

Alternative Methods of Anesthesia for the Repair of Open-Globe Injuries: Ophthalmologists' Perspective

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Abstract

Open-globe injury which is defined as a full thickness defect in the cornea and/or sclera is a common cause of visual loss. It is an ocular emergency and surgical repair should be performed as early as possible in order to restore the structural and functional integrity of the eye. Anesthesia plays a vital role for the success of the surgery for open-globe injuries. Numerous issues must be considered for the selection of anesthesia technique. General anesthesia is the gold standard method of anesthesia and regional anesthesia has conventionally been considered to be contraindicated in patients with open-globe injuries. However, local anaesthetic techniques such as sub-tenon, topical, intracameral, peribulbar and retrobulbar anesthesia are started to become popular for the surgery of open-globe injuries for selected patients. The aim of the present review is to describe and discuss the ophthalmologists' perspective related to the alternative methods of anesthesia for the repair of open-globe injuries.

Keywords: General anesthesia; Local anesthesia; Open-globe injury; Topical anesthesia

Introduction

Open-globe injury which is defined as a full thickness defect in the cornea and/or sclera is a common cause of blindness [1]. The global incidence is approximately 3.5/100.000 persons/year, which means 203.000 open-globe injuries each year [2]. Since young males comprise the majority of open-globe injuries with patients aged between 15 and 34 years old representing nearly one half of all open-globe injuries, it does not only affect the individual, but also affects the healthcare system and community [3,4]. The economic impact, particularly when considering loss of work days due to injury is excessive. In the United States, eye injuries reported to cost more than 300 million U.S. dollars per year due to productivity loss and medical expenditure [5].

Because many open-globe injuries accompany systemic traumatic events requiring more immediate attention, a complete systemic evaluation of the patient should be prioritized before proceeding to the operating room for repair of the eye injury. Thereafter, open-globe injury is an ocular emergency and surgical repair should be performed as early as possible in order to restore the structural and functional integrity of the eye.

However, the emergency or urgency of the surgery depends on the ophthalmologist's evaluation of the viability of the injured eye. If the eye is not viable, it would be reasonable to delay surgery in the patient with a "full-stomach" until the risk of aspiration is minimized. The ophthalmologist needs to weigh the risk of blindness against the risk of aspiration. Most studies have shown no significant difference in final visual outcome for repairing emergently versus postponing for a reasonable amount of time so that appropriate operating room personnel or medical clearance can be obtained. Barr showed that a delay in repair of up to 36 hours does not impact postoperative visual acuity [6] contrary to Cruvinal-Isaac et al. who proposed that a delay in surgical repair may be associated with the reduced vision [5]. It is important to discuss the relative risks so that informed decisions can be made regarding the best timing for surgery. The aim of the present review is to describe and discuss the ophthalmologists' perspective related to the alternative methods of anesthesia for the repair of open-globe injuries.

Anesthesia Techniques

Anesthesia plays a vital role in contributing to the success or failure of the surgery for open-globe injuries. The objectives of anesthesia include safety, akinesia, analgesia, minimal bleeding, avoidance of oculocardiac reflex and prevention of intraocular pressure increase [7]. Patient immobility during the surgery is also essential. Gild et al. reported that 30% of eye injury claims of anesthesiologists related to anesthesia management were associated with patient movement during ophthalmic surgery [8]. It is obvious that a perfect communication among the anesthesiologist, ophthalmologist, and patient is the necessity for optimal outcome of the surgery. The risks, benefits and alternatives of all anesthetic options should be explained clearly to the patient.

Surgical repair of an open-globe injury is a complex procedure requiring expertise as well as proper infrastructure. Numerous issues must be considered for the selection of anesthesia technique. General anesthesia remains the only technique of choice for children, mentally retarded individuals and demented or psychologically unstable patients. Other general anesthesia indications may include claustrophobia, deafness, language problem, Parkinson's disease, and intractable arthritis or orthopnea which impairs the patient's ability to lie flat and remain motionless during surgery [7]. Furthermore, the duration of the procedure must be considered during the selection process, because few patients without general anesthesia can remain comfortable on a narrow and hard operating table for 2 to 3 hours.

Regional anesthesia has conventionally been considered to be

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contraindicated in patients with open-globe injuries because of the concerns with potential extrusion of intraocular contents from the force generated by local anesthetics, from needle instrumentation of the orbit, from squeezing of the eyelids due to pain during injection, or from a potential hemorrhage after injection [9]. However, most eye hospitals in the developing countries do not have 24-hours on-site anesthesia services. Also systemic risks in some patients and some practical considerations combine together to result the regional anesthesia to be a reasonable alternative to general anesthesia for selected patients with open-globe injuries.

Local anaesthetic techniques are started to become popular for the surgery of open-globe injuries, which varies from an akinetic injection technique to a non-akinetic topical technique. Each technique has its own risk/benefit profile, and proven to be highly successful if performed correctly. The choice of the technique should be individualized based upon specific needs of the patient, the nature and extent of the open-globe injury, and the anaesthesiologist's and ophthalmologist's preferences and skill. There are many alternative techniques to general anesthesia for the surgical repair of open-globe injuries: Sub-tenon anesthesia, topical anesthesia, intracameral anesthesia, and peribulbar and retrobulbar anesthesia.

Scott et al. investigated a total of 458 patients with open-globe injuries for the clinical features and visual acuity outcomes associated with regional anesthesia versus general anesthesia [10,11]. They stated that those who underwent surgery without general anesthesia were more likely to have a better presenting visual acuity, more anterior wound location, shorter wound length, and dehiscence of previous surgical wound, and were less likely to have relative afferent pupillary defect. There was no anesthesia-related complications. The general anesthesia groups had longer operating times. Change in visual acuity between the presenting and final examinations was similar in the general anesthesia and regional anesthesia groups. Niemi-Murola et al. also proposed that patients with small penetrating globe injuries may be operated with a combined peri- and retrobulbar anesthetic, with operative conditions as good as those with general anesthesia [12].

Peribulbar blocks have many disadvantages including the risk of globe perforation and hemorrhage. Peribulbar block can cause transient increase in intraocular pressure which may be insignificant in an intact globe, but may increase complications in an open globe. Chakraborty et al. reported a higher percentage of vitreous prolapse in open-globe injuries repaired with peribulbar block (20%) when compared to the ones repaired with topical and intracameral anesthesia (6%) [13].

The combination of topical and intracameral anaesthesia with a facial nerve block found to provide acceptable surgical conditions for the repair of small anterior globe injuries [13]. Chakraborty et al. reported the comparison of combined O'Brien's block (facial nerve block), topical ropivacaine and intracameral lignocaine versus peribulbar block in 100 randomly selected cases of traumatic corneal rupture. The technique consisted of topical instillation of 0.75% ropivacaine combined with facial nerve block with O'Brien's approach with 2% lignocaine with adrenaline and intracameral injection of 1% lignocaine along with intravenous sedation. They stated that their combined technique was as effective as peribulbar block in providing adequate local anesthesia and reducing the incidence of vitreous prolapse and they recommend the use of their technique for the repair of open-globe injuries especially in hospitals where full time on-site anesthesia services are not available. An O'Brien's facial nerve block was added in their technique in order to avoid squeezing of the eyelids

which may prevent an increased intraocular pressure and prevent a damage to an already compromised eye.

Topical anesthesia has been used for an open-globe injury in a situation where cardiopulmonary disease prevented the use of general anesthesia and the extensive extrusion of eye contents made peri and retrobulbar blocks contraindicated [14]. In this case presentation, Auffarth et al. described the surgical repair of a 14-mm scleral wound under topical anesthesia without complication or pain during the procedure. Topical anesthesia was applied with a 10.0 mm×2.5 mm cellulose sponge soaked in oxybuprocaine 0.4% placed under the upper and lower lid for 20 minutes.

A prospective study of 10 open globe injuries repaired under topical anesthesia showed that ophthalmologists have adequate operative conditions (slight difficulty in nine cases and moderate difficulty in one case) for less severe eye injuries and most patients have minimal pain and discomfort [15]. They proposed the combined topical anesthesia and sedation as an alternative to general anesthesia for selected patients with open-globe injuries.

Conclusion

Appropriate anesthesia is complementary for satisfactory visual outcomes following the surgery for open-globe injuries. Although general anesthesia is the technique of choice for patients with suspected or prominent open-globe injuries, regional eye blocks and/or topical anesthesia can be used in selected patients especially with smaller and clean anterior wounds without extensive uveal incarceration. Because the complications of ophthalmic anesthesia can be vision threatening or life threatening, effective communication and planning between ophthalmologists and the anaesthesiologists is essential for consistent perioperative care.

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