

Laser Dot Contrast Imaging Empowers Perfusion Observing Of the Foremost Portion during Eye Muscle a Medical Procedure

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Editorial

We demonstrate that laser speckle contrast imaging can be used to monitor blood perfusion noninvasively during the detachment of ocular muscles, which may be a valuable tool for reducing the risk of anterior segment ischemia as a complication of strabismus surgery [1]. During most strabismus procedures, rectus muscles and their corresponding anterior ciliary arteries are severed. Damage to multiple vessels may result in anterior segment ischemia (ASI), a rare but potentially vision-threatening complication of strabismus surgery. To minimize the risk of ASI, strabismus surgery protocols advocate manipulation of no more than two rectus muscles at a time and one more after a minimum of 6 months' healing time. However, these recommendations are based on empirical observations of clinical outcome and were developed nearly a century ago. To date, no method has proved successful in monitoring the effects of strabismus surgery on anterior segment circulation in real time [2].

We report our successful use of laser speckle contrast imaging (LSCI) to map blood perfusion to the anterior segment of the eye during extraocular muscle surgery. The technique is noninvasive and has proved useful in monitoring blood perfusion in skin with high spatial and temporal resolution. LSCI has previously been used in measurements of perfusion in the retina and in reconstructive surgery [3]. A 72-year-old man was referred to the Skane University Hospital, Lund, for enucleation of the left eye after previous diagnosis and treatment of uveal melanoma. A biopsy had been taken, followed by treatment with iodine plaque radiotherapy. The patient had developed increasing inflammation, resulting in complete retinal detachment and iris bombe.

Physicians were unable to monitor his response to treatment, and the patient was referred for enucleation. Presurgical examination revealed discrete postoperative scars on the conjunctiva and visual acuity of hand motion. Apart from the perfusion measurements, enucleation was performed according to standard procedure under general anesthesia. Prior to surgery, the patient gave his informed consent to participate in the study, which had been approved by the Swedish Ethical Review Authority. Only a few studies have previously evaluated anterior segment circulation in relation to strabismus surgery in humans. These were either conducted with technologies that are not clinically applicable or are invasive, and none of the techniques is suitable for perfusion monitoring during surgery [4].

In 1978, Hayreh and colleagues examined circulation in the iris in 33 blue

or green eyes in 31 patients admitted for strabismus surgery preoperatively and within 24 hours postoperatively, using fluorescein angiography. In cases of tenotomy of only horizontal muscles, no difference was seen in the circulation; however, when vertical muscles were detached, a delay in the filling of the vessels was seen postoperatively in the corresponding part of the iris. Other groups have used fluorescein angiography in a similar manner. In 2001, Chan and colleagues performed pre- and postoperative indocyanine angiography on the anterior segment in patients undergoing strabismus surgery. Most of the patients showed perfusion defects in the early postoperative phase, but almost all recovered within 3-22 weeks after surgery. In comparison with fluorescein, indocyanine angiography has the advantage of being usable in darker irides. Although these methods can provide detailed information on anterior segment circulation, they cannot be used during surgery and are invasive [5].

Optical coherence tomography angiography (OCT-A) has recently been developed. In 2018 Velez and colleagues used OCT-A to measure iris vessel density before and after strabismus surgery. Only a small decrease of 2%-3% was observed. Although it is noninvasive, OCT-A only provides static information on iris vessel density and cannot be used to monitor perfusion in real time.

Conflict of Interest

The authors declare that there is no conflict of interest associated with this manuscript.

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