LASER-DOPPLER IMAGING OF FOREARM SKIN PERFUSION FEATURES AND DEPENDENCE OF THE BIOLOGICAL ZERO ON HEAT-INDUCED HYPEREMIA

HN Mayrovitz, JA Leedham, N Sims College of Medical Sciences, Nova SE University, Ft. Lauderdale, FL

PROTOCOL

Protocol Sequence: Three LDI scans were done: a baseline for non-heated skin, a heat-trace that was initiated immediately after the scanning portion of the target area was heated to 44°C for five minutes of supine rest. The BZ was detected within the area, which was not heated to 44°C, and a third scan, which was the LDI measurement of baseline with the central portion of the heated area. The BZ was started immediately after completion of the heat-scan (Figure 1).

Analyses: Mean skin blood perfusion (SBF) in the target area was defined as the percentage of baseline, heated and occluded (BZ) conditions with increasing consecutive areas. O.5, 1.0, 1.5, 2.5, 3.5 and 7.0 cm² for the condition with the largest BZ and BZ progressively increased as smaller consecutive sample areas were used (Figure 4). Overall, heat-induced perfusion within the central area increased above baseline by a factor of 2.2 ± 0.4.

RESULTS

Forearm Perfusion: Baseline LDI perfusion (Q, a.u.) was independent of sample area (Figure 4), with an average across all subjects and areas of 45.6 ± 2.4 a.u.

Heated SBF was least (158.3 ± 61.4) for largest area and greatest (516.3 ± 117.4 a.u.) for the smallest area. BZ of heated skin had its lowest value (16.3 ± 6.2 a.u.) for the largest area and largest value (22.6 ± 17.3 a.u.) for the central area. SBF and BZ progressively increased as smaller consecutive sample areas were used (Figure 4). Overall, heat-induced perfusion within the central area increased above baseline by a factor of 2.2 ± 0.4.

CONCLUSIONS

SBF HYPEREMIA - BZ of LDI increases with heat-induced SBF hyperemia, but the increase is small relative to SBF changes that occur.

- Thus, BZ's confounding effect can be handled by subtraction of a single BZ value.
- The BZ value to use may be obtained during or after hyperemia with small error when quantifying absolute hyperemic perfusion.
- But, if hyperemic responses are evaluated relative to baselines, then the BZ of the resting state should be used to avoid substantial overestimation of the response.

RESTING SBF

- For resting SBF in forearm skin, other regions with low basal perfusion, a BZ adjustment for the perfusion data is fully indicated to compare groups or treatments.
- If BZ values can not be made, or for clinical reasons should not be made, then detecting differences between groups is limited by the potentially substantial BZ confounding effect.

REFERENCES