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WOUND SURFACE PO₂ IMAGING DURING PHYSIOLOGICAL CUTANEOUS WOUND HEALING

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Aim: The role of oxygen in cutaneous wound healing is poorly understood. We studied wound surface pO₂ during physiological wound healing and the impact of the stratum corneum (SC) on surface pO₂ as the SC is supposed to be a major constituent of the epidermal oxygen barrier.

Methods: Split-thickness skin graft donor sites (n = 12) served as a standardized wound model. Wound surface pO₂ was measured at 1, 6, and 14 days after split-skin harvesting using two-dimensional luminescence lifetime imaging (2D-LLI) of palladium (II)-meso-tetraphenyl-tetrabenzoporphyrin (Pd-TPTBP) embedded in polystyrene-co-acrylonitrile (PSAN) particles on transparent foils. In another experiment the SC (n = 10) was removed by tape strippings to study the impact of the SC on the epidermal oxygen barrier.

Results: Split-skin donor site pO₂ on day 1 was 57.90 ± 5.49 mmHg, 22.14 ± 6.18 mmHg on day 6 and 6.32 ± 3.24 mmHg on day 14 after harvesting (each decrease $p < 0.001$). Regional differences in pO₂ within donor site wounds were visualized. There was no difference in pO₂ before and after SC removal.

Conclusions: The re-establishment of the epidermal barrier during wound healing is reflected by decreasing pO₂ values. The SC is not a major constituent of the epidermal oxygen barrier.