Localized Forearm Skin Water Changes Associated with Heat Induced Hyperemia

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**Background:** Skin water content and distribution are affected by dermatological and cardiovascular conditions. We speculated that localized heat-induced vasodilation increases capillary filtration causing increased interstitial fluid that is measurable as an increase in skin water. Thus, we hypothesized that there should be a significant positive correlation between skin water parameters and the magnitude of hyperemic blood flow.

**Objective:** Our goal was to test this hypothesis by assessing skin water changes subsequent to localized hyperemia.

**Methods:** Skin water was assessed by stratum corneum (SC) capacitance and by tissue dielectric constant measurements (TDC) at 300 MHz to skin depths of 1.5 mm (TDC15) and 2.5 mm (TDC25) on forearm skin of 32 healthy subjects before and after localized skin heating from a baseline of 29.5 ± 1.2°C to 39.0 ± 2.7°C for 12 minutes. Skin water loss was determined prior to and after heating by transepidermal water loss (TEWL) measurements. Hyperemia was assessed by laser Doppler perfusion (LDP) before and during heating; skin temperature (TSK) was assessed via IR.

**Results:** Post-heat peak perfusion assessed via LDP measurements increased from a baseline (35°C) value of 2.8 ± 1.6 pu to 23.6 ± 9.7 pu. The hyperemia ratio (10.5 ± 6.3) was accompanied by significant (p<0.001) increases in all measured skin parameters with the following post-heat/pre-heat ratios; TEWL (4.3 ± 2.4), SC (9.0 ± 11.0), and TDC25 (1.10 ± 0.11) and TDC15 (1.08 ± 0.07). Regression analysis showed significant correlations between SC and TEWL (r = 0.516, p =0.002), LDP and TSK (r=0.585, p<0.001). No other significant relationship between the hyperemic response magnitude and any other skin water parameter was found.

**Conclusion:** Although the present results show major changes in skin water parameters accompanying heat-induced hyperemia and a small correlation between the hyperemia and the 2.5 mm depth TDC value, the absence of a significant correlation between the hyperemia and the other skin water parameters cause us to tentatively reject our initial hypothesis and conclude that processes associated with altering skin water parameters are not importantly dependent on heat induced vasodilation in young adults.

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