2023 MID-ATLANTIC CONFERENCE

11th ANNUAL CURRENT CONCEPTS IN

VASCULAR THERAPIES

2023

Hilton Virginia Beach Oceanfront
Virginia Beach, Virginia

APRIL 20-22

CEAP

Comprehensive Venous Classification

“The Disney Villain Classification”

Priyam K. Vyas, MD

Sentara Vascular Specialist

EVMS Assistant Professor of Surgery

SENTARA®

Overview

- Incidence
- Risk Factors
- Clinical Manifestations
- Pathophysiology
- Classification
- Diagnostic Options

Incidence

- Varicose Veins affects >25m Adults
- Advanced Venous disease >6m

- National Venous Screening Program
  - Varicose Veins >30% pts
  - Advanced Venous Disease >10%

Risk Factors

- Advancing Age
- Family History
- Ligamentous Laxity
- Prolonged standing
- Increased BMI
- Prior VTE (PTS)
- Hereditary Cond.
- High Estrogen state
- Pregnancy
- Obesity

Overview

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Disney Villains

Common Manifestations of CVD

- Telangiectasia
- Reticular Veins
- Varicose Veins
- Leg edema
- Skin Changes
- Skin Ulceration

Common Manifestations of CVD

Telangiectasia

Reticular Veins

Common Manifestations of CVD

Varicose Veins

Skin Changes

Common Manifestations of CVD

Dermatoliposclerosis

Venous Ulcers

Bilateral lower-limb lymphedema. Note involvement of the dorsal aspect of the feet.

- Males and females affected
- Due to failure of lymphatics
- Positive family history in 10%
- No increased bruising
- Brawny skin texture
- Involvement of feet

Lipedema of the lower limbs. Note the 'inverse shouldering' effect above the ankles due to sparing of the feet.

- Exclusively females affected
- Due to abnormal fat deposition
- Positive family history in 20–40%
- Easy bruising
- Normal skin consistency
- Sparing of feet

Overview

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- **Pathophysiology**
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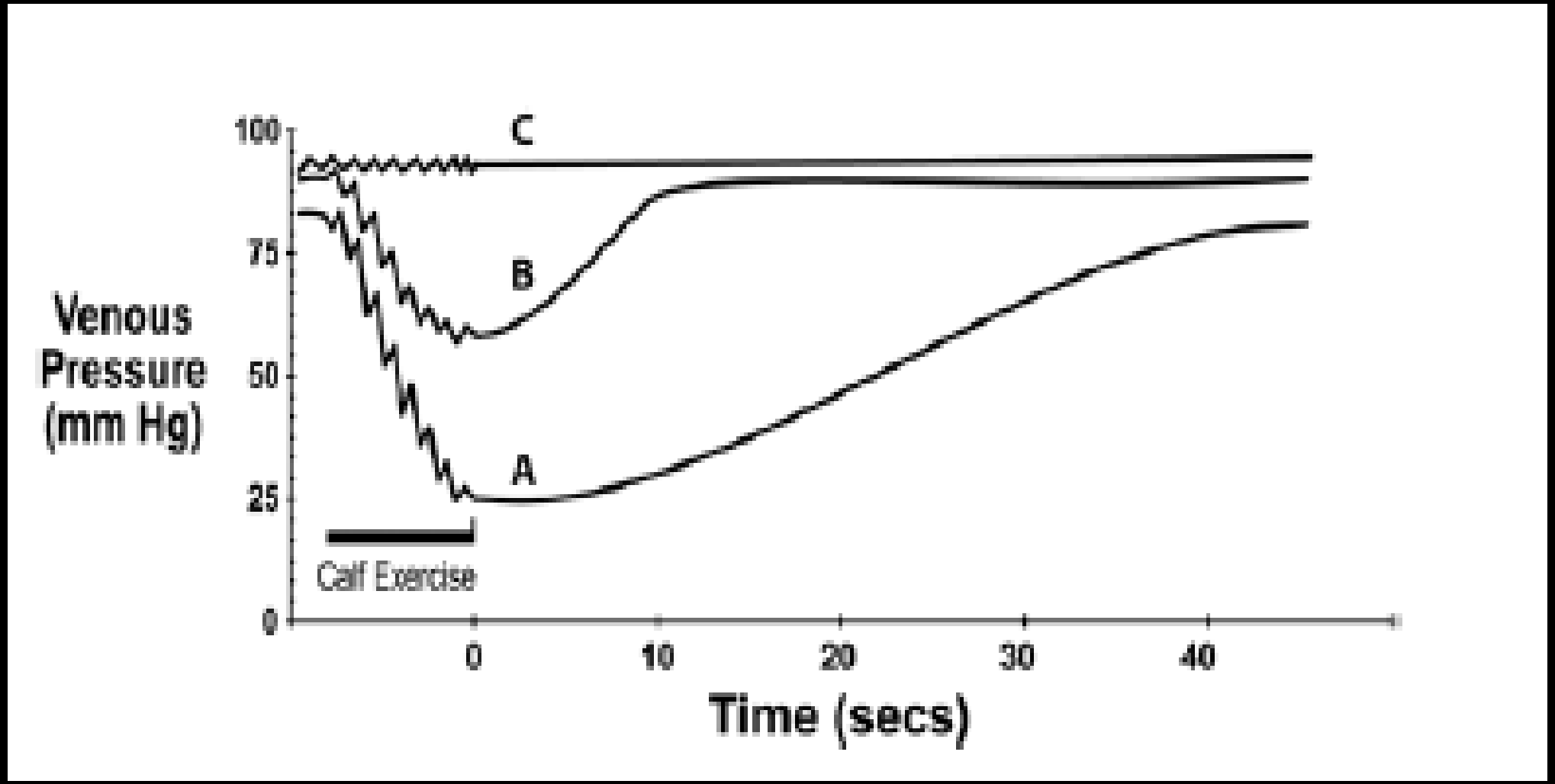
CVI Pathophysiology

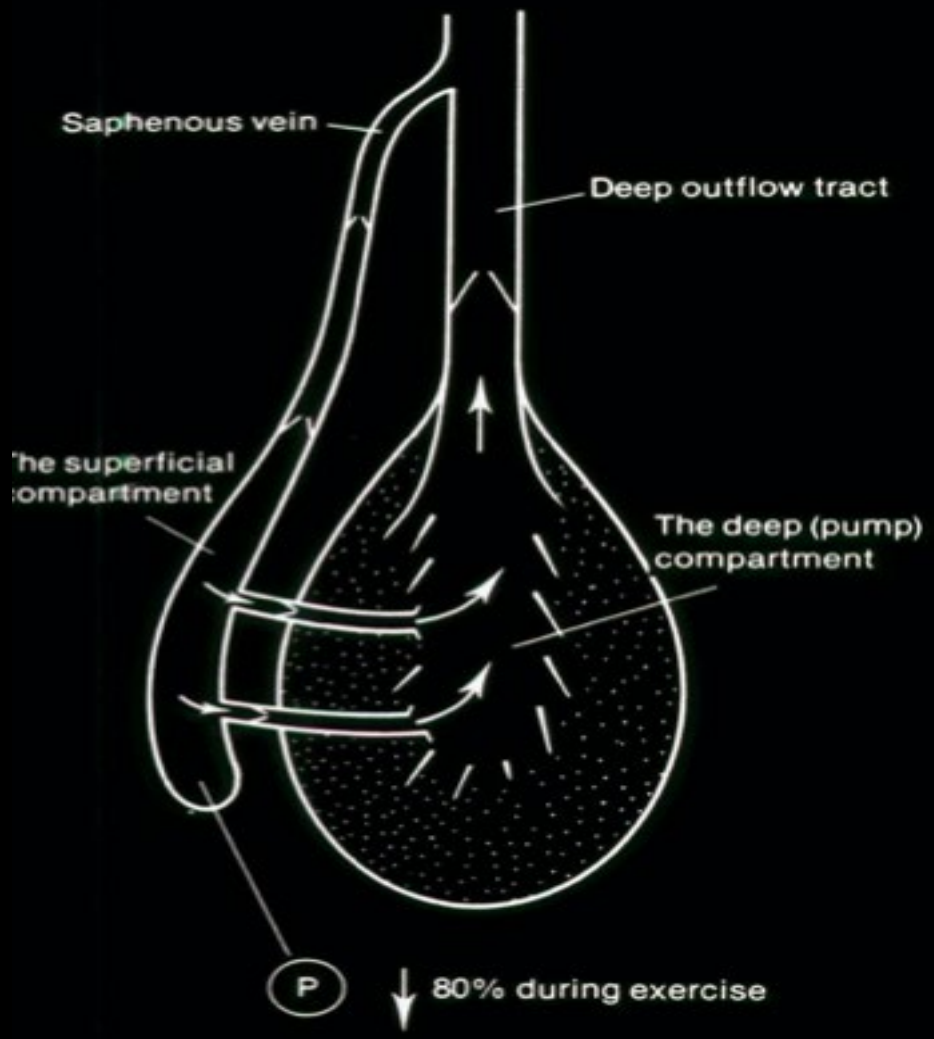
- Inadequate muscle pump function
- Incompetent venous valves (reflux)
- Venous thrombosis
- Non-thrombotic venous obstruction
- ↑ Venous hypertension
- Sequence of anatomic, physiologic, and histologic changes
- Vein dilation, ulceration, etc

Pathophysiology

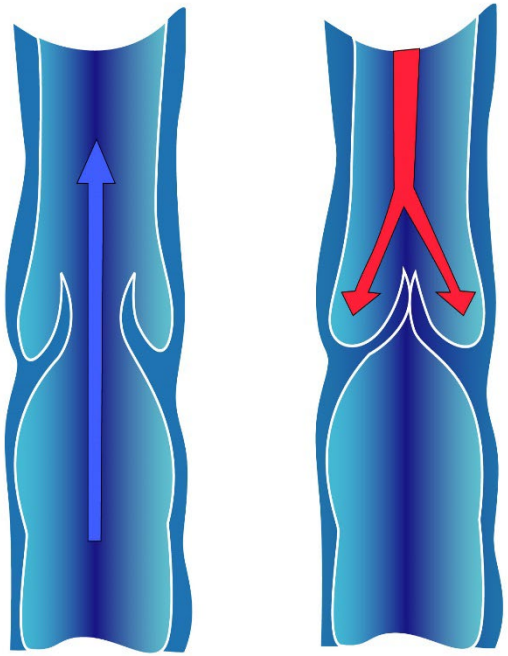


Pathophysiology

- Dysfunction/incompetence of the valves in the superficial venous system
- Retrograde flow of blood “reflux”
- Serves to increase hydrostatic pressures
- Valve failure
  - weakness vessel wall or valve leaflets
  - direct injury, superficial phlebitis, or excessive venous distention resulting from hormonal effects or high pressure



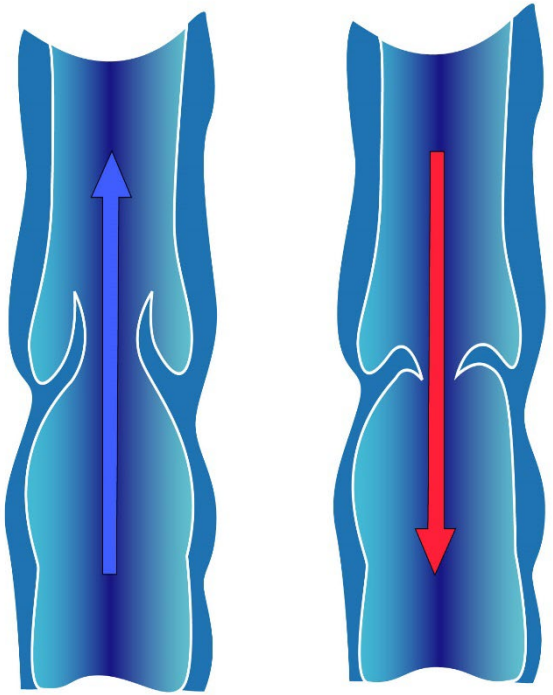
Normal One-Way Vein Valves



Blood flowing to heart

Healthy valve prevents reverse blood flow

Varicose Vein Valves

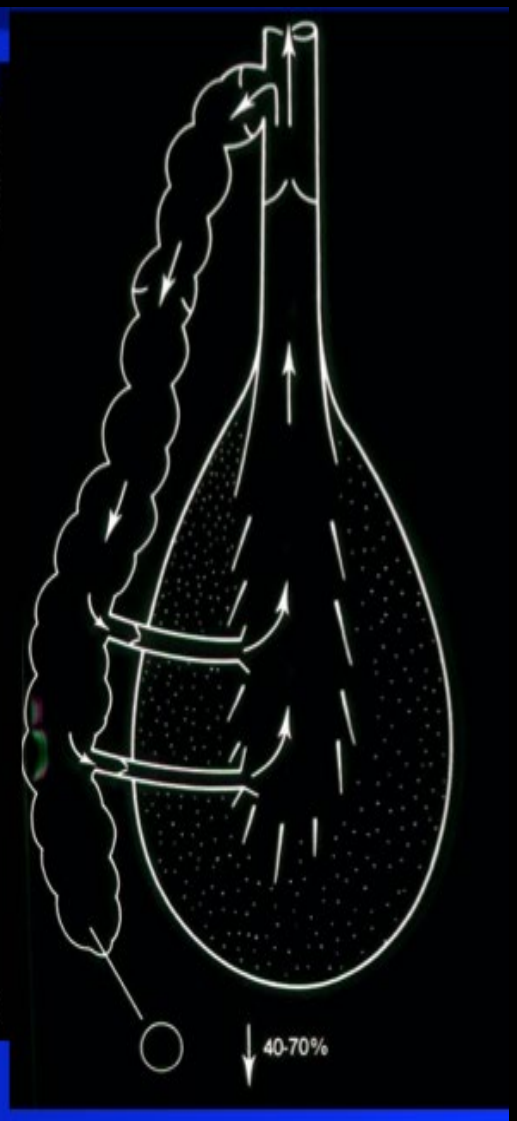


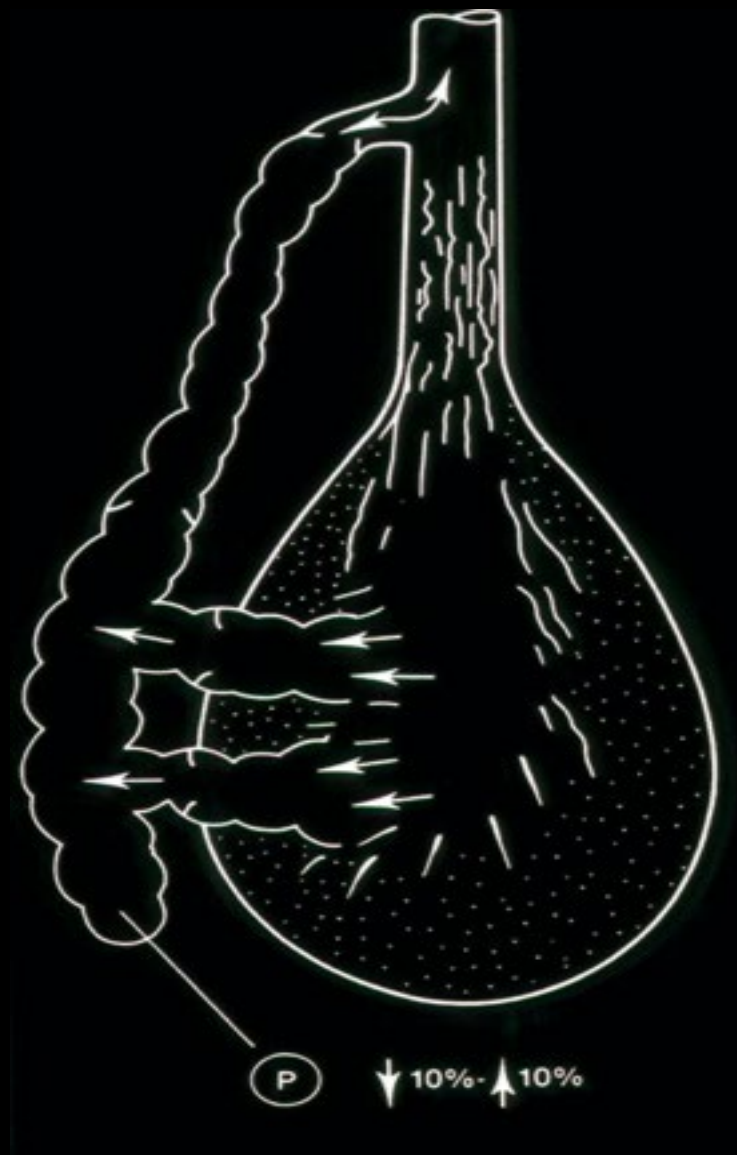
Blood flowing to heart

Reverse blood flow due to damaged valve

CVI


WILLIAM BEAUMONT HOSPITAL
IM#14
5cm 9739L
MEK VEIN
FROZEN
21G
66DR
GE
L GSV
cm/s
+7.7
REFLUX
-7.7
-15
-23
2000P
19F
12DG
4SW
0°
25SD
TIS<0.4 MI=0.5 AO=69%


40-70%

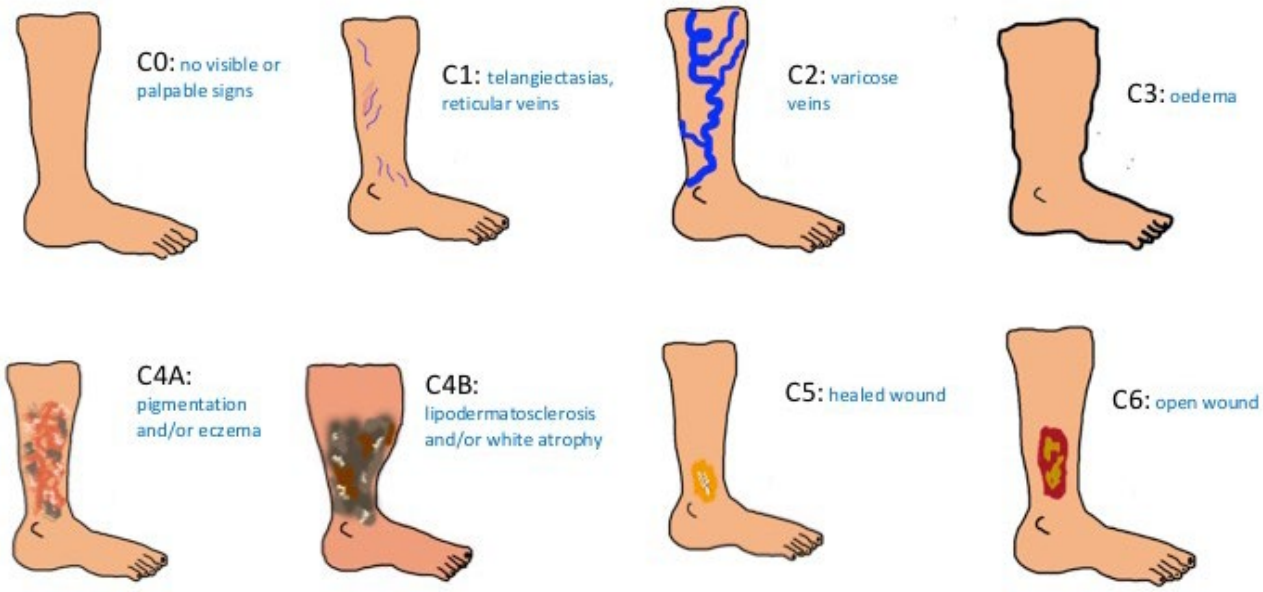

P
10%-
10%

Overview

- Incidence
- Risk Factors
- Clinical Manifestations
- Pathophysiology
- **Classification**
- Diagnostic Options

Classification

Clinical Classification (C)		Etiologic Classification (E)	
C_0	No visible/palpable signs of venous disease	E_c	Congenital
C_1	Telangiectasias or reticular veins	E_p	Primary
C_2	Varicose veins	E_s	Secondary (postthrombotic)
C_3	Edema		
C_{4a}	Pigmentation and/or eczema		
C_{4b}	Lipodermatosclerosis and/or atrophy		
C_5	Healed venous ulcer		
C_6	Open venous ulcer		
	Subscript		
A	Asymptomatic		
S	Symptomatic		
		P_n	No venous pathophysiology identifiable



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Source: Adapted from the 2011 Clinical Guidelines of the Society for Vascular Surgery and American Venous Forum (J Vasc Surg. 2011;53:2S-48S)

Congenital Disorders

Overview

- Incidence
- Risk Factors
- Clinical Manifestations
- Pathophysiology
- Classification
- **Diagnostic Options**

Diagnosis

- Venous Duplex Imaging
- Air Plethysmography
- Photoplethysmography (PPG)
- CT or MR Venography
- Contrast Venogram
- Ambulatory Venous Pressures
- Intravascular U/S

Venous Duplex Imaging

- B mode Imaging
- Pulsed or Color Doppler
- Real Time Maneuvers
- Local Valve Function
- Anatomy

Reflux

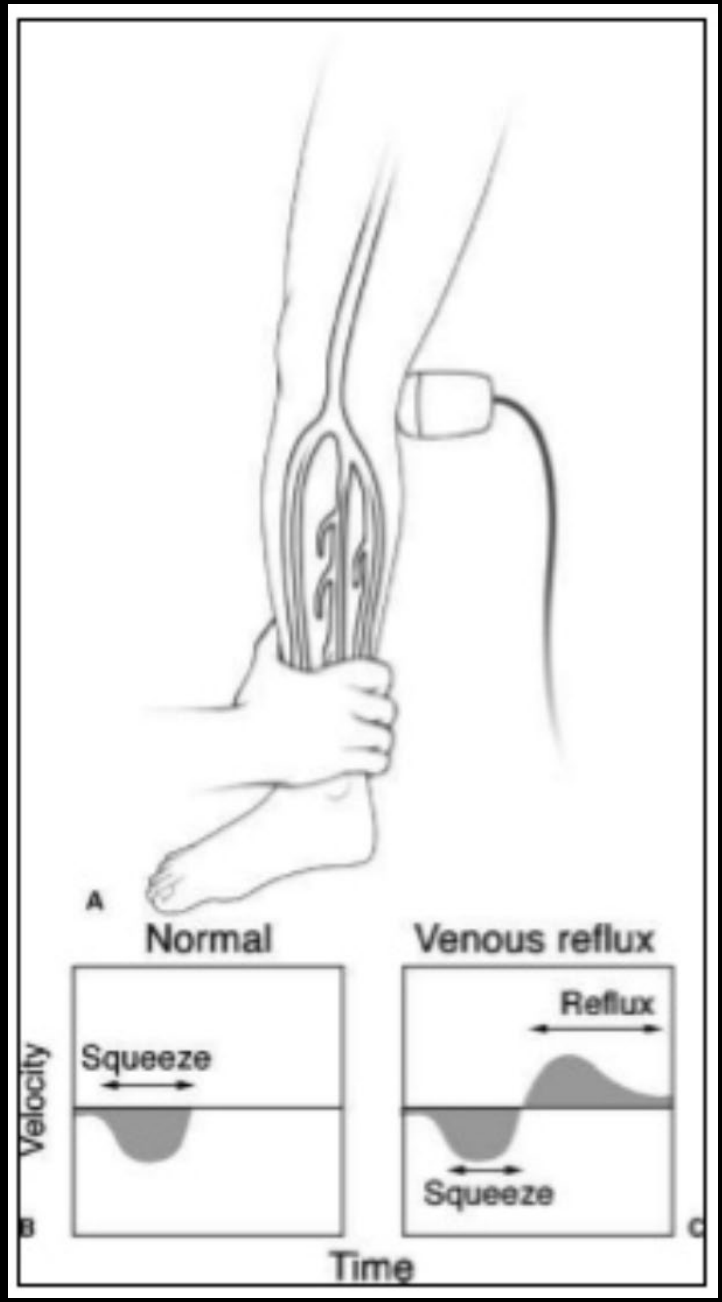
- Determined by the direction of flow
- Any significant flow toward the feet is suggestive of reflux
- Reflux Time: Duration of Reflux
  - >0.5 seconds for superficial veins
  - >1.0 second for deep veins
  - CCF LAB >2sec
  - Perforator incompetence: >3.5, Reflux, ulcer

Doppler U/S Method

- Venous Anatomy (Axial/Superficial)
- Thrombus (occlusion)
- Venous Reflux (Incompetence)
- Perforator Incompetence
- Venous-venous shunts (open vs closed)

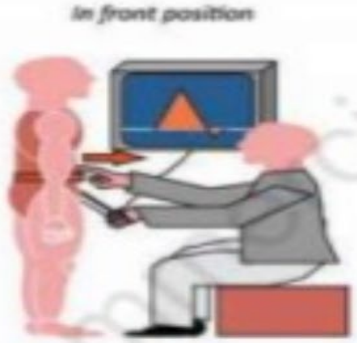
Maneuvers

- Valsalva
- Squeeze
- Dorsal Flexions
- Parana

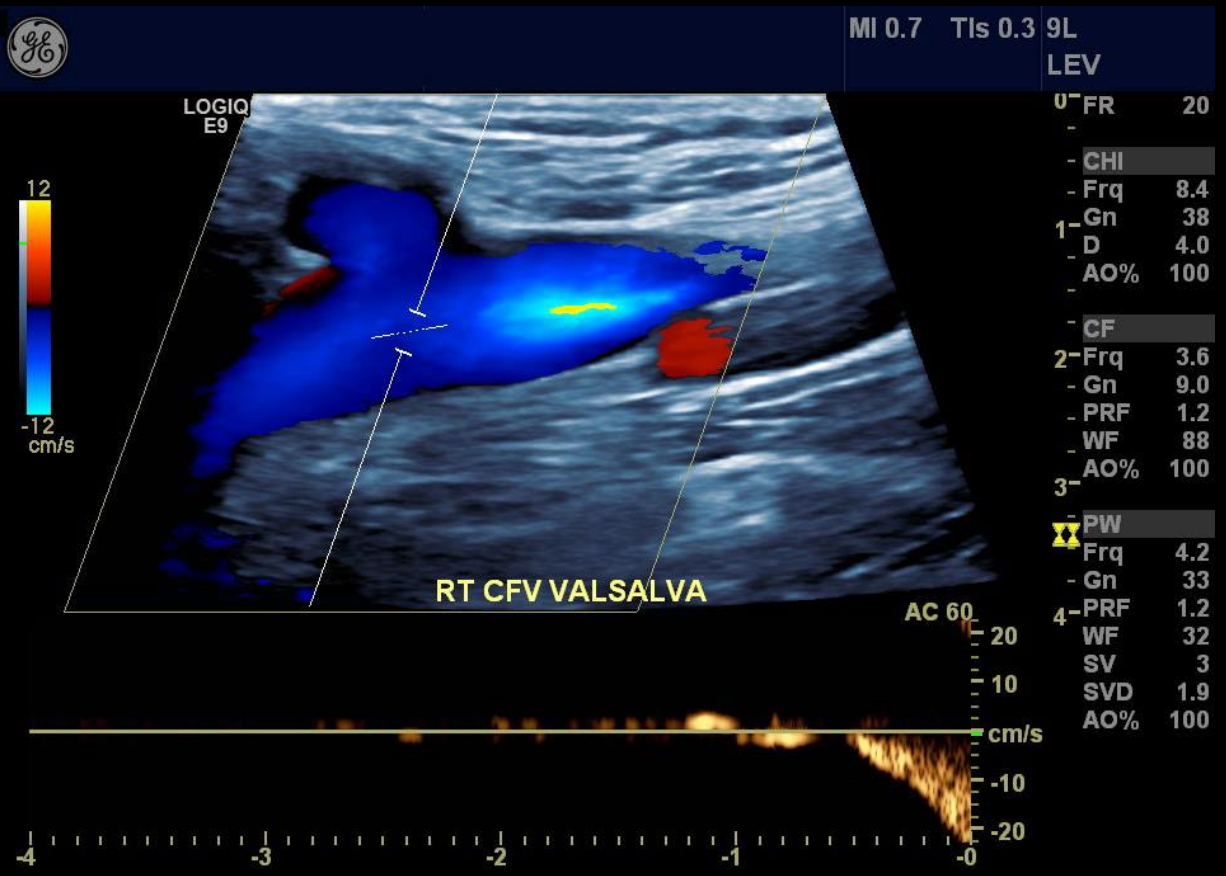


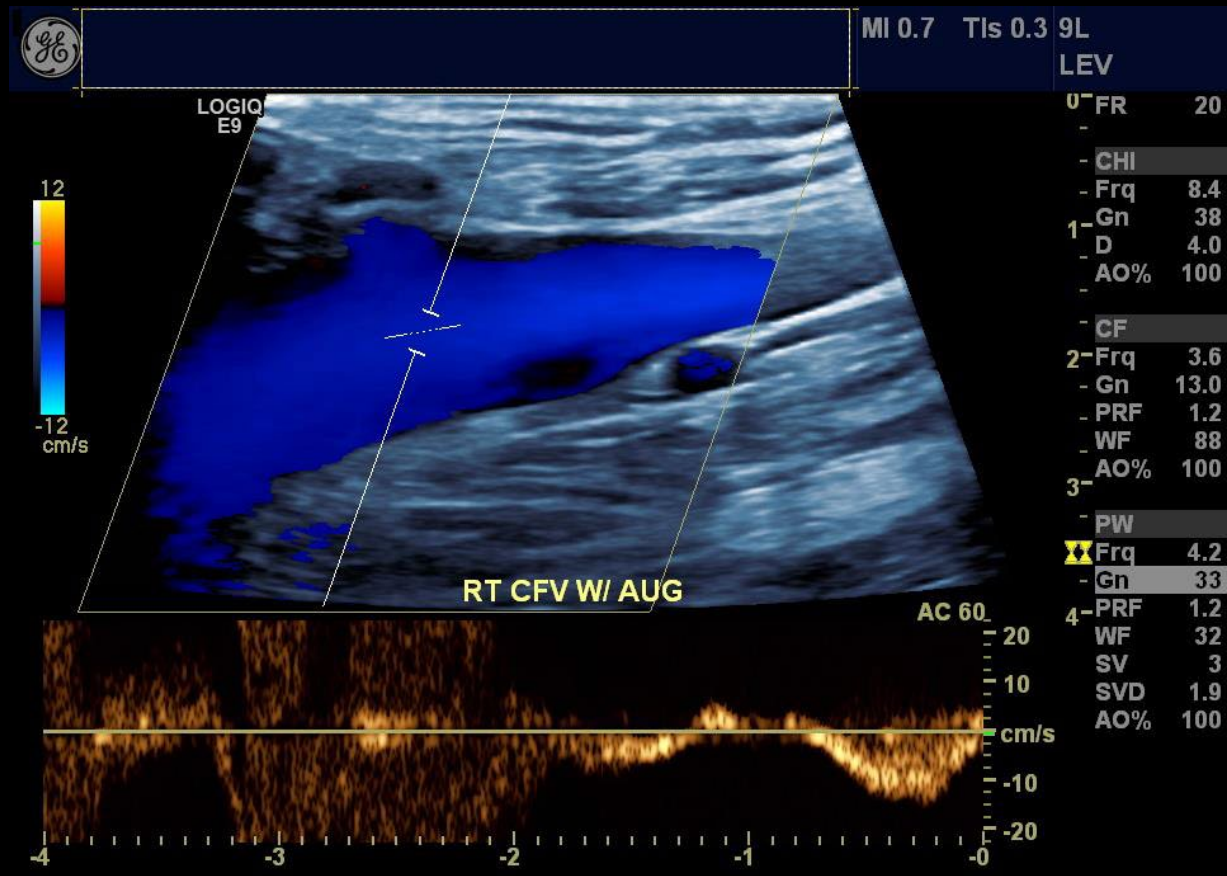
Parana Maneuver

A slight push to the waist line triggers an isométric contraction of the leg muscles, by a proprioceptive reflex, inducing deep vein compression

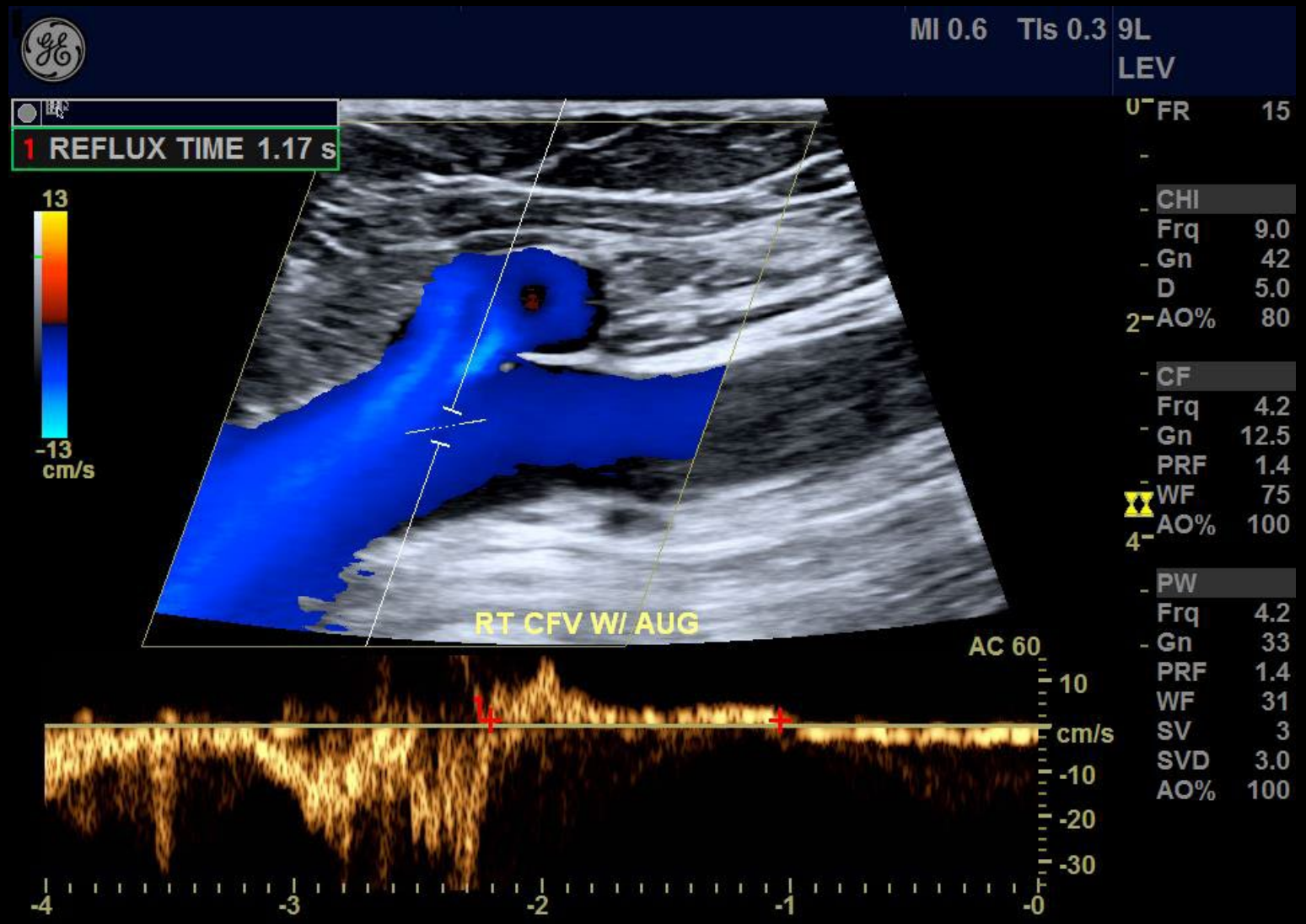


Normal Deep Vein

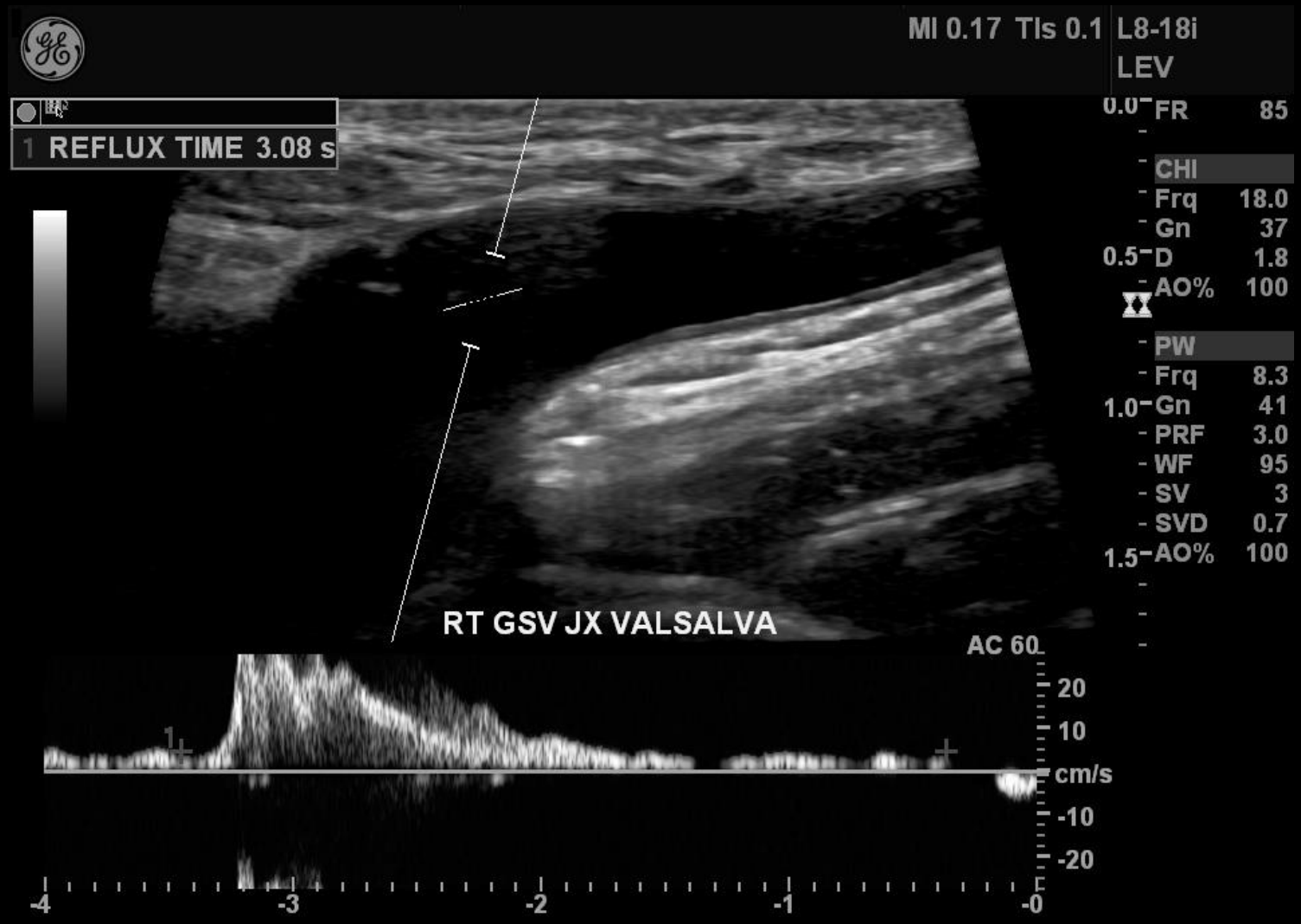




Deep Vein Reflux

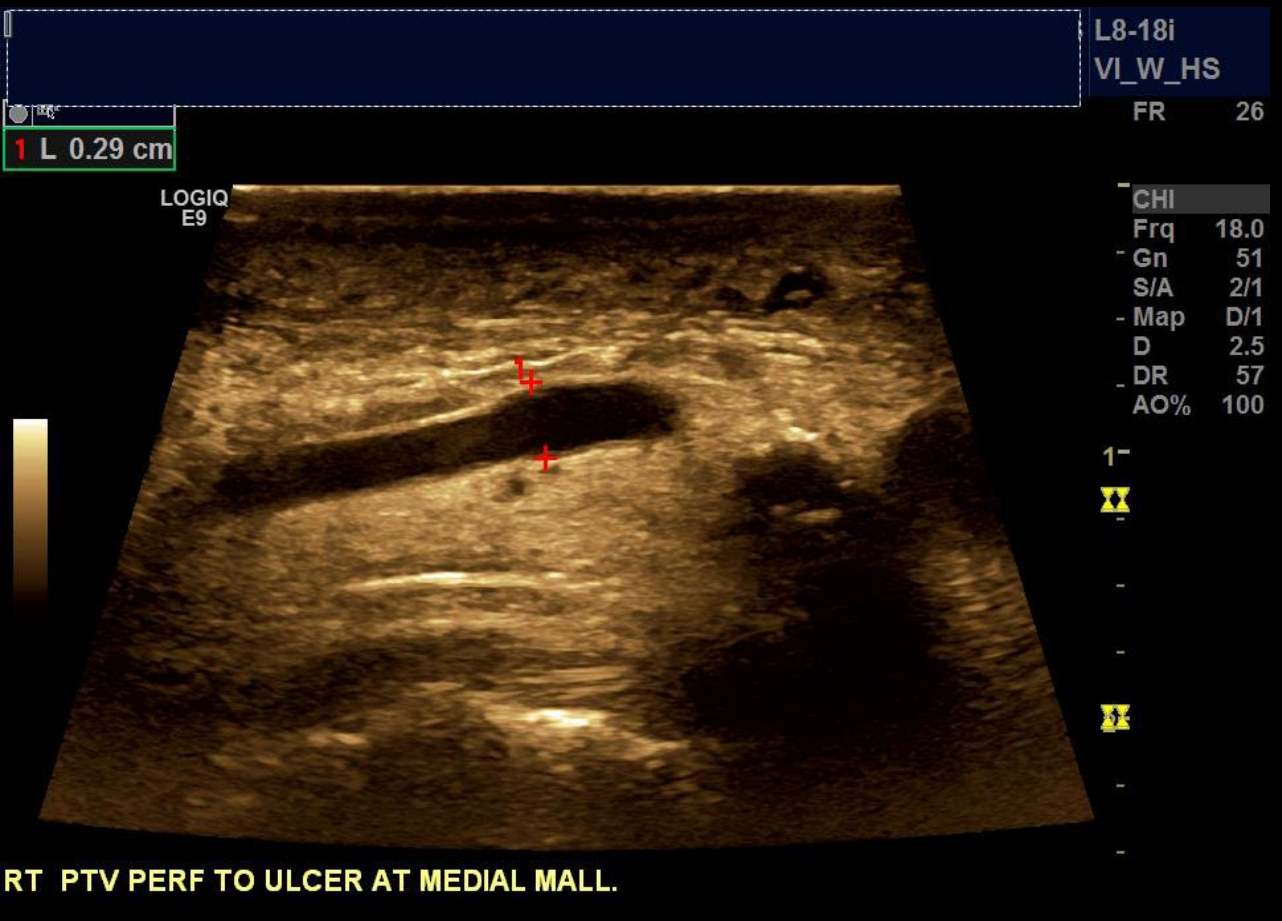


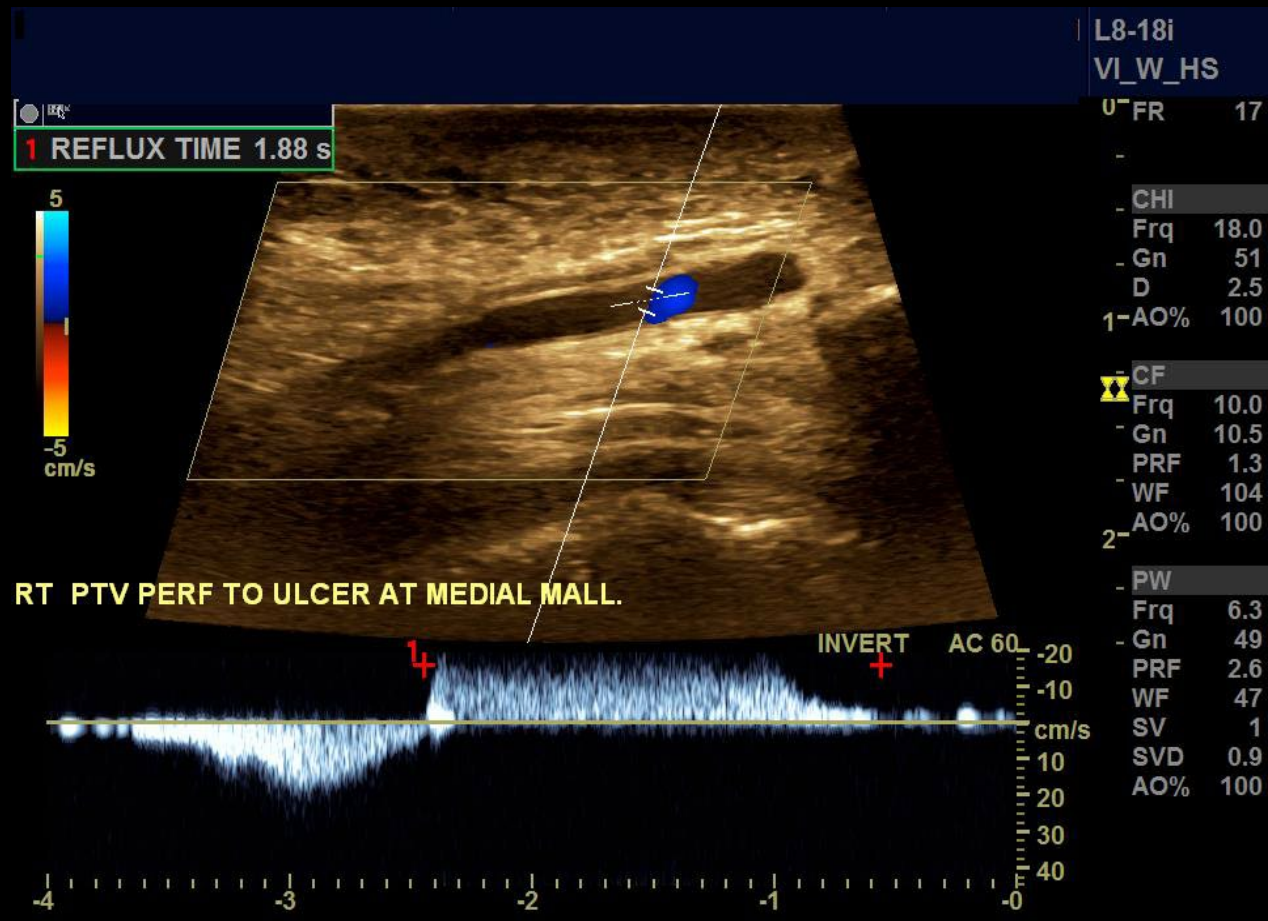
Incompetent Vein

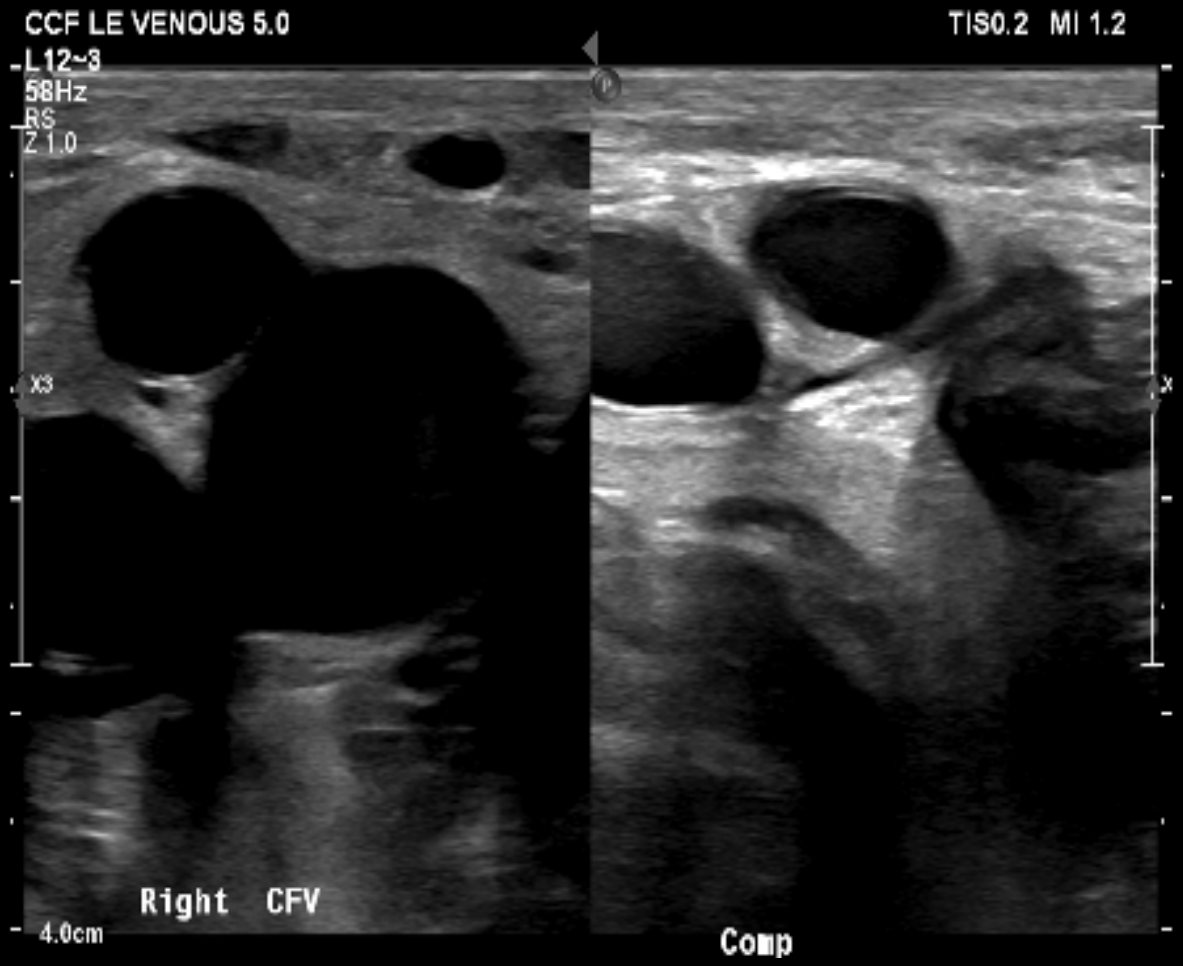


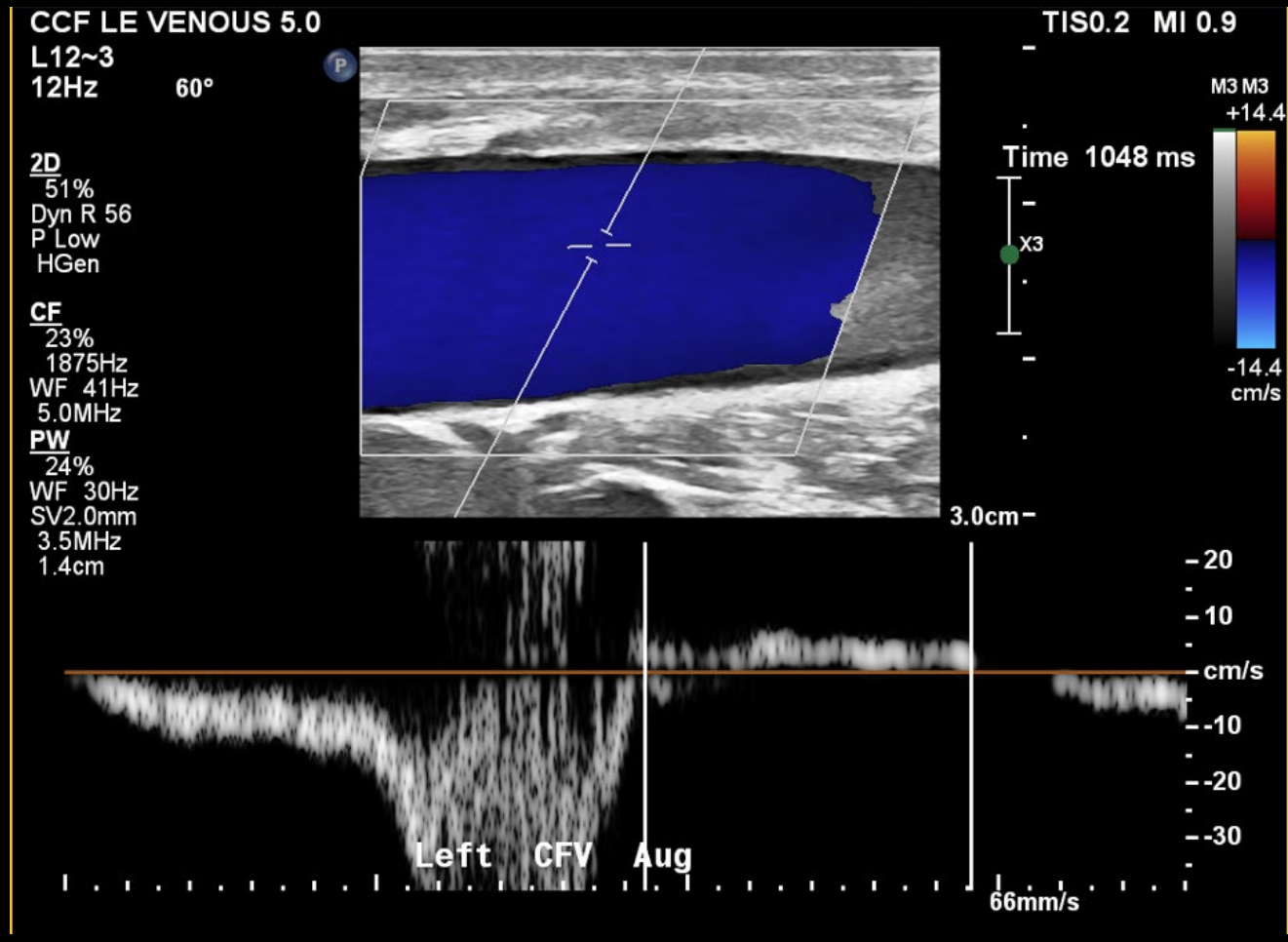
Incompetent Vein

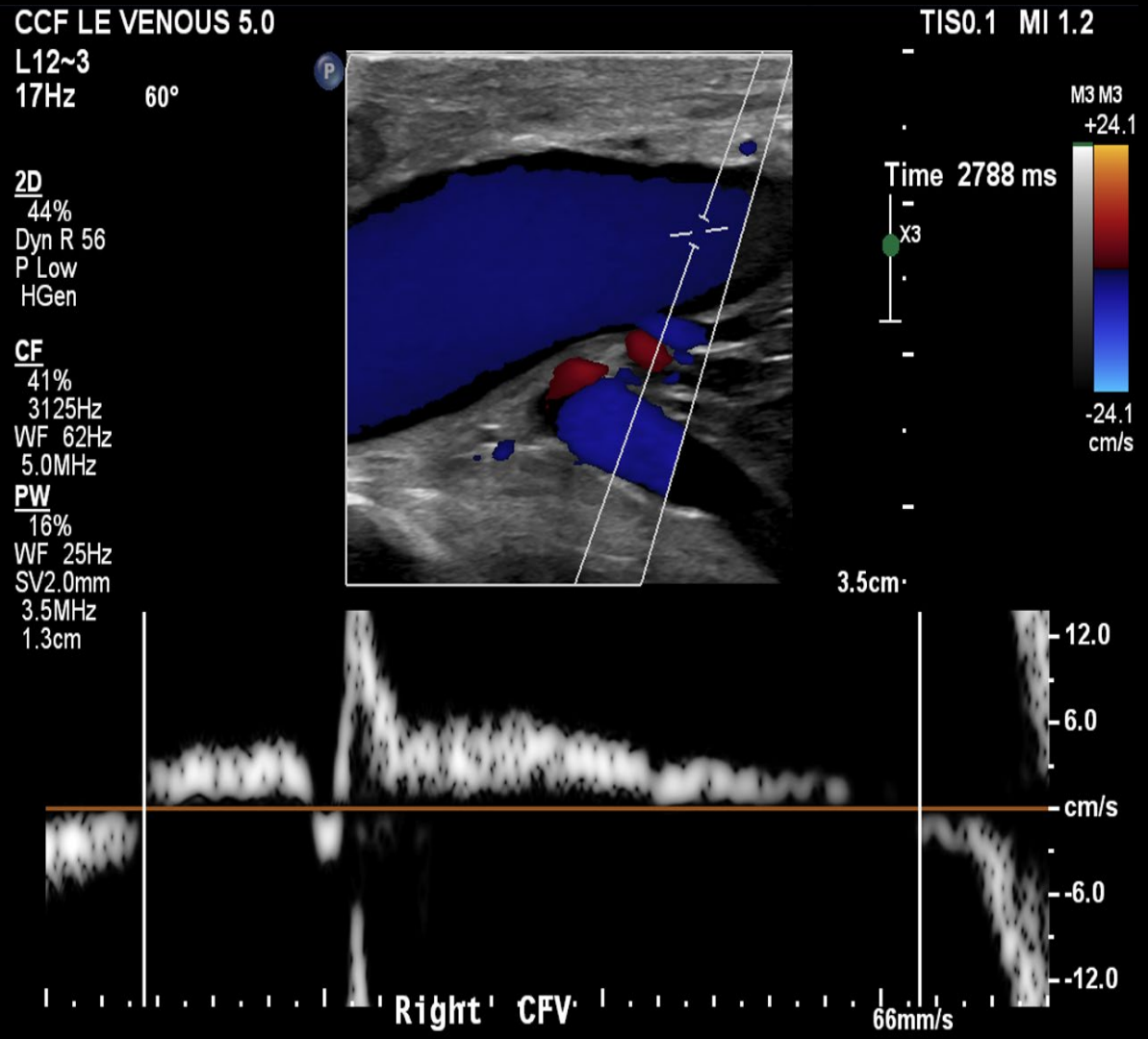
Perforator Feeding Malleolus Ulcer






CCF LE VENOUS 5.0
TIS0.2 MI 1.2
L12~3
58Hz
RS
Z 1.0
X3
Right CFV
4.0cm
Comp

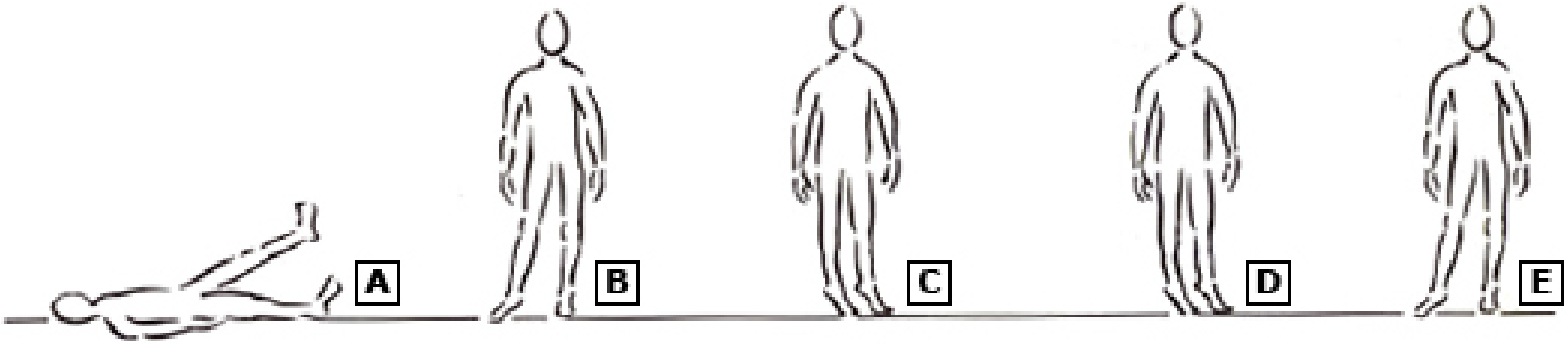

CCF LE VENOUS 5.0
TIS0.2 MI 0.9
L12~3
12Hz
60°
2D
51%
Dyn R 56
P Low
HGen
CF
23%
1875Hz
WF 41Hz
5.0MHz
PW
24%
WF 30Hz
SV2.0mm
3.5MHz
1.4cm
M3 M3
+14.4
-14.4
cm/s
Time 1048 ms
X3
3.0cm
20
10
cm/s
-10
-20
-30
Left CFV Aug
66mm/s

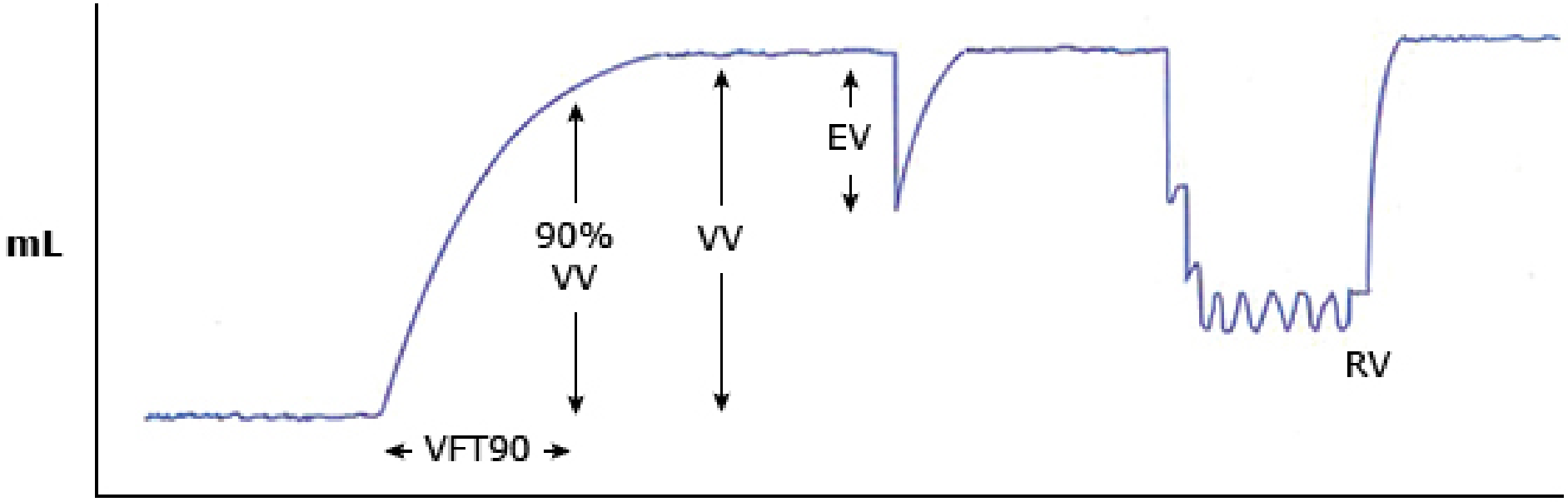

CCF LE VENOUS 5.0
TIS0.1 MI 1.2
L12~3
17Hz 60°
2D
44%
Dyn R 56
P Low
HGen
CF
41%
3125Hz
WF 62Hz
5.0MHz
PW
16%
WF 25Hz
SV2.0mm
3.5MHz
1.3cm
M3 M3
+24.1
Time 2788 ms
X3
-24.1
cm/s
3.5cm
12.0
6.0
cm/s
-6.0
-12.0
Right CFV
66mm/s


CCF LE VENOUS 5.0
TIS0.1 MI 1.2
L12~3
61Hz 60°
RS
2D
46%
Dyn R 56
P Med
HGen
M3
X3
PW
76%
WF 25Hz
SV2.0mm
3.5MHz
0.4cm
2.5cm
-6.0
Inv
cm/s
6.0
12.0
Right SSV
66mm/s

Air Plethysmography

- Changes in limb volume measured by air displacement measurement in a cuff
- Outflow assessed during rapid cuff deflation w/ elevated limb w/ proximal occlusion cuff
- Venous filling index
  - Normal: <2 mL/s
  - Abnormal: >4 mL/s



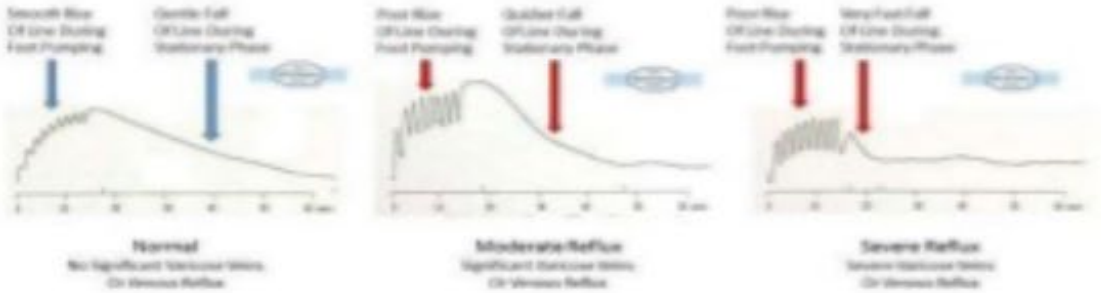


$$\frac{90\%VV}{VFT90} = VFI \qquad \frac{EV}{VV} \times 100 = EF \qquad \frac{RV}{VV} \times 100 = RVF$$

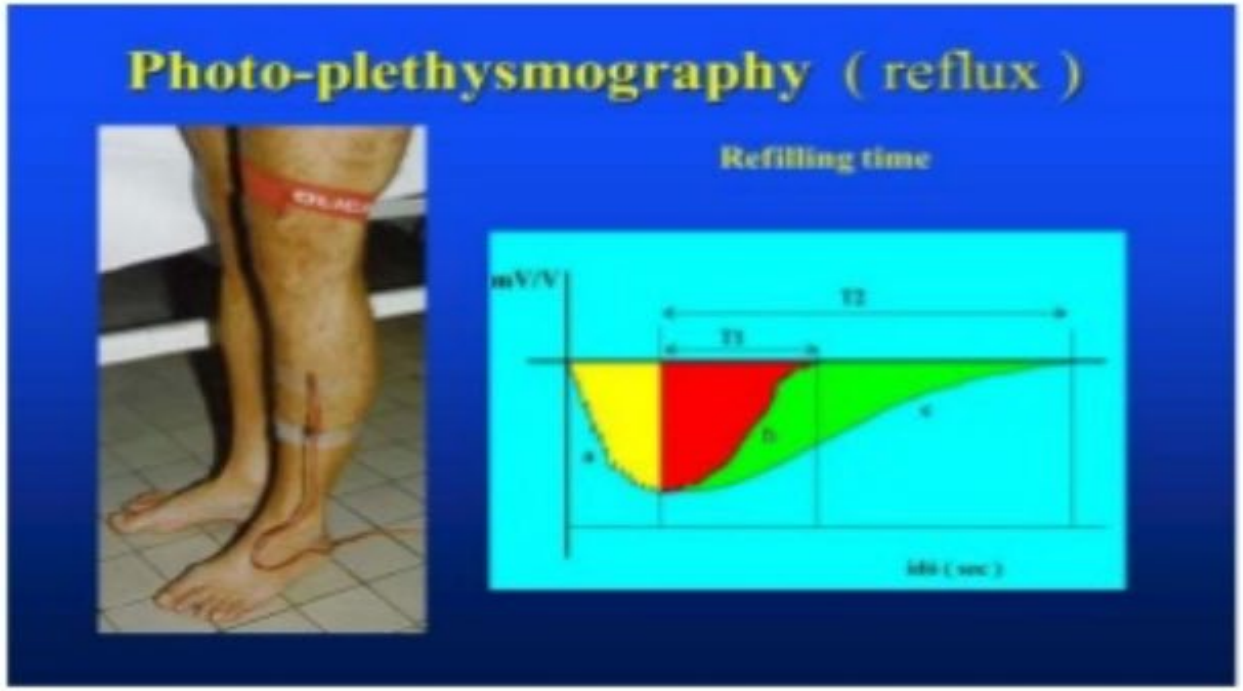
Photoplethysmography

PPG-parameter

- VRT: venous refilling time
- normal value: >20-25 s
- severe reflux: < 10 s

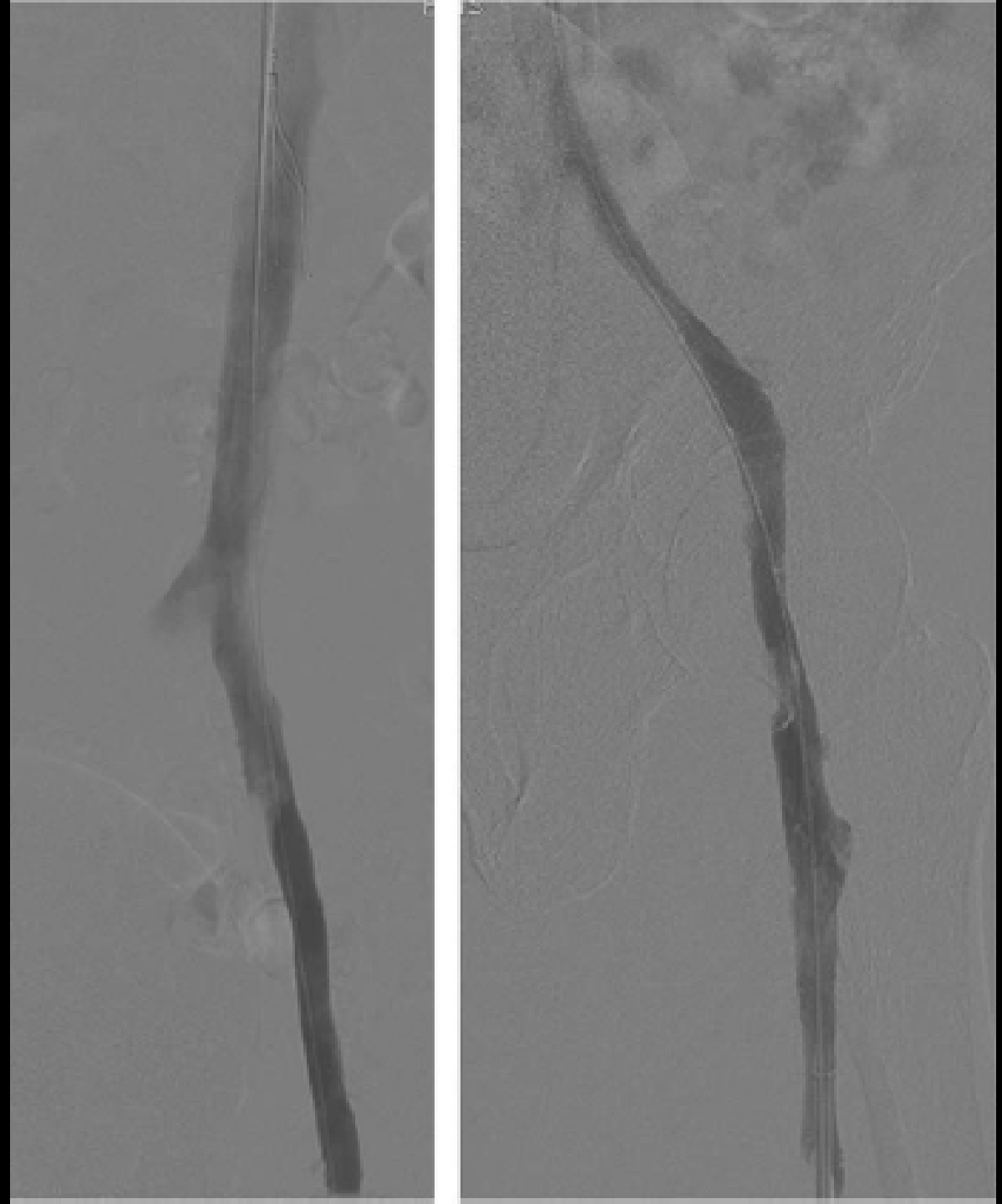


Photoplethysmography (PPG) Traces For Varicose Veins And Venous Reflux



Contrast Venogram

- Visualize venous system and anatomy
- Ascending Venogram:
  - Inject dorsum of foot
  - Details of anatomy and useful surgical intervention
  - Primary vs. Secondary Disease
- Descending Venogram
  - Proximal inject semi-vertical position w/ Valvasava
  - Identify reflux in the CFV and SFJ

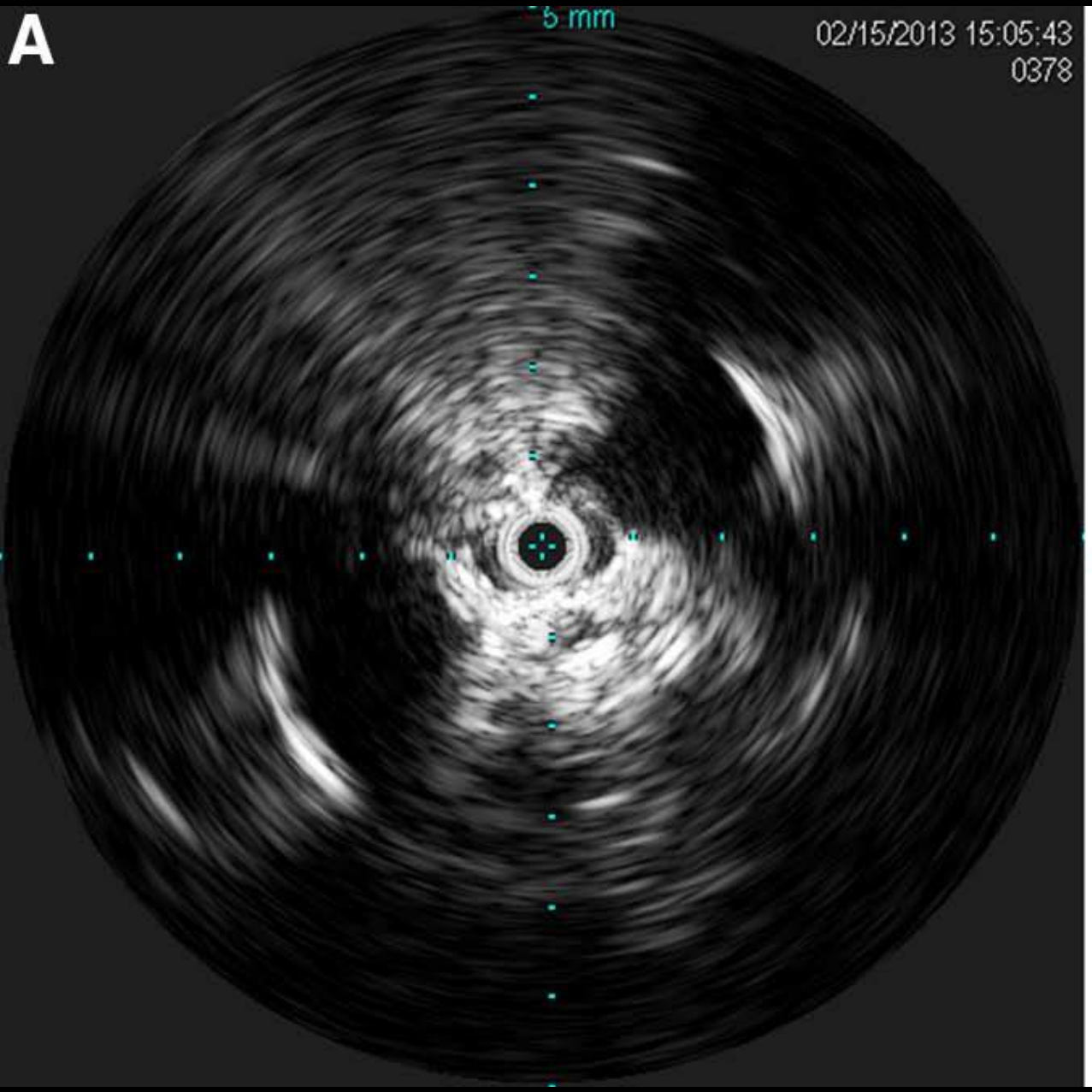


Ambulatory Venous Pressures

- Insertion of needle into dorsal foot vein and connection to a pressure transducer
- Pressure determined in upright posture at rest and after exercise (toe raise)
- Before & after cuff (deep/superficial) reflux
- Mean AVP and refill time most useful

IVUS

- Superior to venography in estimating morphology and severity of central venous stenosis and in visualizing intraluminal anatomy


A
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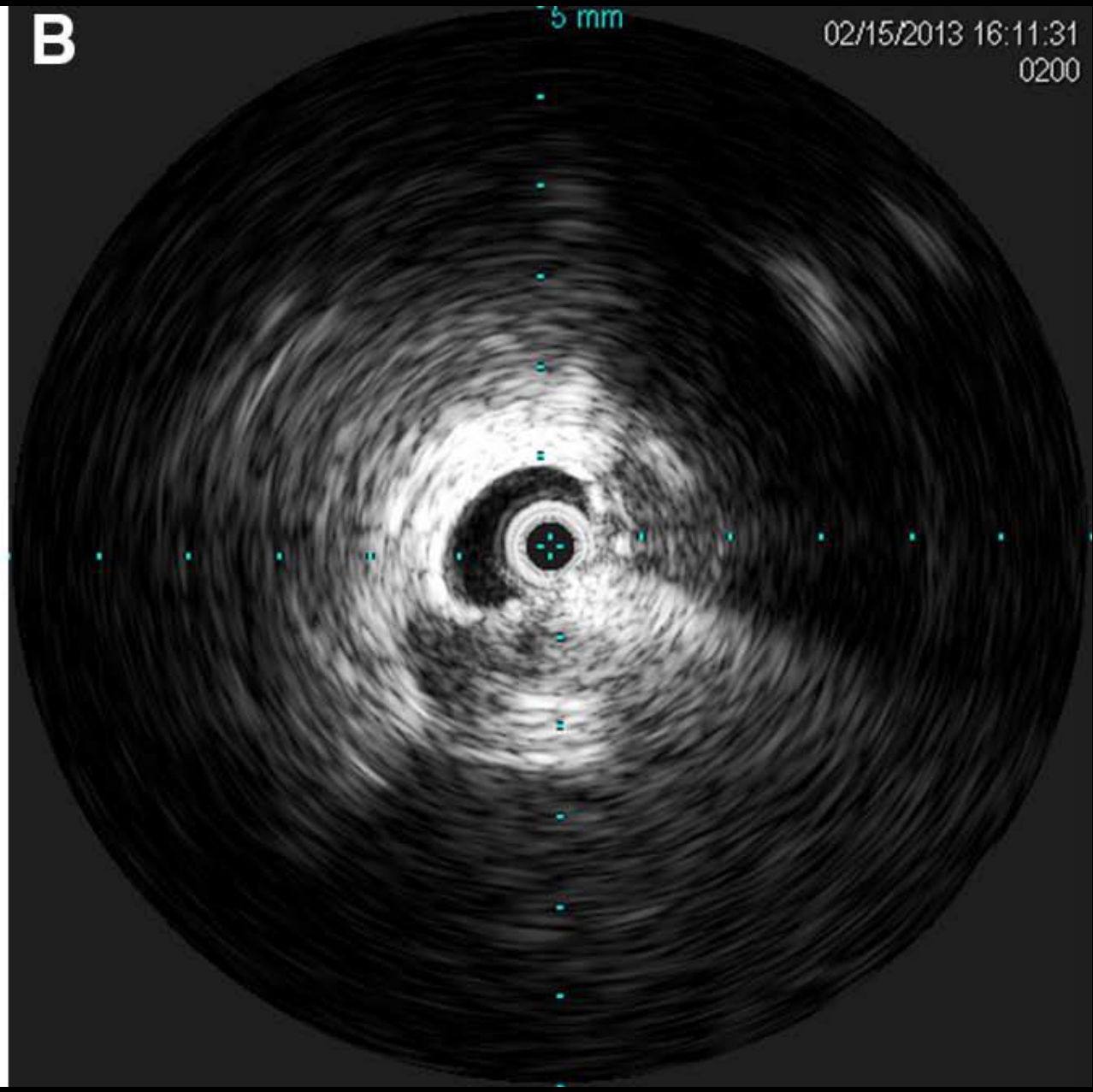
0378


B
5 mm
02/15/2013 16:11:31
0200

Imaging Modalities Compared

	Duplex	APG	MRV/CTV
To establish a diagnosis	+++	++	++
To assess severity	+/–	+++	+/–
To determine anatomy	+++	–	+++
To determine hemodynamic significance	–	+++	–

APG indicates air plethysmography; CTV, computed tomography venography; and MRV, magnetic resonance venography.

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Thank you!

pkvyas@sentara.com

(704) 737-5232