

Near-Infrared Vein Finder for Assessment of Superficial Venous Malformations

Problem Faced

A venous malformation can have a wider extent than what is gauged by inspection and palpation. It is difficult to clinically demarcate its boundaries, which makes it difficult to plan and execute interventions like sclerotherapy or intralesional radiofrequency ablation.^[1] To overcome this, imaging techniques like magnetic resonance imaging, duplex ultrasound, and fluoroscopy are used for pre-operative assessment and for real-time guidance during interventions. However, these require expensive machines, have a steep learning curve, need participation from radiologists and are regulated by legislation in some countries. Therefore, many dermatologists perform these procedures blind, especially for superficial lesions. This may miss some pathological vessels adjacent and deeper to the visible swelling resulting in suboptimal results.

Solution Proposed

A near-infrared vein finder machine (VeinViewer® Flex, Christie Medical Holdings, Inc., Memphis, USA) is an economical, portable, non-contact tool used for finding veins for phlebotomy.^[2] Its usage does not require any help from a radiologist. We propose its use for complete assessment of superficial venous malformations. The dilated tortuous veins surrounding the visible part of a venous malformation are easily visualized [Figure 1a] and differentiated from the normal venous pattern [Figure 1b]. Visualization of clinically invisible veins [Figure 2] helps in pre-operative assessment and guidance during interventions.

A near-infrared vein finder emits near-infrared radiation at the skin surface, which is preferentially absorbed by deoxyhemoglobin in the veins. Since veins absorb near-infrared radiation, the reflected radiation detected over veins is lower in intensity compared to the surrounding tissue. This difference in emitted and reflected radiation is compared in the machine and is projected onto the skin surface using visible light in real

time [Online Supplementary Videos 1 and 2]. As the projection is two-dimensional, the depth cannot be gauged, but the actual extent and caliber of malformed veins can be seen. The surrounding pathological veins appear different, and the boundary between the pathological and non-pathological vessels is easily demarcated. For apparently superficial malformations, a vein finder aids in better planning the interventions and in assessing their outcome as compared to the unaided procedure.

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Conflicts of interest

There are no conflicts of interest.

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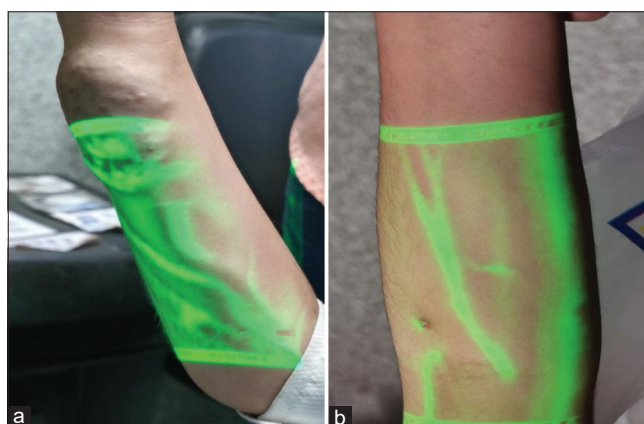


Figure 1: Use of a near-infrared vein finder to assess the extent of a venous malformation. (a) The pathological veins are haphazardly arranged in an irregular pattern. Dilated, irregular, and tortuous veins around the visible swelling are enhanced by the vein finder (b) Contralateral forearm showing the regular linear pattern of normal veins

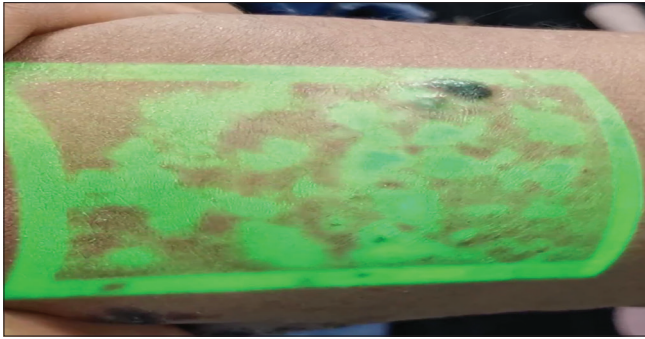


Figure 2: Dilated, irregular, and tortuous veins enhanced by the vein finder in a patient with venous malformation involving the right upper limb

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