

## Three-Dimensional Phlebography of the Saphenous Venous System

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The saphenous venous system was visualized by CT without any contrast medium injection. Volumetric data were acquired with a multidetector spiral CT (Siemens, Somatom Plus 4 Volume Zoom) with the following parameters: collimation, 1 mm; pitch, 4; reconstruction, 1.2 mm. Reformatted images were then transferred in DICOM format to an 02 work station (Silicon Graphics) and postprocessed by the software VITREA 1.2 (Vital Images). 3D images were evaluated by means of the volume-rendering technique (VRT).

VRT-CT allows an excellent morphological demonstration of size, path, and connections of the saphenous trunks and of their tributaries, even if no contrast medium is injected (Figure 1A). To the best of our knowledge, VRT-CT has never been used in the morphological evaluation of the saphenous venous system.

The spatial arrangement of superficial veins is preserved and clearly demonstrated so that with real-time postprocessing, it is possible to observe them from any angulation. In fact, as clearly shown by CT and sonography (Figure 1, B and

C), saphenous veins occupy a deep position in the hypodermis, lying just above the muscular fascia. They are anchored to the muscular fascia by means of the saphenous fascia.<sup>1</sup> Saphenous tributaries course in superficial hypodermic layers and become deeper only as they flow into the saphenous vein.

In varicose limbs, VRT-CT allows an easy discrimination of dilated and tortuous venous trunks from those with a normal caliber (Figure 2, A). In most varicose limbs, the "saphenous fascia"<sup>2</sup> protects saphenous veins from greater varicose changes (Figure 2, B and C). In fact, at the level of varicose tributaries, a saphenous vein of regular caliber is frequently seen (Figure 2, A, B, and C) and is better shown by stereo-pair photographs (Figure 3).

Only when the deep venous system needs to be evaluated is contrast medium injection necessary.

### References

1. Caggiati A, Ricci S. The long saphenous vein compartment. *Phlebology*. 1997;12:107-111.
2. Caggiati A. The fascial relationships of the long saphenous vein. *Circulation*. 1999;100:2547-2549.

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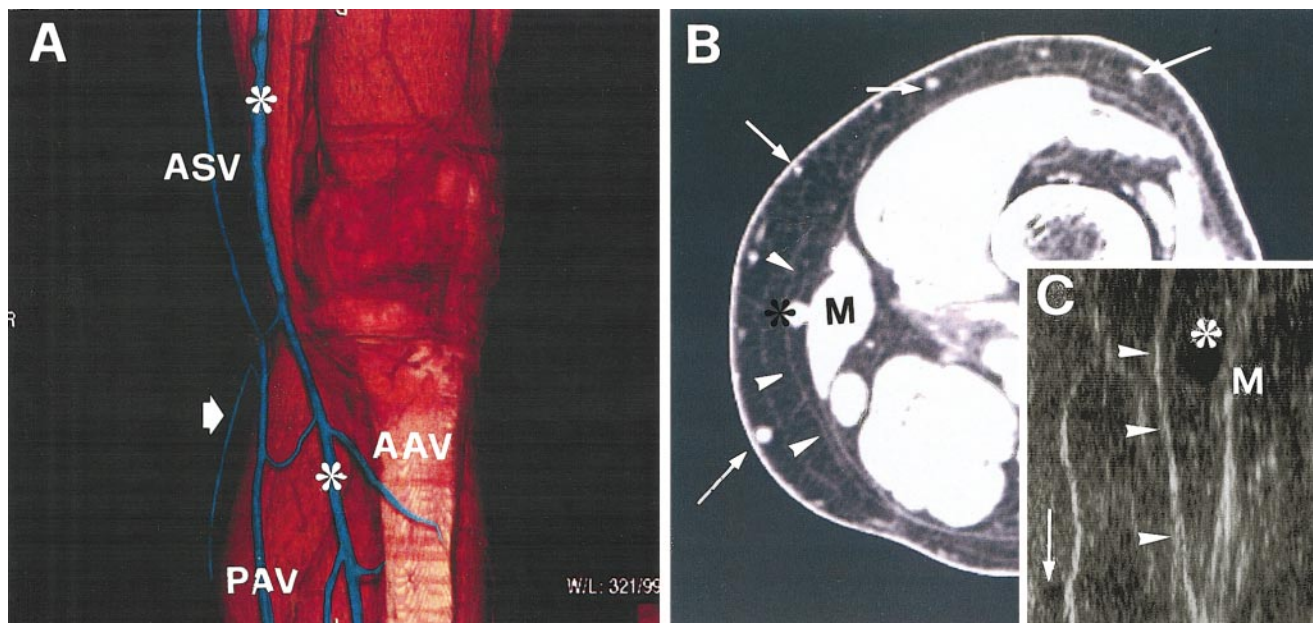
The editor of *Images in Cardiovascular Medicine* is Hugh A. McAllister, Jr, MD, Chief, Department of Pathology, St Luke's Episcopal Hospital and Texas Heart Institute, and Clinical Professor of Pathology, University of Texas Medical School and Baylor College of Medicine.

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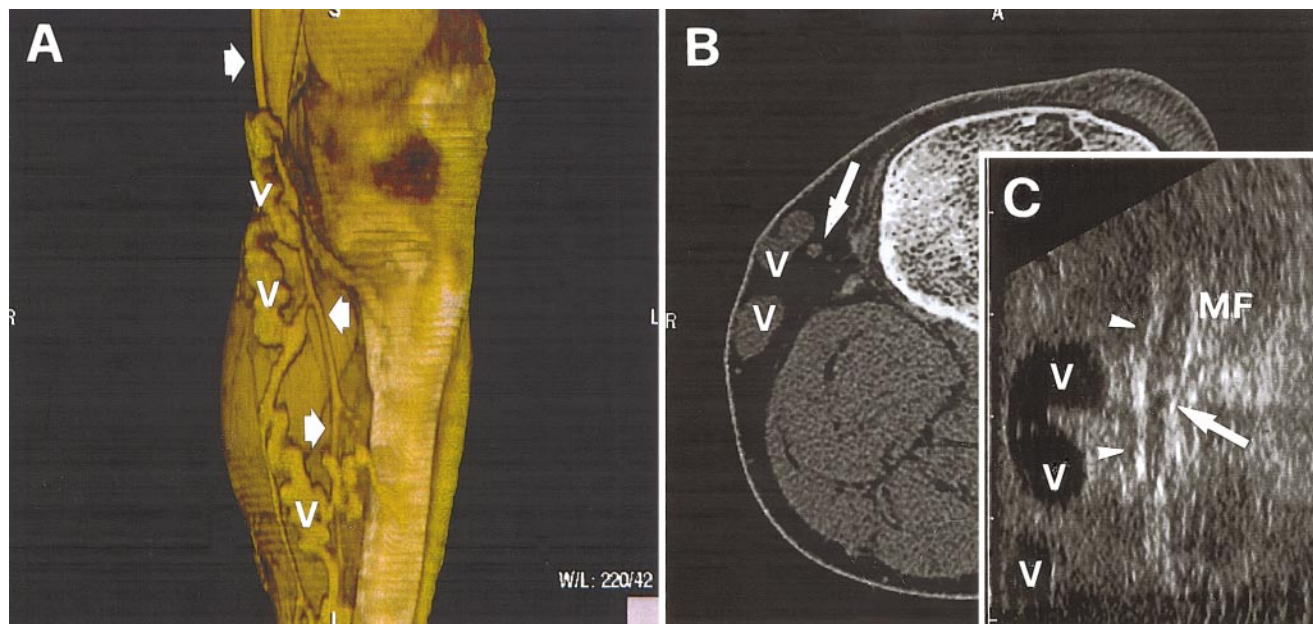
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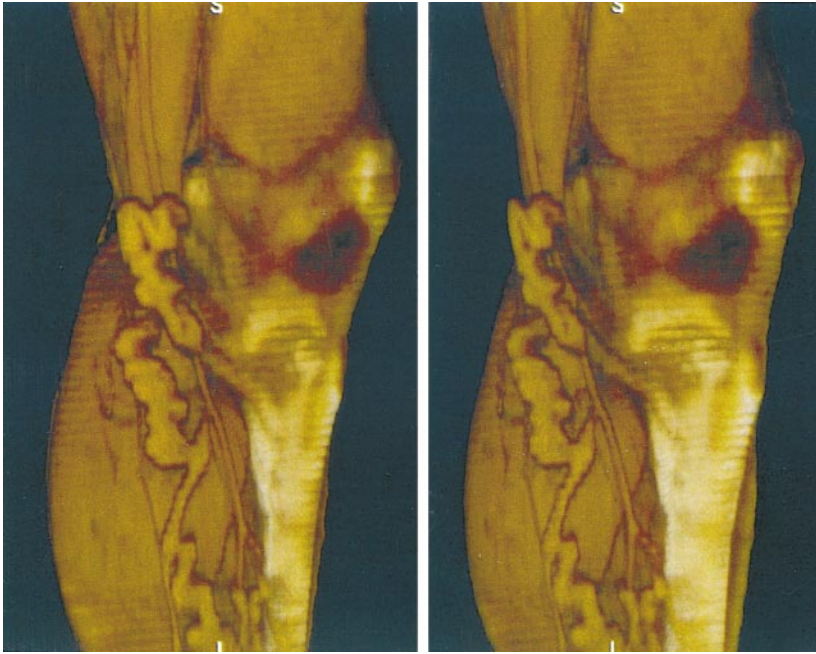
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**Figure 1.** A, VRT-CT visualization of superficial veins of a healthy limb. Long saphenous vein (\*) runs close to muscular compartment. Superficial course of its tributaries is evident from this angulation regarding posterior accessory saphenous vein (ASV) and branch connecting short saphenous vein (arrow). PAV indicates posterior arch vein; AAV, anterior arch vein. B, Conventional CT of same limb. Long saphenous vein (\*) lies close to muscle (M) to which it is anchored by saphenous fascia (arrowheads). Saphenous tributaries (arrows) course in subdermic position. C, Transverse sonography at same level clearly demonstrates planar anatomy and fascial relationships of long saphenous vein (\*) and of accessory saphenous vein (arrow). M indicates muscular fascia; and arrowheads, saphenous fascia.



**Figure 2.** Limb with primitive varicosities. A, VRT-CT shows that long saphenous vein (arrows) of normal caliber courses straight above muscular compartment. Dilatation and tortuosity occur in its tributary veins (V). B, Conventional CT confirms that long saphenous vein (arrow) has normal caliber in relation to varicosities (V) of its tributary vein. C, Transverse sonography at same level. Long saphenous vein (arrow) is covered by saphenous fascia (arrowheads), whereas dilated veins (V) course in fatty tissue of hypodermis.



**Figure 3.** Stereo-pair of same limb as shown in Figure 2. To see 3D arrangement of dilated and normal veins, use stereo glasses.