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Synergy in Pain Relief and Exploring Multimodal Analgesia Techniques

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Introduction

The purpose of this study was to evaluate peri-operative outcome after vitreoretinal surgery when peribulbar anaesthesia is combined with general anaesthesia. Sixty adult patients undergoing elective primary retinal detachment surgery with scleral buckling or an encircling procedure received either peribulbar anaesthesia in conjunction with general anaesthesia or general anaesthesia alone. For peribulbar anaesthesia a single percutaneous injection of 5–7 ml of local anaesthetic solution (0.75% ropivacaine with hyaluronidase 15 iu.ml−1) was used. The incidence of intra-operative oculocardiac reflex and surgical bleeding interfering with the surgical field, postoperative pain and analgesia requirements, and postoperative nausea and vomiting were recorded. In the block group there was a lower incidence of oculocardiac reflex and surgical bleeding intra-operatively. Patients in the block group also had better postoperative analgesia and a lower incidence of postoperative nausea and vomiting compared with the group without a block. The use of peribulbar anaesthesia in conjunction with general anesthesia was superior to general anaesthesia alone for vitreoretinal surgery with scleral buckling.

Vitreoretinal surgery with scleral buckling and intra-ocular expansible gas injection is frequently associated with the oculocardiac reflex intra-operatively, probably as a result of traction on the ocular muscles and sclera. A high incidence of postoperative pain and postoperative nausea and vomiting (PONV) are attributed to increased intra-ocular pressure due to expansion of the gas bubble or tight buckling or encirclement, particularly when performed under general anaesthesia. The reluctance to use local anaesthesia alone for vitreoretinal surgery may stem from the longer, more unpredictable and uncomfortable nature of such surgery. Surgical dissatisfaction because of insufficient akinesia resulting from partial blockade and patient discomfort during prolonged surgery involving scleral buckling are further limitations to the use of local anaesthesia alone. The combination of general anaesthesia and peribulbar anaesthesia may reduce these drawbacks. The aim of this study was to evaluate the effect of peribulbar anaesthesia when used in conjunction with general anaesthesia on peri-operative outcome after vitreoretinal surgery.

Pain Treatment Strategies

After obtaining approval from the Institutional Ethics Committee and written informed consent from all patients, 60 adult patients (ASA 1 or 2), scheduled for elective primary retinal detachment surgery, were enrolled in this prospective, double-blind, randomised study. All patients underwent scleral buckling or an encircling procedure. Twenty–five patients underwent additional pars plana vitrectomy with gas/silicone oil injection. Exclusion criteria included allergy to local anaesthetic solutions, clotting abnormalities, impaired mental status, drug abuse, and surgical procedures entailing vitrectomy without scleral buckling. The study was carried out in the Magrabi Eye & Ear Hospital in Oman between January 2008 and July 2009. All operations were performed by the same surgeon. Patients were randomly allocated (using the block randomisation method, with a block size of six) to one of two groups to receive either peribulbar anaesthesia in conjunction with general anaesthesia (PB-GA group, n=30) or general anaesthesia alone (GA group, n=30).

In the anaesthetic room, an intravenous cannula was placed and standard monitoring, including non-invasive arterial blood pressure, ECG, and peripheral oxygen saturation (SpO2) were started. Propofol 0.5 mg.kg−1 was used to provide a brief period of sedation during the peribulbar injection. All blocks were performed by a senior anaesthetist experienced in the technique who was not involved in the peri-operative management or evaluation of the patients. The study solutions were prepared by this physician at the bedside just before the injection. In the PB-GA group, a single percutaneous injection was performed using a 25-G 16-mm short-bevel needle. The injection site was in the inferior orbital edge and in the same line as the inferior lacrimal canaliculus. The needle was advanced in an antero-posterior direction for half of its length and then obliquely in the direction of the optical foramen as described by Rizzo et al. After negative aspiration, 5–7 ml of the local anaesthetic solution (0.75% ropivacaine with hyaluronidase 15 iu.ml−1) was slowly injected until there was a complete drop and fullness of the upper eyelid. In the GA group, normal saline (2ml) was injected subcutaneously (as placebo) at the same site on the inferior eyelid, using a 25-G 15-mm needle. Intermittent compression was applied for 10 min in both groups, using a Honan balloon set at 30 mmHg. Akinesia was evaluated in the four quadrants using a 3-point scoring system:

0=akinesia; 1=partial akinesia; and 2=normal movement, giving a maximal score of eight for the four muscles. An akinesia score of three or less was defined as a successful block. Sensory block was assessed according to abolition of the corneal reflex and the eye was dressed until induction of anaesthesia. Intra-ocular pressure was measured using a Perkins applanation tonometer at the following times: before block; and 1, 5, 10 and 15 min after injection of the local anaesthetic solution or placebo. Management of patients was then similar in the two groups.

Multimodal Analgesia Solution

General anaesthesia was induced with propofol 1–2 mg.kg −1 and fentanyl 1–2 µg.kg−1 and tracheal intubation was facilitated with cisatracurium 0.15 mg.kg−1. Anaesthesia was maintained with a mixture of 50% oxygen and 50% air and sevoflurane (0.5–3%). The inspired concentration of sevoflurane was adjusted to maintain comparable depths of anaesthesia (BIS value 40–50). Ventilatory frequency was set to obtain an end-expiratory pCO2 of 4–4.6 kPa. An increase of mean arterial pressure or heart rate more than 20% above the patient's baseline despite a BIS value within the targeted range was treated with supplemental boluses of fentanyl 25–50 µg. The last supplemental bolus of fentanyl was given at least 30 min before the end of the operation. A drop of mean arterial pressure below 20% of the patient's baseline was managed with intravenous fluid boluses of 200 ml or ephedrine 5–10 mg boluses. Postoperative analgesia was started 30 min before the end of surgery and maintained for 24 h by infusion of paracetamol 1 g 6-hourly.

Scleral buckling started with 360° conjunctival opening (periotomy). The sub-Tenon's (episcleral) space and the sclera were entered engaging rectus muscle insertions with traction sutures. Retinal breaks were treated with cryopexy. Solid silicone rubber or silicone sponge (Mira, Waltham, MA, USA) were used for explant scleral buckling and to support retinal pathology. These were secured to the sclera with partial thickness non-absorbable scleral sutures. The placement of explant material was either segmental or encircling. Adjustment of a buckle height was done by tighting the encircling element or by adjusting the distance between the scleral sutures.