

General anaesthesia for ophthalmic surgery

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Abstract

Local anaesthesia for eye surgery is increasingly popular, but there will always be a need for general anaesthesia. Patients may refuse local anaesthesia, may be unable to keep still or lie flat for the duration of surgery or lack the mental facility to cooperate whilst awake. Young children and those with allergy to local anaesthetic also need general anaesthesia. Careful patient preparation is important before surgery. Glycaemic control in patients with diabetes, adjustments to warfarin or aspirin dosing, thromboembolic prophylaxis and preoperative fasting need to be considered. Eye surgery alone is rarely a true emergency, and surgery can usually wait until the patient's stomach is empty. Eye pathology requiring surgery is a feature of many medical conditions and syndromes. Many patients are elderly with ischaemic heart disease, hypertension, chronic obstructive pulmonary disease and renal impairment, which must be assessed before general anaesthesia. Systemic effects of ophthalmic medications, such as hypokalaemia caused by acetazolamide should be considered. A wide range of general anaesthetic techniques are suitable for eye surgery, but certain key points are relevant to specific operations. These include the oculo-cardiac reflex in strabismus and retinal surgery, the use of intraocular gas bubbles in vitreo-retinal operations, controlled hypotension in lacrimal, orbital and other oculoplastic procedures, and the high incidence of nausea after strabismus surgery. Total intravenous anaesthesia (TIVA) fulfils many of the requirements for the ideal anaesthetic technique for ophthalmic surgery. Blood pressure, heart rate and intraocular pressure are lowered. It is rapidly titratable and recovery is fast. Postoperative nausea is reduced and TIVA works well in patients with renal and hepatic disease. Remifentanyl infusion allows nitrous oxide to be avoided and top-up doses of muscle relaxants to be minimized during ventilation. For most ophthalmic surgery, postoperative pain is mild and non-steroidal anti-inflammatory drugs work well. Intraoperative sub-Tenon's local anaesthetic is useful.

Keywords General anaesthesia; oculo-cardiac reflex; ophthalmic surgery; remifentanyl

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The use of local anaesthesia for eye surgery is increasing, but general anaesthesia will always have a place (Box 1). Eye conditions are seldom immediately life threatening and it is nearly always possible to wait for the stomach to empty before giving general anaesthesia.

Eye operations are relatively painless procedures; however, patients are often anxious and at the extremes of age. Coexistent

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Learning objectives

After reading this article, you should:

- have an understanding of which patients may require a general anaesthetic for their eye surgery
- be aware of how these patients should be assessed and prepared for anaesthesia
- understand the specific problems and issues that relate to each ophthalmic surgical subspecialty

disease is common. Most patients are treated on a day-care basis or require an overnight stay only. Good cooperation between anaesthetist and surgeon is important, and the surgeon requires a 'soft', motionless eye on which to operate. Clinical strategies to ensure immobility are vital. An analysis of closed insurance claims by the American Society of Anesthesiologists found that 30% of claims for eye injuries associated with anaesthesia were related to patient movement during surgery.

Preparation of patients

Coexistent disease is common in ophthalmic patients and preoperative optimization of medical conditions is required. Investigations can be arranged through the anaesthetic clinic and liaison with appropriate specialists (e.g. cardiologists, neurologists) organized. Eye hospitals are sometimes remote from hospital back-up services such as intensive care and computed tomography scanners.

Blood coagulation control: the maximum acceptable international normalized ratio for a patient taking warfarin depends on the operation (e.g. cataract <3.0, eyelid procedures <2.0). Treatment with non-steroidal anti-inflammatory drugs (NSAIDs) or aspirin should not be stopped for cataract surgery but should be stopped at least 10 days before surgery for eyelid procedures. With newer anti-platelet drugs such as clopidogrel, decisions about stopping the drug should be discussed with the prescribing doctor as there may be serious risk (cardiovascular and stent issues) from withholding the treatment.

Starvation: the patient should be starved of solids for 6 hours before surgery and of clear fluids for 2 hours.

Prophylaxis for deep vein thrombosis: mechanical devices such as compression stockings, calf compressors and ankle elevators are useful. Heparin is usually avoided, especially for retinal and oculoplastic procedures, unless the patient is at high risk.

Control of diabetes: patients with diabetes should be given local anaesthesia if possible. If they require general anaesthesia, their operation should be scheduled early on the operating list, and their morning hypoglycaemic tablet omitted. It is usually possible for patients to eat and drink soon after surgery; therefore, patients may be able to omit only their morning insulin dose.

Drug treatment should be continued in most patients, especially cardiac drugs, antihypertensives, bronchodilators and

Patient selection for general anaesthesia

Absolute

- Patient preference
- Young children
- Uncooperative patient (e.g. learning difficulties)
- Patient unable to keep still (e.g. Parkinson's disease, dystonia, arthritis, nystagmus, tremor, cough, dyspnoea, vertigo)
- Patient unable to lie flat for duration of operation
- Allergy to local anaesthesia

Relative

- Surgery to the patient's only functioning eye
- Claustrophobia
- Communication problems (e.g. deaf patient, poor language comprehension)
- Bleeding disorder
- Long procedure

Box 1

corticosteroids. It should be remembered that eyedrops and other ophthalmic drugs have systemic effects (Table 1).

Premedication may be required. The patient should be given anti-emetics if they have a history of postoperative nausea and vomiting (PONV) or if they are having an emetogenic operation. Antihistamines (H₂-blockers) should be considered if gastric acidity or oesophageal reflux is a problem, particularly if a laryngeal mask airway (LMA) is to be used. Anxiolytics may be given if needed, but should be avoided for day surgery. Antimuscarinics should be given to children having ketamine for glaucoma screening. Topical anaesthetic cream should be used for children and patients with needle phobia.

Marking the side: the surgeon must mark the correct side for surgery before the patient leaves the ward. This is rechecked on arrival in the theatre suite and again in the anaesthetic room before induction. The eye that does not require surgery is taped closed after induction of anaesthesia. The surgeon and scrub

Systemic effects of ophthalmic drugs

Drug	Effect
β-blockers	Hypotension, bradycardia, bronchoconstriction
Phenylephrine	Hypertension
Acetazolamide	Hypokalaemia
Ecothiopate	Prolonged action of neuromuscular junction blockers broken down by pseudochoolinesterases

Table 1

nurse should check which eye requires surgery for a final time just before cleaning the eye in the theatre.

Induction and maintenance of anaesthesia

Airway control

A mask should be used for brief procedures only and avoids airway stimulation. The LMA is the ideal airway for most ocular procedures. Insertion and removal of a tracheal tube causes more cardiovascular stimulation than an LMA. Breath-holding, laryngospasm, bronchospasm and coughing are all less likely using an LMA. However, access to the airway during surgery is not easy without serious disturbance to the surgical field; therefore, the LMA must be well positioned and stable before surgery starts. If there is any doubt about the reliability of the LMA position, it is safest to intubate the trachea.

Tracheal intubation is required in:

- obese patients
- long procedures
- potential airway soiling – nasal bleeding from lacrimal surgery and harvesting of mucous membrane graft material from inside the mouth (lower lip or palate)
- LMA failure
- infants having medium-to-long operations
- low chest compliance with high airway-inflation pressures.

A preformed caudally directed or an armoured flexible tracheal tube, taped away from the eyes, is ideal.

Intraocular surgery requires intermittent positive-pressure ventilation, which allows accurate control of expired carbon dioxide, and, therefore, intraocular blood volume and, to a lesser extent, intraocular pressure. Muscle relaxants are not usually required with the LMA if total intravenous anaesthesia is used. Some patients undergoing total intravenous anaesthesia do not maintain their eyes in the neutral position, they either look up or have a divergent squint. This can happen despite adequate depth of anaesthesia with total intravenous anaesthesia, and sometimes a small dose of non-depolarizing muscle relaxant (rocuronium, 10–20 mg, in an adult) is required to correct it and allow surgery to proceed. If muscle relaxants must be avoided the surgeon can use a traction suture to return the eye to a neutral position.

Intravenous fluids

Provided there is only a small amount of blood loss there is no need for intraoperative fluids other than maintenance crystalloid solutions. A full bladder causes hypertension and elevates intraocular pressure.

Anaesthetic maintenance drugs

Most standard methods of maintaining anaesthesia are possible. Either of the following work well for almost any combination of ocular operation and patient:

- LMA – remifentanyl (Box 2) plus propofol/oxygen/air
- tracheal tube – remifentanyl plus sevoflurane/oxygen/air, with or without muscle relaxant for intubation.

The relatively unstimulating nature of most ophthalmic surgery can cause problems during general anaesthesia. Patients often become hypotensive, and sympathomimetics (e.g. ephedrine, metaraminol) should be used to maintain blood pressure and heart rate. However, awareness and patient movement are

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