Local anaesthesia for ophthalmic surgery

Joint guidelines from the Royal College of Anaesthetists and the Royal College of Ophthalmologists

February 2012

Summary

There have been major advances in every aspect of the management of the ophthalmic surgical patient. These include the shift to day care, increased focus on the patient, and the involvement of the entire ophthalmic team in all components of the process. A working party of the Royal College of Anaesthetists and the Royal College of Ophthalmologists was convened to update the 2001 'Guidelines on Local Anaesthesia for Intraocular Surgery'. The working party agreed unanimously to change this to 'Guidelines on Local Anaesthesia for Ophthalmic Surgery'. These guidelines will now cover the management of patients undergoing most routine ophthalmic procedures and are not limited to intraocular surgery.

The purpose of these guidelines is to provide information for all members of the ophthalmic team in order to promote safe and effective local anaesthesia for ophthalmic patients. They are intended to apply to practice in the United Kingdom.

General comments

- Day care ophthalmic surgery under local anaesthesia (LA) is now preferred by most patients, surgeons and other staff, and is associated with the least disruption to the patient's normal activity.
- Multi-professional team-working is fundamental to safe effective day care surgery. Appropriately trained nurses are increasingly performing tasks that were previously undertaken by medical staff, especially in relation to pre-operative assessment and preparation.
- These guidelines may require to be fine-tuned to meet local requirements, but the following general aspects remain pertinent:
  - record keeping must be comprehensive, clear and unambiguous for patient safety and to comply with clinical audit and governance
  - the results of pre-operative assessment should be recorded on a checklist which is completed before the patient enters the operating theatre area
  - every trust, hospital or unit undertaking ophthalmic surgery should identify one anaesthetist with overall responsibility for the anaesthetic services to the eye department
  - good communication between members of the anaesthesia-surgical team is essential
  - all ophthalmic surgery performed should be carried out in a facility which is appropriately equipped and staffed.

Pre-operative assessment

- The pre-operative assessment should be conducted according to locally designed protocols which should include routes of communication about abnormalities or concerns.
- Pre-operative assessment should normally be undertaken by trained specialist nurses with medical input as required.
- For the patient with no history of significant systemic disease and no abnormal findings on examination at the nurse-led assessment, no special investigations are indicated. Any patient requiring special tests may also need an opinion from a doctor.
- The patient should be provided with appropriate information regarding surgery and anaesthesia, thereby reducing anxiety to a minimum.
- The pre-operative assessment visit should take place within three months of the surgery.

Day of surgery

- Pre-operative checks must be made on the day of surgery. Recent changes in the patient's condition or therapy that might affect the surgical event must be identified.
- Local orbital blocks should be administered by a trained anaesthetist or ophthalmologist. *Appropriately trained, indemnified and professionally regulated** *non-medical staff* may administer topical, subconjunctival or sub-Tenon's blocks for **selected**, ambulatory cataract surgery, provided the criteria for safe monitoring and management of complications are met.
- For difficult cataracts and complex procedures, sub-Tenon's blocks should only be administered by a trained anaesthetist or ophthalmologist.
- Intravenous sedation should only be administered under the direct supervision of an anaesthetist, whose sole responsibility is to that list.
- Local staffing availability will dictate whether an anaesthetist can be provided for all ophthalmic lists. An anaesthetist is not essential when topical, subconjunctival or sub-Tenon's techniques without sedation are used.
- When peribulbar or retrobulbar techniques are used the responsibility for the immediate management of complications lies with the ophthalmologist or anaesthetist administering the local anaesthetic. An anaesthetist should normally be available in the hospital for further management if necessary.
- No LA or surgical technique is entirely free from the risk of serious systemic adverse events, although these events may not be always a consequence of the technique itself.
- The patient should be continuously monitored, from before the administration of the LA to the end of the operation. Monitoring should be by clinical observation, pulse oximetry and using other equipment as appropriate.
- A suitably trained individual must have responsibility for monitoring the patient throughout anaesthesia and surgery.
- All theatre personnel should participate in regular Basic Life Support (BLS) training, and there should always be at least one person immediately available who has Immediate Life Support (ILS) training or equivalent. Where the unit is free-standing and there is no immediate access to a formal cardiac arrest team there should be at least one person with Advanced Life Support (ALS) or equivalent.

Discharge and aftercare

- All patients are advised to have a friend or relative to accompany them to surgery and at discharge and this is essential for those who are frail and elderly.
- Discharge criteria must be established for each unit.
- Written instructions should be given to the patient about what to do and who to contact in the event of problems or concern.

Clinical Governance (training, audit, clinical incident reporting, indemnity)

High quality care requires that all personnel dealing with ophthalmic surgery under LA have specific training. Professional groups should only perform those anaesthetic techniques that are accepted and indemnified by their recognised professional body. Record keeping must be comprehensive, clear and unambiguous. Any potentially life or vision threatening complications of ophthalmic anaesthesia must be reported as critical incidents within each institution's Clinical Governance framework. Audit of ophthalmic anaesthesia should be included in departmental audit programmes.

* Wherever this document refers to '…professionally regulated non-medical staff…' this should be taken to include those Physician's Assistants (Anaesthesia) [PA(A)s] who have qualified against the DH/RCoA curriculum and who are entered on the voluntary register of the Association of PA(A)s. It is anticipated that full registration with the Health Professions Council for these anaesthesia team members will be completed shortly after the publication of this document.

Contents

1 Preface

There have been major advances in every aspect of the management of the ophthalmic surgical patient. These include the shift to day care under local anaesthesia for the majority of procedures, an increased focus on patient-centred outcomes, and the involvement of the entire ophthalmic team in all components of the process.

Most patients presenting for ophthalmic surgery are elderly and likely to have pre-existing medical problems. Local anaesthesia is usually associated with lower morbidity than general anaesthesia. Day care procedures cause the least disruption to the patient's daily routine, and are now preferred by most patients and staff.

Ophthalmic surgery may be performed in a general hospital environment or in isolated units provided they have suitable facilities, staffing and standards.

1.1 Aim of these guidelines

The purpose of these guidelines is to provide information for all members of the ophthalmic team in order to promote safe and effective local anaesthesia for ophthalmic surgery in adults.

These guidelines set minimum standards and do not guarantee a specific outcome. Some units will expect to offer a higher standard of care than the minimum.

1.2 Guidelines and local practice

Specific factors may demand that these guidelines are fine-tuned to meet local requirements, but standards should not be compromised. These guidelines are intended to apply to practice in the United Kingdom.

1.3 Scope of the guidelines

The ophthalmic surgical scene is dominated by cataract surgery, and therefore most of the available evidence relates to anaesthesia for cataract surgery. The guideline development group felt that much of this evidence could be used to provide guidance for other ocular operations, subject to caveats which appear later in this document. These guidelines are intended to meet the requirements of the adult patient who is about to undergo ophthalmic surgery.

It is not possible to predict every possible clinical situation, and there will be occasional situations in which these guidelines will not be strictly applicable. In such situations, clinical judgement should prevail and patient safety should always be a priority.

The following are specifically excluded from this document.

- Patients requiring general anaesthesia, whose pre-operative assessment and anaesthetic management falls within the remit of the anaesthetist.
- Children.

2 Methods

2.1 The working group

A working group of the Royal College of Anaesthetists and the Royal College of Ophthalmologists was convened to review the 2001 guidelines. The working group comprised practicing anaesthetists and ophthalmologists, representing a range of opinion on LA techniques. The members are listed in appendix A.

2.2 Gathering the evidence

The approach taken by members of the working group was as follows.

- An on-line literature search on ophthalmic anaesthesia was conducted. The search was confined to ophthalmic surgery in adults and on reports in the English language. Some references were obtained from committee members' knowledge of the literature
- Following this, only studies taking place within the last 20 years (1990–2011) were prioritised for further review. Only landmark papers before 1990 were reviewed.
- Finally the following attributes were sought in all studies included in the review:

  The characteristics of the study population should be provided. A systematic evaluation and consideration of possible confounding factors should have been undertaken during the statistical analysis, with a description and discussion of the methods used. In the absence of such systematic evaluation there should be at least some discussion of these issues and their likely influence on the findings reported. All studies reviewed were assessed using a framework based on guidance from the Scottish Intercollegiate Guidelines Network (SIGN) and recommendations made graded as follows.[1]

2.2.1 Grades of recommendations

A Requires at least one randomised controlled trial as part of a body of specific recommendation.

B Requires the availability of well conducted clinical studies but no randomised clinical trials on the topic of recommendation.

C Requires evidence obtained from expert committee reports of opinions or clinical experiences of respected authorities. Indicates absence of directly applicable clinical studies of good quality.

2.2.2 Good practice points

✓ Recommended best practice based on the clinical experience of the guidelines development group.

Ideally, robust guidelines are based on numerous high-quality studies which have been designed to answer important clinical questions. For many aspects of these guidelines, it is apparent that the literature is not adequate. We were aware of this issue when preparing this guideline. The sections were all assigned to sub-committees of two to four clinicians for review, then the initial drafts were circulated to all members for comment prior to agreeing the final guideline.

3 Background

3.1 Setting the scene

There has been a progressive change in anaesthetic practice for ophthalmic surgery over the past decade, and this has continued to evolve since the last guidelines on 'Local Anaesthesia for Intraocular Surgery' were produced by the Royal College of Anaesthetists and College of Ophthalmologists in 2001.[2] The British Ophthalmic Anaesthesia Society (www.boas.org) was founded in 1999 and hosts annual scientific meetings. The Cochrane Collaboration has published five systematic reviews[3–7] related to local anaesthesia for eye surgery. Despite these advances, numerous fundamental questions that relate to ophthalmic anaesthesia remain unanswered.

The most common operations continue to be those for cataract and glaucoma. The 2003 national survey[8] identified that over 90% of cataract operations were performed under local anaesthesia without sedation. An estimated 375,000 cataracts were performed under local anaesthesia, and general anaesthesia or local anaesthesia with sedation were both used in approximately 4% of procedures. In common with previous studies, the 2003 survey found that life-threatening and sight-threatening complications still occur, although they remain rare. An audit of the Cataract National Dataset confirmed the low rate of complications following needle based techniques.[8–10]

No LA technique is totally free of the risk of serious systemic adverse events which may occur irrespective of the choice of surgery or anaesthetic technique. Contributing factors include pre-existing medical conditions, anxiety, and pain or stress reactions to the operation.

B **Whatever their cause, serious systemic adverse events in association with ophthalmic surgery do sometimes occur with all types of local anaesthetic techniques.**

3.2 Organisation of ophthalmic anaesthetic services

Teamwork is the key to achieving high surgical throughput without compromising patient safety, whilst maintaining quality and patient satisfaction. Ophthalmic surgery under local anaesthesia is a joint venture between anaesthetists, surgeons, nurses and technical staff. This is particularly important, as specially trained non-medically qualified personnel may perform many of the tasks previously undertaken only by medical staff.

✓ **Multi-professional teamwork is the key to safe surgery and is essential to every stage of the process.**

✓ **Every ophthalmic unit should identify one anaesthetist with overall responsibility for ophthalmic anaesthetic services and critical care pathways.**

3.3 Record keeping

Meticulous recording of important data is mandatory, and is a prerequisite for communication, safe practice, clinical governance and audit. As a minimum the record should include details of:

- pre-operative assessment
- consent (see 5.3)
- use of the appropriate World Health Organisation (WHO) surgical safety checklist[11,12]
- procedures performed, including side of surgery
- monitoring with contemporaneous recording
- anaesthetic technique (see 6.7)
- safety/infection control measures taken,
- outcomes such as patient comfort.

This data recording is necessary, even if the most simple technique is chosen, e.g. topical.

Where possible, there should be standardised forms on which to record all components of the process in a clinical pathway.

3.3.1 General

For all data entry the following should be the norm.

- Clarity – data should be recorded clearly and unambiguously.
- Accountability – all data entries should be dated, timed and attributable.

4 Selection criteria for local or general anaesthesia

4.1 Contraindications to LA

These may include:

- patient refusal after careful counselling
- local sepsis
- trauma or perforated globe
- grossly abnormal coagulation (see 5.1.6.2)
- severe reaction, allergy or other complication of LA.
- confusion, inability to communicate or to comply with instructions
- uncontrolled tremor
- inability to adopt acceptable positioning.

The alternatives are GA, or LA with sedation.

4.2 Recommending the type of anaesthesia

Decisions regarding the type of anaesthesia should be made individually for each patient and each procedure. General anaesthesia should be available as an option either in the same or in another institution.

If clinically indicated, a formal assessment of competence should be made in line with the requirements of the Mental Capacity Act 2005,[13] Adults with Incapacity (Scotland) Act 2000, or equivalent applicable legislation. The competent patient should be given sufficient understandable information on the options available, in order to make a fully informed choice. The surgical assessment can include recommendations on the type of anaesthetic indicated for that individual patient. This will depend on psychological aspects, the particular features of the globe and orbit as well as the anticipated difficulty of the surgery. If the patient is incompetent to make an informed choice, the clinical team should consult the named attorney if the patient has submitted a valid lasting power of attorney regarding medical care. Alternatively, the unit's patient advocate should agree what technique is in that patient's best interest. The decision should be fully documented in the patient record.

Day case ophthalmic surgery has a good safety record[3,14–17] and is preferred by patients, surgeons and staff alike. Maximum health economic benefit is achieved if cataract surgery is delivered on a day care basis using local anaesthesia.[18] LA also has advantages over GA for many other ophthalmic procedures.

A **For the majority of day case ophthalmic surgery, LA is the method of choice.**

✓ **GA may be preferred for more complex or prolonged surgery, or when LA is contraindicated.**

5 Pre-operative assessment

Preparation is essential for the smooth running of surgery, and most of this should be done at pre-operative assessment. The purpose of pre-operative assessment is to ensure that the patient is fit for the planned procedure. This process should instil confidence in the patient, minimise unexpected problems and prevent late cancellation. Pre-operative assessment is increasingly undertaken at the initial consultation.[19]

Ophthalmic anaesthesia and surgery can be complicated by both ocular and systemic complications.[8–10] Some of these may be avoided if predisposing ophthalmological and medical factors are identified and, where possible, controlled before surgery.

✓ **Ophthalmic pre-operative assessment clinics may be undertaken by appropriately trained nurses. It is essential to have effective lines of communication with surgical and anaesthetic teams.**

5.1 Assessment

5.1.1 General issues

While the focus of this section is directed at determining fitness for anaesthesia, this is inextricably linked with the surgery and some overlap is inevitable.

5.1.1.1 Suitability for day care

The purpose of pre-operative assessment is to identify abnormalities that might interfere with the safe performance and outcome of the operation. The vast majority of patients are suitable for day care surgery[3,18,20] and neither age nor weight need be an issue in this respect.

Living alone, either with or without a telephone, and distance from the hospital do not contraindicate day care surgery under local anaesthesia without sedation,[18] provided there is adequate support.

✓ **All patients should have a relative, friend or carer to accompany them to surgery, at discharge and at home, ideally for the first 24 hrs.**

5.1.1.2 Timing

The assessment should be within three months of the operation. A telephone call to see that nothing has changed may be done in the week preceding surgery. A telephone review may also be appropriate when a second procedure is planned in healthy patients (for instance 2nd eye for cataract surgery) within 3 months of the first operation under LA. Final checks must be made on the day of surgery.

5.1.1.3 Pre-assessment records

The general medical records should be available. If the patient has significant systemic or ocular disease, and no information is available, the general practitioner or relevant hospital should be contacted. If the relevant information is not available, planned surgery should be deferred.

✓ **There should be a record of the history, examination, results of investigations and any actions to be taken. A checklist should be completed before the patient enters the operating theatre area.**

5.1.2 Communication

It is recommended that each unit has defined pathways where issues that will influence the operation or require communication with another medical practitioner are identified.

✓ **Factors identified at the pre-operative assessment that affect any part of the surgical episode, or its follow-up, must be identified and dealt with by relevant members of the surgical and anaesthetic team.**

5.1.3 Medical assessment

5.1.3.1 History

The following should be noted during history taking.

- Patient's age.
- Past illness.
- Present illness and any abnormal symptoms, determined by system e.g. cardiovascular, respiratory (including orthopnoea), nervous system, renal (including urinary incontinence), hepatobiliary, endocrine (including diabetes) and severe positional vertigo on lying flat.
- The ability to lie flat and still.
- All current medications with generic names should be recorded, including eye drops. Some medications are particularly relevant to the choice of anaesthesia and surgery, e.g. aspirin, clopidogrel, warfarin, tamsulosin, doxazosin. Non-prescription medicines (e.g. ginkgo biloba) should also be recorded.
- Allergies, idiosyncratic drug reactions and sensitivities, noting the presumed causative agent and the effect of exposure.
- Past surgery and any complications.
- Past anaesthetic procedures and any complications.
- Psychosocial matters including anxiety, confusion, panic attacks and claustrophobia.
- Communicable diseases, e.g. viral status.
- Communication issues.

5.1.3.2 Venous thrombo-embolism (VTE) assessment

A venous thrombo-embolism (VTE) assessment should be undertaken according to local guidelines before surgery.

5.1.4 Examination

The following minimum should be included in the examination.

- Pulse rate and rhythm.
- Blood pressure (to be repeated if abnormal).
- Hearing, comprehension and co-operation.
- Tremor and abnormal body movements.

The following should be included when clinically indicated.

- If there is respiratory distress or breathlessness present, the respiratory rate should be measured, the oxygen saturation measured by pulse oximetry recorded and the patient should be reviewed by a clinician.

- The patient's ability to lie flat and still in the appropriate position for the duration of the operation.
- Examination for sepsis elsewhere that might lead to sight-threatening complications.
- Pulse oximetry is the only examination that will pick up occult hypoxaemia.

5.1.5 Investigations

In general, tests should only be considered when the history or physical findings would have indicated the need for an investigation even if surgery had not been planned.[4,21–23] However, some specific tests which are routinely indicated include the following.

- Clotting profile should normally be checked within 24 hours of surgery for patients on anticoagulants (see 5.1.6.2).
- Electrolytes on the day of surgery for patients on dialysis (see 5.1.6.6).
- If a peribulbar or retrobulbar injection technique is anticipated for anaesthesia, measurement of the axial length should be considered; if the patient is either highly myopic or has a long axial length, examination for staphyloma (e.g. by clinical examination or ultrasound B-scan) should be considered (see 8.2.2).
- Screening tests in accordance with local infection control protocols.

A **For the patient with no history of significant systemic disease and no abnormal findings on examination at the nurse-led assessment, no special investigations are indicated.**

✓ **Any patient requiring special tests may need a medical opinion.**

5.1.6 Specific disorders for consideration in pre-operative assessment

5.1.6.1 Hypertension

Uncontrolled hypertension may increase the risks of systemic and ophthalmic complications. However there is insufficient evidence to support a specific value above which surgery should be deferred. Patients who are taking anti-hypertensive medication should continue their drugs up to and including the day of surgery. Rapidly lowering blood pressure immediately prior to surgery is not advised.

5.1.6.2 Myocardial ischaemia, antiplatelet and anticoagulant medication

Stress may provoke ECG changes similar to those provoked by exercise and patients may experience angina during surgery. Every effort should be made to reduce anxiety and patients should have their usual angina medication available in theatre.

For ambulatory cataract surgery it is not advisable to stop the anticoagulants (warfarin) and anti-platelet drugs (aspirin, clopidogrel, dipyradamole) as the risk of stopping these drugs may outweigh the risk of peri-operative haemorrhage (see also 5.1.5).

For more complex surgery with a higher risk of bleeding, anticoagulants and antiplatelet agents may compromise surgical outcome and influence the choice of anaesthesia. Currently, there is insufficient evidence to make anaesthesia-specific recommendations regarding continuation or cessation of these drugs.[24] Each patient and procedure should be treated on its own merits with multi-disciplinary input as required.

Patients who have had a recent cardiac therapeutic intervention have a higher risk of subsequent myocardial events. If anti-platelet therapy needs to be stopped for surgery, then elective surgery should be deferred for 12 months after drug-eluting stent implantation and at least six weeks following bare metal stent insertion.[25] If there are concerns that anti-platelet agents may complicate surgery, then the medical team that started treatment should be consulted to discuss stopping these agents.

5.1.6.3 Diabetes mellitus

Diabetic patients should have their blood sugar controlled. At present there is insufficient evidence to recommend cancelling the surgery above a certain high level of blood sugar and clinical judgement should prevail. Diabetic patients should have their usual medication and diet if surgery is planned under LA without sedation.

5.1.6.4 Chronic obstructive pulmonary disease

Although patients with high arterial carbon dioxide in air may be at risk if given indiscriminate oxygen therapy, it is unusual for oxygen supplementation over a short period of time to cause respiratory depression. Hypoxaemia can occur in the elderly purely by adopting the supine position. Oxygen supplementation is recommended. Accumulation of carbon dioxide occurs with several types of draping system.[26] This can lead to anxiety, as well as hypertension and increased choroidal blood flow. An open draping system, suction or a simple high flow oxygen-enriched air system below the drapes may reduce carbon dioxide accumulation.[27]

5.1.6.5 Valvular heart disease

There is no need for systemic antibiotic prophylaxis for ophthalmic surgery.[28]

5.1.6.6 Chronic renal failure

The preparation of patients undergoing dialysis requires close liaison with the dialysis unit. Blood biochemistry should be optimised (see 5.1.5) and careful attention paid to the patient's haemodynamic status and ability to lie flat. Arterio-venous fistula should be noted and protected. The blood pressure cuff should not be applied to the same limb as the fistula. Intravenous access should be secured at a site remote from arterio-venous fistulae.

5.1.6.7 Pacemakers and implantable cardioverter defbrillators

Management of these complex devices should be directed at protecting the patient and preventing inappropriate functioning. The cardiology team should be consulted to identify the device and advise whether it needs to be disabled or re-programmed in the peri-operative period.

5.1.6.8 Abnormal ocular pathology

Ophthalmic factors which might affect the operation or anaesthetic e.g. orbicularis spasm, proptosis, deep set eye, small palpebral fissure, long axial length, staphyloma, scleral explants/buckles, local infection and obvious anatomical abnormalities should be assessed (see 5.1.5).

5.2 Pre-operative information

The surgical episode is a partnership involving the patient and the theatre team. The pre-operative assessment is an important opportunity for providing information to the patient and their family/carers, discussing their concerns and expectations, and clarifying any points of uncertainty. Patient information may be supplied by locally developed leaflets or that produced by the Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland, and the Royal College of Ophthalmologists.[29,30]

Prepare the patient and carers for the day of surgery by discussing what will happen on the day and during the operation. In particular, transport, what to wear, time of arrival and discharge, food and drink, the wearing of dentures and hearing aids during the operation, concerns about being able to lie still, etc should be discussed.

- The pre-operative assessment is the time to establish rapport with the patient and to discuss procedures in the detail that the patient wishes or needs.
- The pre-operative assessment appointment should give reassurance that a trained person will be assigned to look after the patient throughout the operation.
- Patients should be provided with written, audio or video information well in advance of surgery (see patient information materials on RCoA and RCOphth websites).

5.3 Consent

Consent must be obtained in the full knowledge of both general and special risks relevant to the operation and anaesthesia.[31] It is the responsibility of the individual administering the anaesthetic to discuss possible complications of the anaesthetic. A separate consent form for the anaesthetic *per se* is not required, although it is advisable to record the discussion in the patient records (see 4.2).

6 The day of surgery

6.1 The pre-operative process

The patient should be invited to arrive at the unit with sufficient time to complete formalities, but not so far in advance as to inconvenience the patient, escort and staff. Formal hospital admission is frequently unnecessary if day case surgery is planned, and the patient may be allowed to remain in their own clean and loose fitting clothing. It may be necessary to admit patients undergoing complex/long procedures.

The findings of the pre-operative assessment should be reviewed by the ophthalmologist, and where appropriate, the anaesthetist. Any change in the patient's condition or therapy since pre-operative assessment should be brought to their attention.[32]

C **The findings of the pre-operative assessment should be reviewed by the ophthalmologist, and where appropriate, the anaesthetist.**

C **Any change in the patient's condition or therapy since pre-operative assessment should be brought to the attention of the operating team.**

6.1.1 Pre-operative checks and procedures.

6.1.1.1 Pre-operative marking

The patient's identity should be confirmed and a name band attached to the patient's wrist. Prior to marking, checks should be made regarding the nature of the operation, side, and consent process. The surgeon has the primary responsibility to check that he/she is operating on the correct eye.

The operating surgeon or a nominated deputy should mark the eye to be operated upon with a clear, indelible mark. This mark should be robust enough to remain visible after surgical cleaning and draping.[33]

C **The eye to be operated upon should be marked with a clear, indelible mark. This mark should remain visible after surgical cleaning and draping.**

6.1.1.2 Bilateral surgery

It is important that there is clear communication between the surgical and anaesthetic team regarding the site as well as the nature of surgery. Local protocols should be developed to ensure that each eye receives the correct surgical and anaesthetic intervention to prevent the confusion that may arise during bilateral surgery.

✓ **It is not advisable to administer simultaneous LA blocks for bilateral ophthalmic surgery. Should bilateral surgery under LA be necessary in the same sitting, the blocks should be staggered to allow for any complications to be identified and managed.**

6.1.1.3 *Pre-operative fasting and medication*

It is generally not necessary to starve patients prior to ophthalmic surgery under local anaesthesia. Although there are theoretical reasons for believing that a period of fasting prior to local anaesthesia might be appropriate, there have been no reported cases of aspiration under local anaesthesia during cataract operations.

If sedation is to be additionally administered the patients may need to be fasted in accordance with the local protocols (see section 7 for guidance).[34,35]

C **It is unnecessary for patients to be fasted prior to local anaesthesia for eye surgery without sedation.**

✓ **Patients should have their normal medication on the day of surgery.**

✓ **Hypoglycaemia must be avoided in diabetic patients. Local protocols should be developed to cater for patients having surgery later in the day.**

6.1.1.4 *General checks*

Results of the pre-operative assessment should be available and, together with the following, be recorded on a checklist.[36,37]

- Confirm that the patient has been well since the pre-operative assessment visit and does not have any acute illness, e.g. upper respiratory tract infection.
- Confirm whether the patient has taken his/her medication.
- Blood pressure, pulse rate, and oxygen saturation should be checked.
- Check that the consent form has been signed.
- See that the patient has provision for a safe return home.
- Ensure that the pre-operative eye drops are instilled.

B **The results of pre-operative assessment should be recorded on a checklist which is completed before the patient enters the operating theatre.**

C **For cataract surgery a specific WHO checklist or a locally adapted version is recommended. For other ocular surgery the standard WHO checklist should be used.**

6.1.1.5 *Eye examination*

- Examination facilities should be available for the operating surgeon and anaesthetist to confirm the findings of the pre-operative assessment. These facilities should be sufficiently private to allow confidential discussions.
- The eye should be checked to exclude acute inflammation or infection. Factors that may affect the safe conduct of anaesthesia such as poor anatomical landmarks, previous orbital trauma, and surgery to orbit or globe, significant exophthalmos, blepharospasm etc should be noted. (see section 8).

6.2 Local anaesthesia (LA)

6.2.1 Goal of LA for ophthalmic surgery

The goal of anaesthesia for ophthalmic surgery is:

- to provide pain-free surgery
- to facilitate the surgical procedure
- to minimise the risk of systemic and local complications
- to reduce the risk of surgical complications.

6.2.2 LA techniques used for ophthalmic surgery

- Topical anaesthesia, alone, or in conjunction with preservative-free intracameral local anaesthetic.
- Sub-conjunctival anaesthesia.
- Sub-Tenon's anaesthesia.
- Peribulbar (extraconal) anaesthesia.
- Retrobulbar (intraconal) anaesthesia.

6.2.3 Choice of local anaesthetic technique

The pros and cons of each LA technique have long been debated.[38] When deciding which type of anaesthesia to use, consideration needs to be given to patient, surgical and operator factors.

6.2.3.1 Patient factors

Ocular surgery with all forms of local anaesthesia requires constant patient co-operation. It is therefore important that the patient's preferences, anxiety level and ability to co-operate are taken into account.

LA is the procedure of choice for the majority of patients, even those with impaired hearing or who do not speak English. The patient's ability to tolerate manipulation around the eye without blepharospasm and maintain the required posture for the duration of surgery should have been assessed at the pre-operative assessment and confirmed on the day of surgery.

Patients with axial myopia tend to have eyes that are more likely to be longer, wider, and have posterior bulges (staphylomata). Circumferential bands may induce staphyloma-like bulging of the sclera. These eyes generally have marked scleral thinning, rendering them vulnerable to operative trauma. There is a higher risk of needle penetration/perforation with retrobulbar and inferolateral peribulbar injections.

Scleral explants and previous retinal surgery may make sub-Tenon's blocks difficult or impossible. The site of surgery should be preserved in eyes with previous or proposed glaucoma surgery. Certain ocular cicatricial conditions such as ocular pemphigoid or Stevens-Johnson syndrome require conjunctival preservation to prevent progression to symblepharon; sub-Tenon's blocks in these cases should be avoided if possible.

Topical ophthalmic anaesthesia for intraocular surgery does not provide akinesia and may fail to provide an adequate sensory block. These patients may require intraoperative anxiolysis and other rescue interventions.

6.2.3.2 *Surgical factors*

These include:

- the type and size of incision
- the complexity of the procedure
- the risk of complications
- the duration of the operation
- the experience of the surgeon.

Longer procedures are not necessarily a contraindication to LA. An understanding of the proposed surgical procedure, and clear communication between the surgical and anaesthetic team is essential.

6.3 Who should administer LA?

Local orbital blocks should normally be administered by a trained anaesthetist or ophthalmologist. Appropriately trained, professionally regulated and indemnified non-medical staff may administer subconjunctival or sub-Tenon's blocks for selected, ambulatory cataract surgery, provided the criteria for safe monitoring and management of complications are met. For surgical procedures using topical local anaesthesia, protocols should be locally agreed.

Non-medical staff should not administer LA blocks for complex procedures such as difficult cataracts, strabismus, vitreoretinal, glaucoma, oculoplastic and corneal transplant surgery. These patients often have significant co-morbidities and the procedures are generally more prolonged. These patients may also have higher risk of ocular and systemic complications. Sub-Tenon's blocks, although generally safe, are not without risks.[39,40]

C **Peribulbar or retrobulbar needle blocks should only be performed by medically trained personnel.**

C **For difficult cataracts and complex procedures, sub-Tenon's blocks should only be administered by a trained anaesthetist or ophthalmologist.**

6.4 Monitoring

Severe systemic complications during ophthalmic surgery are well recognised and have been known to be associated with all types of orbital blocks. It is therefore important that the patients are selected carefully and monitored at all times.

Monitoring should start before the administration of local anaesthesia and continue until the surgical procedure is completed. The level of monitoring and intra-operative interventions required for each case will depend on the medical condition of the patient, the LA technique used and the surgical procedure.

6.4.1 Methods of monitoring

There are guidelines on monitoring in general and specialised ophthalmic practice[41–43] but the most important aspects are:

- **Communication**: Probably the most important monitor is communication by an attendant who remains in constant contact with the patient. The patient's hand may be held for monitoring, communication and reassurance.
- **Clinical observations**: These include the patient's colour, respiratory movements, pulse and responses to surgical stimuli.
- **Pulse oximetry** (SpO_2)

- **Electrocardiogram** (ECG)
- **Non-invasive blood pressure** (NIBP)

C The minimum monitoring (e.g. for a fit person having routine surgery under topical anaesthesia) is clinical observation, communication and pulse oximetry.

C The ECG and blood pressure should be monitored in sedated patients and those who are at risk of cardiovascular complications (e.g. hypertensives, patients with pacemaker, diabetics). In stable patients the NIBP measurements should be kept to a minimum to avoid discomfort and undue disturbance during surgery.

B Certain situations (e.g. strabismus surgery, intra-operative use of ocular sympathomimetics such as phenylephrine, Mydricaine®) may lead to sudden significant haemodynamic disturbances. These patients need extra vigilance and monitoring.

6.4.2 Intravenous access

- **Essential** with peribulbar and retrobulbar blocks and when intra-operative sedation is used.
- **Recommended** for long/complex cases, sub-Tenon's blocks, and patients with poor general health.

6.4.3 Who should monitor the patient?

Monitoring should be performed by a member of staff who remains with the patient throughout the monitoring period and whose sole responsibility is to the patient. This task may be carried out by an anaesthetist, a nurse, an operating department practitioner (ODP), an operating department assistant (ODA) or an anaesthetic nurse as long as they are trained in basic life support (BLS). This person must be trained to detect any adverse events and to initiate appropriate treatment.

The ultimate responsibility for the patient rests with the operating surgeon and, when present, the anaesthetist.

Eye surgery under local anaesthesia can have life-threatening complications.[8–10] These can result from the anaesthetic block itself or the patient's pre-existing co-morbidities and may require immediate intervention. Certain subgroups of patients required significantly more anaesthetic intervention compared to others; younger age, systemic hypertension, pulmonary disease, renal disease and cancer.[44]

No local anaesthetic technique is entirely safe.

C All theatre personnel should have regular training in Basic Life Support (BLS).

C All ophthalmic units should have formal policy for dealing with medical emergencies should they occur. Appropriate backup from a cardiac arrest/Medical Emergency Team should always be available.

C There should be at least one person available in the operating theatre suite with an Immediate Life Support (ILS) or equivalent qualification, who should be supported by staff with the knowledge and skills to assist in resuscitation. Where the unit is free-standing and there is no immediate access to a formal cardiac arrest team there should be at least one person with Advanced Life Support (ALS) or equivalent. This is especially important where transfer of the patient may be necessary.

6.4.3.1 The role of the anaesthetist

The anaesthetist should be aware of all the non-surgical factors that promote the smooth running of the ophthalmic operating list. Their role ranges from leading pre-operative assessment to administering the local anaesthetic, sedation, general anaesthesia, intravenous antibiotics, steroids, intraocular pressure reducing medication, as well as monitoring, prevention and management of adverse events should they occur.[45,46]

6.4.4 Staff and monitoring requirements for each LA technique

Ideally, an anaesthetist should be available in the theatre complex, particularly when needle blocks such as peribulbar, retrobulbar, and sub-Tenon's blocks for difficult cataracts, or when complex or long cases are being performed. If an anaesthetist is not immediately available, the operating ophthalmologist is directly responsible for the management of any untoward event and should have the appropriate skills to safely manage resuscitation, or to have these skills within the theatre team. Where these procedures are performed outside a main theatre complex, clear, agreed and regularly tested protocols and pathways must be in place to enable the patient to receive advanced medical care, including intensive care, in a timely manner.

C Ideally, an anaesthetist should be available in the theatre complex, particularly when needle blocks such as peribulbar, retrobulbar, and sub-Tenon's blocks for difficult cataracts, or when complex or long cases are being performed.

C If an anaesthetist is not available in the hospital or ophthalmic unit, peribulbar or retrobulbar techniques should only be used if appropriately skilled staff are immediately available in the operating theatre.

C A clear, agreed and regularly tested pathway to enable the patient to receive appropriate advanced medical care, including intensive care, should be in place for isolated units.

6.5 Facilities and equipment

All ophthalmic surgery performed under LA should be carried out in a facility which is appropriately equipped and staffed for advanced resuscitation according to Resuscitation Council standards and recommendations. Patients should be on a tipping trolley or equivalent chair.[47]

6.6 Immediate post-operative period and before discharge

After the operation, and before discharge, the patient should feel well and have stable vital signs. Discharge criteria should be established and met. Before discharge the safety arrangements for the patient's return to home, and the level of support available should be confirmed. Written instructions should be provided about what to do and who to contact in the event of problems.

6.7 Record keeping

Appropriate anaesthetic records are required for each case. The minimum dataset should include the following.

- The name of the person performing the block.
- The exact technique employed, including:
  - asepsis,
  - the entry site/s
  - length and type of needle/cannula
  - volume and concentration of local anaesthetic agent and adjuvant
  - requirement for supplemental LA
  - use of oculo-compression
  - use of systemic analgesia or sedation
  - quality of block. This may be in the form of objective scoring system[48]
  - complications.
- Monitoring techniques, frequency and recordings should be noted.
- Details of any complications, discussions, interventions or advice offered.
- Each unit should have a provision for local critical incident recording and outcome audits.

7 Sedation for ophthalmic procedures

Sedation techniques may make potentially unpleasant surgical procedures more acceptable to patients, but in certain instances also can cause life- and sight-threatening complications.[49–51]

With careful selection, explanation, reassurance and a sympathetic approach, most patients accept ophthalmic surgery under local anaesthesia. This is greatly facilitated by continuity of staff care at all stages. However, there will remain a proportion of patients who may benefit from sedation.[52] As more technically complex ophthalmic surgical procedures are now being undertaken under local anaesthesia as day cases, there may be an increasing need for sedation.[53] Ideally, the patient undergoing ophthalmic surgical procedures should be fully conscious, responsive, and without anxiety, discomfort or pain.

There is limited published information regarding the use of sedative drugs and the practice of sedation during ophthalmic surgery. The use of sedation for ophthalmic surgery varies widely between countries.[54] More recent evidence from the UK in 2001–2006[9] confirms a low rate of sedation (1.4%) for cataract surgery.

✓ **Good patient selection, rapport, counselling, support and the use of relatively painless techniques all reduce the need for sedation.**

✓ **Hand-holding during surgery has been shown to reduce patient anxiety levels, and this may make sedation unnecessary for some patients.**

7.1 Aims of sedation

The aim of sedation is to minimise anxiety without increasing risk while providing the maximum degree of safety. The effects of the sedation should be easily controlled, with smooth onset, rapid recovery and minimal side-effects.

The American Society of Anesthesiologists (ASA) policy statement on Continuum of Depth of Sedation provides useful guidance on the different levels of sedation applicable to ophthalmic surgery.[55] See Table A.

Table A
The American Society of Anesthesiologists (ASA) policy statement on Continuum of Depth of Sedation

Minimal sedation (Anxiolysis) is a drug-induced state during which patients respond normally to verbal commands. Although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.
Moderate sedation/Analgesia (Conscious Sedation) is a drug-induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.
Deep sedation/Analgesia is a drug-induced depression of consciousness during which patients cannot be easily aroused but respond purposefully following repeated or painful stimulation. The ability to independently maintain ventilatory function may be impaired. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained.

Minimal sedation (or no sedation) is desirable in most ophthalmic surgery such as cataract and vitreo-retinal surgery. Moderate sedation may be appropriate for strabismus, complex glaucoma, external retinal detachment surgery and naso-lacrimal surgery. Deep sedation may occasionally be used for patients undergoing extensive orbital surgery. However, in these circumstances general anaesthesia may be preferable. All the principles and standards of monitoring and safe practice applied to general anaesthesia also apply to the state of deep sedation.

✓ **Sedation should only be used to allay anxiety and not to cover inadequate blocks, which must be corrected by the administration of more LA.**

✓ **Despite the effectiveness of various strategies, there is small group of patients who would not be suitable for local anaesthesia with sedation. For these patients a general anaesthetic or a different approach to local anaesthetic surgery should be considered.**

✓ **Whenever deep sedation is being considered, the use of general anaesthesia should be discussed. Reasons for the final decision should be recorded in the case documentation.**

7.2 Unwanted effects of sedation

All sedative drugs depress the central nervous system (CNS). Patients can therefore become unresponsive to command and mild stimulation. The complications of sedation include excessive restlessness, sudden movement, and airway obstruction which may jeopardise the operation. A US study found that the majority of claims in elective ophthalmic surgery were associated with inadequate analgesia, gross patient movement during sedation, or both.[51]

✓ **When the patient fails to respond to verbal commands, the state of sedation has been lost and anaesthesia has been induced, with all its attendant risks. Surgery should stop while the safety of the patient is assured.**

7.3 Patient selection

Patients who may require sedation should be identified at the point of surgical listing and/or pre-operative assessment. Anaesthetists should be involved in making the final decision. Patients and relatives should be counselled with regards to the intra and post-operative effects of sedation. Sedation techniques may not be suitable for pooled operating lists and are best managed with dedicated surgical and anaesthetic teams. The effect achieved from a given dose of sedative can vary markedly between different patients. Sedation should be used only with caution in the elderly and frail, and low weight individuals. Those with respiratory disease and anatomical airway obstruction such as obstructive sleep apnoea are also at risk.

7.4 Preparing the patient

Starvation is generally not necessary for minimal sedation.[34,35] However, when moderate or deep sedation is planned, the patient must be fasted and fully prepared as for general anaesthesia.

A dependable intravenous cannula line must be secured to allow sedative drugs to be administered reliably during the procedure and also for emergency medication.

7.5 Administration of sedation

The preferred route of administration of sedation is intravenous, as the effects are more predictable and titratable with a more rapid onset. The onset of sedation is unpredictable with oral, intramuscular, transdermal and other routes of administration, especially in the elderly. Effects are more variable due to differences in pharmacokinetics and pharmacodynamics.

An anaesthetist must be present when moderate or deep sedation is administered.

7.6 Monitoring, facilities and staff

Safety depends on maintaining respiratory function, ensuring adequate oxygenation and the removal of carbon dioxide. Supplementary oxygen should normally be administered for all levels of sedation. Significant cardiovascular depression secondary to sedation is unlikely provided that consciousness and adequate respiratory function are maintained.

An inappropriate lack of response to command and mild physical stimulation indicates that sedation is excessive. A decrease in oxygen saturation is a late indication of the onset of respiratory complications. Steps should be taken to ensure adequate cardio-respiratory function and consideration given to reducing the level of sedation.

The minimum requirements for caring for patients who are intravenously sedated are:

- an anaesthetist
- an ODP/ODA/PA(A)/anaesthetic nurse
- IV access
- pulse oximetry
- non-invasive blood pressure monitoring
- ECG
- resuscitation equipment
- recovery facilities with level 2 capacity, appropriate nursing staff, and the facility for overnight stay in patients who are slow to recover from the effects of sedation or who experience medical problems during sedation.

- ✓ Intravenous sedation should only be administered by the anaesthetist whose sole responsibility is to that operating list.
- ✓ Supplementary oxygen should be administered.
- ✓ Minimum monitoring required includes ECG, non-invasive blood pressure and pulse oximetry.

7.7 Discharge criteria

There must be clear guidelines for patient discharge following day case sedation. Patients should meet the same discharge criteria considered appropriate for day case general anaesthesia. It is recommended that trained staff have the responsibility for patient discharge. Patients should receive similar post-operative instructions to those given after day case general anaesthesia.

8 Complications and how to avoid them

The individual administering the orbital regional block should understand the relevant anatomy and the pharmacological agents in common usage. They must appreciate the potential complications of their chosen local anaesthetic technique, how to avoid them and how to manage any complications that may occur.

8.1 Minor complications

Sub-conjunctival haemorrhage and chemosis are minor complications that occur more commonly with sub-Tenon's anaesthesia than with other techniques. Although these complications do not cause direct visual loss, they may significantly interfere with the intraoperative surgical view because of pooling of irrigating fluid. This may be particularly troublesome for junior surgeons.

Some clinicians use vasoconstrictor soaked cotton buds and localised conjunctival cautery during sub-Tenon's anaesthesia to reduce the incidence and severity of sub-conjunctival haemorrhage. However, vasoconstrictors may be rapidly absorbed systemically with associated undesirable cardiac side-effects.[43]

Careful dissection and the application of gentle pressure on the globe may reduce the incidence of chemosis during sub-Tenon's anaesthesia.[38]

8.2 Major sight and life-threatening complications

8.2.1 Orbital haemorrhage

Orbital haemorrhage is a rare complication of sharp-needle injection[8,10,56,57] and sub-Tenon's block.[39] An arterial bleed at the orbital apex can cause a rapid onset compartment syndrome, leading to compression of the optic nerve and central retinal artery. This can lead to irreversible blindness. A blunt-tipped sub-Tenon's cannula may be less likely to cause retrobulbar haemorrhage. However, both sharp needle and sub-Tenon's techniques have the potential to damage vortex veins.

Retrobulbar orbital haemorrhage is an ophthalmic emergency. Patients present with a rapid onset of intraorbital and intraocular pressure elevation. There may be marked pain with increasing proptosis, ecchymoses in the eyelids, chemosis and reduction of vision down to poor perception or no perception of light. Indirect ophthalmoscopy should be performed to look for evidence of central retinal artery perfusion compromise.

Immediate medical treatment includes the use of intravenous osmotic agents such as acetazolamide and mannitol.[24] Severe cases may require surgical decompression such as canthotomy, cantholysis or orbital decompression.[58,59]

For orbital injections, the risk may be minimised by avoiding injection into the highly vascular orbital apex and normally using fine (no larger than 25 gauge) and short needles (not longer than 25 mm).[24,60]

Injection should be into the less vascular orbital compartments such as the inferotemporal or nasal sites with the eye in the straight-ahead position.[60,61] The superonasal compartment, with its rich vascular supply, should be avoided if possible.

For patients on warfarin, the INR should be within the therapeutic ratio which is determined by the condition for which the patient is being anticoagulated. However, the higher the INR, the greater is the risk of haemorrhagic anaesthetic and surgical complications. When a high INR is required in patients on warfarin therapy (e.g. those with prosthetic heart valves) and there are specific haemorrhagic concerns (e.g. complicated surgery or only eye surgery), then there should be discussion between anaesthetist, surgeon, haematologist and patient regarding the risks and benefits of warfarin therapy, and the proposed surgery to agree an acceptable approach.

8.2.2 Globe perforation

Globe perforation has been reported with sharp-needle techniques. Almost all reported cases occurred with retrobulbar and peribulbar anaesthesia. A few cases have been reported with sharp-needle sub-Tenon's (episcleral) block and sub-conjunctival local anaesthesia.[57,62] Scleral laceration has also been reported during dissection prior to blunt-cannula sub-Tenon's anaesthesia.[39,63] Previously operated eyes are particularly vulnerable to ocular injury especially if the sclera is thinned or scarred.

With sharp-needle local anaesthesia, the incidence of globe perforation has been reported as 1 in 874 to over 16,000.[56,57,64] The needle may enter the globe (penetration) or pass right through it (perforation). 50% are not recognised at the time of occurrence and so a high index of suspicion is required.[65,66]

Globe perforation should be suspected if the patient experiences marked pain during the delivery of local anaesthesia. Intraoperative signs of perforation include hypotony with inability to secure a stable globe.[57] There may also be a reduced red reflex due to vitreous haemorrhage. In the immediate post-operative period the patient may have markedly reduced vision. Serious sight threatening vitreoretinal complications may result. Clinicians must always be alert to the possibility of globe perforation and should seek the advice of a specialist vitreoretinal surgeon.

Longer (myopic) eyes are at increased risk of perforation, particularly if the axial length is over 26 mm (axial length is routinely measured for cataract surgery).[64] Myopic (near-sighted) and buphthalmic eyes with congenital glaucoma are likely to be longer, wider and may have abnormal posterior scleral bulge (posterior staphyloma).[67] Eyes with previous retinal detachment surgery (encircling band) may become more 'hour-glass' shaped. Other ocular surgery may distort the globe, e.g. resection or plaque application for tumours. Practitioners should be aware that although myopia may have been corrected by laser or 'cataract' surgery, the globe abnormality still remains.

When using sharp-needle local anaesthesia, the risks of globe perforation can be reduced by:

- insertion of the needle based on anatomical principles
- patient co-operation
- peribulbar rather than retrobulbar block
- using a needle of maximum length 25mm
- awareness that ocular and orbital anatomy may be disturbed by pre-existing ocular pathology and surgery.

8.2.3 Severe systemic adverse events

These are defined as 'life-threatening events', e.g. an epileptic fit, a patient requiring transfer to an intensive therapy unit, or subsequent death attributed to the adverse event. The incidence of these events has been reported as 3.4/10,000 or more.[10] Some are due to spread of local anaesthetic along the optic nerve sheath, causing brain stem anaesthesia. The technique most likely to cause severe systemic complications is retrobulbar injection, using long needles, with a prevalence of around 1 in 1,000 to 3 in 1,000.[57] Large studies have shown that peribulbar injection, especially if administered through a needle less than 31 mm, is rarely associated with severe systemic events. However it is pertinent to note that the difference between peri- and retrobulbar techniques in some instances is difficult to define.[68,69]

8.2.3.1 Symptoms and signs of brain stem anaesthesia

Symptoms and signs range from drowsiness, light-headedness, confusion, loss of verbal contact, to cranial nerve palsies, convulsions, respiratory depression or respiratory arrest, and even cardiac arrest. The onset of symptoms is usually within 10 minutes of the LA injection. The respiratory depression and cardiovascular events may require assisted ventilation and/or cardiopulmonary resuscitation. Symptoms and signs may last for many hours, depending on the local anaesthetic used. Brain stem anaesthesia has been reported with retrobulbar/peribulbar and sub-Tenon's anaesthesia.[8,10,39,57]

8.2.3.2 Risk factors

No LA technique is entirely free of severe systemic adverse events, and they cannot be reliably predicted. Some of these severe events may be due to the LA itself, and this is most likely when long needles are used. Other factors may include: the stress of the day's event, eye drops and other agents used in the eye, ocular manipulation, or causes entirely unrelated to the anaesthesia or surgery.

8.2.3.3 Prevention

To reduce the risks with sharp-needle injection techniques, a short, fine needle should be used, keeping the eye in the primary gaze position (looking straight ahead), which avoids nerve rotation towards the needle.[60] Use of sub-Tenon's, topical, topical-intracameral and sub-conjunctival anaesthesia should lower the risk of some life-threatening adverse events associated with the technique.

Many patients presenting for ophthalmic surgery are elderly with a high incidence of associated systemic disease. In a large multicentre study,[22] 75% of patients undergoing cataract operations had a systemic co-existing medical condition; 35% were ASA Class 3 and 1% ASA Class 4 patients. Similar findings were reported in more recent studies.[70,71] In view of the high incidence of co-morbidity, it is not surprising that systemic adverse events are encountered peri-operatively. All recent major studies of complications during ophthalmic surgery and anaesthesia.[8,9,40] have reported that serious adverse events are associated with all local anaesthetic techniques. These patients require close monitoring and direct access to advanced medical care.

8.2.4 Nerve Injury

The optic nerve may be damaged by:

- direct trauma by needle or scissors
- ischaemic damage from intrasheath injection or haemorrhage
- pressure from retrobulbar haemorrhage
- pressure from excess local anaesthetic injection into the retrobulbar space, or
- excessive applied external pressure.

The likelihood of optic nerve damage may be minimised by avoiding deep injections into the orbit and injecting with the eye in the primary position.

Other nerves in the orbit may be damaged by direct needle trauma. The nerve to the inferior oblique muscle may be damaged by a needle advancing along the orbit floor.

8.2.5 Muscle palsy

Diplopia and ptosis are common for 24–48 hours post-operatively when large volumes of long-acting local anaesthetics are used. However, if this persists for days or weeks, or fails to recover, it may be due to muscle damage occurring as a result of:

- intramuscular injection of local anaesthetics
- local anaesthetic myotoxicity
- surgical trauma
- ischaemic contracture following haemorrhage/trauma
- antibiotic injections.

Diplopia after cataract surgery may not be due to muscle palsy. Instead, pre-existing strabismus or concurrent disorders may have been unmasked following cataract surgery.[72,73]

All local anaesthetic agents are myotoxic and therefore direct injection into a muscle should be avoided.

8.2.6 Seventh nerve complications

Block of the proximal facial nerve may lead to dysphagia, or even respiratory obstruction due to spread to the glossopharyngeal, vagus and spinal accessory nerves. If a separate seventh nerve block is required, a more distal block (e.g. van Lint's, near to the lateral orbital margin) is preferred.

8.2.7 Allergy

Allergy to local anaesthetic agents or hyaluronidase is very rare. A history should be sought in all cases, and the relevant drugs avoided as necessary. Although uncommon, allergy to hyaluronidase injected during ophthalmic blocks should be considered in the differential diagnosis of patients who present with acute post-operative orbital swelling and inflammation.[74,75]

Severe cases have responded to treatment with antihistamines and /or steroids.

8.2.8 Oculocardiac reflex

The oculocardiac reflex is very rare with local anaesthetic blocks, although vasovagal reactions may occasionally arise.

8.2.9 Surgical complications

Surgeons may experience surgical difficulties with any type of anaesthesia. Eccentric gaze has been reported with general anaesthesia and local anaesthetic blocks. High intra-operative posterior vitreous pressure may be more common with local anaesthetic blocks. Topical anaesthesia with a 'mobile eye' may result in surgical difficulty; this can be minimised by careful pre-operative selection, appropriate pre-operative and intra-operative measures. A systematic review of topical versus sub-Tenon's anaesthesia for cataract surgery concluded that sub-Tenon's block provided better analgesia, better operating conditions and was associated with a reduction in posterior capsular tear and vitreous loss.[5] However this reduction did not reach statistical significance. There is still insufficient published evidence to conclude whether one type of anaesthesia has a better surgical risk profile.

9 Clinical Governance (training, audit, clinical incident reporting, indemnity)

High quality care requires that all personnel dealing with ophthalmic surgery under LA have specific training.

9.1 Knowledge and skills required

9.1.1 Staff performing orbital regional anaesthesia (normally anaesthetists and ophthalmologists)

- To pre-operatively assess and manage the ophthalmic patient, and to be able to seek consent for the anaesthetic procedure.
- To understand the relevant ophthalmic anatomy, physiology and pharmacology.
- To understand the variations in orbital anatomy and how this is affected by previous surgical procedures and their relevance to local anaesthesia techniques.
- To be able to administer regional local anaesthesia safely and efficiently.
- To understand the procedures required to check which eye is to be operated on, including:
  - marking of the eye by the responsible surgical team before admission to the surgical suite
  - checking the consent form by the person performing the anaesthetic procedure and an ODP or nurse
  - verbal confirmation from the patient.
- To understand the prevention and management of complications of orbital regional anaesthesia.
- To understand how to effectively audit practice.

9.1.2 Theatre nurses, anaesthetic nurses and ODPs

- To have a basic understanding of ophthalmic anatomy and pathology and its relevance to local anaesthesia.
- To understand the complications of orbital regional anaesthesia.
- To be able to monitor the patient, detect abnormal parameters, understand their significance and seek appropriate assistance to correct them rapidly.
- To have up to date basic life support training (BLS).
- To be able to assist resuscitation, know where drugs are kept and how to locate and operate resuscitation equipment.

9.1.3 Ophthalmic nurses

- To be aware of the relevant criteria for selection of patients for local anaesthesia.
- To be aware of the relevance of existing medical and ophthalmic conditions which may affect the patient's suitability for surgery under local anaesthesia, and the local guidelines to be followed if an abnormality is detected.
- To be familiar with the pre-operative assessment process in their unit and the lines of communication when dealing with problem cases.
- To have up to date basic life support training (BLS).

9.2 Training process

9.2.1 Training for staff performing orbital regional anaesthesia (normally anaesthetists and ophthalmologists)

- Each department or facility that provides ophthalmic anaesthetic services should have a consultant with nominated responsibility for ophthalmic anaesthesia.

- There should be a number of consultants who each deliver a comprehensive ophthalmic anaesthesia service including the use of orbital regional anaesthetic techniques.
- Training in ophthalmic anaesthesia must deliver those areas of knowledge, skills, attitudes, behaviours and workplace training objectives as detailed in the CCT in Anaesthesia documents.[76]
- There should be an agreed training programme provided by experienced educational supervisors. It is not intended that these guidelines should contain detailed instructions on how to teach the practical skills of regional orbital anaesthesia, but some general recommendations are appropriate.
  - Most importantly; the safety and comfort of the patient must be paramount. The training process should be calm such that the patient is not put under any undue stress. Patient consent should be sought.
  - The workplace based training should be structured and modular i.e. there should be an agreed system of training which allows the trainee to become proficient at each part of the procedure before embarking on a complete one
  - The trainee should be supervised by a practitioner who is an expert at the technique being used.

9.2.2 Training for anaesthetic assistants

- The appropriate qualification for ODPs is the NVQ level three in operating department practice.
- Qualified nurses are already registered professionals but require additional training before taking on the duties of anaesthesia assistant. There are a number of operating department ENB courses available or 'Fast Track' NVQ.
- Skills in BLS must be maintained.

9.3 Record keeping, critical Incidents and audit[77]

- Record keeping must be comprehensive, clear and unambiguous.
- Methods of data collection will vary between institutions but the committee recommends the use of electronic medical record systems that collect nationally agreed datasets (such as the Cataract National Dataset)[9] which help enforce 100% collection of standardised data, including the presence or absence of anaesthetic complications in all cases.
- Any potentially life or vision threatening complications of ophthalmic anaesthesia must be reported as critical incidents within each institution's Clinical Governance framework
- Audit of ophthalmic anaesthesia should be included in departmental audit programmes
- Suggested topics for audit include but should not be limited to:
  - frequency and severity of ocular and systemic complications/adverse events
  - quality of blocks (patient and surgeon's opinion)
  - patient experience
  - degree of akinesia
  - standards of records
  - adherence to these guidelines.

9.4 Indemnity

Each professional group performing regional anaesthetic techniques is answerable to their recognised professional body, which should endorse their practice. Professional groups should only perform those anaesthetic techniques that are accepted and indemnified by their recognised professional body.

APPENDIX A

The working group

A working group of the Royal College of Anaesthetists (RCoA) and the Royal College of Ophthalmologists (RCOphth) was convened to review the 2001 guidelines. The working group comprised practicing anaesthetists and ophthalmologists, representing a range of opinion on LA techniques.

Professor Chandra Kumar (Joint Chairman)	Ex RCoA Council Member Senior Consultant in Anaesthesia	Khoo Teck Puat Hospital, Singapore
Mr Tom Eke (Joint Chairman)	Consultant Ophthalmologist	Norfolk & Norwich University Hospital
Professor Chris Dodds (Joint Chairman)	Ex RCoA Council Member Consultant Anaesthetist	The James Cook University Hospital, Middlesbrough
Mr James Deane	Consultant Ophthalmologist	Leicester Royal Infirmary
Mr Nabil El-Hindy	Consultant Ophthalmologist	York Teaching Hospital NHS Foundation Trust
Mr Rob Johnston	Consultant Ophthalmologist RCOphth Revalidation Lead	Gloucestershire Hospitals NHS Foundation Trust
Dr K-L Kong	Consultant Anaesthetist	Birmingham and Midland Eye Centre, City Hospital, Birmingham
Dr Hamish McLure	Consultant Anaesthetist	St James's University Hospital, Leeds
Professor Peter Shah	Consultant Ophthalmologist	University Hospitals Birmingham NHS Foundation Trust, NIHR Biomedical Research Centre
Dr Sean Q M Tighe	Consultant Anaesthetist	Countess of Chester Hospital NHS Foundation Trust
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