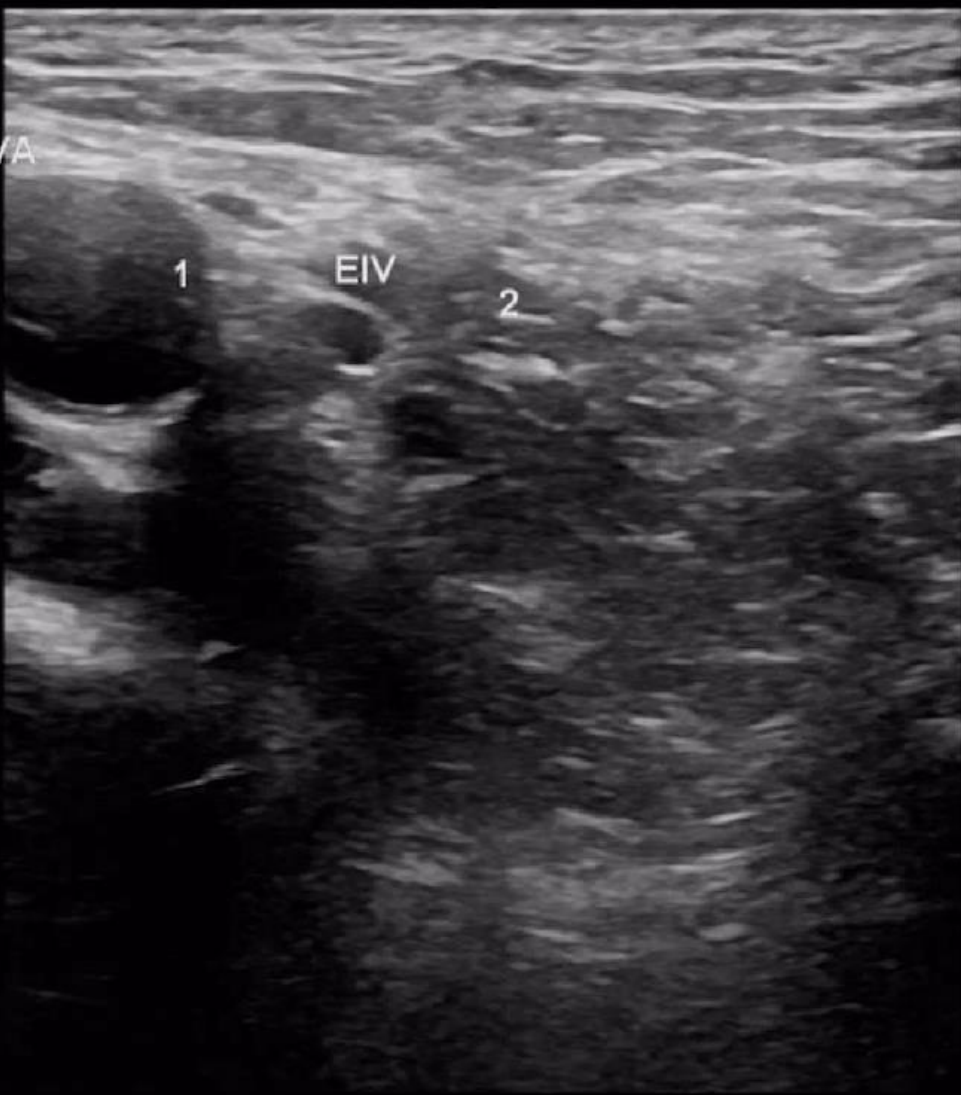
4

-

L J

LOGIQ

RIGHT GROIN
W/VALSALVA



0

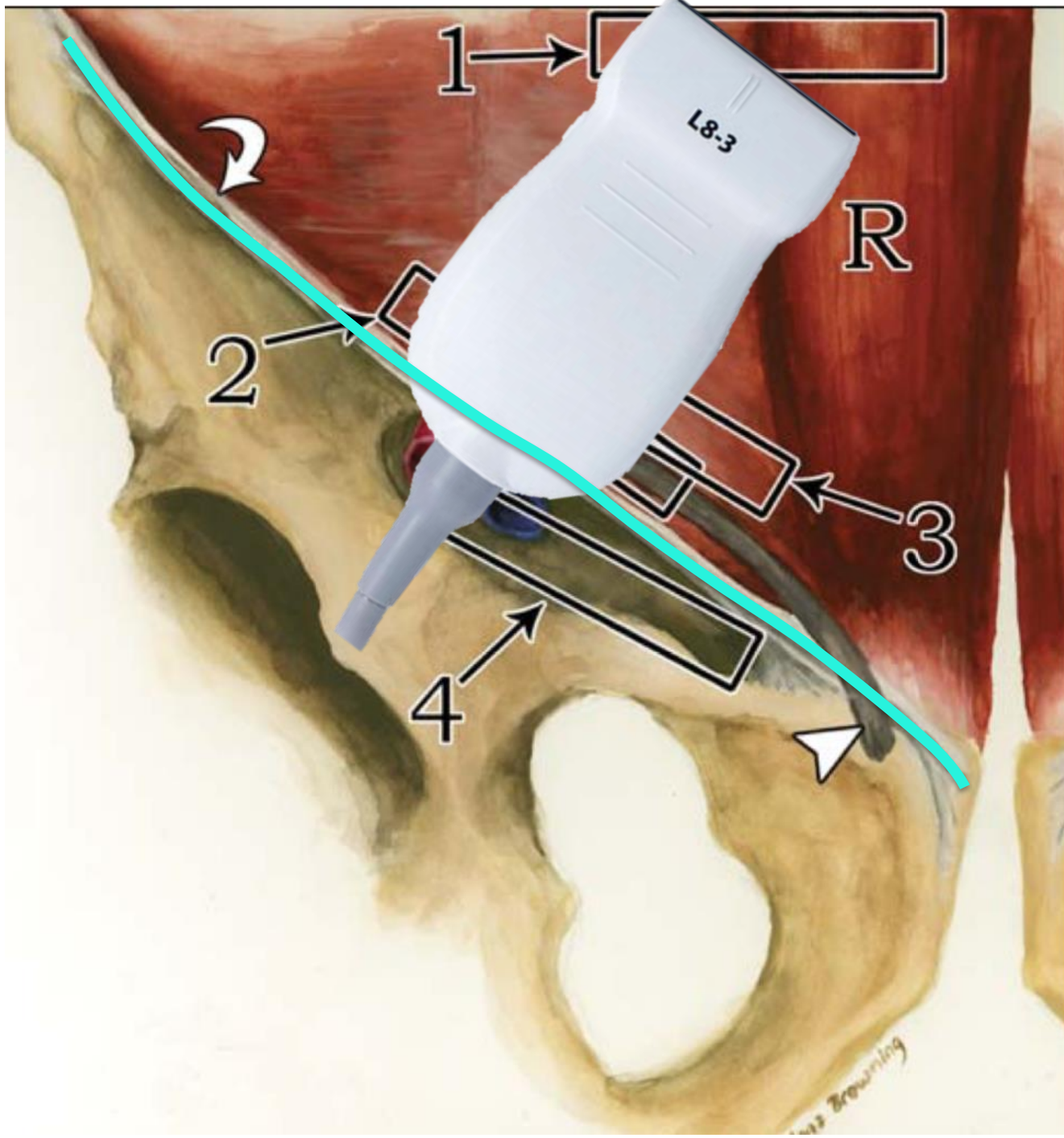
2

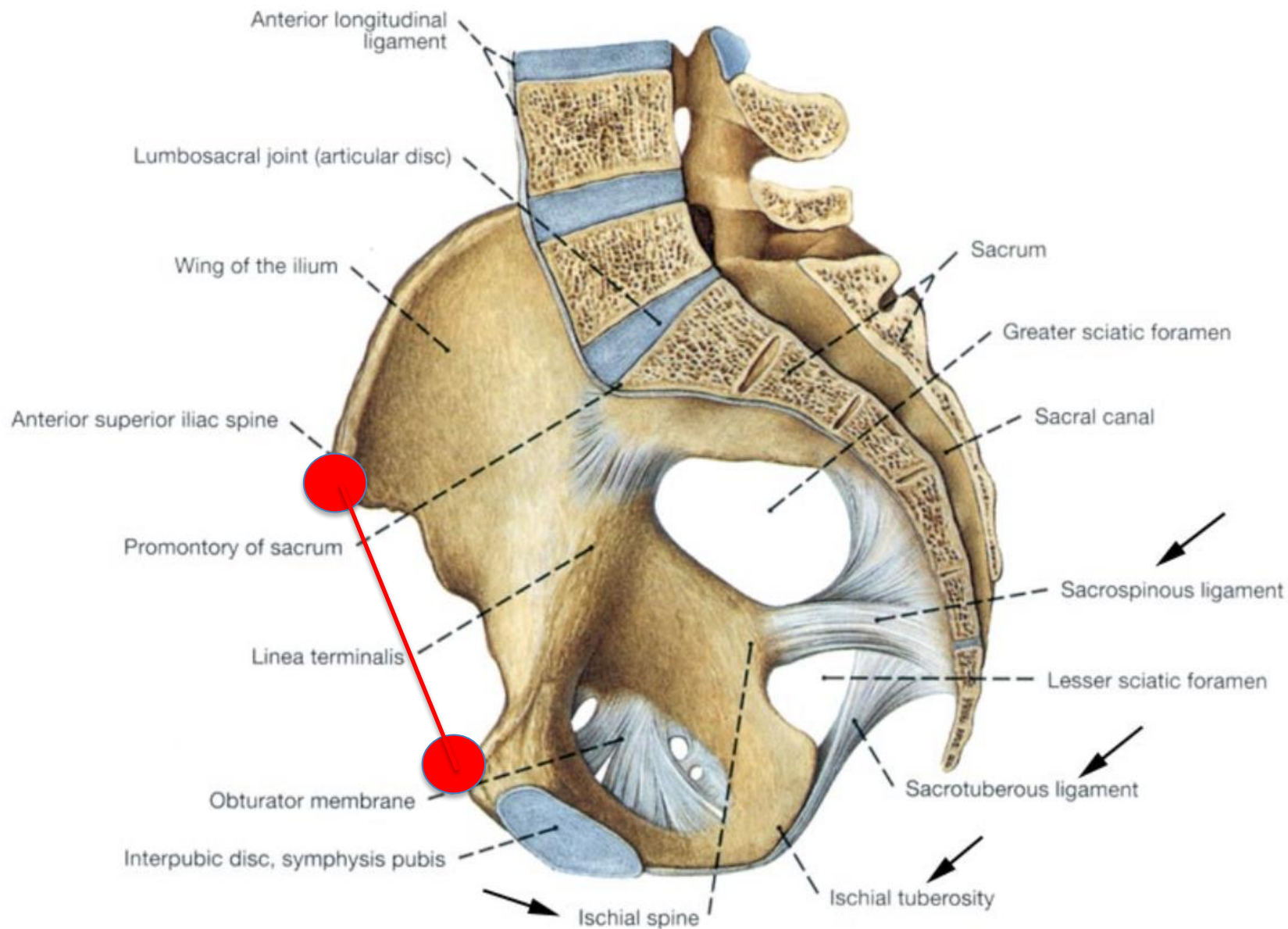
4

6

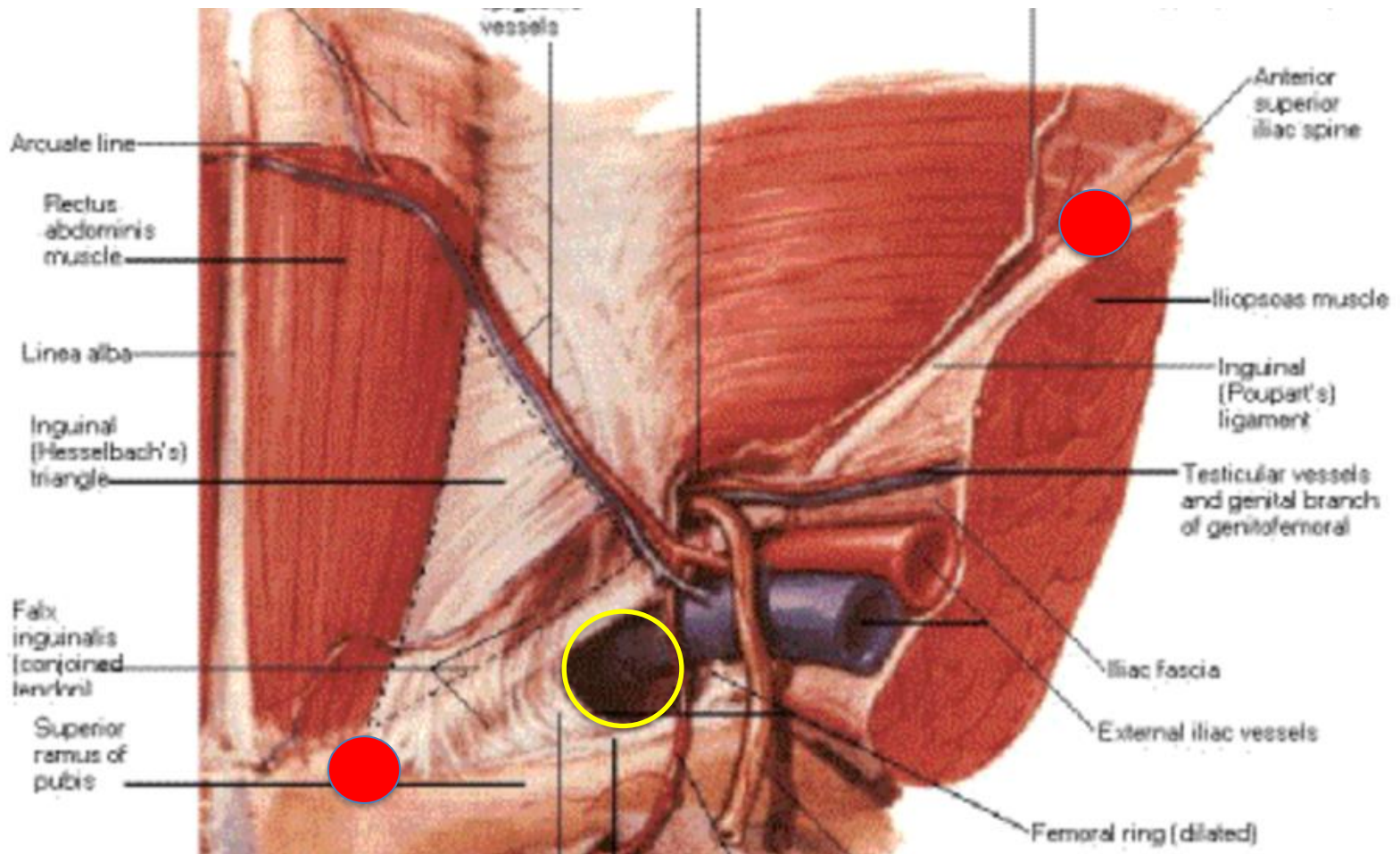
Femoral Hernia's

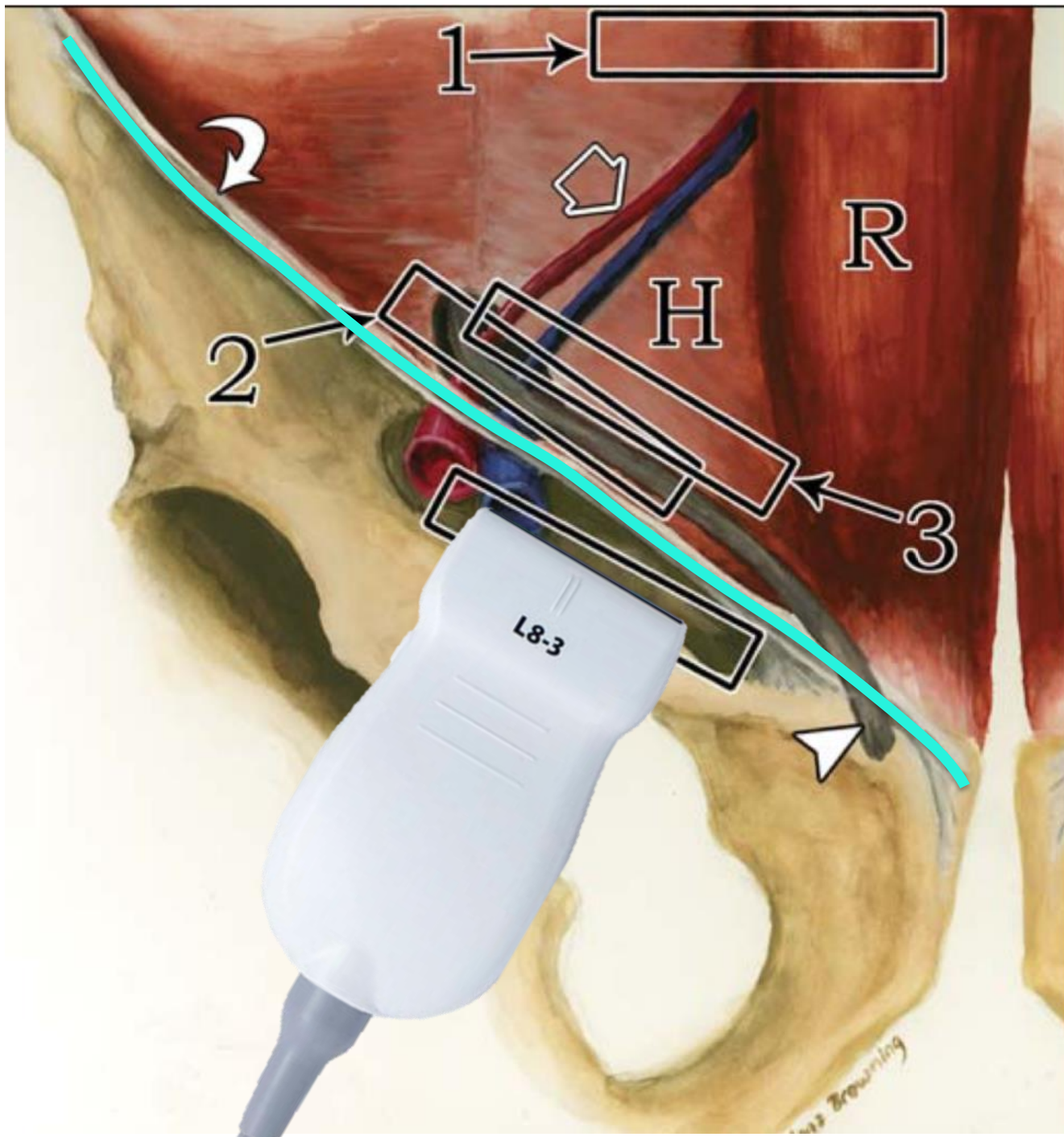
- Go back to the origin of Inferior Epigastric Artery from the External Iliac Artery... again.
- This actually marks the anatomical landmark for the level of the **Inguinal Ligament**.

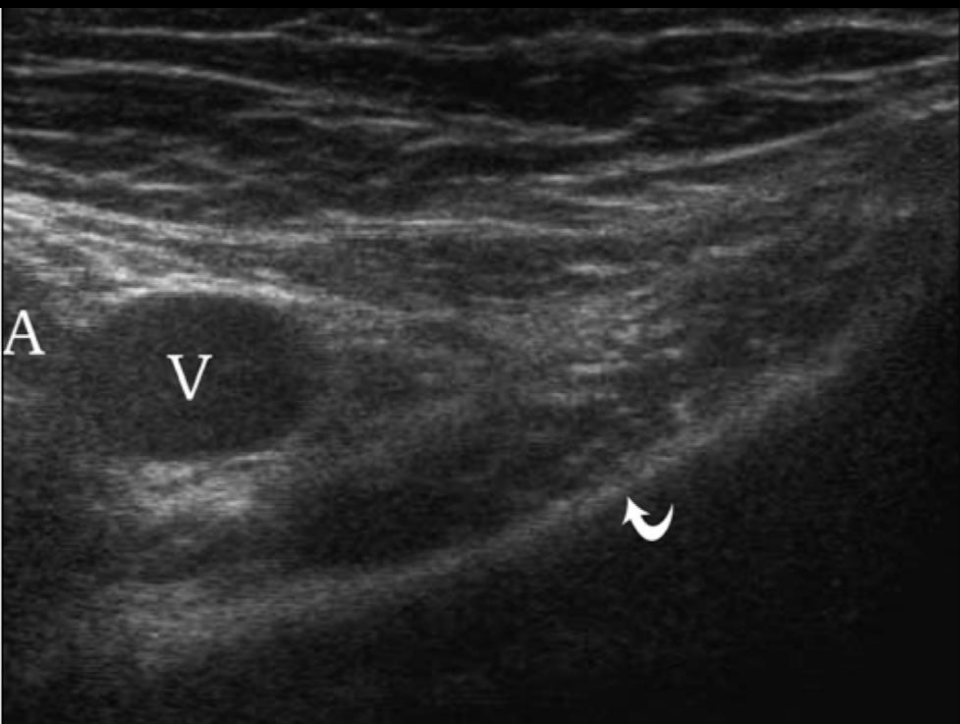




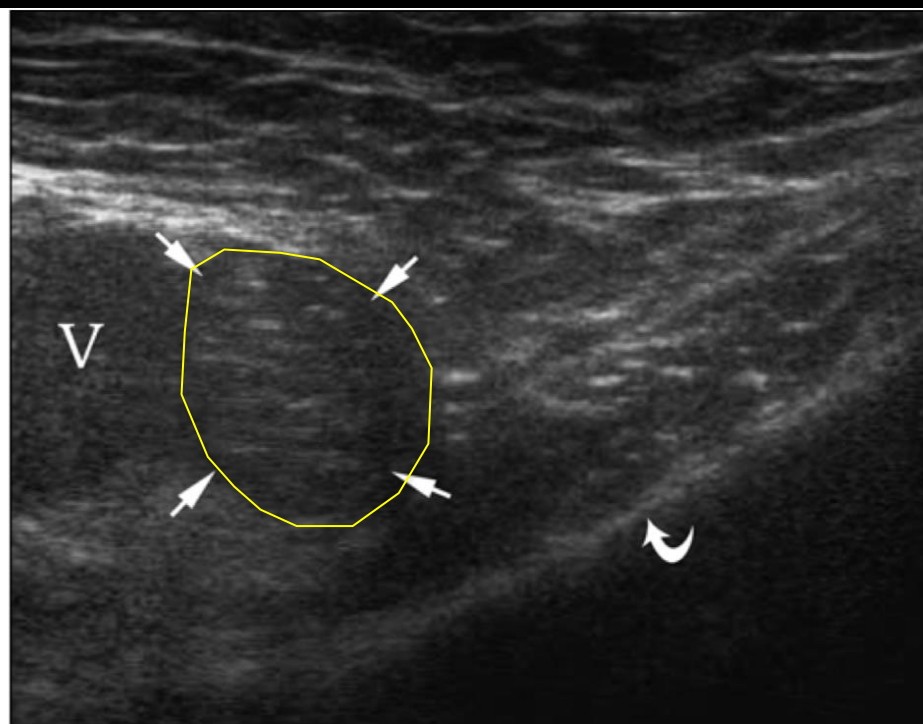
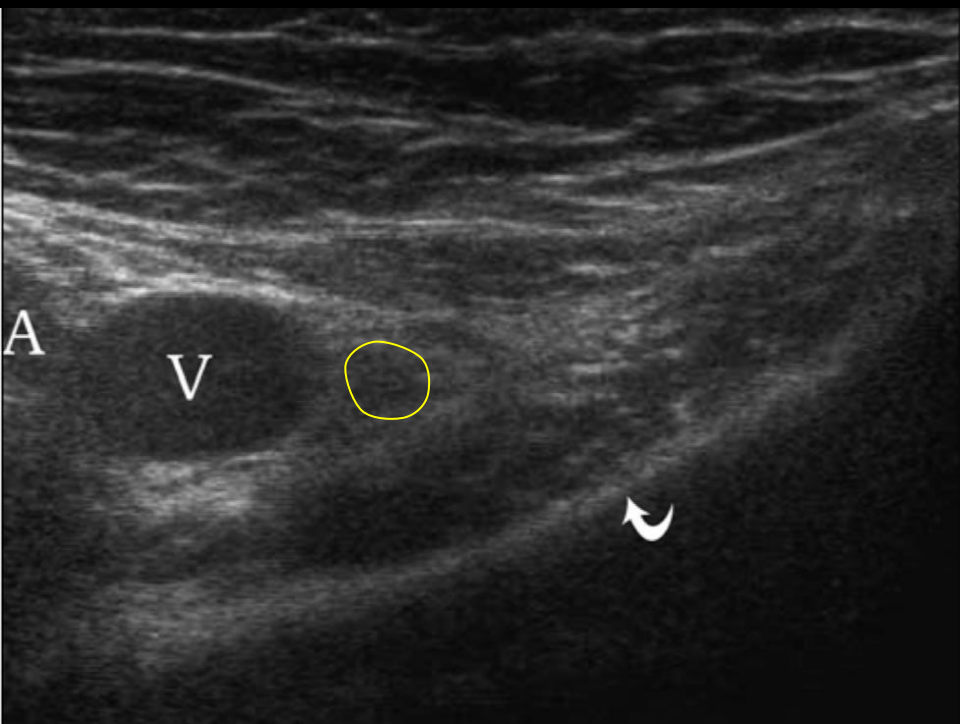
View from the inside looking out







A

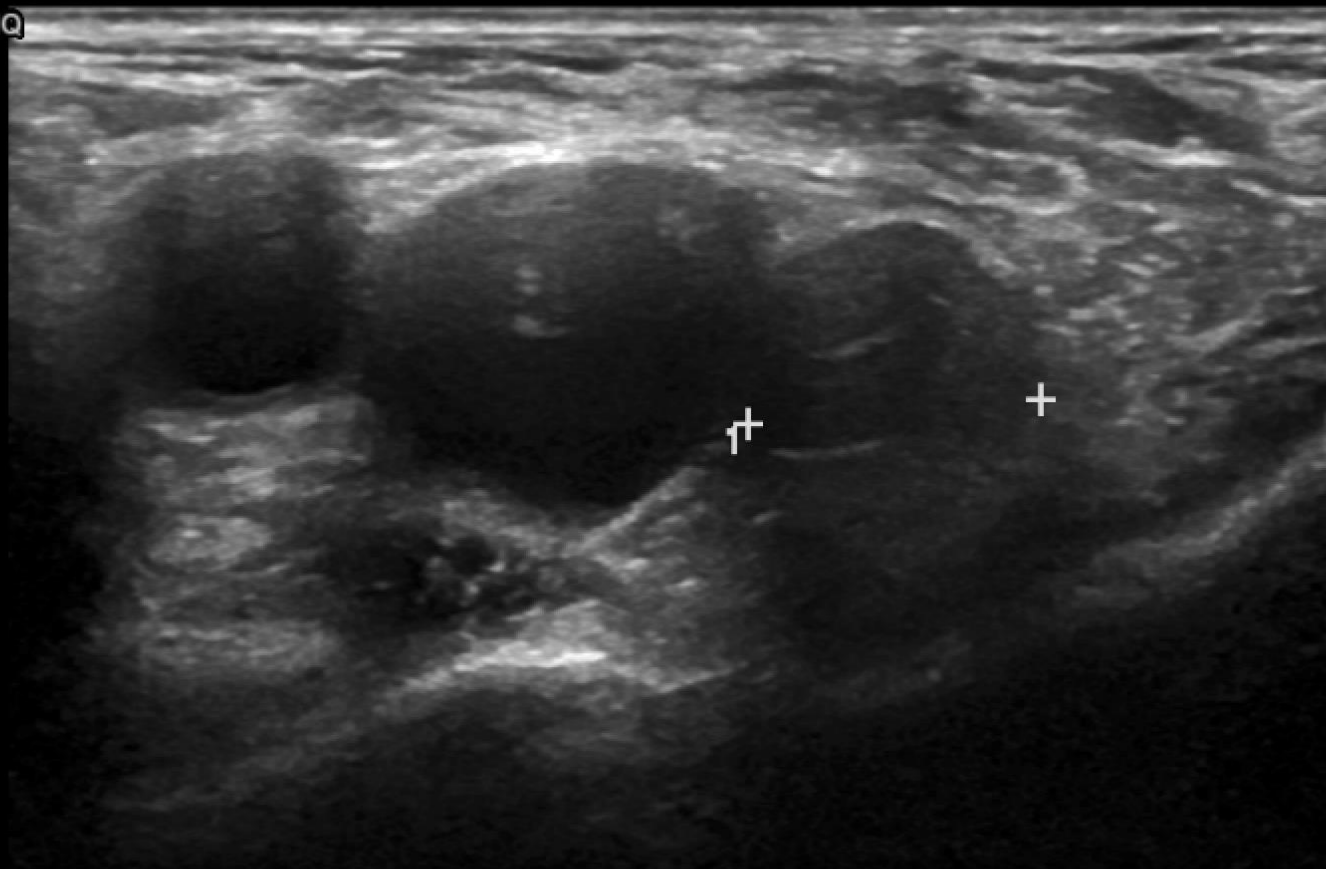


A

FR 22

LOGIQ
E9

- CHI
- Frq 12.0
- Gn 57
- S/A 3/3
Map A/0
- D 3.3
DR 60
⌘ AO% 100



50 pixe

2-

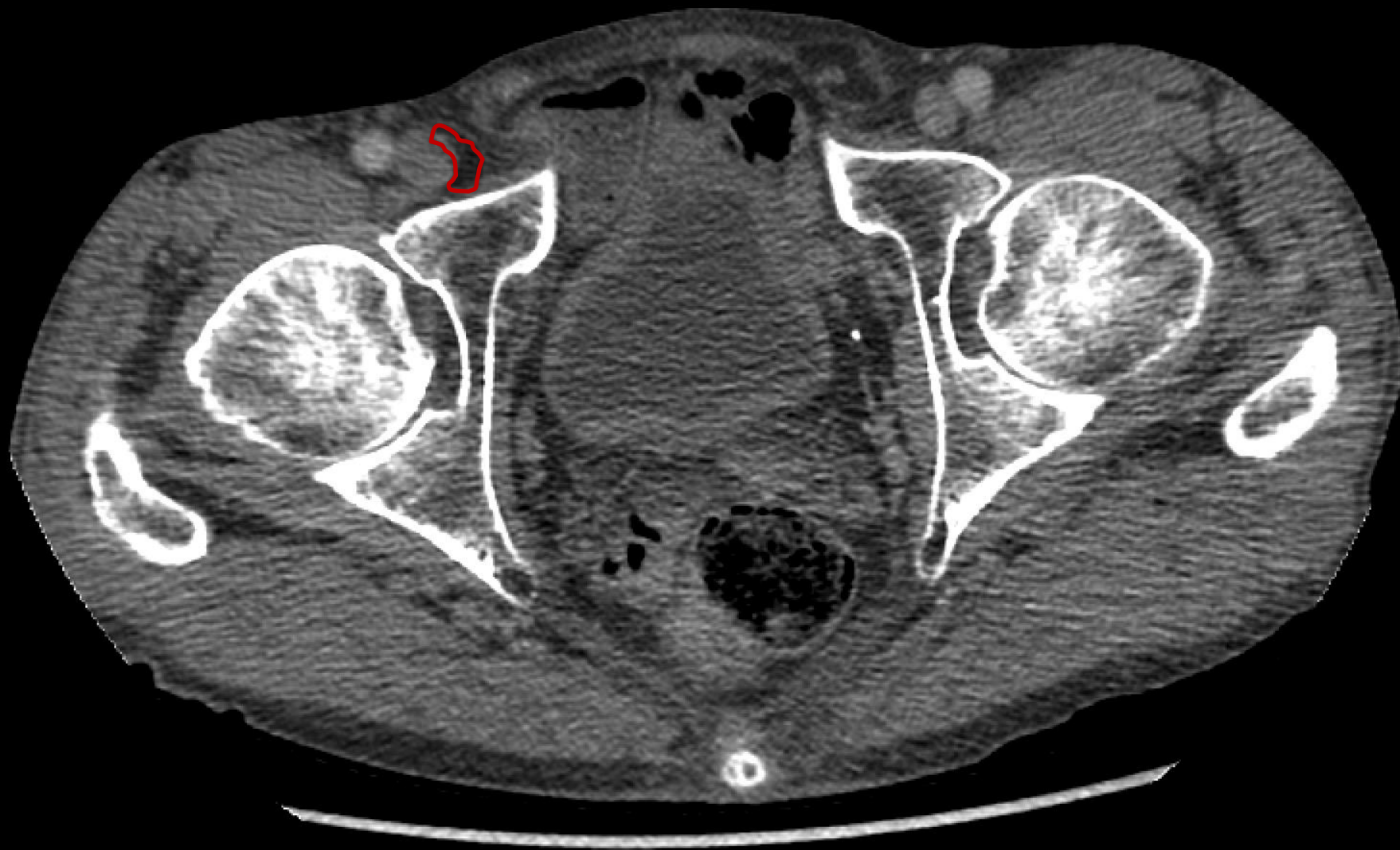


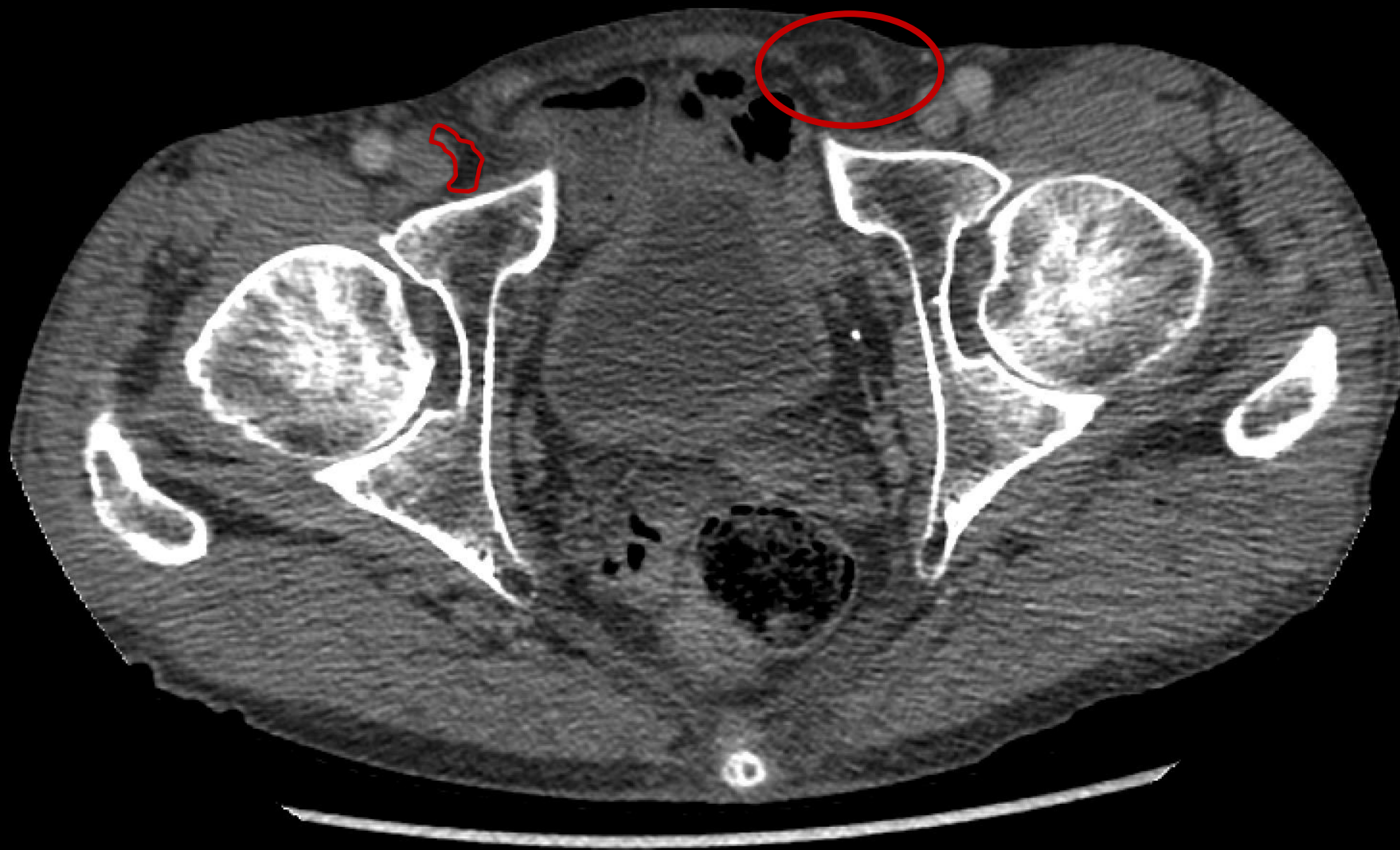
3-

RT CFV VS

● 1.11 cm







Significance of Finding Deep Ring/IIE Origin

1. You know where to look for indirect hernias
2. You know Hesselbach's Triangle and direct inguinal hernias are medial
3. You know you're at/just above the inguinal ligament
4. Anything below it is femoral

This groin anatomy is complex, does it really make a difference whether I say it's direct, indirect or femoral?

Yes and No!

This groin anatomy is complex, does it really make a difference whether I say it's direct, indirect or femoral?

Large and obvious hernias will be obvious

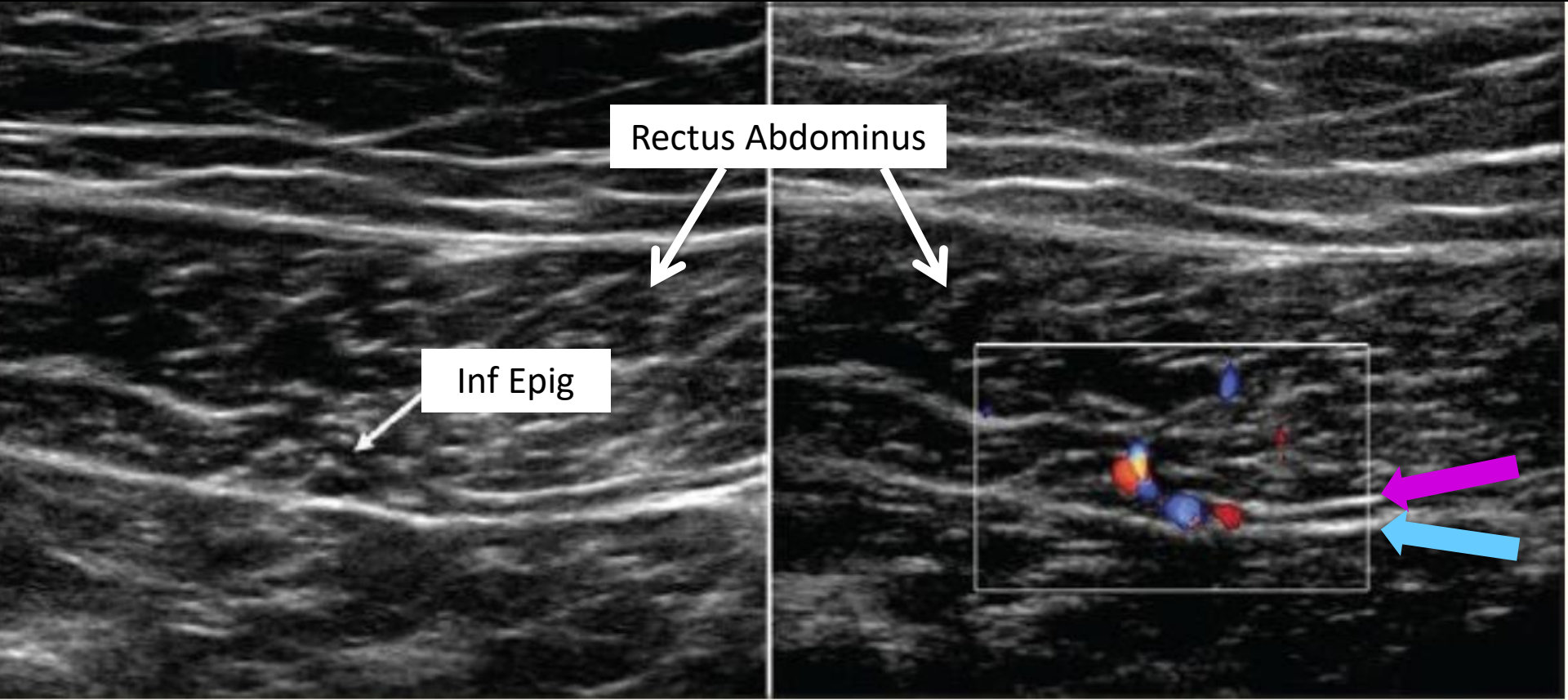
This groin anatomy is complex, does it really make a difference whether I say it's direct, indirect or femoral?

Surgical repair of direct, indirect and femoral hernias is similar – put a patch over the defect

This groin anatomy is complex, does it really make a difference whether I say it's direct, indirect or femoral?

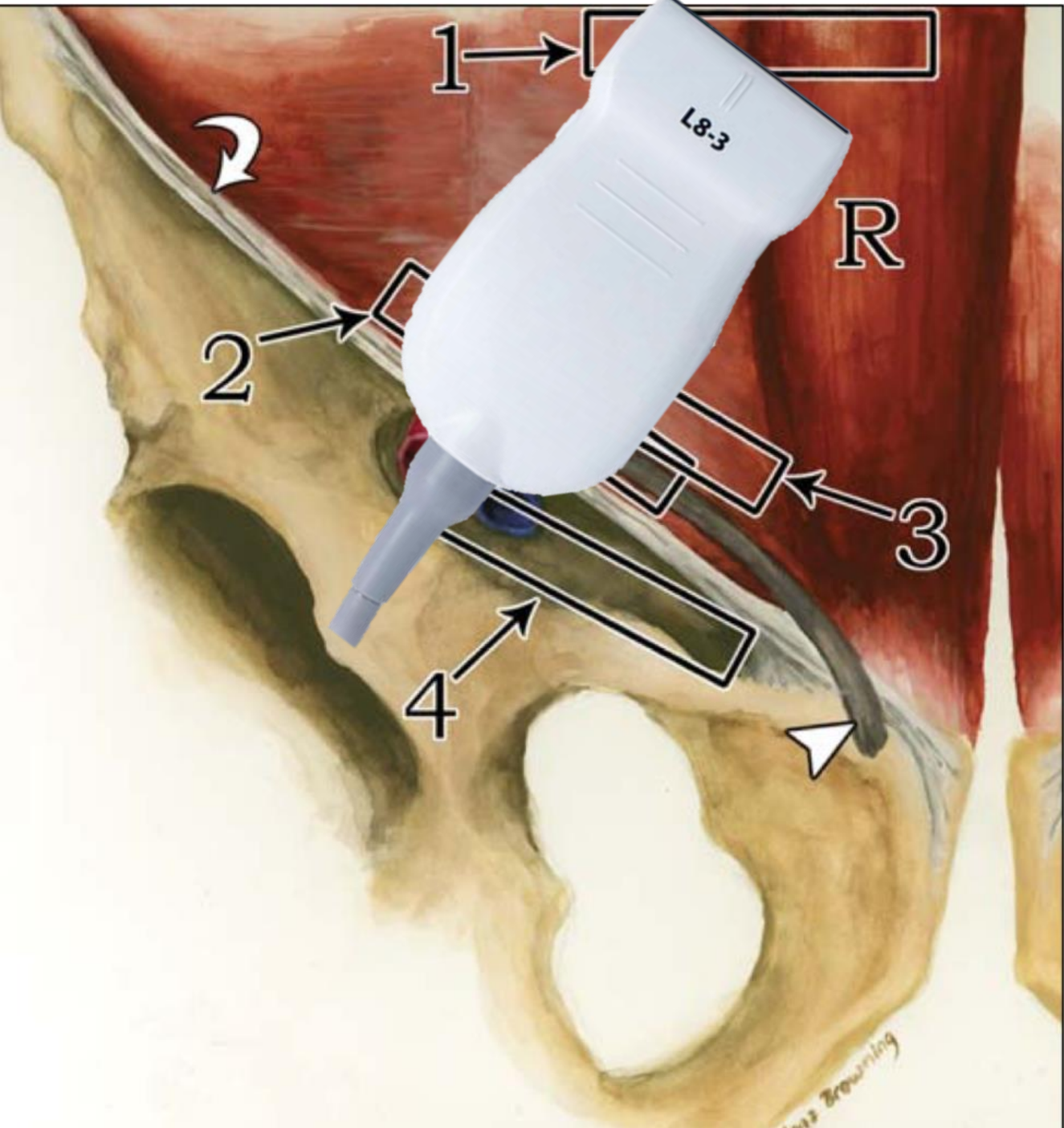
Small and symptomatic reducible hernias may be completely missed unless there is direct interrogation of the deep inguinal ring, Hesselbachs triangle and the femoral canal

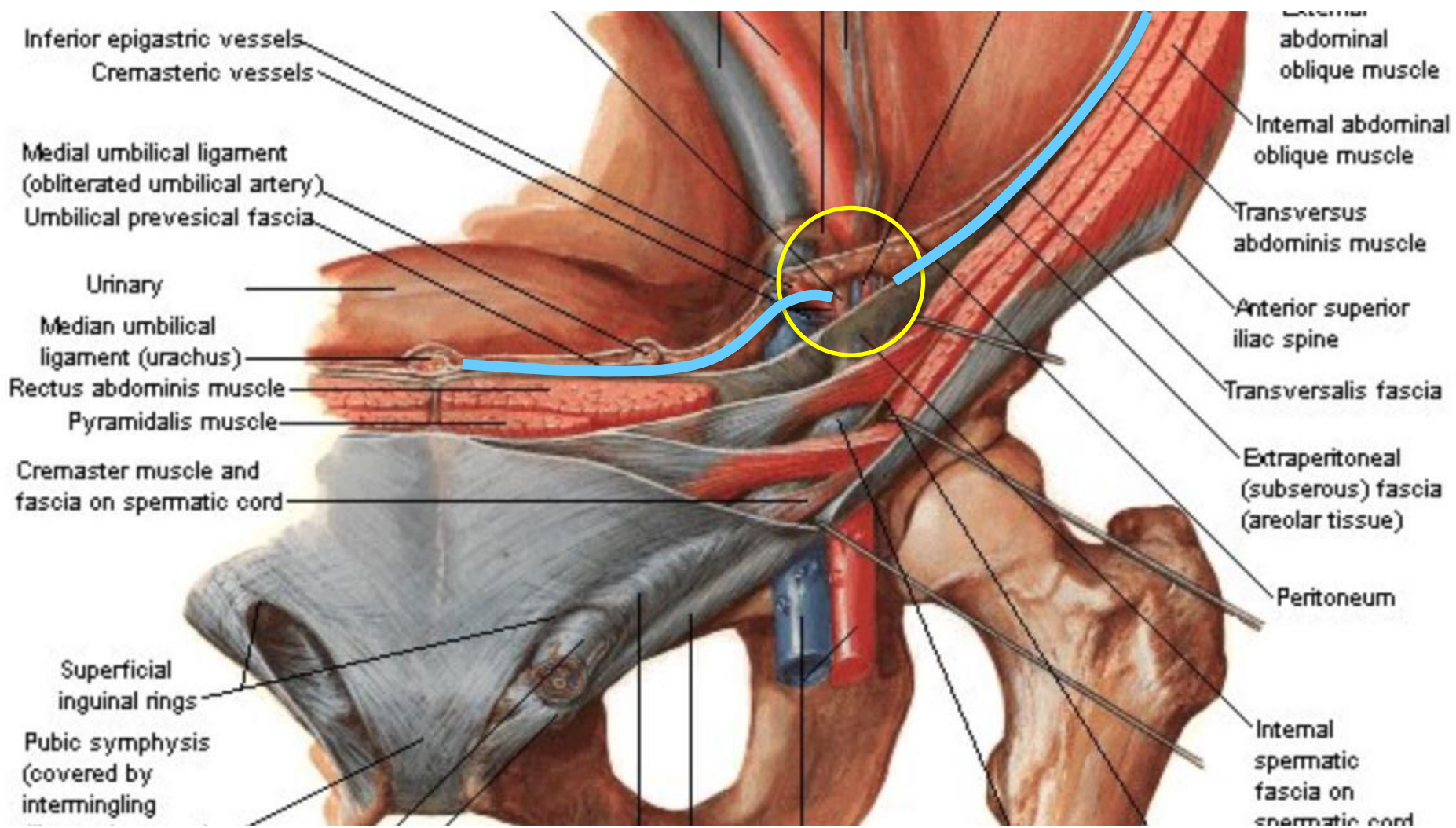
Recap



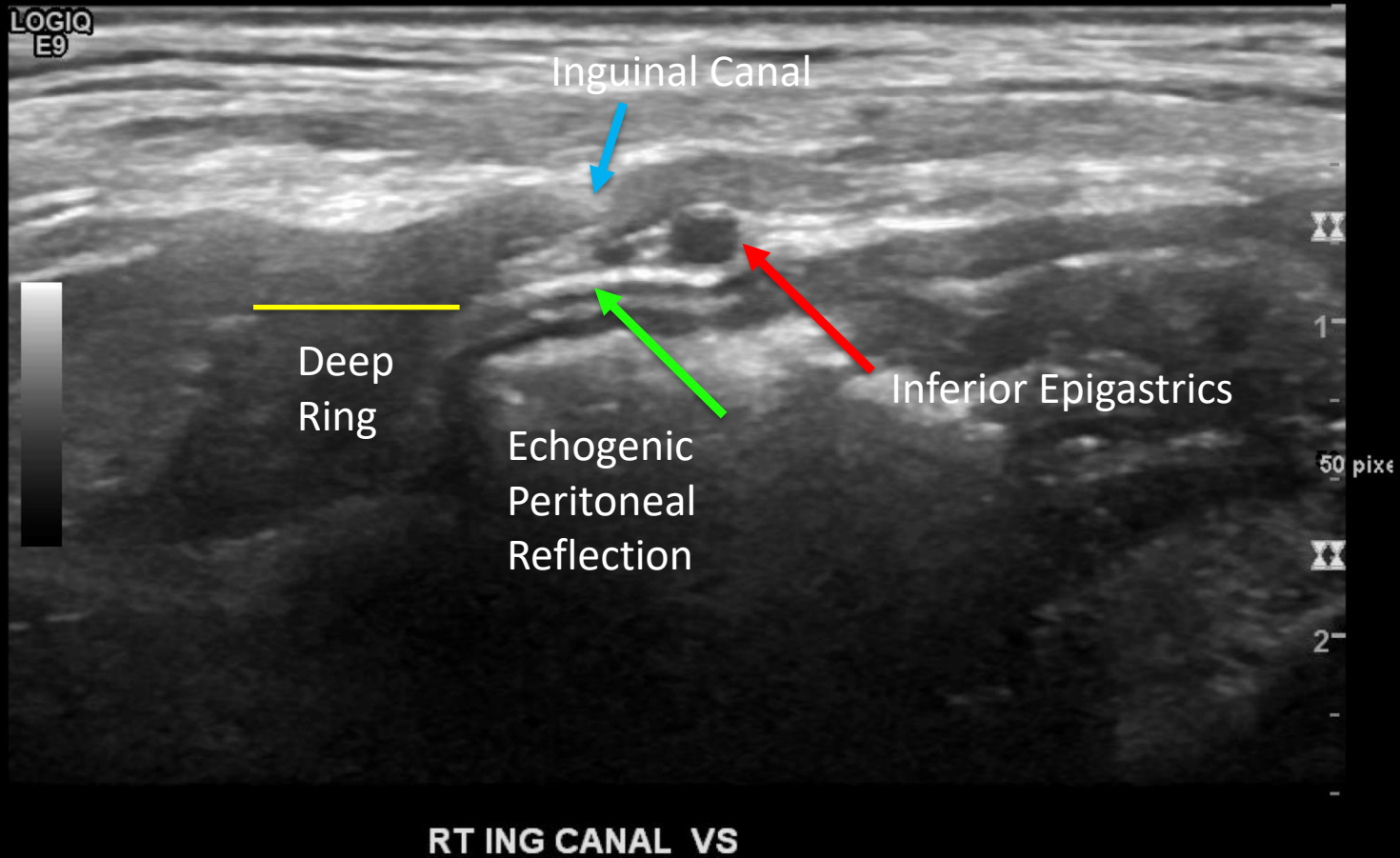
Rectus Abdominus

Inf Epig





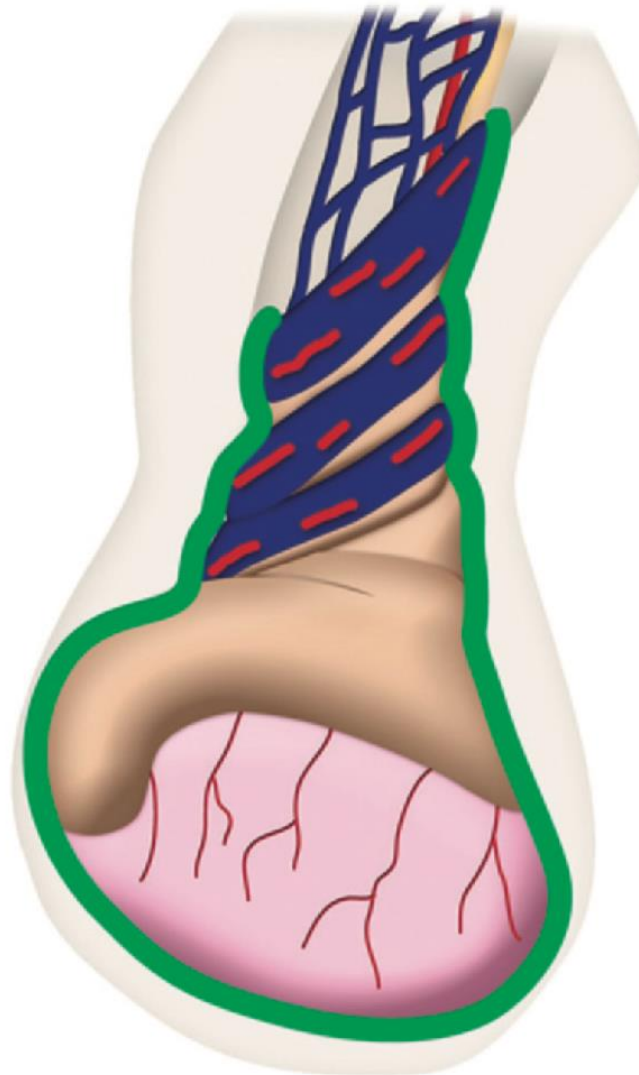
Losing the echogenic line helps us find the deep inguinal ring...



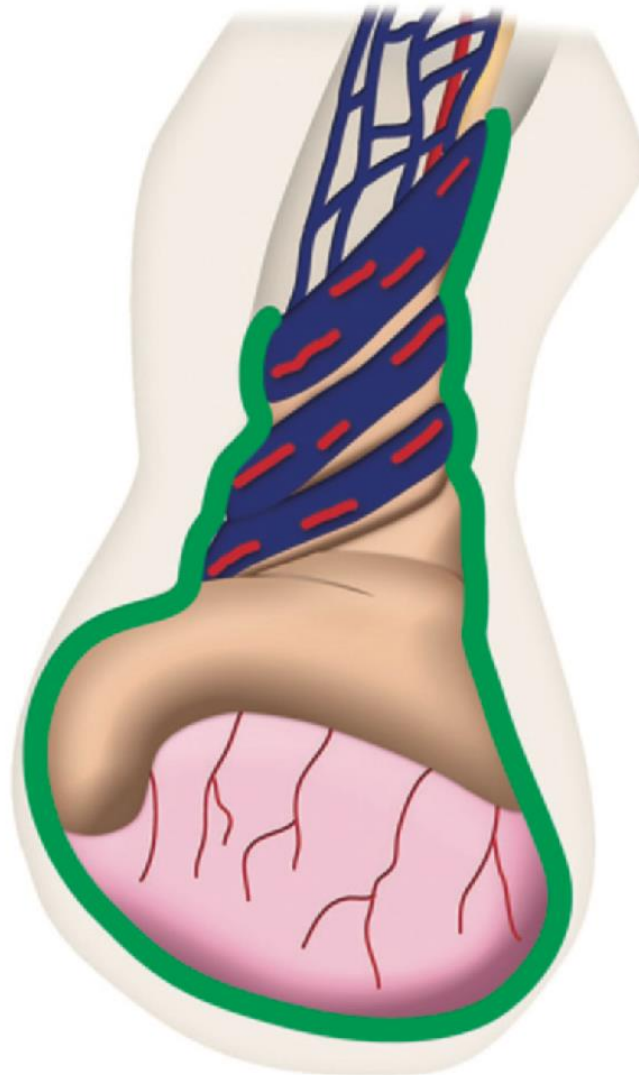
Section Two

Ultrasound Assessment of "Testicular" Torsion

Testicular Torsion

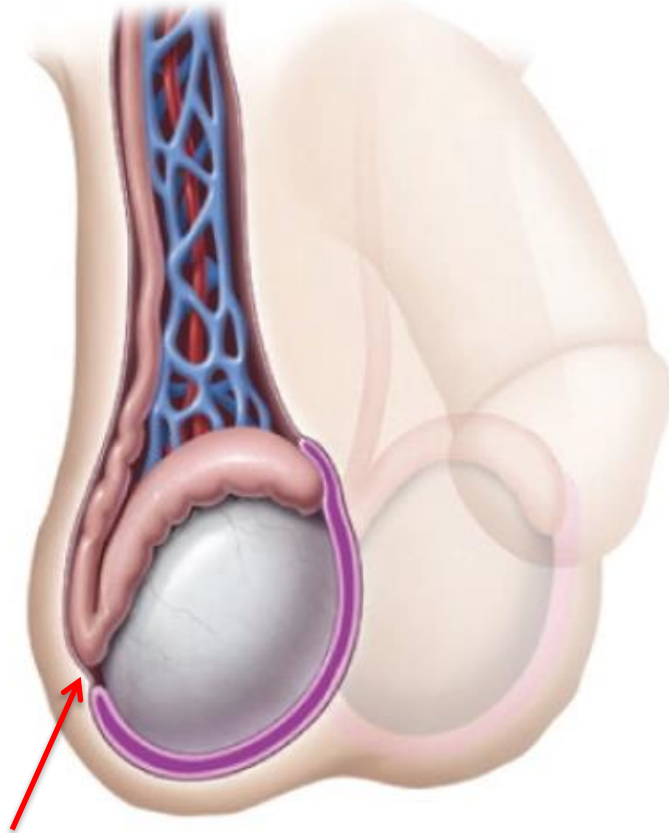


Spermatic Cord Torsion



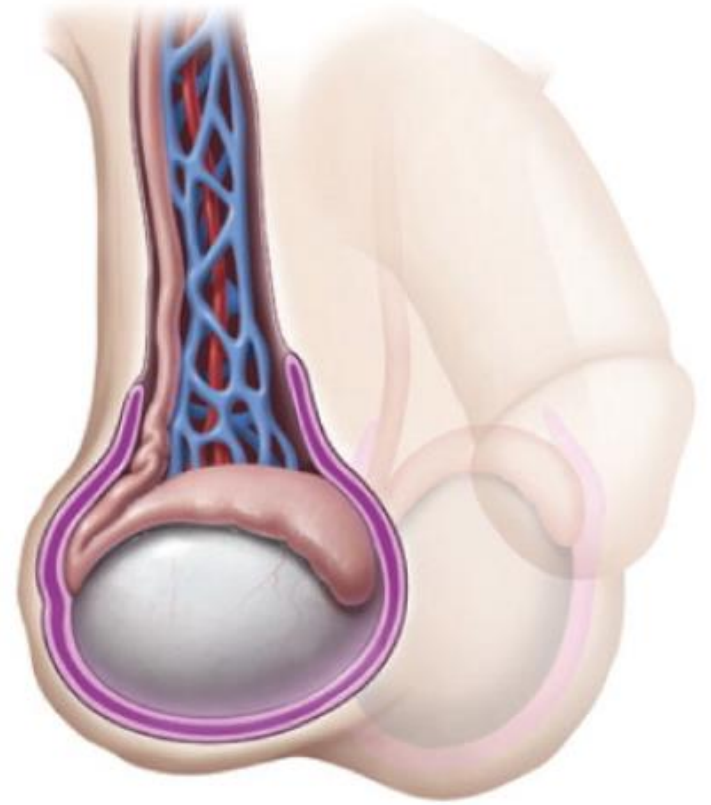
Bell-clapper Deformity

Normal



Gubernaculum

Bell-Clapper Deformity



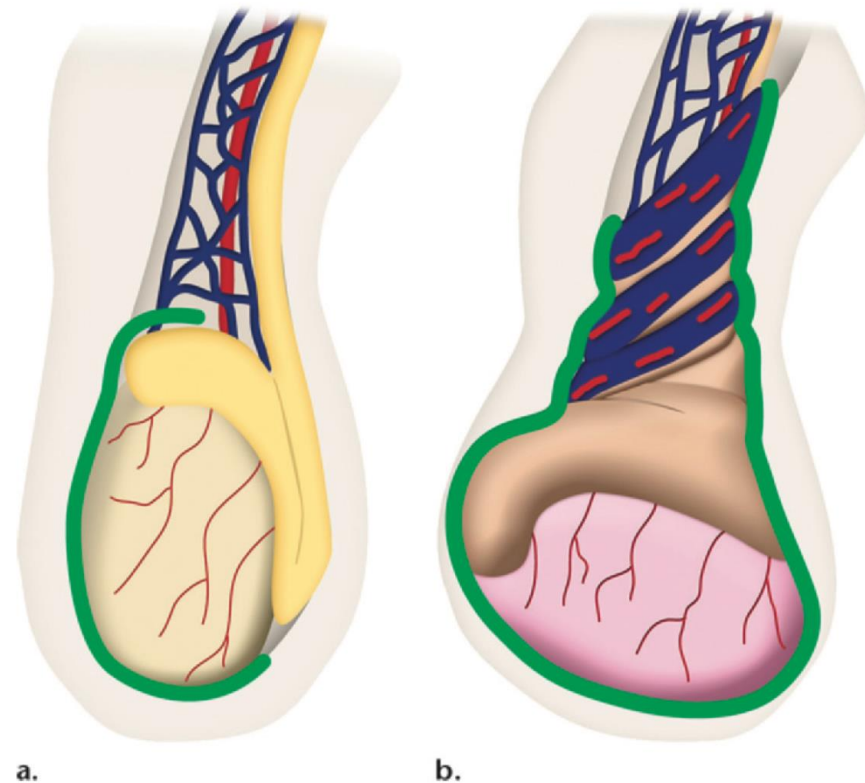
Tunica
Vaginalis



Testicular/Spermatic Cord Torsion

Important Considerations

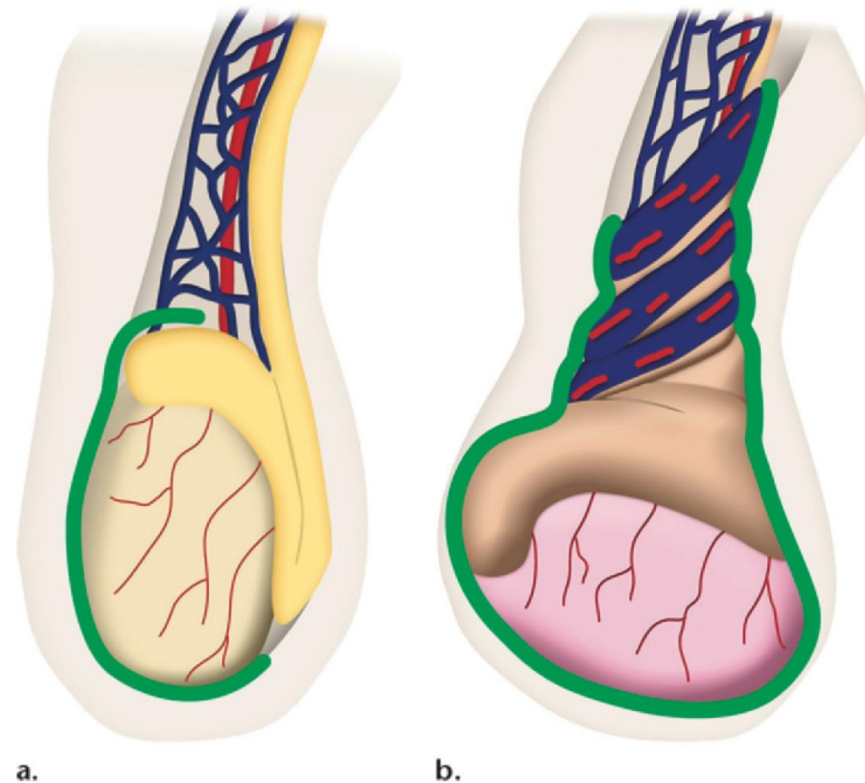
- In adolescents/adults, essentially all patients with testicular torsion will have an underlying **bell-clapper deformity**.
 - Prevalence in the population is 1:125
 - Typically bilateral



Testicular/Spermatic Cord Torsion

Important Considerations

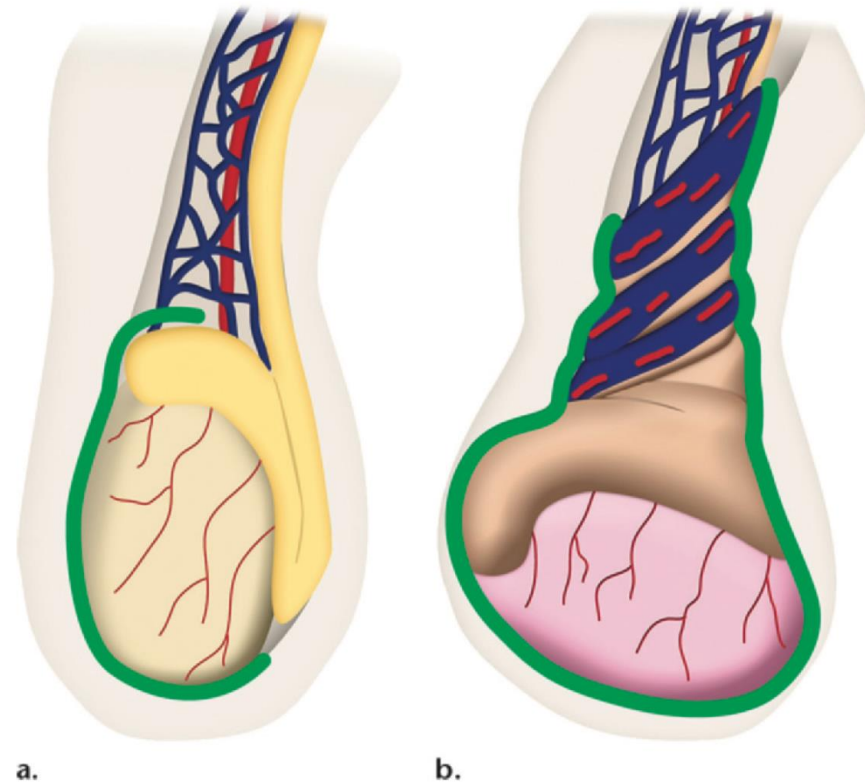
- When the testicle twists, it is the **SPERMATIC CORD** that torts.
 - The torsion usually occurs just beyond the superficial inguinal ring.



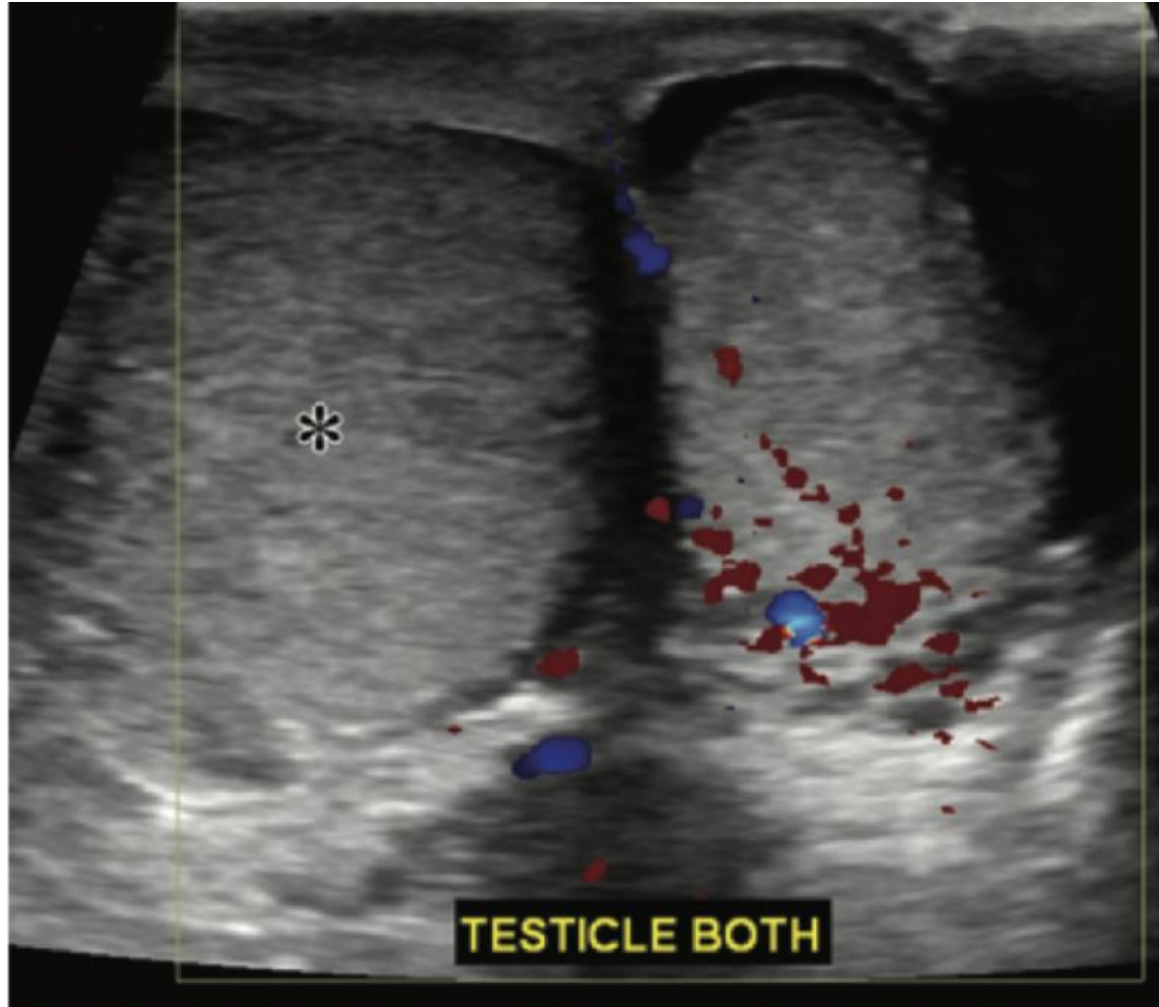
Testicular/Spermatic Cord Torsion

Important Considerations

- When the spermatic cord torts, only the **veins compress** unless the torsion is greater than 360 degrees
 - May still have arterial testicular flow in a torsion.



Torsion – Typical Image Presented



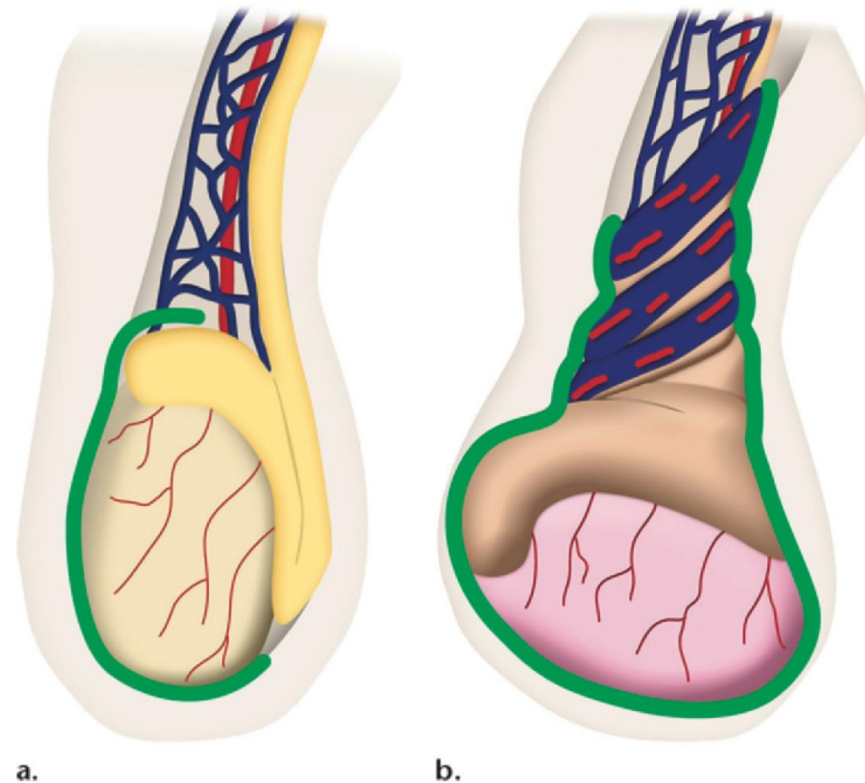
Torsion – Limitations of just assessing for asymmetrical flow

- Arterial flow **may not reduce** or be absent unless torsion is >360 degrees.
- Flow **transiently increases** in affected testis if there has been recent spontaneous de-torsion/reduction.
 - Can be very difficult to differentiate orchitis from recent de-torsion.

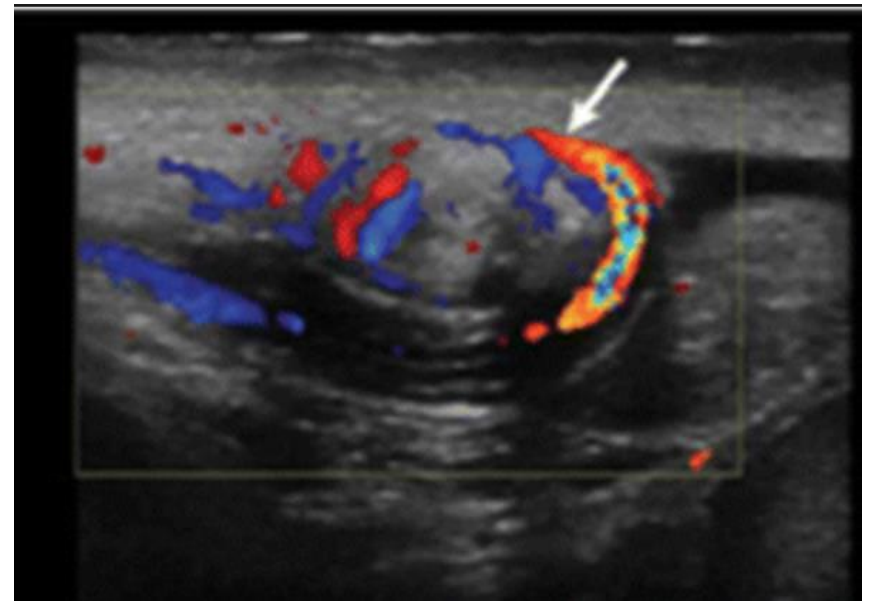
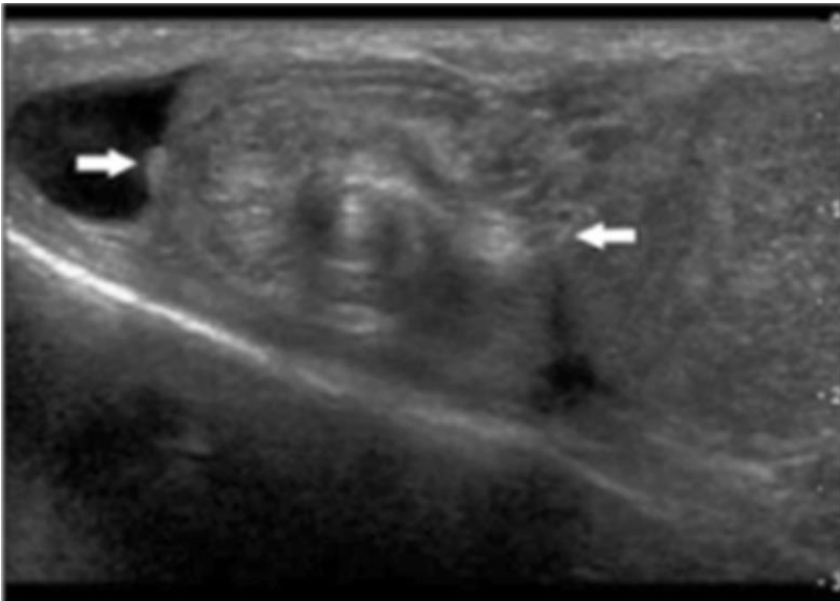


Torsion – Useful **Additional** Ultrasound Findings

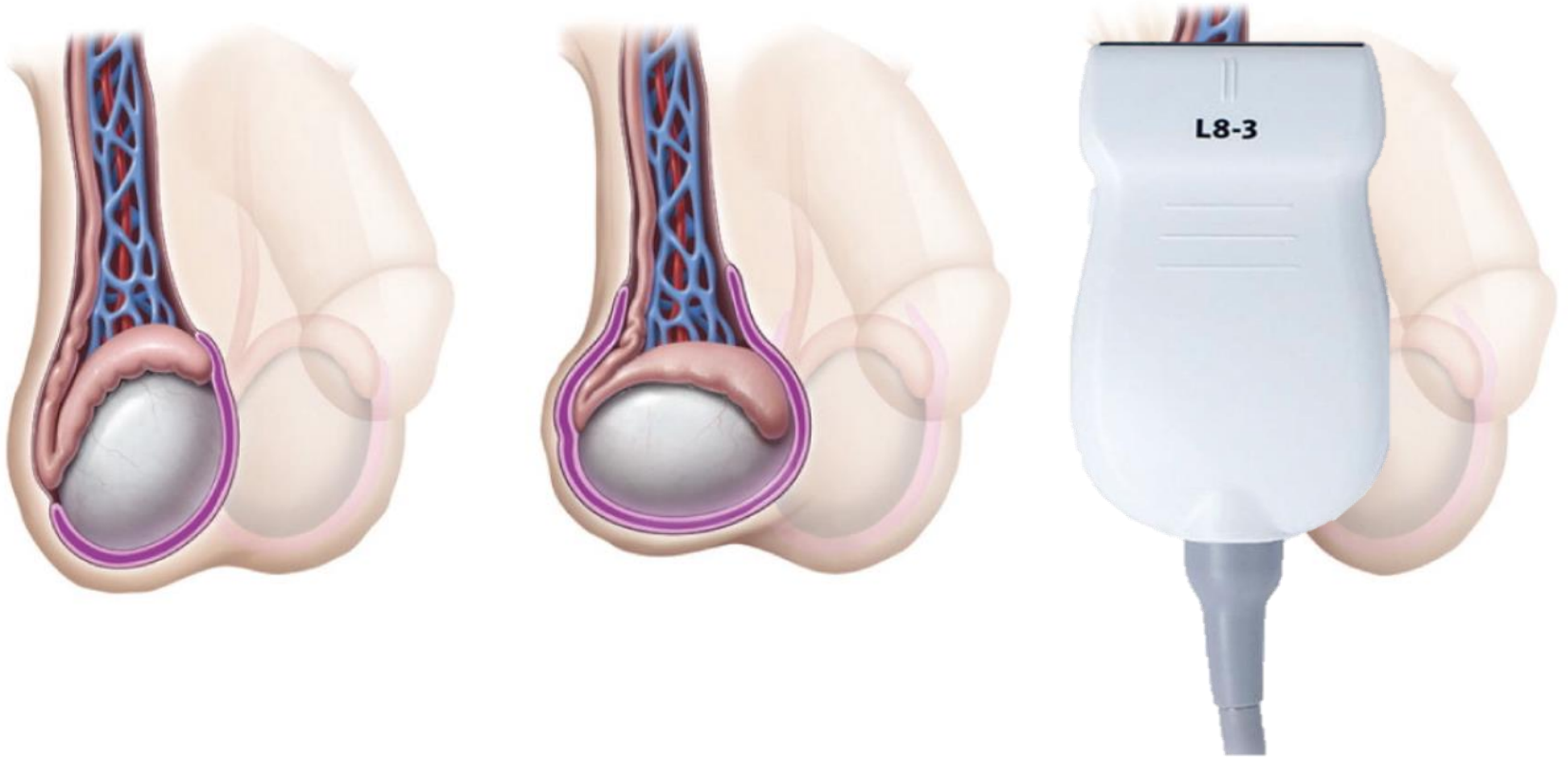
- Think of ‘testicular torsion’ as **spermatic cord torsion**
 - Assess the spermatic cord
 - Scan along spermatic cord looking for **swirling/whirling** of vessels beyond superficial inguinal ring



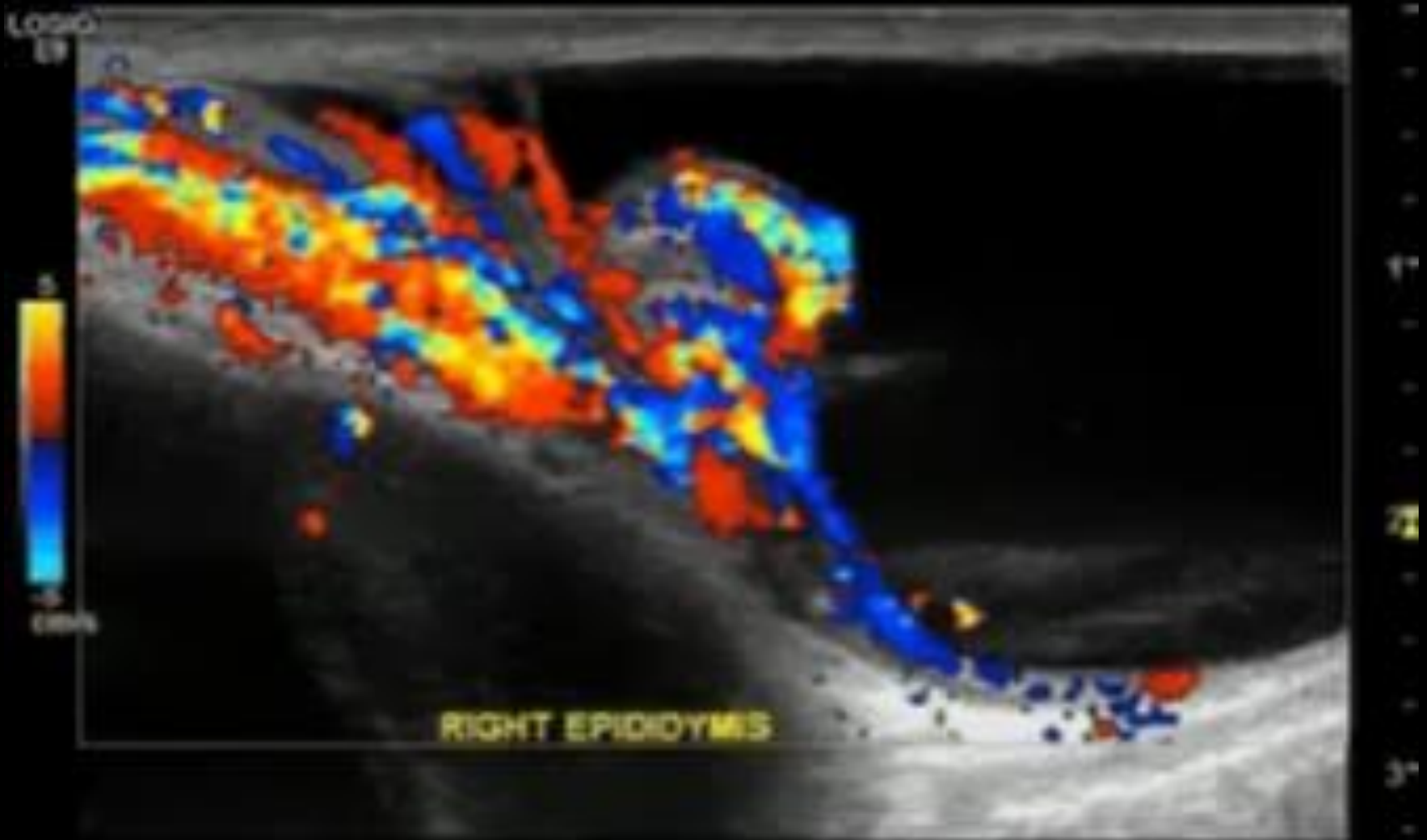
'Whirlpool Sign'



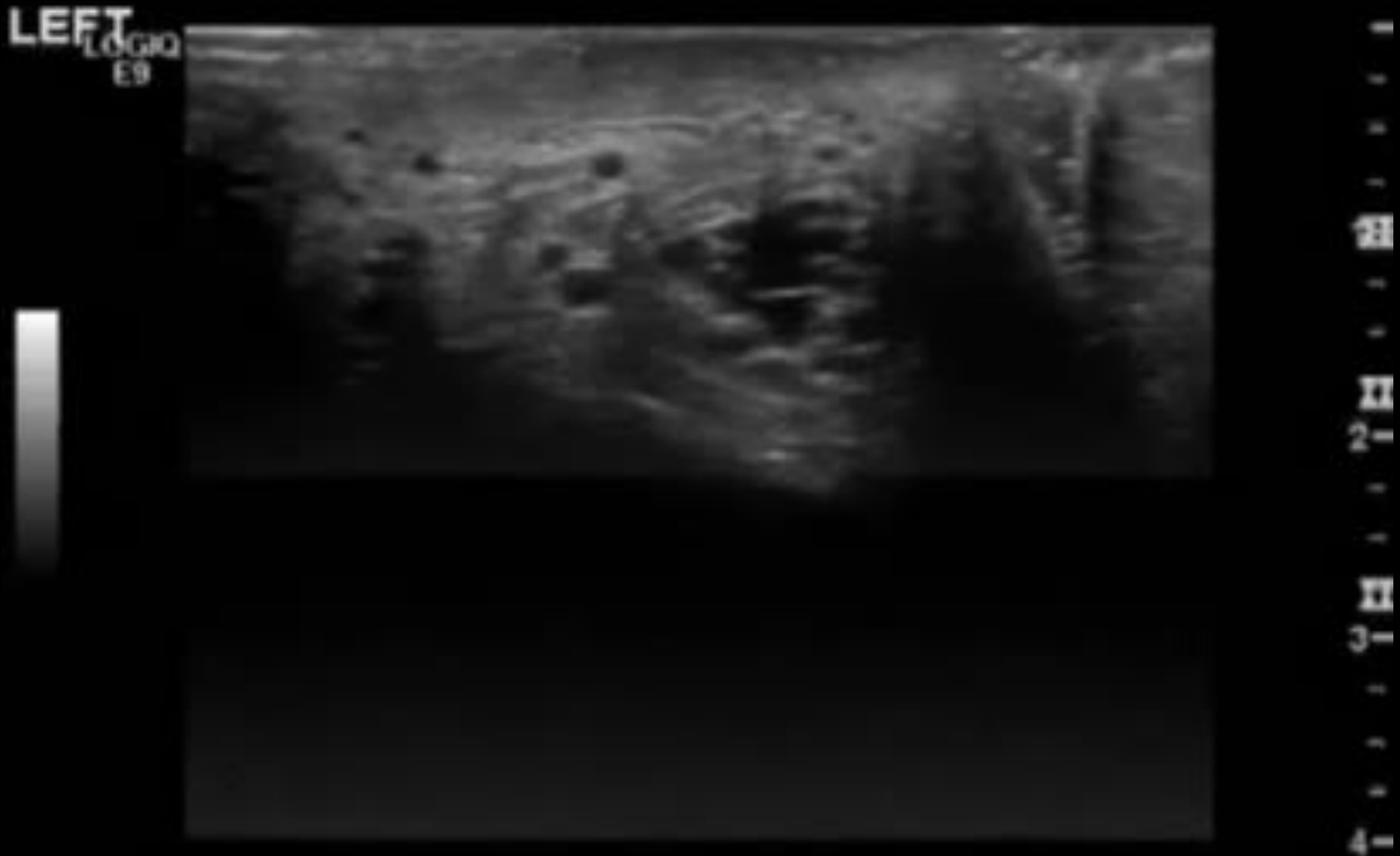
Torsion – It is the Spermatic Cord that twists



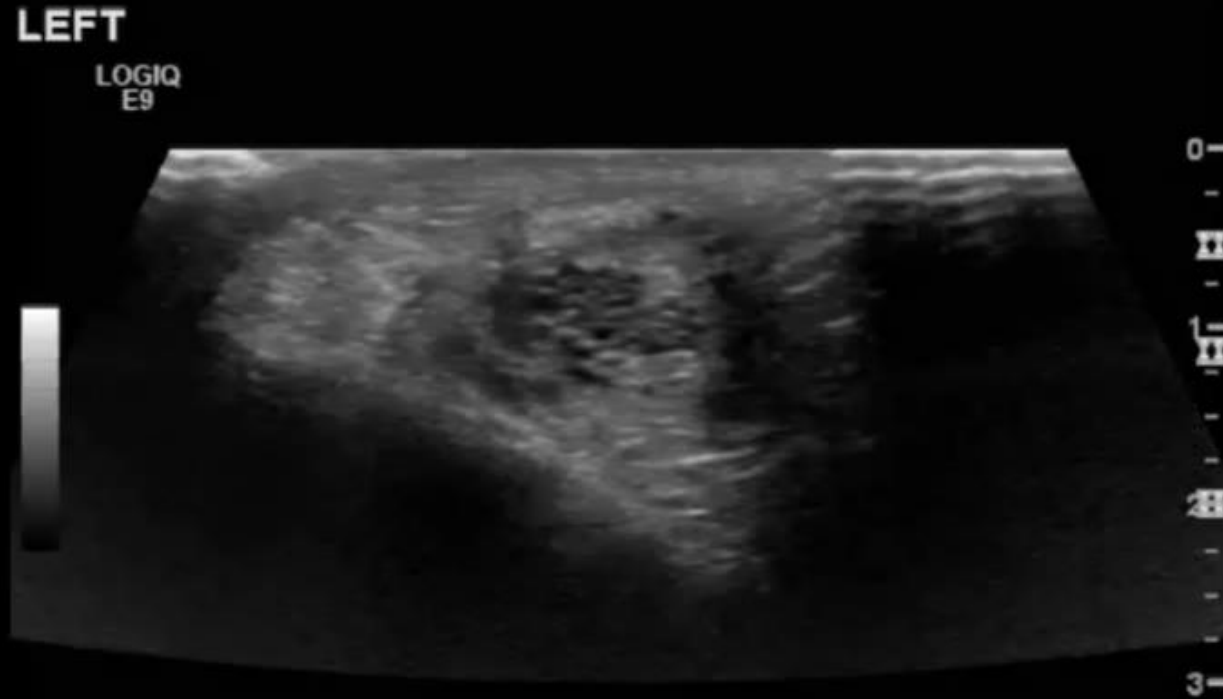
Whirlpool Sign



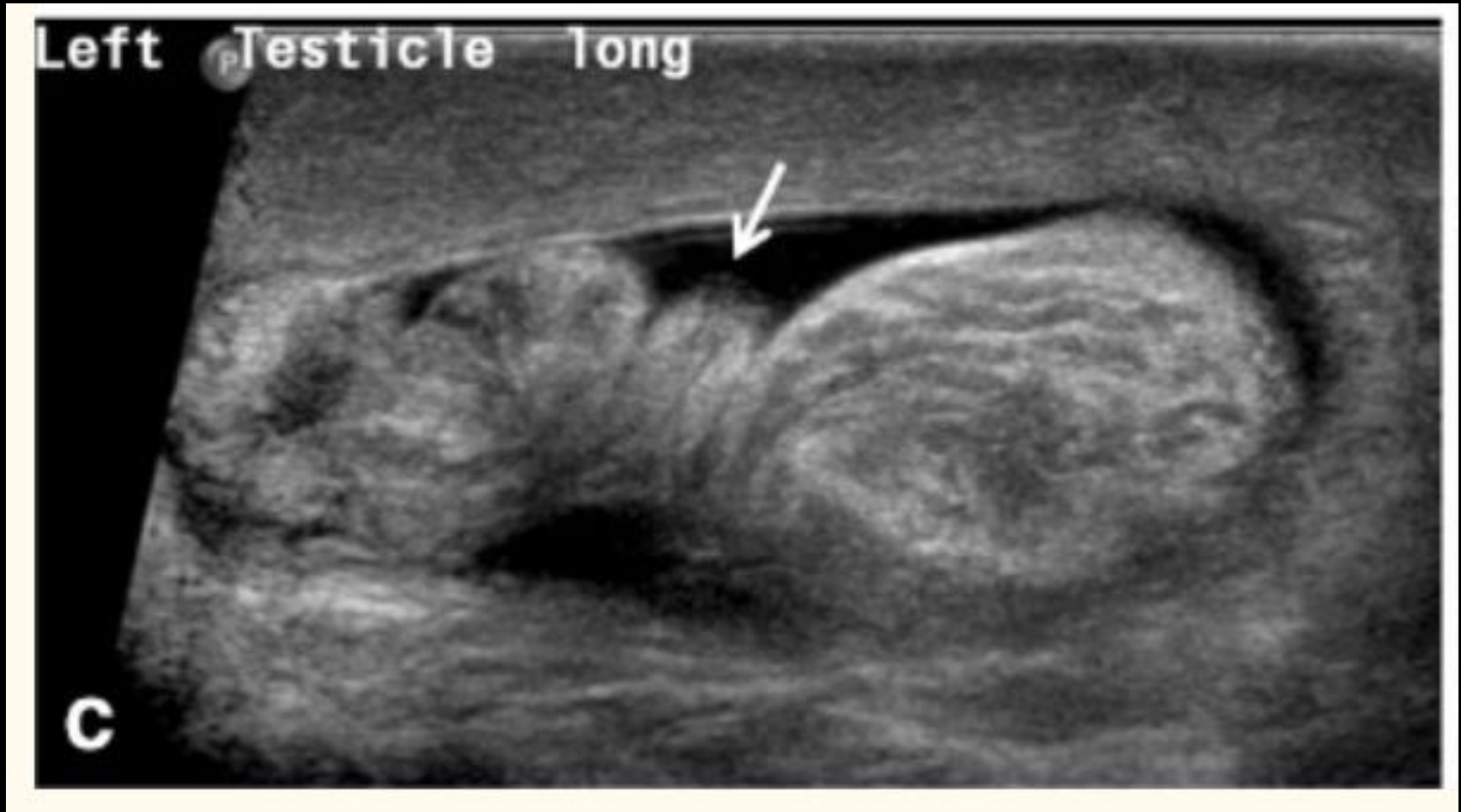
Whirlpool Sign



Whirlpool Sign

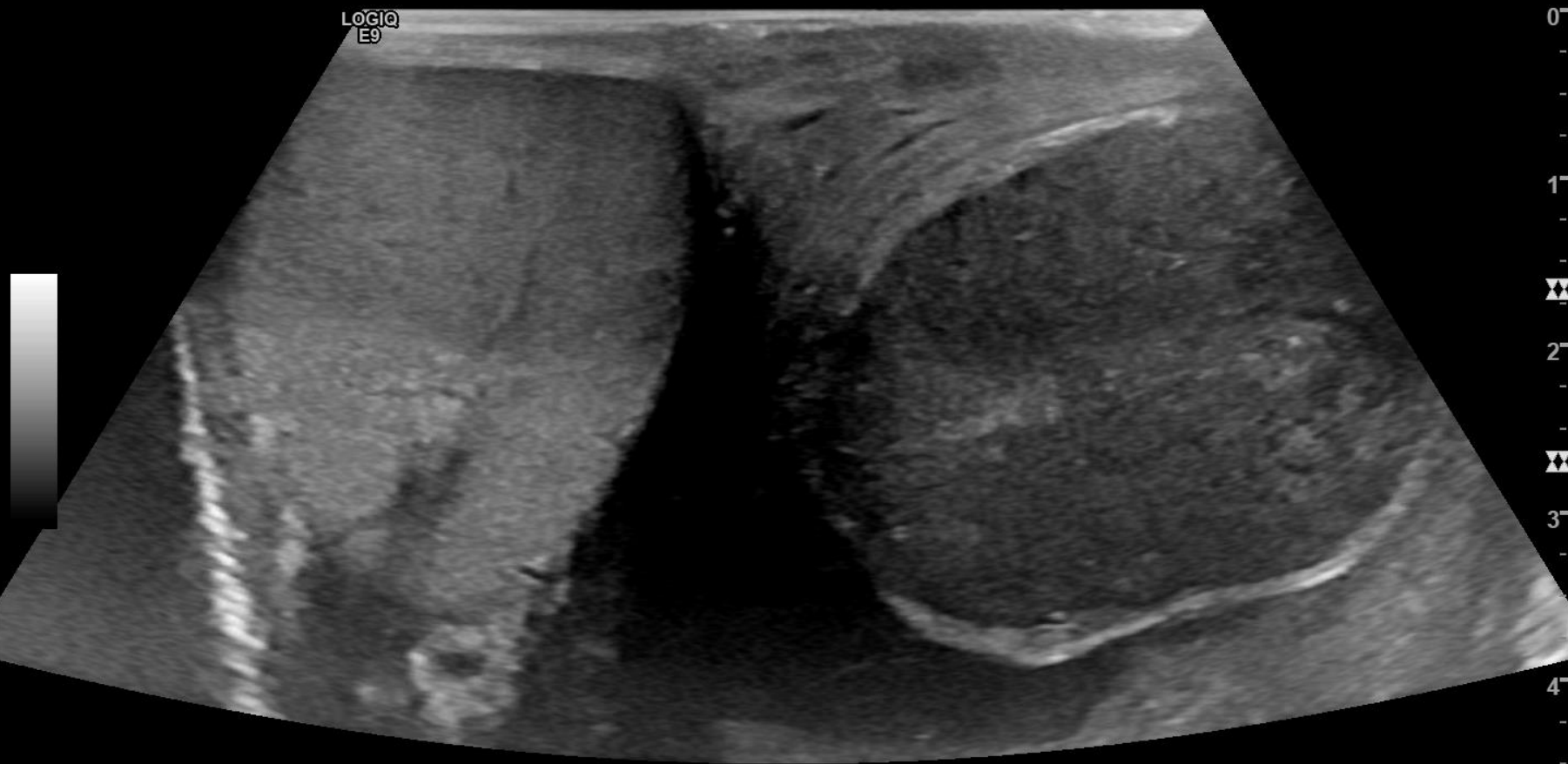


Whirlpool Sign



Real World Case - NGH

TS BOTH TESTES



CHI	15.
0- Frq	2
- Gn	2/
- S/A	D/
- Map	4.
- D	7
DR	10
1- AO%	

XX

2-

XX

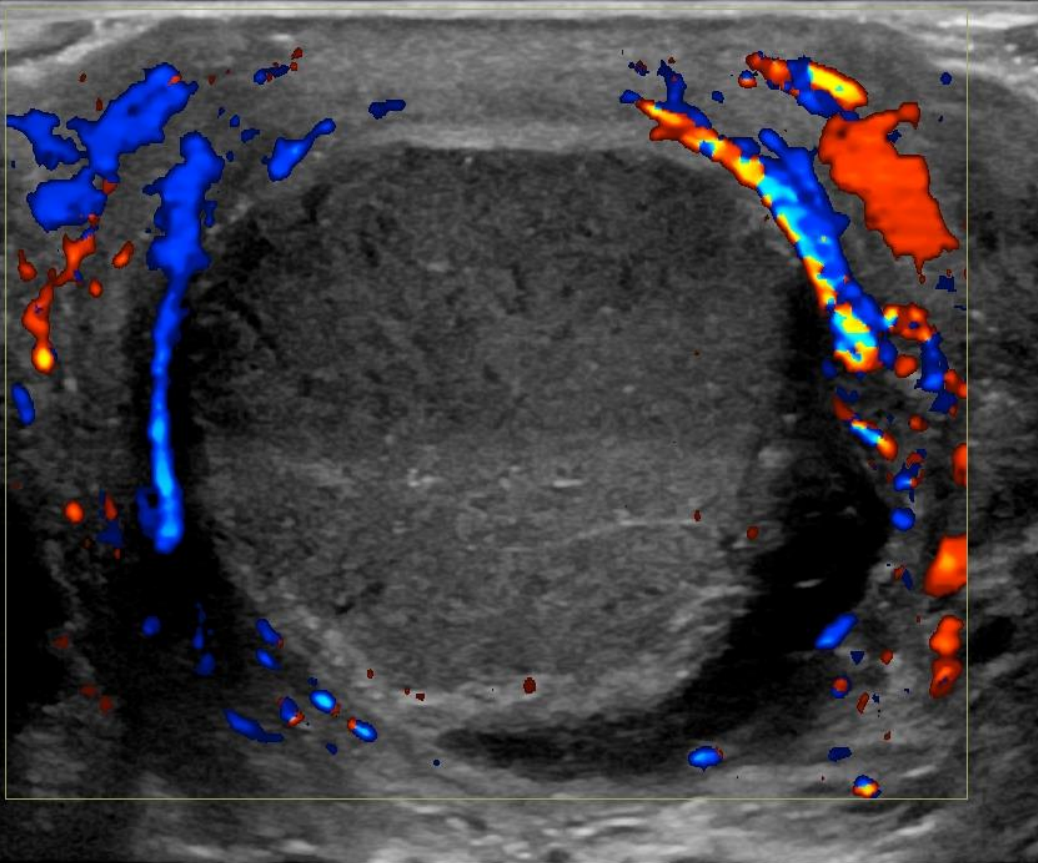
3-

4-

Real World Case - NGH

LEFT TESTIS TS

LOGIQ
E9



- CHI
Frq 11.0
- Gn 31
D 4.0
- AO% 100

- CF
Frq 6.3
1- Gn 17.5
- L/A 3/6
PRF 0.3
- WF 43
S/P 1/16
- AO% 100

2-

-

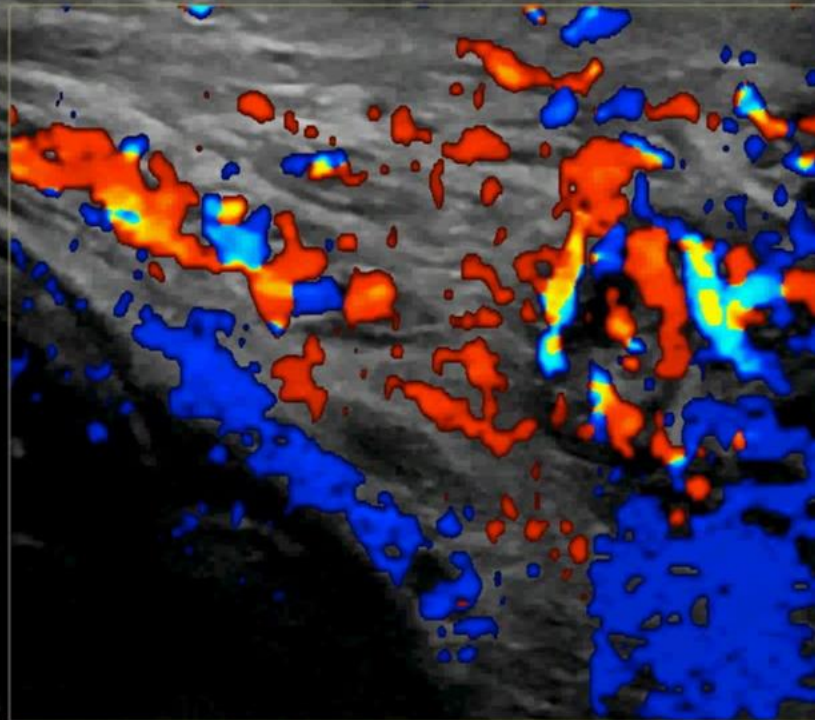
3-

4-

Real World Case - NGH

LEFT

LOGIQ
E9

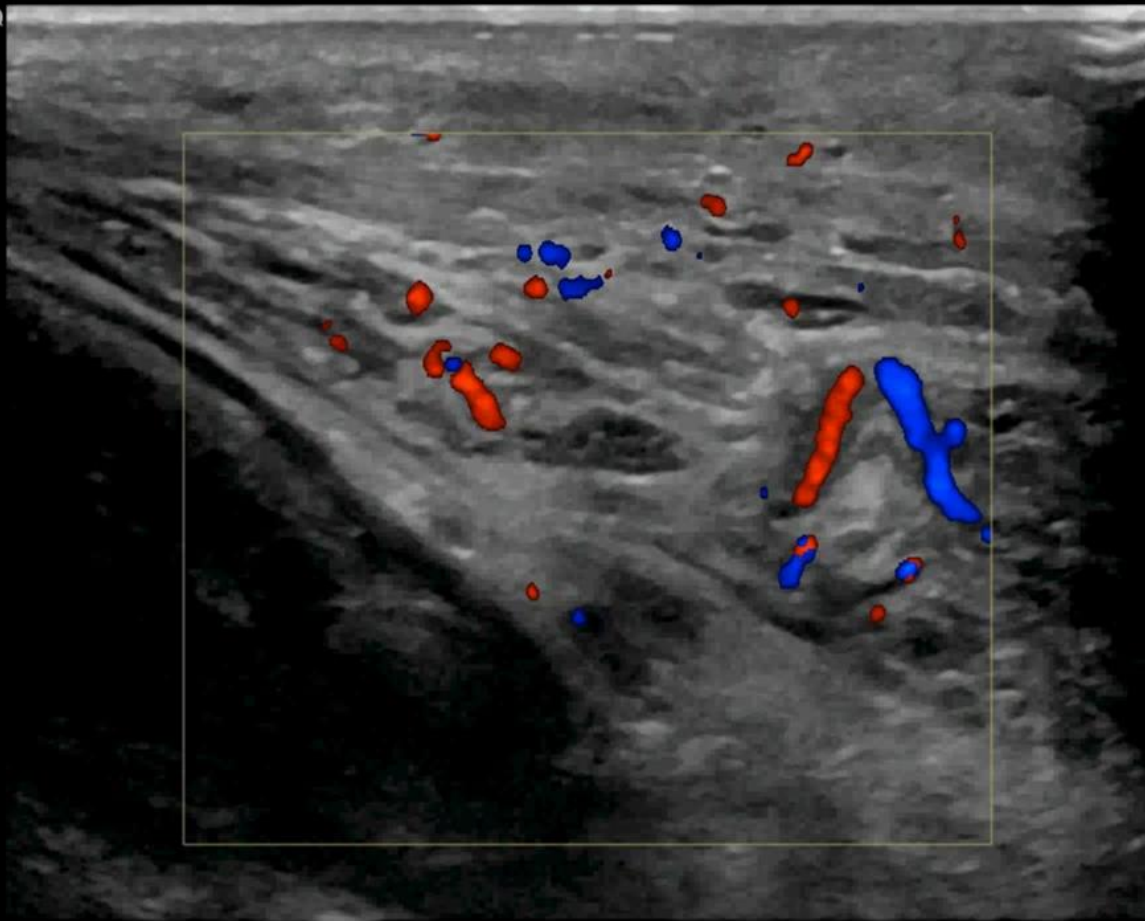


1"
2"
3"
4"

Real World Case - NGH

LEFT

LOGIQ
E9

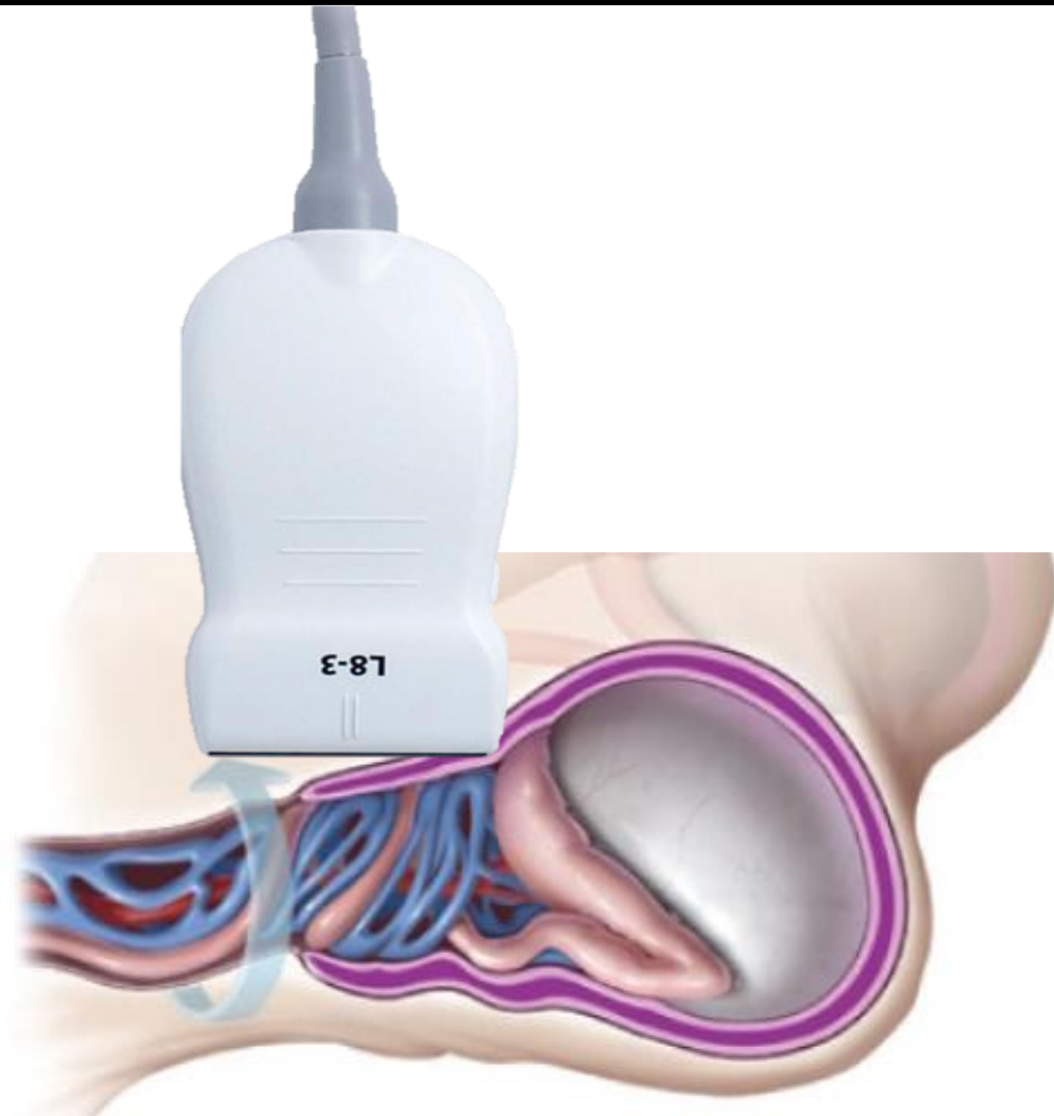


1"
2"
3"
4"

Torsion – It is the Spermatic Cord that twists



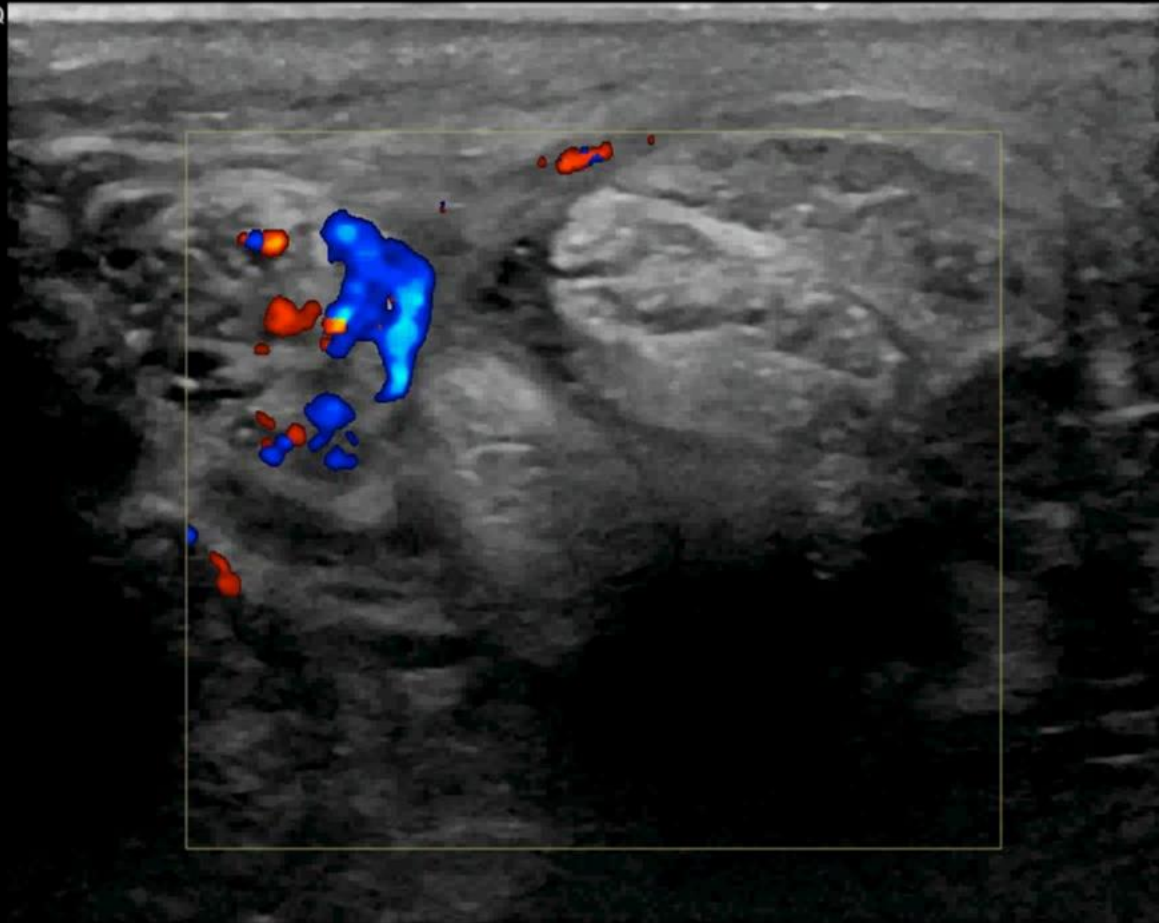
Torsion – It is the Spermatic Cord that twists



Real World Case - NGH

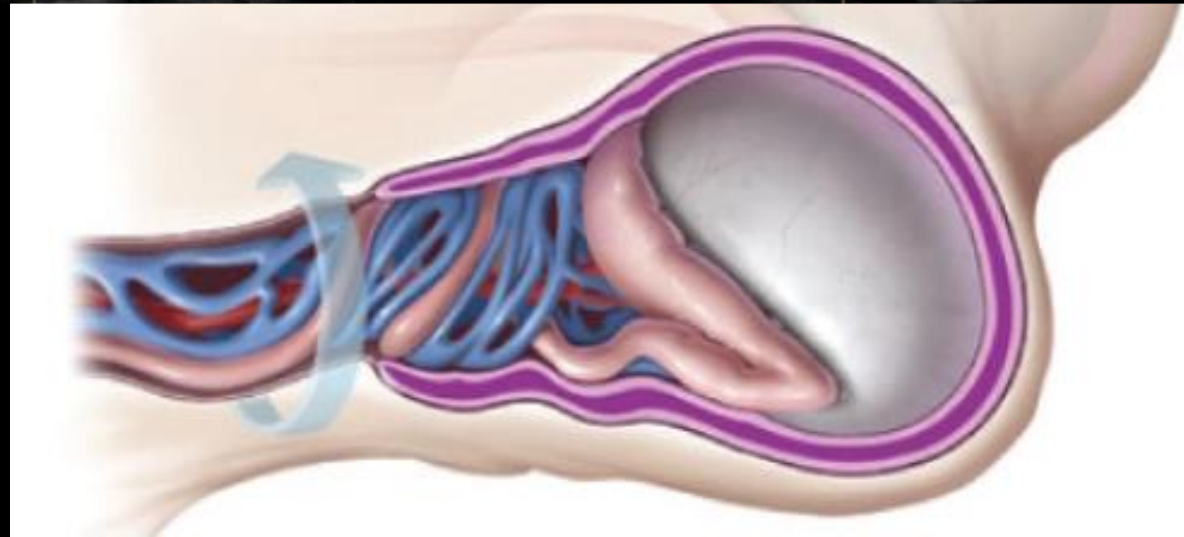
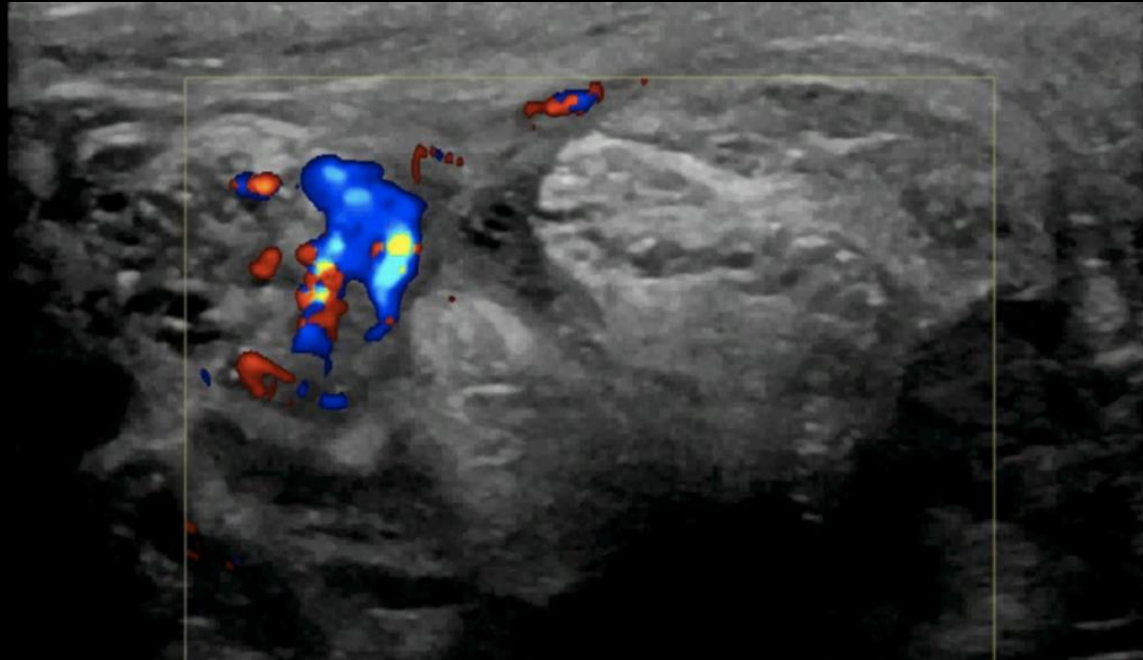
LEFT

LOGIQ
E9

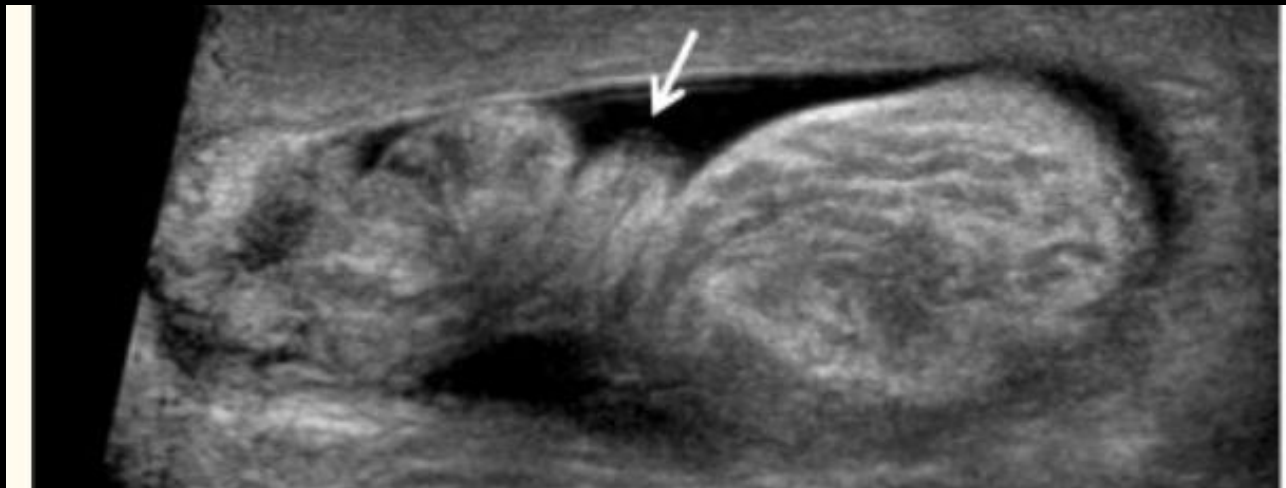
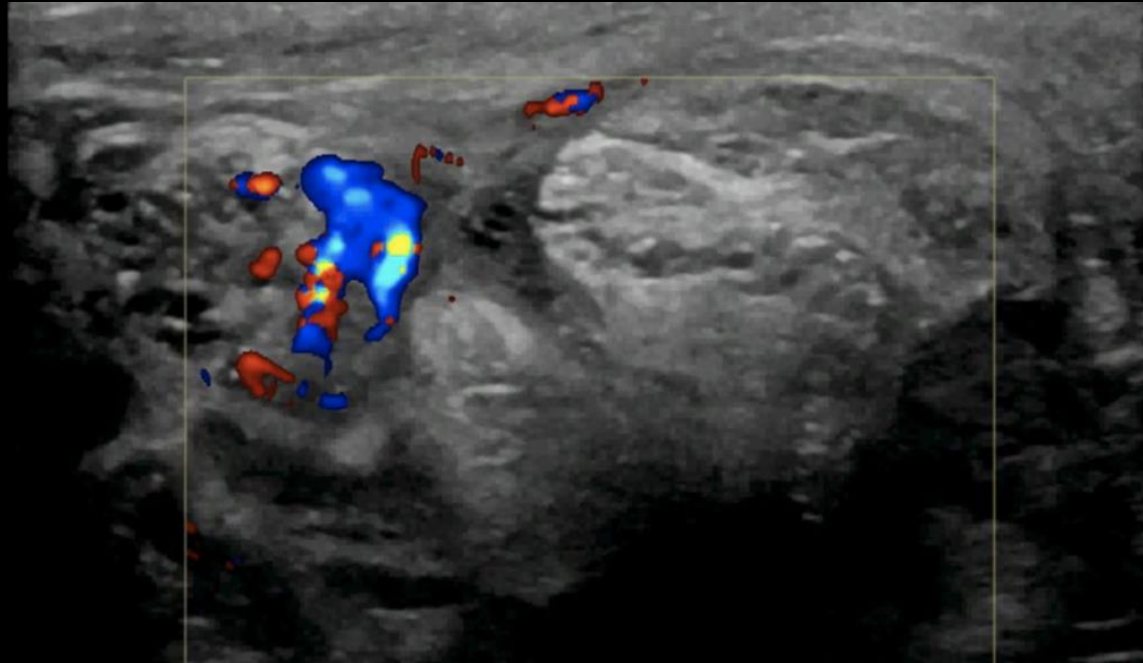


1"
2"
3"
4"

Real World Case - NGH



Real World Case - NGH



Recap

- Think **Spermatic Cord torsion** rather than testicular torsion.
- In early torsion or **<360 twist, only veins are occluded**, so flow may still remain symmetrical.
- Assess the spermatic cord for **'whirlpool'**. No 'acute scrotal' ultrasound should be considered complete without assessment of the spermatic cord.

Summary

- Anatomy
- Anatomy
- Anatomy
- Anatomy

Summary

- Locate **origin of Inferior Epigastric Artery** by tracing backwards from Rectus Abdominus (at least when you're learning).
- Losing the Echogenic line lateral to Epigastrics near their origin allows us identify the deep inguinal ring
 - The key to all groin hernia anatomy.
- Think **Spermatic Cord Torsion**, not Testicular Torsion – examine for **'whirlpool'** at the superficial inguinal ring.

Take Home Point

You cannot consider your examination complete unless you've identified the relevant anatomical landmark and interrogated at that site.

Take Home Point

You need to practice identifying the deep inguinal ring and Hesselbach's triangle on normal patients

“looking for the ovaries” on pelvic US on slim patients is a great opportunity to see what normal looks like.

- it's very hard to assess abnormal unless you're comfortable with normal

Sales Pitch

Consider Naas in the future

We have a great Ultrasound CSR... AND you get
to work with me...

You will learn loads (and feel supported)!

Acknowledgements

Deirdre Mulvaney
Stephen Mulvaney
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Karen Dale Planta



Questions?

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