Duplex scan and venous mapping

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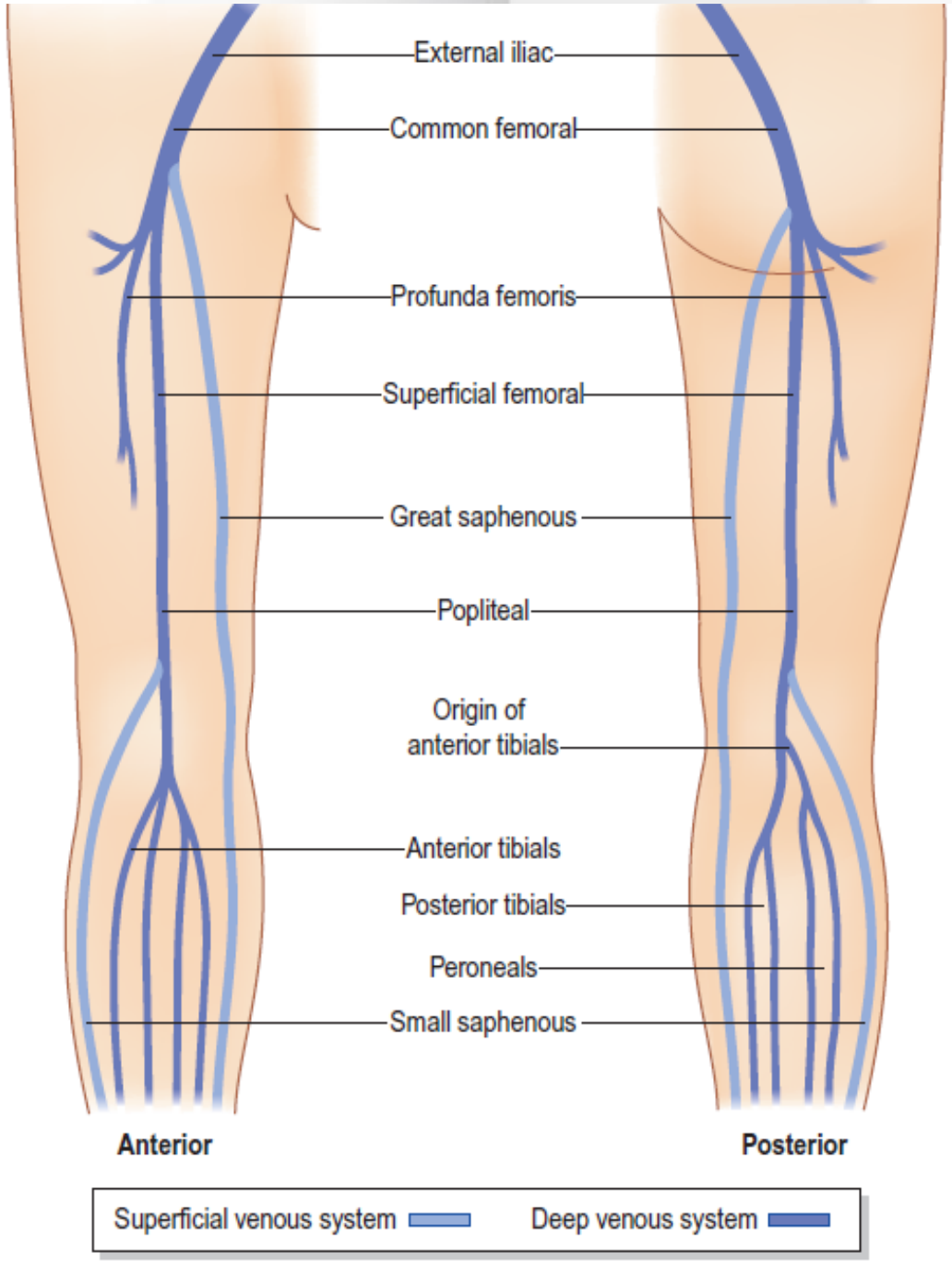
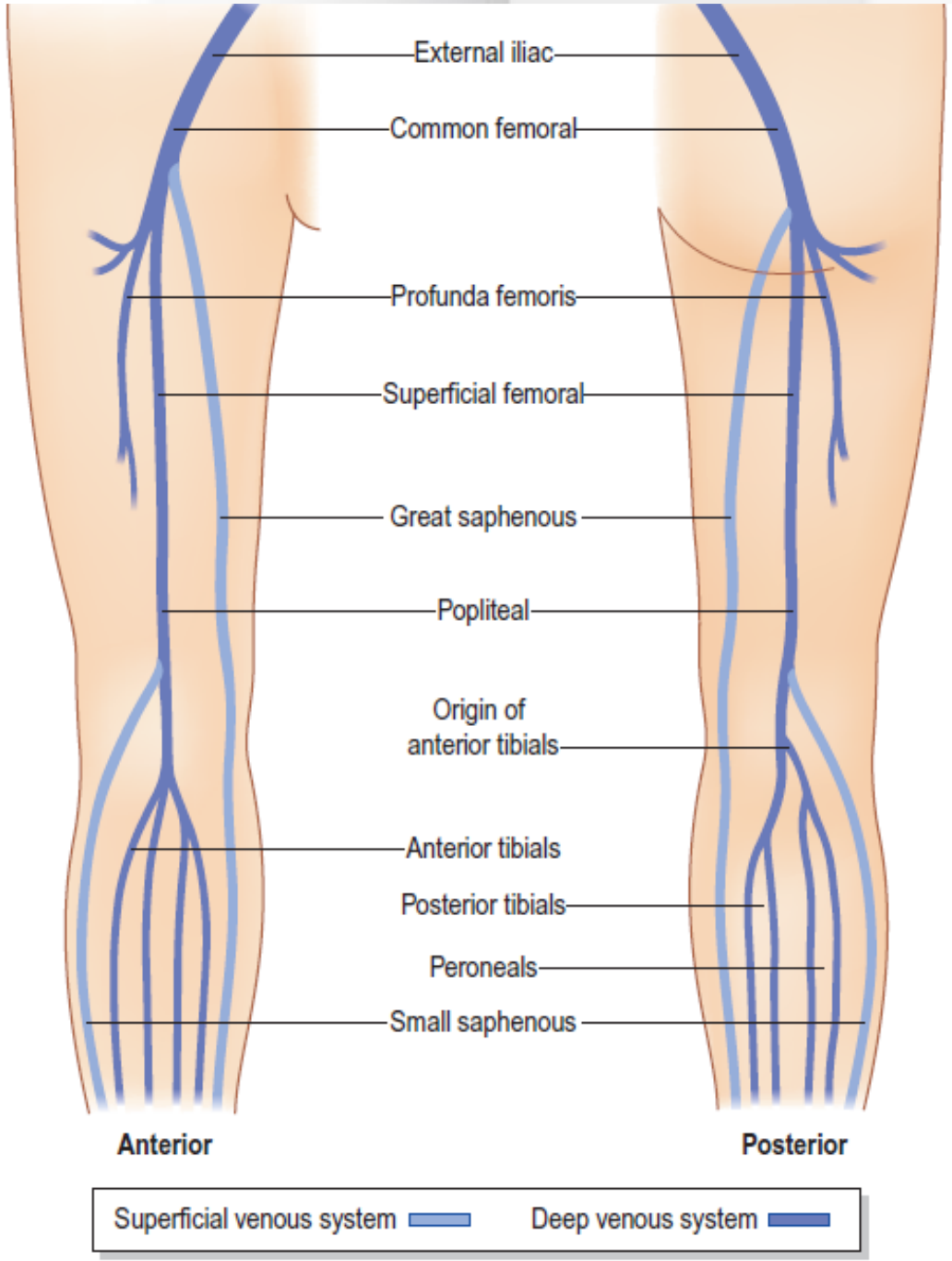
Background

- Venous valve failure → retrograde venous flow → raised distal venous pressure.
- Primary valve failure.
- Secondary incompetence → DVT with subsequent recanalisation.
  - Chronic outflow obstruction → increases resistance to venous flow
- Long-term incompetence, outflow obstruction or a combination of → swelling and ulceration characteristic of the post-phlebitic limb.
- The signs and symptoms : Clinical-Etiology-Anatomy- Pathophysiology (CEAP) classification.



Venous Anatomy

- Divided into the deep and superficial systems with small communicating veins between.
- Three paired calf veins below the knee, accompanied by a single artery
- Popliteal vein →, the femoral vein at the level of the adductor canal
- Femoral vein + profunda femoris vein → common femoral vein → iliac veins.
- Two sets of iliac veins → inferior vena cava (IVC).
- Duplicated - 20% of femoral veins and 35% of popliteal veins



Superficial system

- Great saphenous vein - the medial aspect of the calf and thigh → common femoral vein at the level of the inguinal ligament.
- Small saphenous system - runs along the posterolateral aspect of the calf to join the popliteal vein behind the knee.
- Connected by a series of small communicating veins,
  - more numerous below the knee than above;
  - prominent in the medial aspect of the lower leg

Colour duplex ultrasound examination

- Precise identification of the variable venous anatomy
- Colour Doppler imaging / spectral Doppler - evidence of venous reflux
  - exact site of venous reflux
    - deep or superficial veins
    - specific venous confluence
    - perforator veins
    - combination of these.
- Diagnostic & Less invasive varicose vein treatments.

Technique

Patient position

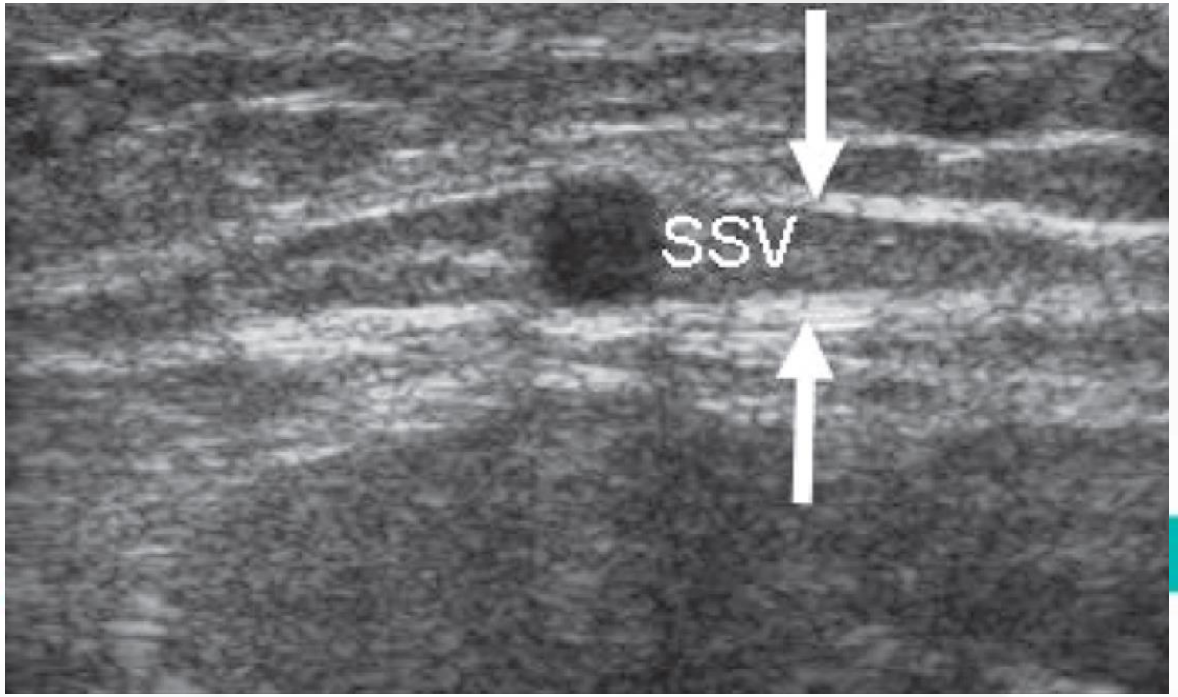
- Ideally – standing
  - To fill the leg veins and promote venous reflux in the presence of incompetent valves.
  - Put their weight on the contralateral limb & slightly bending the examined limb at the knee and keeping the foot and heel flat on the floor.
- A degree of head-up tilt can be applied for the bed-bound patient.
- Sit on the edge of a raised couch with their feet on the floor.

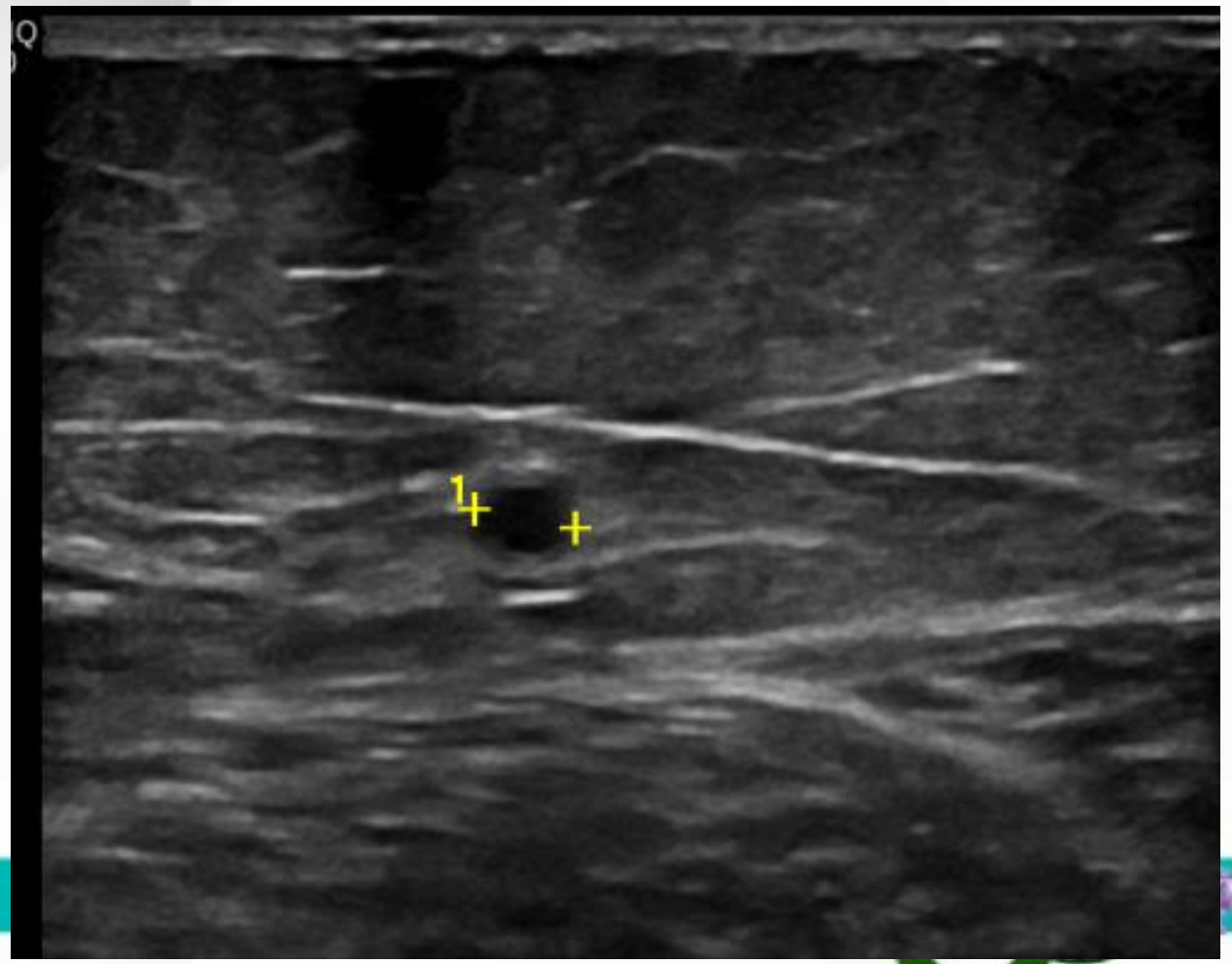
Equipment

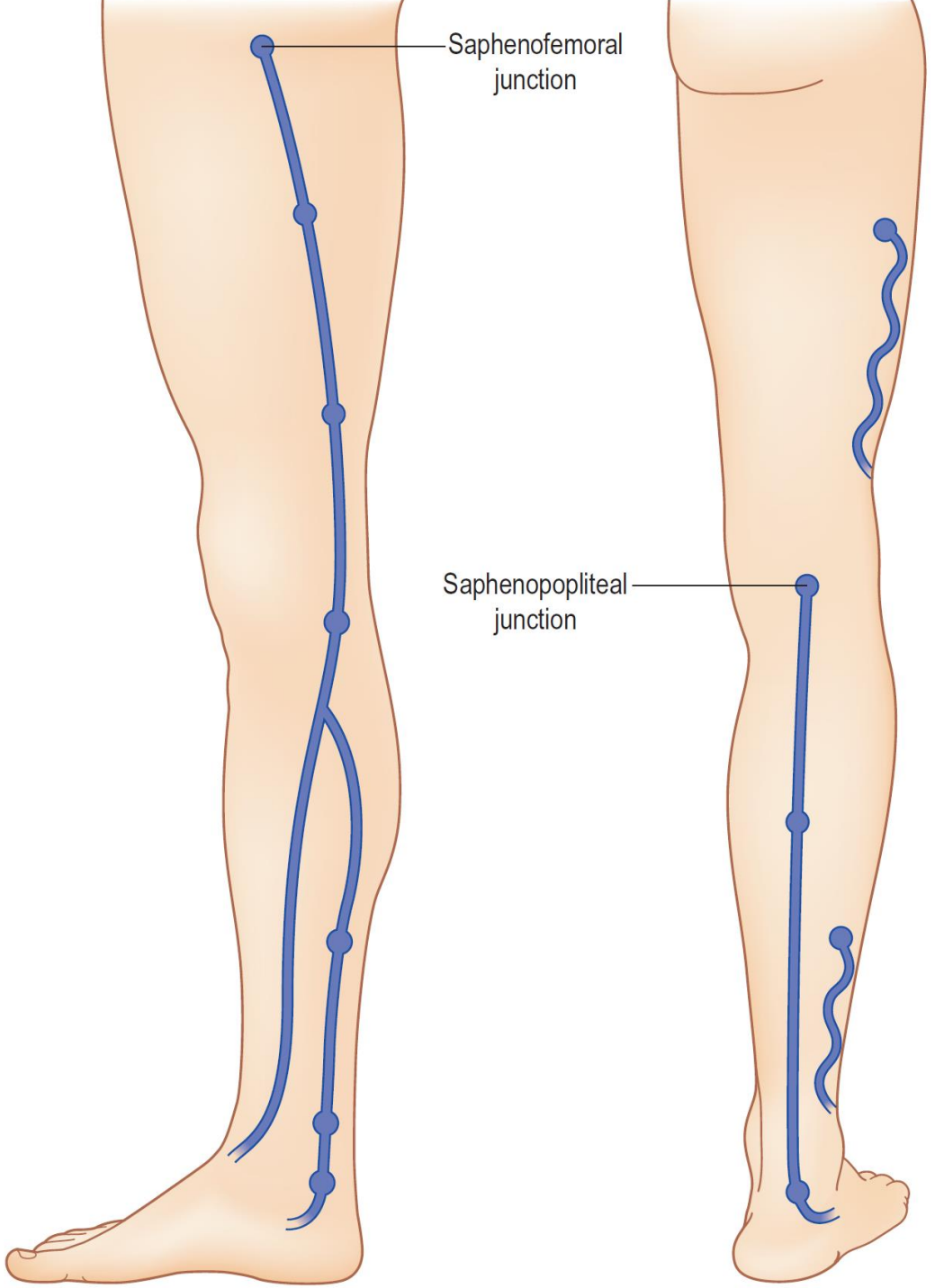
- Linear transducer - frequency of 5–9 MHz.
  - Superficial veins requires less penetration than for the deep veins and high sensitivity to low flow velocities.
- 2- to 5-MHz sector/curved array transducer for deeper field imaging
- Depends on the size of the patient / deep or superficial veins

Identification of anatomy

- The main trunks of GSV and SSV within a fascial envelope
- Egyptian eye





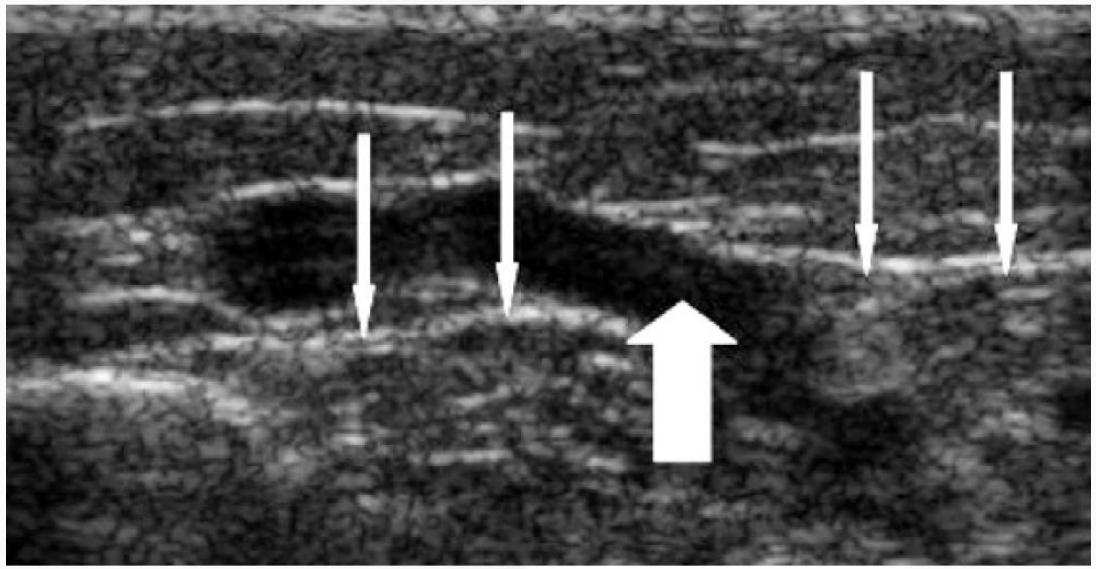


Anatomy

- Identification of SFJ, GSV along thigh and leg, SPJ and SSV
- Perforating veins
  - Along the course of the main saphenous trunks
  - Scanning transversely along the deep or superficial vein.

Identification of anatomy

- Tributaries, branches and perforators
  - Outside fascial sheath and
  - Superficial to the deep fascia.



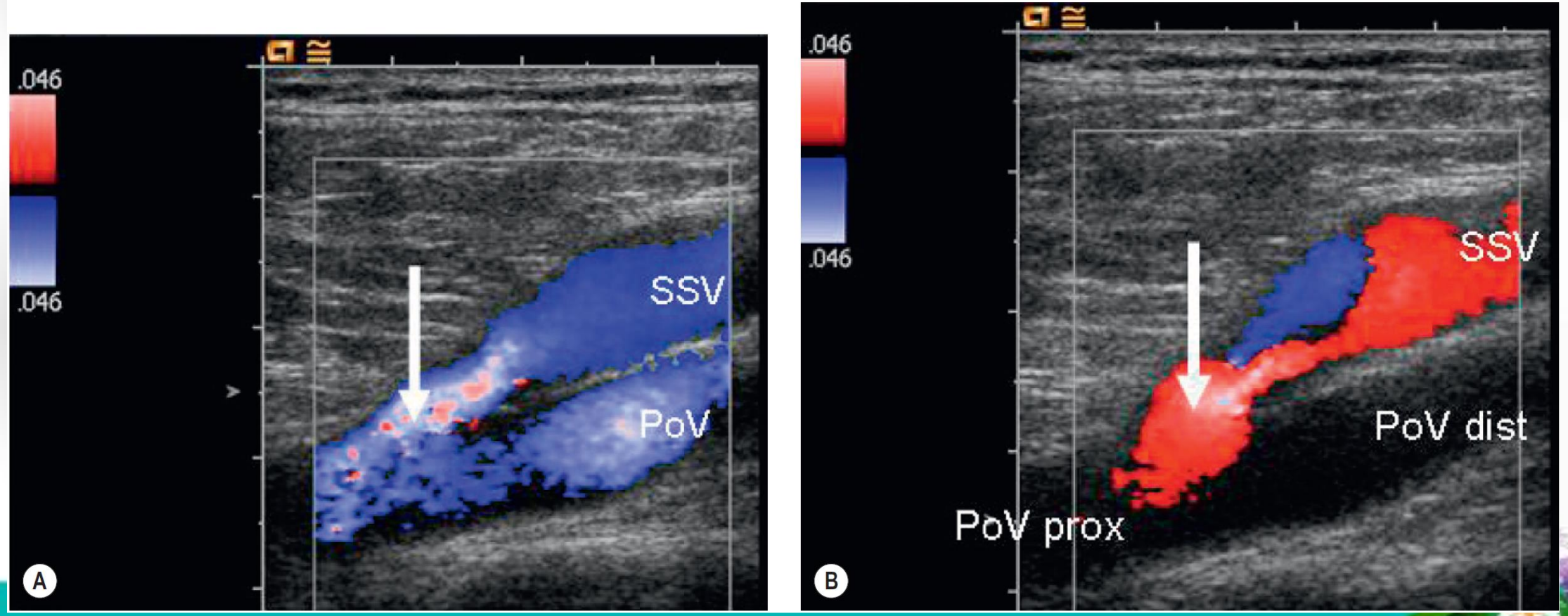
- The great saphenous vein
  - Duplicated with two veins within the saphenous sheath
  - Additional communications with accessory veins distally in the thigh or upper calf.
- Giacomini vein - Another communicating pathway between the great and small saphenous systems.

Quantifying venous reflux

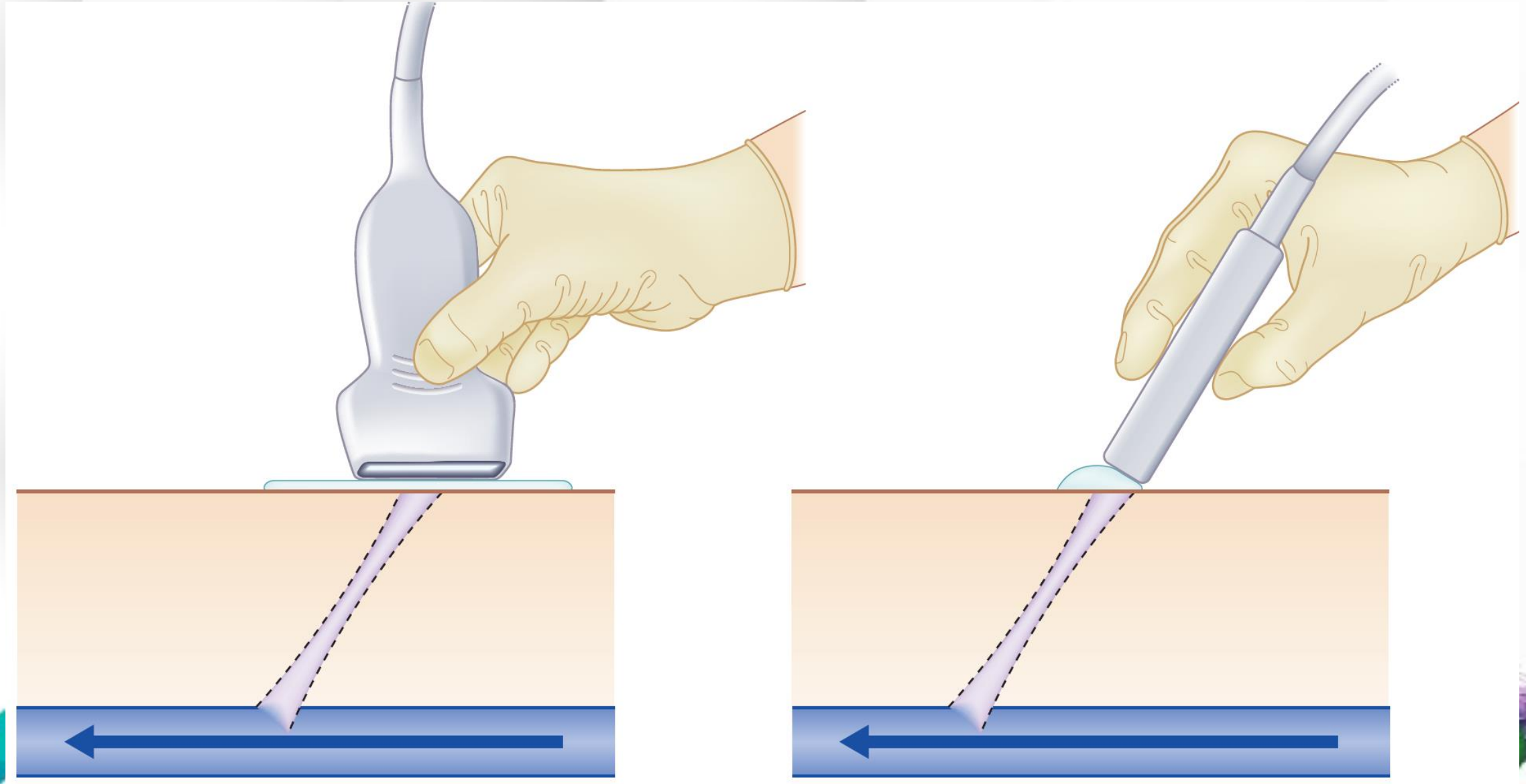
- Venous reflux - squeezing the calf muscle, slowly and firmly, and then rapidly releasing the grip.
- Emptying the compressed calf veins and creating a potential venous volume that can be filled on release of compression either normally from the more distal veins, or rapidly by retrograde flow if there are incompetent proximal valves.
- Compress the bulk of the muscle, not merely pinch the skin
- The thigh and foot can be similarly compressed.

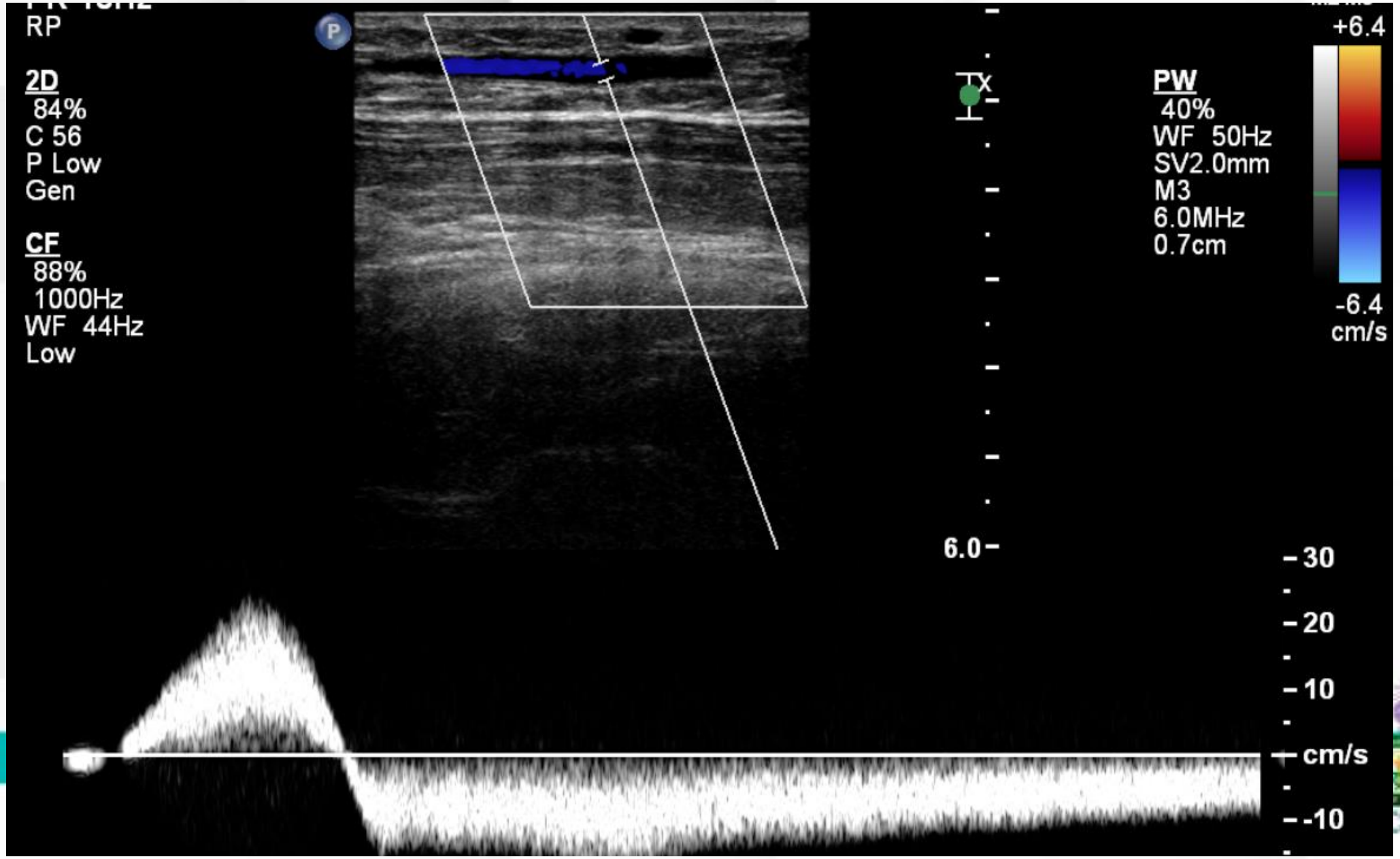

A

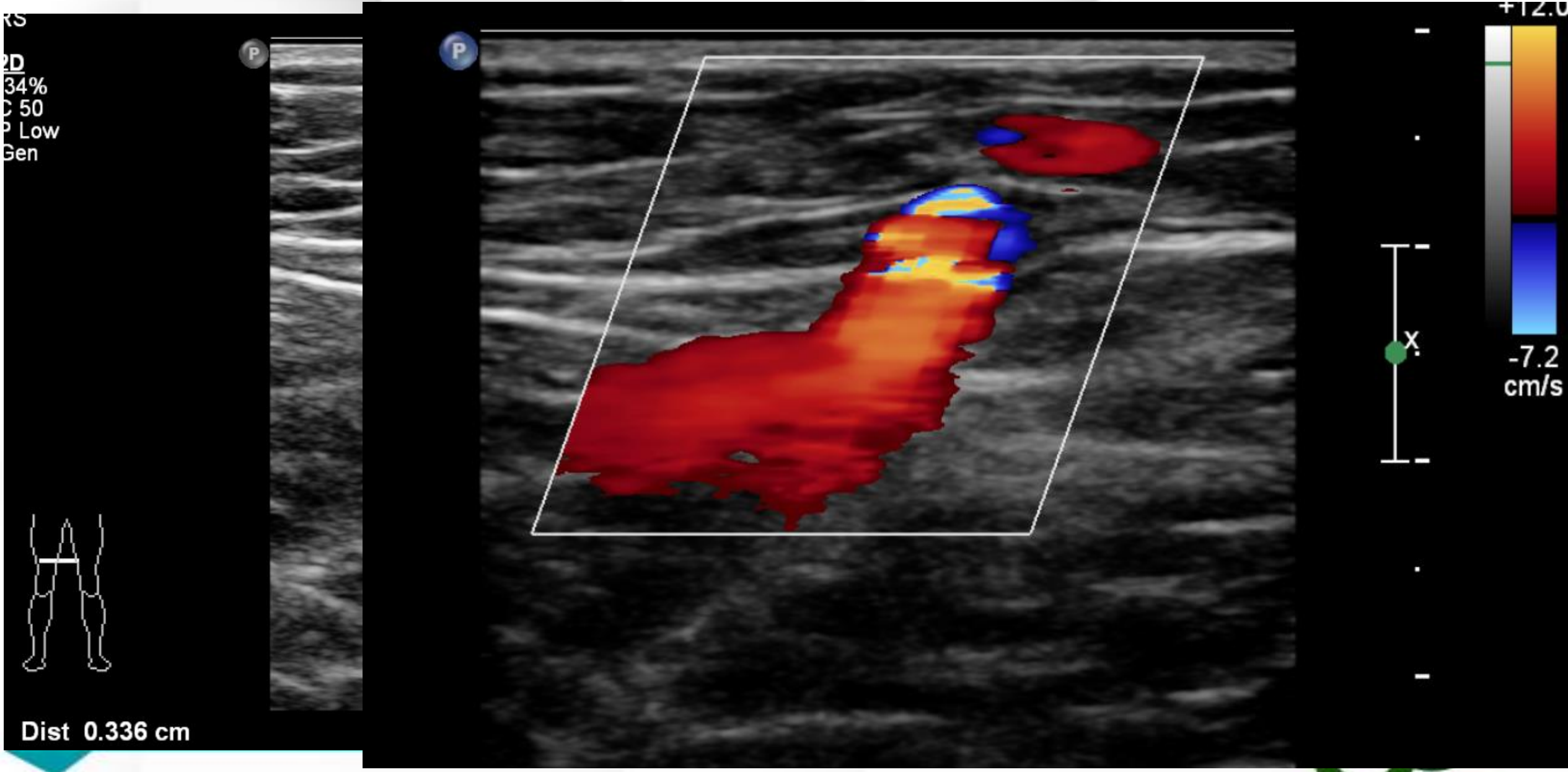

B


.046
.046
SSV
PoV
A
.046
.046
SSV
PoV dist
PoV prox
B

- The transverse plane - Distinguish between normal flow direction with no reflux and obvious reflux
- Longitudinal plane - Quantification of reflux - Spectral Doppler trace of the flow recorded should be taken
  - > 0.5 s in superficial vein
  - > 1.0 s in deep vein
- Dependent upon a number of factors including venous pressure and tone.
- Colour and spectral Doppler are velocimetric and not volume flow measurements



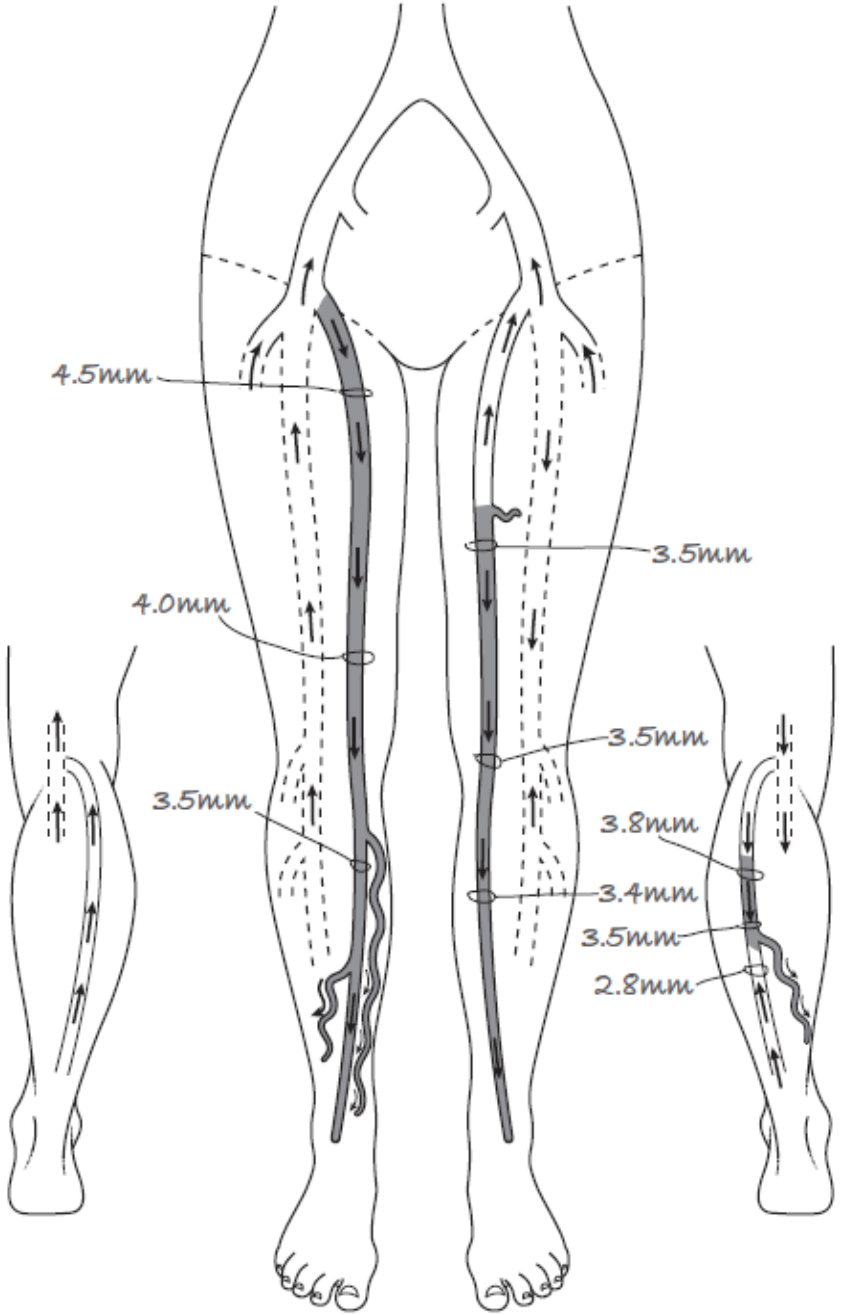

RP
2D
84%
C 56
P Low
Gen
CF
88%
1000Hz
WF 44Hz
Low
PW
40%
WF 50Hz
SV2.0mm
M3
6.0MHz
0.7cm
+6.4
-6.4
cm/s
6.0
30
20
10
cm/s
-10


RS
2D
34%
C 50
P Low
Gen
Dist 0.336 cm
+12.0
-7.2
cm/s

Sources of superficial reflux

- Identifying the ultimate source of reflux → Successful treatment
  - Saphenofemoral junction incompetence to the great saphenous vein
  - Saphenopopliteal incompetence to the small saphenous vein.
    - Level above the knee crease
    - Orientation (deep, superficial, lateral or medial insertion)
  - Multiple sources of reflux, from the saphenous vein junctions and/ or from perforating veins.
  - Unlikely source
    - Subcutaneous collaterals between the great and small saphenous systems
    - Giacomini vein.

Duplex ultrasound: Lower limb Venous Assessment



Summary

CFV	P+C	CFV	P+C
CFJ	P+INC	CFJ	P+C
LSV	P+INC	LSV	P+INC
PFV	P+C	PFV	P+C
SFV	P+C	SFV	P+INC
POP	P+C	POP	P+INC
SPJ	P+C	SPJ	P+INC
SSV	P+C	SSV	P+INC

P = Patient
C = Competent = ↑
INC = Incompetent = ↓
COMP = Compressible
T = Thrombus
⊙ = Incompetent Perforators >3mm

Comments

Right

Significant S-F junction, LSV and tributary incompetence

Left

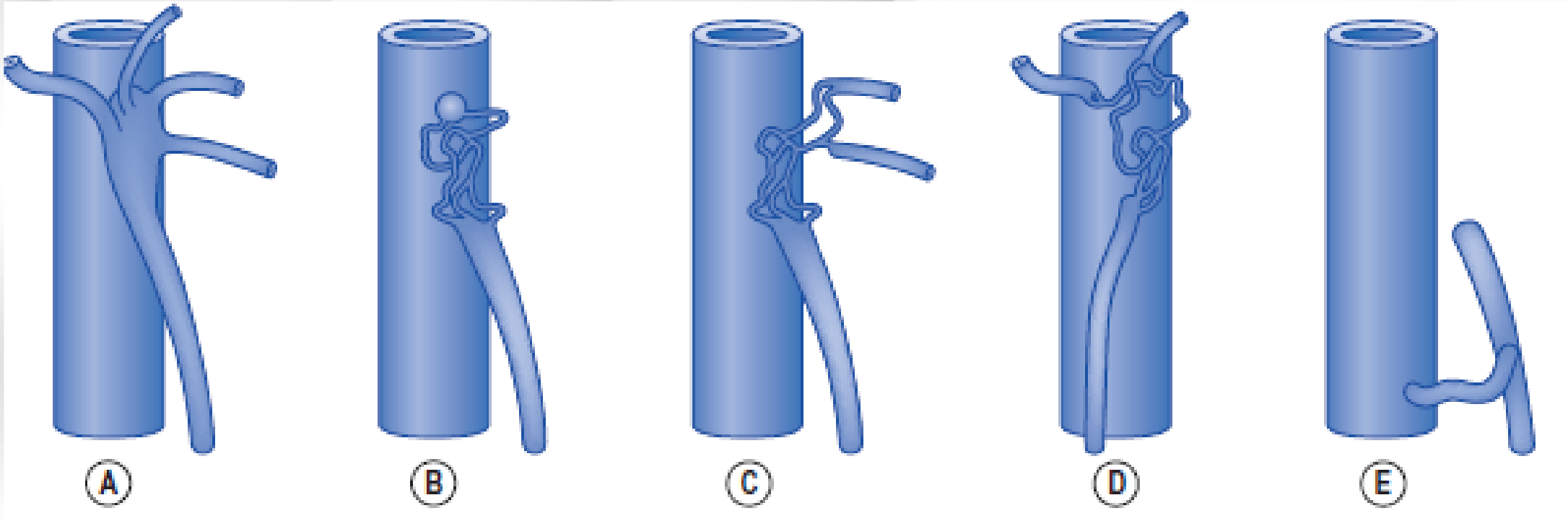
Incompetent mid thigh perforator
LSV incompetent as illustrated
signficant S-P junction, SSV and tributary incompetence
SFV and proximal POP significantly incompetent

Signature:

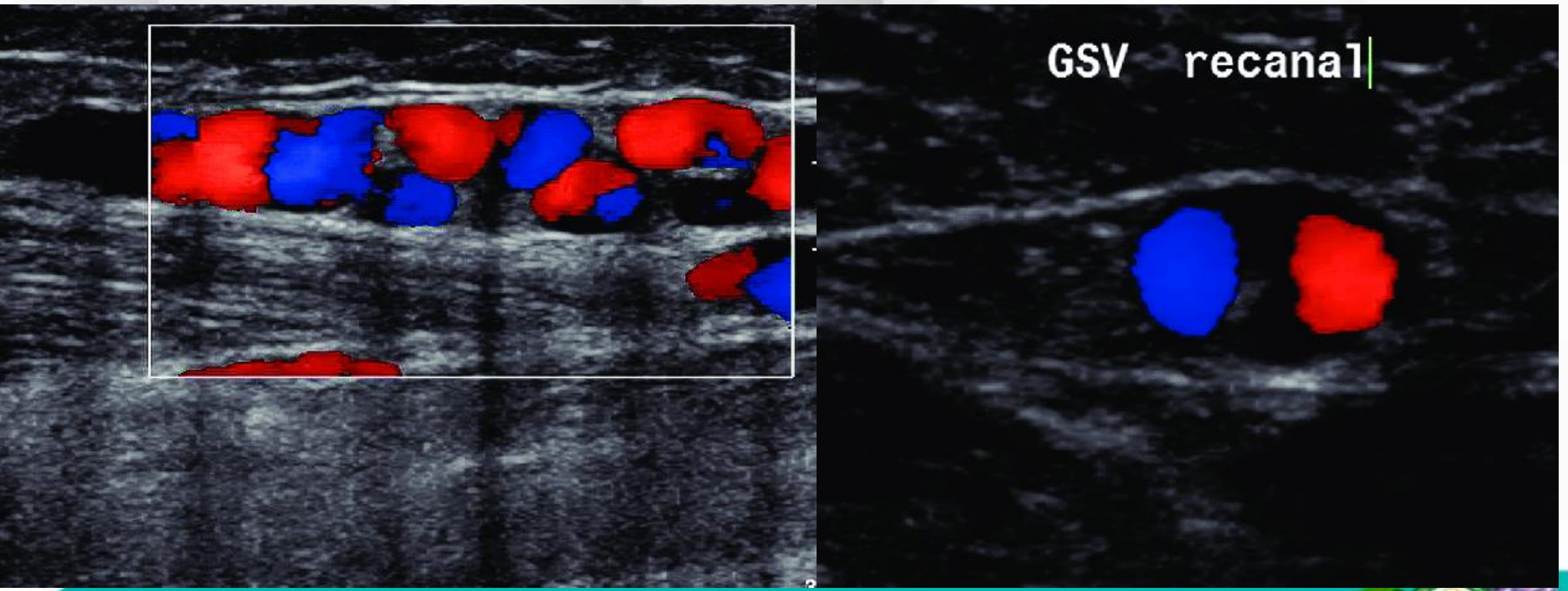
Please print name and designation

Date:

Common sources of recurrent saphenofemoral incompetence



A: Intact junction after failed surgery. B: Neovascularisation from the site of the junction to GSV remnant or accessory vein. C: Pudendal or medial tributary. D: Superficial abdominal veins. E: Medial thigh perforating vein.


GSV recanal

Summary

- The signs and symptoms of venous incompetence are due to valve failure, which permits retrograde flow known as venous reflux.
- Duplex ultrasound is the standard test for venous incompetence and is used to locate the exact site of reflux.
- Preferably be investigated standing
- The examination is best performed in the transverse scan with colour flow used to identify venous reflux.
- Reflux is best produced by manual muscle compression followed by its rapid release.
- Reflux : > 0.5 s in superficial vein > 1.0 s in deep vein

Thank You

ณ ห้องประชุม โรงแรมเชียงใหม่แกรนด์วิว โฮเต็ล แอนด์ คอนเว็นชั่น เซ็นเตอร์

วันที่ 1 กุมภาพันธ์ 2563

Period	Topic	Speaker
8.40-8.50	พิธีเปิด-กล่าวต้อนรับ โดยประธานราชวิทยาลัยศัลยแพทย์แห่งประเทศไทย	ผศ.นพ.ไพศิษฎ์ ศิริวิทยากร
8.50-9.10	Keynote Lecture: hemorrhoidal disease: what you should know?	
Session 1		
9.10-9.22	Anatomy and venous physiology	ผศ.นพ.สารนาถ ออรพินท์
9.22-9.34	Prevalence and problem of venous disease in Thailand	อ.พญ.จิณตสุภางค์ หวังทรัพย์ทวี
9.34-9.46	Pathophysiology of varicose veins	รศ.นพ.บุญยิ่ง ศิริบำรุงวงศ์
9.46-9.58	Clinical feature/Patient assessment / CEAP	รศ.นพ.บุญยิ่ง ศิริบำรุงวงศ์
9.58-10.10	Duplex scanning and venous mapping	อ.นพ.ธเนศ ขัตติพัฒนาพงษ์
10.10-10.25	Question/open discussion	
10.25-10.55	Break	
Session 2		
10.55-11.07	Microsclerotherapy for C1	Dr. Claudine Hamel-Desnos
11.07-11.19	Ultrasound guided foam sclerotherapy truncal disease	Dr. Claudine Hamel-Desnos
11.19-11.31	Ultrasound-guided foam sclerotherapy for beautiful legs and sclerotherapy complications	รศ.พญ.ศิริญญา ศิลาพันธ์
11.31-11.43	High ligation and venous stripping	ศ.นพ.ประมุข มุทิรางกูร
11.43-12.00	Question/open discussion	
12.00-13.00	Lunch	
Session 3		
13.00-13.12	Endovenous thermal ablation	ศ.นพ.กิตติพันธุ์ ฤกษ์เกษม
13.12-13.24	Non-thermal non-tumescent ablation by glue	ศ.นพ.กิตติพันธุ์ ฤกษ์เกษม
13.24-13.36	Machanico-chemical ablation: How I do it?	นพ.วิสูตร วงษ์กล้าหาญ
13.36-13.48	Ambulatory phlebectomy	รศ.พญ.ศิริญญา ศิลาพันธ์
13.48-14.00	Pharmacologic therapy	ผศ.นพ.ศุภพงษ์ อาวรณ์
14.00-14.15	Question/open discussion	
14.15-14.45	Break	
Session 4		