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Blood perfusion and oxygenation in human eyelid skin flaps examined by laser speckle contrast imaging and hyperspectral imaging – importance of flap length

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Conclusion

Perfusion decreases considerably over the length of the upper eyelid flap, while oxygenation (sO₂) is preserved to a greater extent. These results thus indicate that the remaining blood supply of the upper eyelid is sufficient to maintain adequate sO₂ of the flap despite the drop in perfusion.

Objective

Excision of periocular tumors often requires reconstructive surgery with skin grafts or flaps. Flap survival is dependent on sufficient blood perfusion and sO₂. The purpose of the present study was to investigate how the perfusion and sO₂ in human eyelid skin flaps is affected by flap length.

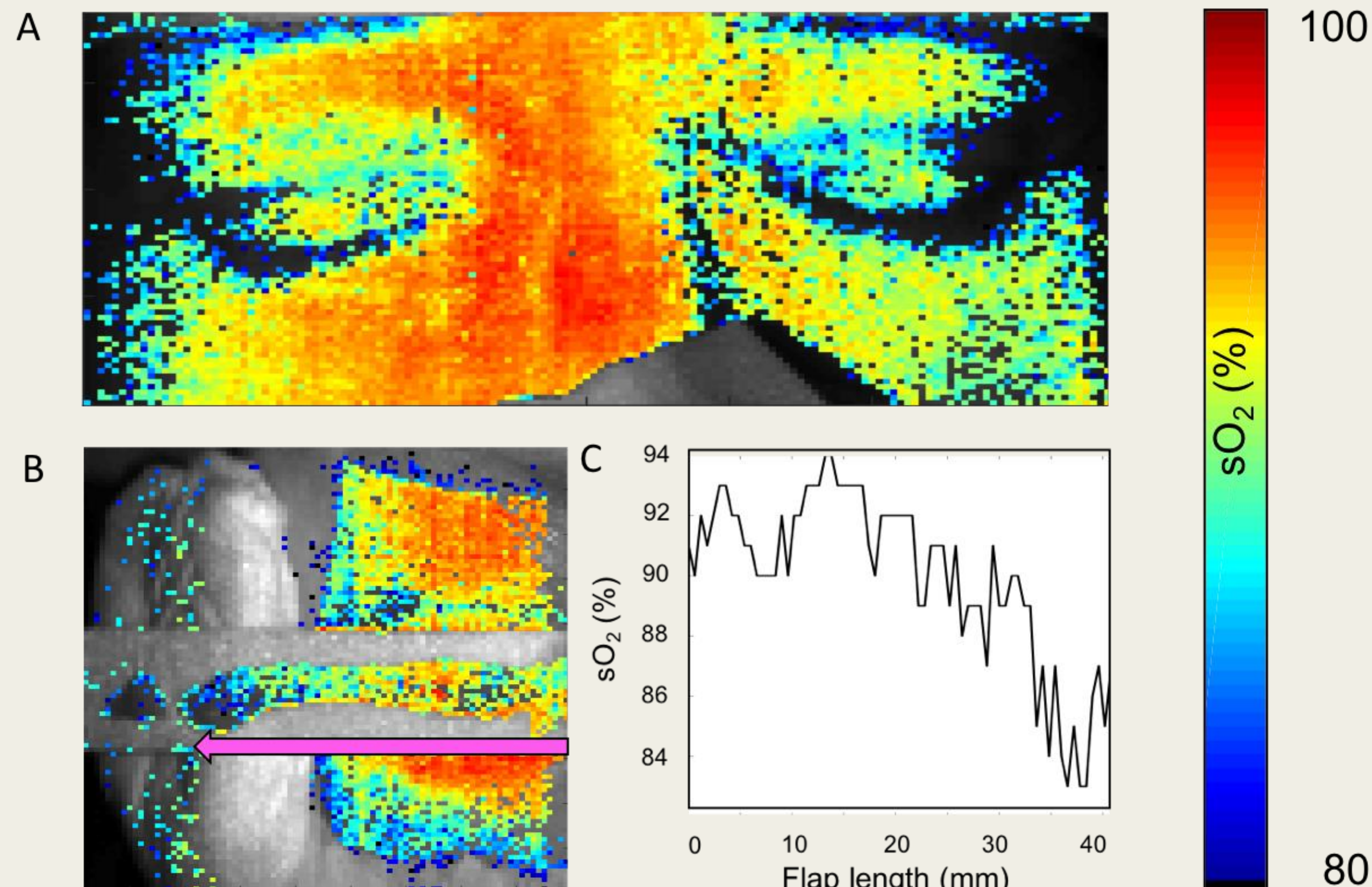


Figure 1. Representative example of hyperspectral imaging (HSI) of the eye region and an eyelid flap with a colored scale for guidance (of A and B). A. HSI of the right and left eye, the colors representing oxygen saturation (sO₂) of the periocular skin. B. Eyelid flap with the free end to the left and the arrow indicating the length of the flap. Here a gradual decrease in sO₂ is seen as a change of color throughout the flap length. C. A representative example of the decrease of sO₂ over the flap length, here seen in a diagram.

Methods

10 patients scheduled for blepharoplasty were included in the study. The upper eyelid skin was dissected, releasing a ~45 mm long piece of skin, while allowing the ~7 mm wide medial part of the skin to remain attached, to resemble a myocutaneous flap. The eyelids were monitored with laser speckle contrast imaging and hyperspectral imaging to determine the perfusion and sO₂ of the flap.

Results

Blood perfusion decreased from the base to the tip of the flap. Close to the base (5 mm away), the perfusion was 69 % of the reference value, while at 25 mm from the base it was only 16 %. sO₂ was only slightly reduced along the length of the flap.

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