VALIDATION OF AN OPTOELECTRONIC LIMB VOLUMETER (PEROMETER®)

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ABSTRACT

The Perometer, a device designed for the measurement of limb volume, has been rigorously assessed by comparison with other methods. Differences in the volume of geometric shapes and limbs determined by the Perometer and a tape measure/meter rule (i.e., Perometer minus direct measurement) were -0.8 to -2.4% (cylinders), -4.6% (truncated cone), -3.3% (mannequin limbs), 6.1% (normal human arms) and 6.8% (lymphedema arms). The larger differences were likely to be due to deviation from circular or elliptical cross-section (Perometer or tape method) and compression of the arm (tape method). Errors arising from incorrect positioning within the measuring frame were generally small, but larger errors occurred when a cylinder was partially rotated within the frame (i.e., no longer perpendicular to the light beams). The Perometer was highly reproducible, each measurement taking only a few seconds.

When recording the change in volume with time of a segment of arm during venous occlusion (blood flow measurement by venous occlusion plethysmography) using the Perometer plus a mercury strain gauge, between-method differences for individual blood flow recordings were apparent. The source of these differences is discussed. However, using the average of a number of blood flow recordings the Perometer and the strain gauge agreed fairly closely for both the normal and lymphedema arms.

The Perometer is thus a reliable and convenient tool for the measurement of limb volume, and may also be used to measure the rate of swelling during venous occlusion plethysmography.