

Localized Forearm Skin Water Changes Associated with Heat Induced Hyperemia

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Objective: Our goal was to test the hypothesis of a significant positive correlation between skin water and heat-induced hyperemic blood flow.

Background: Skin water is important to skin physiology and is affected by multiple clinical conditions. We reasoned that localized heat-induced-vasodilation increases capillary filtration causing increased skin water.

Methods: Skin water was assessed by stratum corneum (SC) capacitance and tissue dielectric constant measurements (TDC) on forearm of 30 healthy subjects before and after localized skin heating to $\sim 40^{\circ}\text{C}$ for 12 minutes. Skin water loss was determined by transepidermal-water-loss (TEWL). Hyperemia was assessed with laser-Doppler methods.

Results: Immediate post-heat peak blood flow increased from 2.6 ± 1.4 to 25.1 ± 8.5 units and a significant increase ($p < 0.001$) in all skin water parameters. Male pre-and-post heating TDC values were significantly greater ($p < 0.01$) than female values. Post-heat skin water parameters declined but remained above baseline ($p < 0.001$) for at least 15 minutes. Post-heating SC and TEWL were positively correlated but the blood flow hyperemia was uncorrelated with any skin water parameter.

Conclusions: Although all skin water parameters increased there was no demonstrable relationship to the hyperemia. We thus reject our initial hypothesis and conclude that processes associated with altering skin water parameters are not importantly dependent on heat-induced vasodilation in healthy young adults. However, the role of vascular components in this process in aged persons and persons with compromised circulations should not be ruled out. These possibilities represent areas needing further investigation that will be aided by using the present data for reference comparisons.