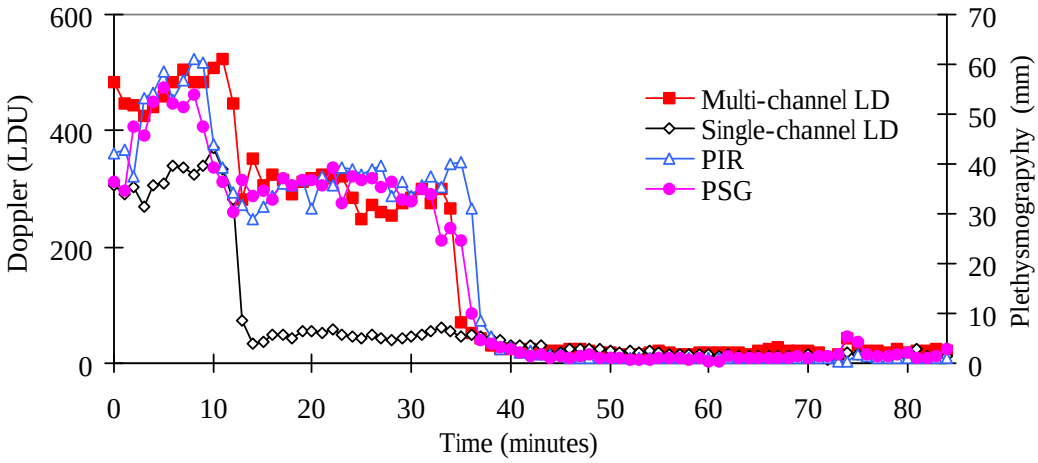
A COMPARISON OF FOUR TECHNIQUES FOR ASSESSING SKIN BLOOD FLOW

J.R. House[1] and M.J. Tipton[1,2], [1]Institute of Naval Medicine, Gosport, UK. and [2]University of Portsmouth, Portsmouth, UK.

Laser Doppler rheometry (LD) is widely used as an estimation of skin blood flow (SkBF). Unpublished data from this laboratory have demonstrated unexpected, and counter-intuative LD SkBF responses. This study was undertaken to compare LD with other methods of assessing SkBF, in conditions where vasodilatation and vasoconstriction were evoked. After ethical approval, 7 medically fit volunteer subjects (6M 1F, 20-22 years) gave informed consent to participate. The subjects were immersed to chest level in a water bath (WB, initial temperature 40.6°C) with their arms at the level of the heart, and the left hand placed inside a polythene bag within a plastic box (BOX). Each finger pad of the left hand was instrumented with either, single- or multi-channel LD probes (Moors Instruments Ltd, UK), infra-red (P_{IR}) or mercury strain gauge (P_{SG}) plethysmography probes (Vasculab Inc, USA). When insulated auditory canal (t_{ac}) and rectal (t_r) temperature had increased to 38.5°C, water at 38.5°C was added to the BOX. After 10 minutes the water in the BOX was chilled and maintained at 10.3°C for the remainder of the experiment. After a further 10 minutes, the WB was cooled at 0.6°C.min^{-1} until all SkBF measures indicated vasoconstriction. SkBF responses were variable and mean plots misleading, those from subject 1 are in the figure. After approximately 5-15 minutes of cooling in the WB, profound vasoconstriction was usually indicated. In 5 of the 7 subjects vasoconstriction occurred simultaneously, as indicated by all 4 SkBF measurement techniques. In the other 2 subjects, at least one of the SkBF techniques indicated vasoconstriction before the other methods, or the responses were variable. Before cold-induced vasoconstriction occurred, each technique indicated variable SkBF responses, but in different subjects. For example, large reductions in SkBF (>20%) were indicated on filling the BOX with warm water in 2 to 4 subjects (hydrostatic effect), dependent upon the measurement technique. When the BOX was chilled, further reductions in SkBF (>20%) (thermal effect) were indicated in 2-4 subjects (generally the same subjects). For each SkBF technique, 3-5 subjects did not exhibit large changes in SkBF (>20%) when the BOX water temperature was cooled, but the WB remained high. These data suggest that any of the techniques may be used for detecting gross vasomotor tone, but SkBF responses can vary significantly between techniques when vasodilated.



windyhouses@aol.com