

Epinephrine for local anesthesia in oculoplastic surgery – hypoperfusion measured using laser Doppler velocimetry, laser speckle contrast imaging and a novel form of extended-wavelength diffuse reflectance spectroscopy

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Objective: This study investigates the hypoperfusion effects of epinephrine in local anesthesia in oculoplastic surgery. A novel form of extended-wavelength diffuse reflectance spectroscopy (DRS, also called elastic scattering spectroscopy) was evaluated.

Methods: Blood perfusion in porcine eyelid flaps was measured using laser Doppler velocimetry (LDV) and laser speckle contrast imaging (LSCI), while the tissue response was measured using DRS with a broad spectrum (450 to 1550 nm). Epinephrine was either injected cumulatively (0.1, 1.0, 10 and 100 µg/ml), to determine the dose–response relation, or given as a single dose (12.5 µg/ml epinephrine + 20 mg/ml lidocaine). Control experiments were performed with saline or lidocaine.

Results: Increasing concentrations of epinephrine resulted in a gradual decrease in tissue perfusion, measured by LDV and LSCI, approaching a minimum after the injection of 10 µg/ml. Similar tissue response was observed with DRS. The time from the injection of epinephrine (10 µg/ml) to the stabilization of hypoperfusion was 75 s. After administration of 10 µg/ml epinephrine, about 20% of the blood perfusion remained, supporting the use of epinephrine in eyelid flaps with a narrow pedicle.

Conclusions: 10 µg/ml epinephrine appears to be adequate for vasoconstriction prior to oculoplastic surgery. Incisions need only be delayed for about 1 minute. Extended-wavelength DRS appears to be a promising technique for monitoring the tissue response following changes in blood perfusion in plastic surgery reconstructions. However, more rigorous validation of the technique is required before it can be implemented in clinical practice.