

## CASE 1. LOWER EXTREMITY VENOUS INSUFFICIENCY

### Request

■■■■■ a 70-year-old woman, was referred to the outpatient vascular with visible varicose veins and lower limb pain on the right side. She had been seen by a vascular surgeon and referred for a venous insufficiency scan to confirm the presence of superficial venous insufficiency and to rule out associated pathology such as deep venous incompetence or obstruction. She had no history of previous DVT or venous surgery.

### Conduct of the Scan

1. The patient was positioned on tilting ultrasound examination table with head end elevated relative to the foot end by about 15 degrees and the leg was externally rotated slightly.
2. The machine was pre-set to venous examination, which configured the colour and PW Doppler settings for optimal low-flow detection.
3. The duplex ultrasound (DUS) examination began with the interrogation of the sapheno-femoral junction (SFJ) at the patient's right groin. As the patient was reasonably slim, a high-frequency linear transducer (3-11MHz) was used. In larger patients where vessels are deeper, a lower frequency transducer such as a curvilinear (1.5-6MHz) can be used.
4. Patency of the common femoral vein (CFV), sapheno-femoral junction (SFJ) and femoral vein (FV) were confirmed by demonstrating spontaneous flow and normal plasticity on PW spectral Doppler (long-axis), and normal compressibility (short-axis).
5. Next, competency was assessed by augmentation. Above the knee, a brief squeeze of the calf causes antegrade flow in the vein being interrogated. Below the knee, a gentle squeeze of the foot or lower leg distal to the transducer was used. In the absence of significant reflux, there should be a minimal amount of retrograde flow detected on PW Spectral Doppler, <0.5 sec, which represents the normal time required for competent

valves to close. For deep veins and perforating veins, the criteria are slightly modified (see table 1). Using this method, reflux was assessed at CFV, SFJ, FV, popliteal vein (PV), proximal, mid and distal locations and along the course of the great saphenous vein (GSV) and short saphenous vein (SSV).

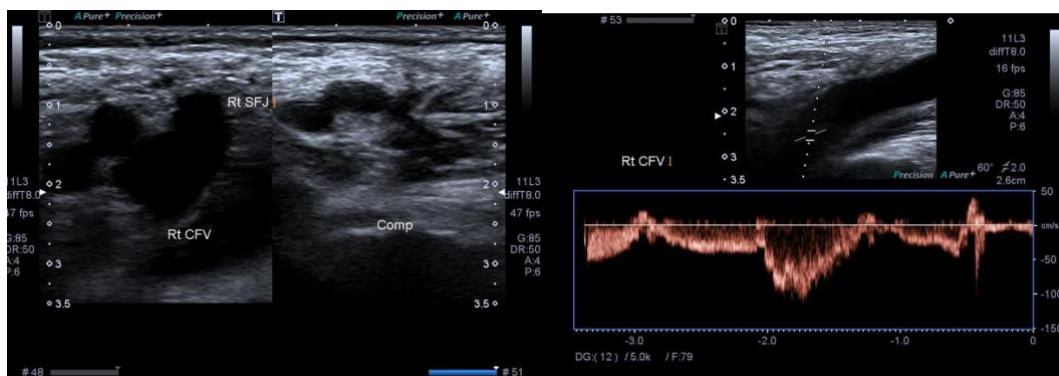
6. Angle correction is not as crucial as it is during arterial examinations, as velocity parameters are not part of diagnostic criteria, however, an angle of <60 degrees is typically used.

Table 1.1. Diagnostic criteria for venous insufficiency.			
	Deep	Superficial	Perforating
Normal	<1 sec	<0.5 sec	<0.35 sec
Abnormal	>1 sec	>0.5 sec	>0.35 sec

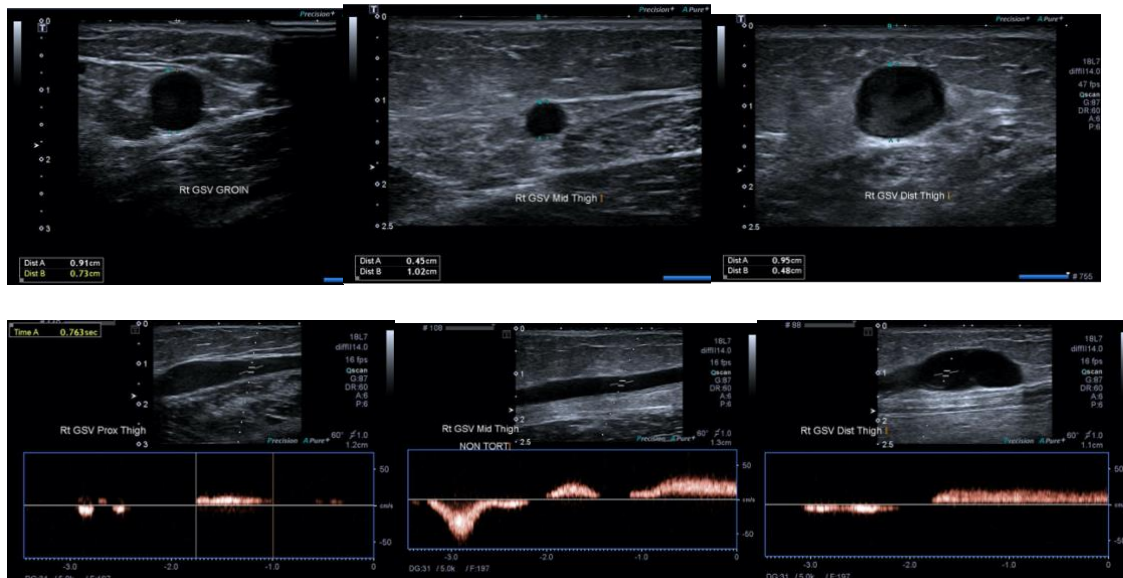
7. The Valsalva manoeuvre can also be an alternative method to promote retrograde venous flow at the CFV/SFJ and FV and the same criteria applies.
8. Several diameter measurements are made of SFJ, GSV, SSV and perforators, which are useful for planning interventions such as endothermal techniques, radiofrequency and laser ablation. This is important because these treatments tend to be less successful when GSV diameters are larger than 14mm in the thigh. Furthermore, a minimum distance of 8-10mm from the skin is required to minimise burns, and this should be documented.

## Indicate how the examination assisted diagnosis

- In this patient's case, the CFV, FV and SFJ were demonstrated to be patent with the former demonstrating normal phasic flow and no abnormal reflux.
- The GSV in the thigh was dilated up to 9mm and demonstrated reflux greater than 0.5 sec along its length in the thigh and proximal calf.



**Figure 1.1** The first image in this figure demonstrates the right sapheno-femoral junction without compression and with compression (Comp), thus confirming the absence of DVT. The second image demonstrates the CFV in long axis with spectral Doppler indicating spontaneous flow with normal respiratory plasticity, augmentation confirms patency of the CFV and implies a patency to the thoracic level.



**Figure 1.2.** This series of duplex images demonstrates dilated right GSV, as viewed in short-axis (top row) and reflux evidenced by retrograde flow ( $>0.5$  sec) in the GSV following augmentation. In addition, the GSV is between 5-10mm from the skin surface, which may increase the risk of skin burns during endovenous thermal ablation.

### Indicate how the examination assisted management

This study confirmed the presence of superficial venous incompetence in the absence of deep venous incompetence or obstruction. The patient was recommended to wear class II compression stockings and the various forms of intervention were discussed (surgery, endovenous, sclerotherapy). As there were segments of GSV that were  $<5$ mm deep to the skin, a higher risk of skin burns was discussed. The patient elected to trial conservative therapy for 3 months and this will be followed up again in the outpatient clinic.

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In the right leg, the long saphenous vein refluxed from the groin area to the ankle. There was also reflux in a tributary of the long saphenous vein in the proximal calf and in another tributary in the distal calf. There was no other evidence of reflux in the veins of the right leg. In the left leg, there was reflux in the long saphenous vein in the thigh. The long saphenous vein was not identified in the calf. There was an incompetent tributary of the long saphenous vein in the proximal calf. There was also an incompetent medial calf perforator in the proximal calf. There was no other evidence of reflux in the veins of the left leg.

## References

1. Necas M. Duplex ultrasound in the assessment of lower extremity venous insufficiency. *Australas J ultrasound Med.* 2010 Nov;13(4):37–45.
2. Pellerito J, Polak JF. Ultrasound Diagnosis of Venous Insufficiency. In: *Introduction to Vascular Ultrasonography.* 6th ed. Philadelphia: Elsevier Health Sciences; 2012. p. 408–427.
3. Size GP, Lozanski L, Russo T, French-Sherry E, Skelly CL. Lower Extremity Venous Insufficiency Duplex. In: *Inside ultrasound vascular reference guide.* 1st ed. Pearce, Arizona: Inside Ultrasound; 2016. p. 219–224.