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Simple, fast and reliable perfusion monitoring of microvascular flaps

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Abstract:

Background: Free tissue transfer in head and neck reconstructions has a very high success rate, but thrombotic vessel occlusion is still a serious complication occurring in up to 10 % of all cases. Thus, a simple, fast and reliable monitoring system for free flaps would be of advantage.

Objective: The aim of this study was to investigate whether free flap monitoring by measuring perfusion-dependant parameters is a suitable method for discovering vessel thrombosis in free flaps.

Methods: 10 patients requiring tissue reconstruction after tumour surgery or because of chronic wounds were included in this study. 10 microvascular flaps were harvested and transplanted. Perfusion was determined by measuring a fluorescent oxygen sensor foil covering the flap's skin surface by means of a USB-handheld fluorescence microscope prototype. The sensor contained an oxygen reservoir which was consumed by the tissue corresponding to the perfusion status of the flap. Measurements were done before explantation, after successful anastomosis and 1 day after surgery.

Results: Clinically well-perfused grafts showed slope values between 0.07 and 0.27 (mean: 0.18 ± 0.007), and clinically poorly perfused grafts showed slope values between 0.35 and 0.75 (mean: 0.52 ± 0.19). In the present study, we used a threshold slope value of 0.3 for differentiating between well-perfused and poorly perfused flaps.

Conclusion: Flap monitoring via oxygen imaging by means of fluorescent sensor foils appears to be a fast, non-invasive cost-effective and thus suitable method for analyzing flap perfusion with the additional advantage of aiding decision making on flap revision.

Key-words: Free flap, microvascular, pO₂ imaging, fluorescent optical sensor