

## **Topic: Interpreting Duplex Reports**

Date: Tuesday 18<sup>th</sup> September, 2007

Time: 1130-1150

### ***Speaker:***

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### ***Conference:***

Australian College of Phlebology 2007 Scientific Meeting and Workshops  
Basic Phlebology Certificate Course (Phlebology Part 1)  
18-21 September, Stamford Plaza Double Bay, Sydney, Australia

### ***Session Content***

- Indications
- Nomenclature
- Examination Types
- Results/Reporting
- Limitations/Artifacts
- Resources
- Future Directions

### ***Audience Survey***

- Access to Diagnostic Ultrasound
- Visiting Medical Officers
- Ownership of Equipment
- Operation of Diagnostic Ultrasound

## Indications

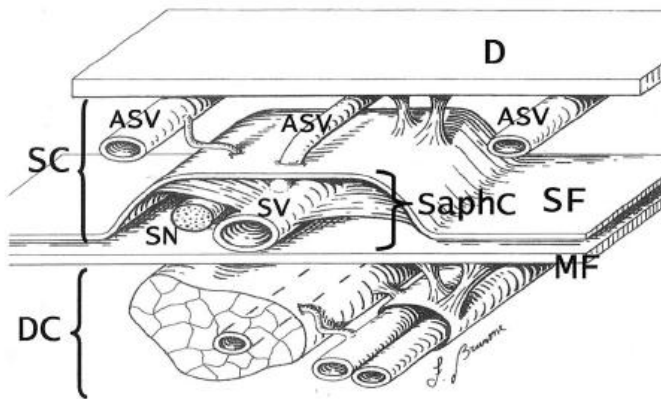
- Assessment
- Diagnosis
- Intervention
- Follow-up
- Predictive Tool

## Nomenclature

- Consensus Statement
- Relationship to fascial planes

## Lower Limb Venous Framework

JOURNAL OF VASCULAR SURGERY  
Volume 36, Number 2



## Saphenofemoral Junction

JOURNAL OF VASCULAR SURGERY  
Volume 41, Number 4

Caggiati et al 721

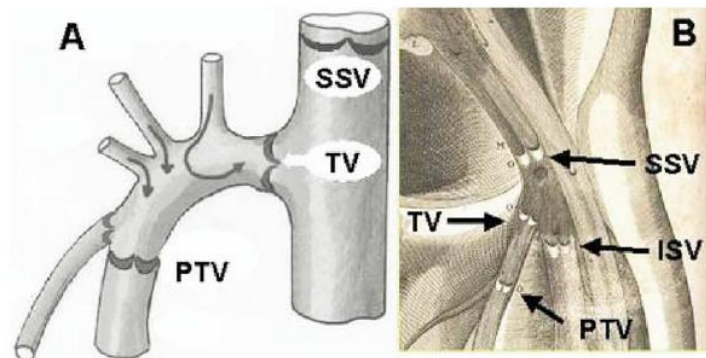


Fig 2. A, Schematic representation of the hemodynamic role of the sapheno-femoral junction (SFJ) valves (modified from Pieri et al, 1995). B, The first exhaustive representation of the SFJ with its valves. Modified from the *De Venarum Ostiolis*, of Jeronimus Fabricius Ab Acquapendente, Venice, 1603. TV, Terminal valve; PTV, preterminal valve; SSV, suprasaphenic valve; ISV, infrapopliteal valve.

## GSV Anatomy

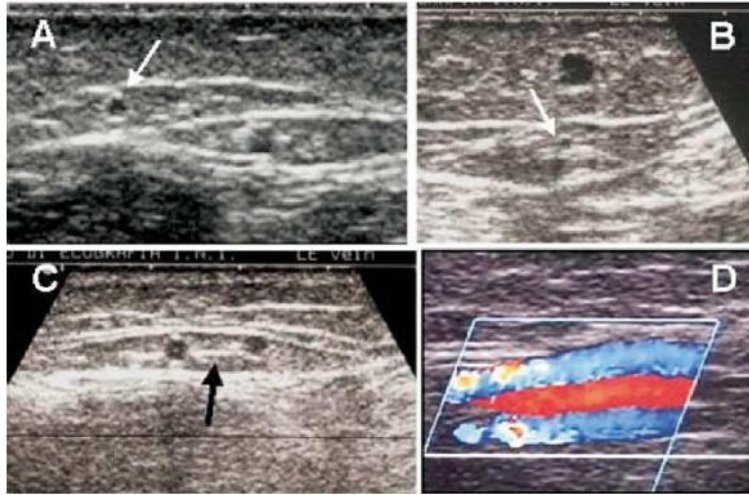


Fig 3. A, At the groin, the anterior accessory of the great saphenous vein (GSV) (*arrow*) courses deeply in the subcutaneous layer, and below a hyperechoic fascia that resembles the GSV covering. B, The small lumen of a hypoplastic GSV as seen by duplex scan. Note the compensatory enlargement of the overlying saphenous accessory. C, Real double GSV. The two veins course within the saphenous compartment and are connected by the saphenous ligament (*arrow*). D, Real double femoral vein. The two veins (*in blue*) course close to the femoral artery (*in red*).

## Saphenous System Anatomy

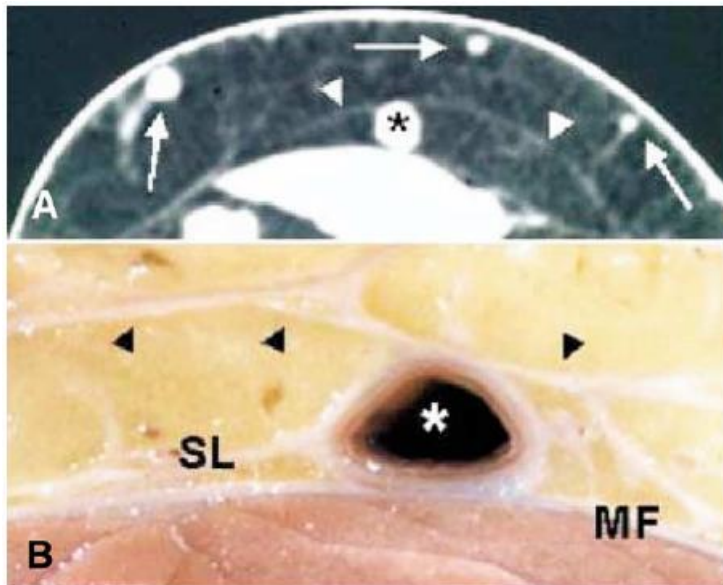
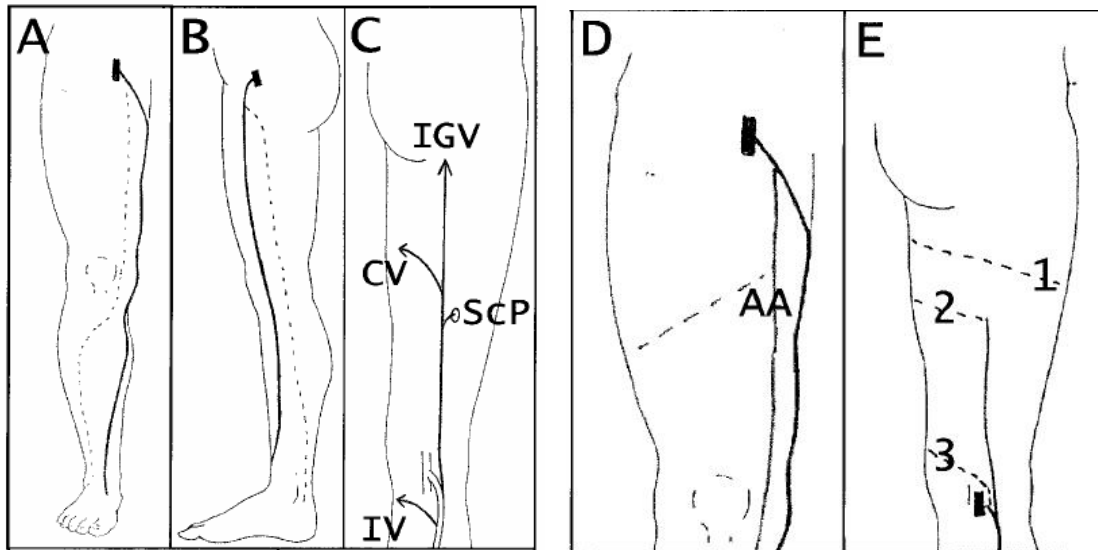


Fig 1. A, Axial computed tomography scan of the thigh. The greater saphenous vein (\*) and the saphenous accessories (*arrows*) course in different planes, separated by the saphenous fascia (*arrowheads*). B, Axial section from a cadaveric limb showing the close relationships of the great saphenous vein (\*) with the saphenous fascia (*arrowheads*) and the underlying muscular fascia (*MF*). *SL*, Saphenous ligament.

## **Saphenous Variations**

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### ***Examination Types***

- Venous Mapping (SCM)
- Pre-Operative Markings (SCP)
- Cross Sectional Echography (SCE)
- Deep Venous Scan (SCD)

### ***Venous Mapping (SCM)***

- Deep Venous Map
- Truncal Venous Map
- Perforators map
- Tributaries map
- Critical Positive/Negative Findings
  - Anatomical Variations
  - Reflux
  - Abnormal Flow

### ***Deep Venous Scan (SCD)***

- Post Treatment
- Investigation of DVT

### ***Results/Reporting***

- Venous Map
- B Mode image
- B Mode-Colour Image (Duplex)
- Pulsed Doppler (Triplex)
- Report
- Data Entry

## Results Examples

The diagrams illustrate various phlebology treatments and their results on the lower extremities. Each diagram includes a legend for vessel types and treatment outcomes, and a box for patient information.

**Legend 1 (Top Left):**

- Exam Date: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_
- Sonographer: \_\_\_\_\_
- REQ. Doctor: \_\_\_\_\_
- REP. Doctor: \_\_\_\_\_
- Clinic Code: \_\_\_\_\_
- Clinic Item#: \_\_\_\_\_

**Legend 2 (Top Right):**

- Acute Thrombus
- Chronic Thrombus
- Other
- Other

**Legend 3 (Middle Right):**

- Competent Perforator
- Incompetent Perforator
- Veinout
- Phlebostomy

**Legend 4 (Bottom Right):**

- Venous Blood Flow Direction
- Treated Vessel
- Partial Treatment/Re-Opening
- Scored Canal

**Diagram 1 (Top):** Shows a leg with a network of veins. A legend box is on the left. A legend box on the right identifies vessel types. A legend box on the middle right identifies treatment outcomes. A legend box on the bottom right identifies specific treatment types.

**Diagram 2 (Second from Top):** Shows a leg with a network of veins. A legend box is on the left. A legend box on the right identifies vessel types. A legend box on the middle right identifies treatment outcomes. A legend box on the bottom right identifies specific treatment types.

**Diagram 3 (Third from Top):** Shows a leg with a network of veins. A legend box is on the left. A legend box on the right identifies vessel types. A legend box on the middle right identifies treatment outcomes. A legend box on the bottom right identifies specific treatment types.

**Diagram 4 (Bottom):** Shows a leg with a network of veins. A legend box is on the left. A legend box on the right identifies vessel types. A legend box on the middle right identifies treatment outcomes. A legend box on the bottom right identifies specific treatment types.

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## ***Limitations & Examples***

- Technology
  - Artifacts
  - Physics
- Operator
  - Experience
  - Skill
- 2D slice of moving 3D object
  - Training

## ***Artifacts***

- Attenuation Artifacts
  - Acoustic Shadowing
  - Acoustic Enhancement
  - Edge Effect
- Beam Dimension Artifacts
  - Beam Width
  - Slice Thickness
  - Side Lobes
  - Grating Lobe

## ***More Artifacts***

- Depth of Origin Artifacts
  - Reverberation
  - Comet Tail
  - Ringdown
  - Velocity Artifacts
  - Range Ambiguity
- Beam Path Artifacts
  - Refraction Artifacts
  - Reflection Artifacts
  - Mirror Artifacts

## ***Even More Artifacts***

- Equipment Settings Artifacts
  - TGA Artifacts
  - Multiple Focal Zones Artifacts
  - Electronic Noise Artifacts
- Operator Dependant

## ***Future Directions***

- Image/Resolution Improvement
- Post-processing Power
- Smart Probes

## **Resources**

### **Books**

- Myers, K & Clough, A (2004), Making Sense of Vascular Ultrasound. A hands-on guide. Arnold, London.
- Gent, R (1997), Applied Physics and Technology of Diagnostic Ultrasound, Women's and Children's Hospital, South Australia.
- Zweibel, J & Pellerito, J (2005), Introduction to Vascular Sonography (*Fifth Edition*), Elsevier Saunders Philadelphia, Pennsylvania 19106.

### **Web**

- ASUM
- [http://pear.co.nz/asum/docs.php?s=1&m=clinical\\_guides](http://pear.co.nz/asum/docs.php?s=1&m=clinical_guides)

### **Journals**

#### **References**

- Caggiati, A, Bergan, JJ, Gloviczki, P, Jantet, G, Wendell-Smith, CP, Partsch, H (2004), Nomenclature of the veins of the lower limbs: an international interdisciplinary consensus statement. International Interdisciplinary Consensus Committee on Venous Anatomical Terminology. Department of Anatomy, University of Rome, Rome, Italy. Journal of Vascular Surgery May, vol. 39(5), pp.1144
- Raghavendra, BN, Horii, SC, Hilton, S, Subramanyam, BR, Rosen, RJ, Lam, S (1986) Deep venous thrombosis: detection by probe compression of veins, Journal of Ultrasound Medicine, Feb, vol. 5(2), pp. 89-95.