

A novel method for assessing cutaneous reactive hyperemia with laser speckle contrast imagery

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Purpose: The human cutaneous circulation is a representative vascular bed used to assess microvascular function through a variety of skin-specific stimuli including reactive hyperemia (RH). Laser speckle contrast image (LSCI) is a state-of-the-art method to measure skin blood flow (SkBF), compared to single point laser-Doppler flowmetry (LDF). We sought to develop a new technique for quantifying the RH response and examine between-subject variability of the RH response. **Methods:** A standardized RH protocol was performed on 5 men and women with three, five minute suprasystolic occlusions. SkBF was imaged using LSCI. Regions of interest (ROI) for the LSCI were determined and integrated. The total hyperemic response (THR) was calculated using the trapezoidal method in Excel subtracting baseline and normalizing to a percentage of the maximum vasodilation to local heating (44°C). The normalized value was integrated over the corresponding time interval to give the final corrected THR. **Results:** The between-subject coefficient of variation for the calculated THR from LSCI was 42.5% ($4,697 \pm 893\% \text{CVC}_{\text{max}} \cdot \text{sec}$), compared to LDF 74% ($3,320 \pm 2,441\% \text{CVC}_{\text{max}} \cdot \text{s}$). **Conclusion:** There is less variation for the THR with LSCI compared to the traditional LDF method, likely due to the larger surface area being measured.