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Acute effects of splint immobilization of the forearm on in vivo microcirculation and histomorphology of the human skin.

Altintas AA, Vogt PM, Altintas MA.; Microsc Res Tech. 2014 Jan;77(1):99-103.

ABSTRACT

BACKGROUND: Splint immobilization of the forearm is often performed in clinical practice. Previous studies investigated the effect of immobilization on bone, cartilage, muscle, and tendon, however, the acute effects on human skin microcirculation and histomorphology remains elusive.

METHODS: In 12 healthy, nonsmoking individuals (aged 29.7 ± 9.1 years) a randomly selected forearm was immobilized by splinting for 72 h, whereas the other forearm served as control. In vivo Reflectance-Mode Confocal-Microscopy (RMCM) was performed prior (baseline value) and postimmobilization to evaluate: quantitative blood cell flow; density of functional dermal capillaries; epidermal thickness; and granular cell size. **RESULTS:** At 72h forearm immobilization, quantitative blood cell flow was significantly reduced (42.86 ± 3.68 cells/min) compared to the control blood flow (53.11 ± 3.68 cells/min, $P < 0.05$) and dermal capillaries indicates less functional density (5.73 ± 0.63 capillaries/mm²) compared to the controls (7.04 ± 0.81 capillaries/mm², $P < 0.05$). Histometric assessment reveals significantly thinner epidermis following immobilization compared to the control site (40.02 ± 2.91 vs. 46.64 ± 3.09 μ m, $P < 0.05$). Granular cell size was significantly altered at 72 h splinting (730.1 ± 42.53 μ m²) compared to the control cell size at 770.2 ± 38.21 μ m². Comparison of baseline values of both forearms indicate statistical insignificance ($P > 0.05$) for each parameter. **CONCLUSION:** At 72 h splint immobilization, for the first time, significant adaptive mechanisms were evaluated on human skin microcirculation and histomorphology using in vivo RMCM. These adaptations may be considered as an incipient atrophy of the human skin. Long-term effects of immobilization including the regenerative potential should be evaluated in further RMCM studies.