The use of near-infrared light for safe and effective visualization of subsurface blood vessels


Abstract:

Obtaining access to blood vessels can be difficult, especially in children. Visualization of subsurface blood vessels might be a solution. Ultrasound and visible light have been used to this purpose, but have some drawbacks. Near-infrared light might be a better option since subsurface blood vessels can be visualized in high contrast due to less absorption and scattering in tissue as compared to visible light. Our findings with a multispectral imaging system support this theory. A device, the VascuLuminator, was developed, based on transillumination of the puncture site with near-infrared light. The VascuLuminator was designed to meet the requirements of compact and safe use. A phantom study showed that the maximum depth of visibility (5.5mm for a 3.6mm blood vessel) is sufficient to visualize blood vessels in typical locations for peripheral venous and arterial access. A quantitative comparison of the VascuLuminator and to two other vessel imaging devices, using reflection of near-infrared light instead of transillumination, was conducted. The VascuLuminator is able to decrease failure at first attempt in blood withdrawal in pediatric patients from 10/80 (13%) to 1/45 (2%; P=.05).
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