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BOAS COUNCIL

EDITORIAL

There has been a metamorphosis in the last year at BOAS. The Council has some new members, recently elected. Dr Keith Allman from Exeter, Professor Ezzat Aziz, professor in Cairo and a consultant in anaesthesia at Chesterfield, UK, Professor Peter Shah from Birmingham and Dr Peter James from Basingstoke have joined us and we look forward to receiving their ideas and wisdom.

The second metamorphosis is that our previous Society publication, *Ophthalmic Anaesthesia News* has been renamed *Ophthalmic Anaesthesia* to more reflect its role as a Society journal rather than a newsletter. We aim to publish the views of members, and indeed, non members, on any topic related to ophthalmic anaesthesia, and also to give a forum to trainees and others to publish articles and case reports, which are peer reviewed, but in an "easier" environment than the mainstream anaesthesia journals.

The contribution from our President this time is centred on the role of the anaesthetist in the care of ophthalmic patients, and in the widest sense. It is not just about performing blocks!

The question of how to manage patients on anticoagulants and antiplatelet drugs has been an ongoing discussion in BOAS circles for over 2 years now, and in 2008 the Council commissioned a working group (myself, Dr K-L Kong and Dr Shashi Vohra) to produce a position paper on this subject. I presented our conclusions at the BOAS annual Scientific Meeting in Manchester this summer and invited comments from delegates. So far I have received none from any members outside the Council. Accordingly, a summary of that position paper is published in this edition, to I hope a wider audience. We need to hear your views and practice, as this is what is happening up and down the UK and abroad, and reflects the current management of patients. Getting a wide range of views will enable us to build a picture of current practice and facilitate recommendations for best practice. In this summary document we do draw some conclusions and make some recommendations, based on the available evidence and what we consider to be best practice currently. So please let me have your opinions and tell us what you are currently doing. We hope our position paper will inform the Royal Colleges when they review their advice.

We have a selection of interesting articles and case reports for you in this edition, some of which are based on presentations given at the Scientific Meeting this year.

I hope you find the journal both informative and interesting, and that you will be prompted to make a contribution yourself.

We welcome letters giving opinion, articles both research and review, and case reports – in fact anything which will be of interest to your colleagues working with ophthalmic patients.

Please send your contributions to the editor by email at the address below.

It will soon be time to think about next year's study leave. ***BOAS 2010*** will be hosted by Dr Jonathan Lord and his colleagues at Moorfield's Eye Hospital in London on 3 and 4 June. More details, including the programme, will follow on the website.

Steve Mather

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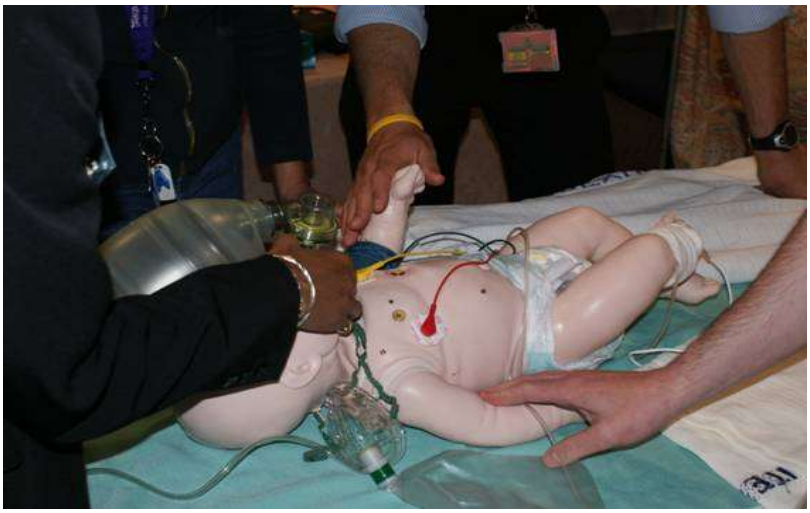
REPORT OF BOAS ANNUAL SCIENTIFIC MEETING 2009 MANCHESTER 18 – 19 JUNE 2009

Manchester was the location for the 10th annual scientific meeting of the society. The meeting was held in the Manchester Conference Centre, just a few minutes walk from the city centre.

The faculty included specialists from the UK, Europe and the USA. Those attending comprised consultants and trainees from the UK, as well as guests from France, Switzerland, Russia, Brazil and Chile.

In the first session, chaired by Anthony Rubin, Hamish Mclure outlined the applied anatomy of orbital blocks and examined the alternative scoring systems for formal assessment of ophthalmic regional anaesthesia. Keith Allman then gave details of clinical work he had conducted into the use of the relatively new local anaesthetic agent articaine for ophthalmic regional anaesthesia and demonstrated his novel technique of incisionless sub-Tenon's block. The session ended with Malachy Column's review of local anaesthesia therapy and toxicity and the conclusion that despite extensive research and developments there has been no really significant advance in local anaesthetic agents since the development of bupivicaine.

The next session, chaired by Steve Gayer, began with a comprehensive and clear review by Nigel Harper of the problems of anaphylaxis encountered by anaesthetists and surgeons. He included an update of the revised AAGBI guidelines in suspected anaphylaxis and the new National Anaesthesia Anaphylaxis Database. Brian Pollard then provided an exposition of the problems around the risks of awareness and recall after general anaesthesia, including Hollywood's recent contribution to the issue in the film "Aware". He reviewed methods of assessing depth of anaesthesia including recent work carried out in Manchester. Finally Ralph MacKinnon gave an energetic and detailed presentation on the use of simulation in paediatric anaesthetic emergency training. He emphasised the importance of simulators in medical education and discussed regional and national plans for the development of training with scenarios in the management of specific emergencies. Over the two days Ralph ran informal workshops for delegates using full paediatric simulation equipment.



Paediatric simulation

The first afternoon session, chaired by Roger Slater, began with Brian Leatherbarrow providing an overview of orbital and oculoplastic surgery, including slides and videos of pathology encountered in his practice, and the implications for the anaesthetist. Dan Conway then looked at the choices of anaesthesia in oculoplastic surgery and outlined his experience and the techniques he uses in his everyday practice.

Chandra Kumar chaired the second afternoon session which encompassed presentations from the USA, France and Bristol. Firstly Steve Gayer from the University of Miami demonstrated the potential use of ultrasound of the globe in providing safer peribulbar blocks. Jacques Ripart then gave a fascinating presentation relating the scientific background and his experience of the use of xenon as a general anaesthetic agent. Finally Steve Mather presented the preliminary findings of the BOAS Working Group following a systematic review of the subject of anticoagulant and antiplatelet therapy and ophthalmic surgery. The society was then asked to consider the recommendations produced. The day concluded with the annual dinner which took place in the Conference Centre.

The first session of the second day, chaired by Hamish McLure, began with K- L Kong's comprehensive review of anaesthesia for vitreo-retinal surgery. The second lecture was given by Simon Howell and examined the subject of pre-operative assessment in relation to cardiovascular issues such as hypertension, aspirin therapy and coronary stents. After the break Chandra Kumar returned to the chair and Jacques Ripart returned to the podium to give the French view of the role of the anaesthetist in ophthalmic surgery. Chris Dodds then gave the view from the Royal College of Anaesthetists of the impending change to medical regulation in the Revalidation and Recertification process.

Chris Dodds receiving his Lifetime Achievement Award

During the session the BOAS annual general meeting was held and included the granting of the BOAS Lifetime Achievement Award to Chris Dodds. Chandra Kumar gave an eloquent and touching tribute to his friend and colleague.

The free paper presentations took the final session of the morning. This was chaired jointly by Shashi Vohra and Jonathan Lord.

Council member Shashi Vohra

Dr Peres Bota from Lille gave her presentation on the use of low-dose ketamine infusions following enucleation. Vip Gill from Moorfields then outlined a technique of high-volume sub-tenon's anaesthesia in V-R surgery. Laura Tulloch from Birmingham presented an audit of bedside INR monitoring in ophthalmic patients. The final trainee presentation was by Richard Lee from Norwich who presented work on the "face to face" position for cataract surgery.

Three international speakers followed; Haroldo Carneiro from Brazil compared CT scans of the orbit in intraconal and extraconal blocks; Dagobert Lerch from Switzerland described a novel method to reduce subconjunctival haemorrhage after subtenon's blocks; then Pavlov Rylov from Russia gave a DVD presentation from his ophthalmic surgery unit in Yekaterinburg and the interaction between surgeon and anaesthetist. Tom Eke showed a video of a patient undergoing cataract surgery using the "face to face" position. Finally there were two case presentations of patients with challenging medical conditions. Sofia Khan from Stockport presented "Severe pulmonary hypertension in a patient requiring enucleation" and Kailash Bhatia from Manchester presented "Tracheal stenosis in Wegener's Granulomatosis; managing orbital surgery".

Before lunch Jonathan Lord took the opportunity to invite the delegates to the 2010 BOAS meeting in London.

After lunch and the opportunity to try the paediatric resuscitation simulator, the first afternoon session, chaired by Steve Mather, commenced with Chris Lloyd describing the advances in the management of congenital and infantile cataract surgery in Manchester. Jonathan Lord then gave an insight into the anaesthetic management of paediatric glaucoma surgery including the use of ketamine. The final presentation in this session was from Tom Eke who discussed the choices of anaesthesia for glaucoma surgery and gave a pictorial guide to the surgical technique.

The final session of the meeting was chaired by KL Kong. Niall Patton presented recent advances in vitreo-retinal surgery including sutureless vitrectomy and the latest information about the implantation of "bionic eye" devices. Shashi Vohra described her work on the subject of visual perceptions during V-R surgery under local anaesthesia and measures to reassure patients undergoing such procedures.

Throughout the conference poster abstracts were displayed on subjects ranging from the use of depth of anaesthesia monitors (BIS®) in V-R surgery to the "virtual surgical assistant" in sub-tenon's blockade. The best podium presentation went to Laura Tulloch and the best poster presentation to Richard Lee.

The conference was grateful for the support of a number of medical and surgical companies over the two days. All agreed the conference to have been a success and the delegates departed looking forward to 2010 in London.

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FROM THE PRESIDENT

The Anaesthetist's role in 21st century ophthalmology

Summary
Anaesthetists play a pivotal role in 21st century ophthalmology by providing anaesthesia for various ophthalmic surgical procedures. They not only administer general anaesthesia but also perform local blocks and provide sedation, orbital pain relief for both acute as well as chronic conditions, monitor patients and manage life threatening complications should the need arise.

Keywords: anaesthesia, ophthalmology, anaesthetist's role

Ophthalmic surgery has been carried out in one form or another for centuries but there is little detail of any anaesthetic that might have been used. According to the published literature, it is apparent that advances in ophthalmic surgery occur in tandem with advances in anaesthesia. In the late 19th century ophthalmic surgery was limited to cataract treatment and iridectomy performed sometimes with topical cocaine. Later, needle techniques were introduced using at first cocaine and then procaine. However, general anaesthesia provided the opportunity for more complex surgery without fear of pain and this led to advances in ophthalmic surgery over the last century. There has been a steady and progressive development in ophthalmic surgical technique that continues to evolve.

With recent various global healthcare reforms and consequent financial constraint, various models of reorganisation, restructure and centralisation of services have been introduced with increasing super specialization. It is important to understand how these have been adopted into everyday practice and how anaesthetic practice has evolved alongside to maximise the benefit to our patients. Models such as 'One Stop Clinics' [1], 'High Volume Cataract Surgery' [2] and 'Fast Track Surgery' [3] have been introduced to streamline the patient's journey through diagnosis and treatment impacting on waiting times and cost. Although these initiatives have benefits, they are seen to have adverse effects on training [4]. 'One Stop Clinics' and 'Fast Track Surgery' concepts are possible if there are strict procedures and protocols in place but success also depends on patients being adequately assessed and prepared before surgery itself.

At present ophthalmic surgery is performed in single large tertiary referral specialist centres, district general hospitals or stand alone dedicated cataract centres. Tertiary centres perform routine to complex surgical procedures and anaesthesia is provided by dedicated trained ophthalmic anaesthetists. District General Hospitals perform extraocular and intraocular as well as oculoplastic procedures with anaesthesia often provided by general anaesthetists with one or two weekly sessions in the ophthalmic theatre. With closure and amalgamation of various eye units in recent years, many ophthalmologists have become interested in a particular sub-speciality of ophthalmology even in large district hospitals. In cataract surgery-dedicated stand alone day units, anaesthesia is usually provided by ophthalmologists without an anaesthetist.

The provision of anaesthesia for ophthalmic surgical procedures varies around the world with an increasing tendency towards orbital regional and local anaesthesia [5, 6], the exception being where general anaesthesia is desirable or essential.

Advances in general anaesthesia over the last 50 years include new intravenous induction agents (eg propofol), muscle relaxants (vecuronium, rocuronium and cisatracurium), analgesic agents (fentanyl,alfentanil,remifentanil), volatile agents (sevoflurane and desflurane), supraglottic airway devices (laryngeal mask airway) and newer technology including computerised anaesthetic machines, monitoring and infusion devices. Intravenous induction and balanced anaesthesia with a secured airway aided with muscle relaxant, analgesic and volatile agent or equivalent remain the gold standard technique. However, the introduction of supraglottic devices has allowed many ophthalmic surgical procedures to be performed whilst patients breathe spontaneously. The role of anaesthetists in general anaesthesia is very well defined and no further reference to general anaesthesia will be made in the rest of this article. Cataract surgery with lens implant is the commonest ophthalmic surgical procedure but it is not uncommon for other surgical procedures such as glaucoma operations, viteroretinal surgery, oculoplastic surgery and other less common procedures such as enucleation and evisceration to be performed under orbital regional anaesthesia.

Orbital regional and local anaesthesia for ophthalmic surgery has traditionally been and continues to be performed by ophthalmologists. Orbital regional anaesthesia is a conduction block. Safe and successful use of a conduction block depends on many factors but knowledge of anatomy, pharmacology and resuscitation skills are necessary prerequisites. Anaesthetists by training are individuals who possess these prerequisites and no wonder many anaesthetists undertook the task of performing orbital regional anaesthesia in the1970s and many more have followed since then.

On a wider level, anaesthetists have defined and established roles both in clinical as well as non-clinical areas. They play a pivotal role in the provision of anaesthesia and perioperative care for various sub-specialities including ophthalmology as well as pain management. They play an important role in non technical fields which include managing the theatre, equipment, enforcing minimum monitoring standards, training, education, research and audit.

Patients undergoing routine ophthalmic surgery are usually elderly with morbidities requiring multiple drugs [7]. Many suffer from hypertension, diabetes, cardiorespiratory & other systemic diseases. Their well being depends on proper preoperative assessment, evaluation and preparation before surgery. Written guidelines, protocols and structured preassessment help in initiating appropriate investigations and selection of appropriate anaesthesia resulting in minimum disruption to the patient's routine life, less cancellation and the safe conduct of surgery. Anaesthetists are important in providing these services by organising and running successful preoperative assessment and optimization clinics while guiding other healthcare professionals.

Provision of orbital regional or local anaesthesia is fundamental to the concept of fast track cataract surgery. The use of topical anaesthesia is seen as crucial to make the system work. However, topical anaesthesia is not and cannot be suitable for all patients[8]. If the ophthalmologist has to perform his regional block the option is limited to sub-Tenon's block as the presence of an anaesthetist is considered essential if a needle block is performed [9]. Many ophthalmologists do not agree with the concept of fast track

surgery and insist on a good anaesthesia and akinesia service being provided by an anaesthetist.

Ophthalmic anaesthetists can provide suitable orbital regional anaesthesia according to the requirements of surgery, surgeons' and patients' wishes [10]. Orbital regional anaesthesia can be performed with a needle (intraconal or extraconal blocks) or a blunt cannula (sub-Tenon's block) to match the type of surgery [7].

The popularity of needle block has declined in recent years due to its complications [11, 12]. Although these complications are rare, they can be life threatening. Responsibility for treating complications such as cardiorespiratory arrest cannot entirely rest with the operating ophthalmologist. Many ophthalmic surgeons are of the opinion that their job is to perform surgery alone and the provision of anaesthesia should be left to the expert. The Joint Colleges report [9] recommends that an anaesthetist must be present when a needle block is performed.

Sub-Tenon's block was introduced as a simple, safe and effective technique.[13]. Although the presence of an anaesthetist is not considered essential [9], many serious sight and life threatening complications including central spread of local anaesthetic [14] and death have occurred [15]. Other serious adverse events unrelated to sub-Tenon's block have also been reported [16] and if they are undetected or untreated the patient's life may be at risk. Arguably, the presence of an anaesthetist is important [18] but often ignored on financial grounds.

Anaesthetists are trained specialists who provide regional anaesthesia not only for ophthalmic surgery but also for non-ophthalmic surgery and they have a wide and in-depth knowledge and skills base. Over the last three decades anaesthetists have become proficient in performing orbital regional anaesthesia and led the development in anaesthetic techniques with resulting reduced morbidity and mortality. Although scientific data is not available to prove this, the clinical view supports this. Provision of anaesthesia by an anaesthetist can only result in good quality anaesthesia without interruption and unnecessary delay with safety and improved quality for the patient's journey through the surgical pathway.

Dacryocystorhinostomy (DCR) surgery is usually performed under general anaesthesia, the preferred technique. DCR is known to be performed under local anaesthesia but usually multiple injections are required and sedation may be necessary requiring the presence of an anaesthetist. DCR *can* be performed under a single injection technique and with or without sedation [18] but the presence of an anaesthetist will be a necessity if sedation is used [19].

In hospitals where topical anaesthesia is common, it is not unusual for the patient to feel discomfort and anxiety during surgery. The use of sedation and topical anaesthesia for cataract and non-cataract surgery in finance and quality driven centres (private sector) is not uncommon [5]. The routine use of sedation in ophthalmic surgery is discouraged [9] but sedation may be used in anxious patients and in patients undergoing longer surgery such as vitreoretinal procedures, dacryocystorhinostomy and others [19]. Sedation should only be administered by an anaesthetist, he/she is not there only to monitor the patient but also to deal with any adverse events which do occur in these high risk patients [19].

Anaesthetists can help in alleviating both postoperative and chronic orbital pain. Anaesthetists are trained to treat postoperative pain and have variety of techniques in their armamentarium (including PCA, retrobulbar and sub-Tenon's catheters).

Treatment of chronic orbital pain is an area which has not attracted the attention of ophthalmic anaesthetists. Patients suffering from chronic orbital pain are mainly treated by ophthalmologists pharmacologically and rarely by neurolytic injections. Ophthalmologists refer these patients to the chronic pain specialist if drug therapy fails. Chronic pain specialists may not be conversant with ophthalmological neurolytic injections. Neurolytic injections are known to be helpful in the treatment of severe orbital pain in seeing and non-seeing eyes. Anaesthetists who are trained to administer retrobulbar block and have knowledge of neurolytic agents can help in the management of chronic orbital pain [20].

Anaesthetists have many non clinical roles which include theatre management and scheduling, utilization of appropriate resources and facilitating teaching and training.

Conclusion

Anaesthetists play a pivotal role in ophthalmic surgery. They can administer anaesthesia both general and orbital blocks, sedation, monitor patients, manage life threatening complications should the need arise and provide orbital pain relief as well as contribute in essential non-clinical areas.

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Loco- regional anaesthesia for ocular surgery: Patients on anticoagulant and antiplatelet drugs

BOAS Working Party on anticoagulant and antiplatelet drugs

This article is a summary of the Working Party's position document which was submitted to BOAS Council in June 2009 and presented at the Annual Scientific Meeting in Manchester. The subject of anticoagulants and antiplatelet drugs in relation to ophthalmic regional anaesthesia is one of current debate and the Working Party would like to receive comments from members of BOAS.

The Working Party's full report and references will be available in due course on the BOAS website.

Background
Cataract operation is by far the most common ophthalmic surgical procedure and the vast majority of the patients are elderly with a higher incidence of associated systemic disease such as coronary artery disease. There has been a steady increase in the use of local anaesthetic (LA) techniques in recent years but many of these patients are on antiplatelet or anticoagulant drugs.

Why are patients on anticoagulant and antiplatelet drugs?
It is well established that long-term use of these drugs reduces the risk of thromboembolic events in patients with atrial fibrillation (AF) and a history of atherosclerotic disease, such as cerebrovascular accident (CVA), myocardial infarction (MI) or peripheral vascular disease. A dilemma arises when these patients present for ocular surgery under LA due to the risk of ocular haemorrhagic complications.

Randomized controlled trial
There has been no randomized controlled trial (RCT) comparing the thromboembolic events rate and the haemorrhagic anaesthetic and surgical complications rate in cataract or other ocular surgical patients who stopped their anticoagulant and antiplatelet drugs and those who continued them during the perioperative period. Such a trial would require a prohibitively large sample size.

Review of the literature
The use of local anaesthetic techniques grew from 46% in 1990 to 96% in 2003 and is now even higher in some institutions.[1,2] There has been a move away from sharp needle blocks recently towards sub-Tenon's (ST) anaesthesia and to a lesser extent topical-intracameral or topical anaesthesia alone. This varies considerably by centre with a wide variation in technique. There are, however, still reports of sight-threatening and life- threatening complications which are almost certainly under-reported. Is the recent trend toward sub-Tenon's block because it is perceived to be safer, and is this borne out by any evidence?

After over 6000 uncomplicated ST blocks in Auckland, New Zealand, ST blocks replaced sharp needle blocks[3] in Auckland – but are needle blocks that much less safe? The

complication rate for *both* ST and peribulbar block seems to be *low*. Some "peribulbar blocks" can actually be *retrobulbar* although still extraconal (periconal) since a 25mm (1 inch) needle is longer than an average eye (22 - 23mm), and the cornea protrudes forward of the lower orbital rim. This "pericone" type of block presents less risk to the optic nerve than an intraconal retrobulbar block but the risk to blood vessels and muscles remains. The question is, do antiplatelet drugs and anticoagulants significantly increase the risk *and* is there evidence to show the risk is less with sub-Tenon's blocks? One study looked at 1383 patients having medial peribulbar and inferolateral retrobulbar blocks.[4] 35% of patients were on aspirin, 5.5% on warfarin and 19% on non-steroidal anti-inflammatory drugs (NSAIDs). 4% developed lid haemorrhages but there were no serious orbital or intraocular haemorrhagic complications. *The authors concluded that the preoperative use of aspirin, non-steroidal anti-inflammatory drugs or warfarin, whether or not they had been discontinued, did not predispose to haemorrhage associated with retrobulbar/peribulbar block.*

In a study of haemorrhagic complications with ST block,[5] 75 patients were taking aspirin, 65 were on warfarin and 40 on clopidogrel. The control group of 75 patients was not on any of these drugs. Subconjunctival haemorrhage occurred in 19% of the control group, 40% of the clopidogrel group, 35% of the warfarin group and 21% of the aspirin group. However, no sight-threatening haemorrhagic complications were noted and no surgery was postponed due to an anaesthetic complication. *The authors concluded that the results of their study support the continued use of anticoagulant agents during cataract surgery using a sub-Tenon's block.*

There have been no large randomised controlled trials to compare LA techniques and haemorrhagic complications. Most reports are based on historical data recording complications. The largest is the *National Cataract Dataset Electronic Multicentre Audit*.[6] This attempts to record data about the operation, including major and minor complications and the anaesthetic technique and complications, using an electronic proforma which is then stored in a database. However, an incorrect record for anaesthesia may be entered if it is not done or checked by the anesthetist doing the block since assumptions may be made about technique. The maximum data which could be input is often not completed, merely the name of the technique and the drug name. Such incorrect entries "skew" the data. This may mean a recorded complication is attributed to the wrong technique. We do not know the scale of this problem. Thus there is difficulty for reviewers in obtaining meaningful data.

A further limitation is that the data are derived from only 12 participating UK NHS Trusts and may therefore not be representative of the whole country. To obtain truly meaningful comparative data, an extremely large number of subjects would be required. Bearing these limitations in mind, the following observations were made:

In 55,567 cataract operations, LA was used in 95.5% of cases. 46.9% were ST blocks, 19.5% peribulbar, 0.5% retrobulbar (presumed intraconal) and the remainder received topical or topical-intracameral anaesthesia. Of the total of 38,058 patients who received ST, peribulbar or retrobulbar blocks, there were no complications in 95.6% of patients. 4.3% suffered a "minor" complication (not sight or life-threatening) and 0.066% [N=25] suffered a "serious" complication (sight or life-threatening). Peribulbar or retrobulbar haemorrhage occurred in 12 patients, suprachoroidal haemorrhage in 2. Of the 25 "serious" complications, 13 occurred with needle block and 12 with sub-Tenon's

anaesthesia. Of these, 8 and 4 respectively were periocular haemorrhages. "Minor" complications were significantly more common after ST block.
The data showed anaesthesia was delivered by a consultant in 62.1% of cases. Data recorded on the professional group administering anaesthesia showed 56.7% of anesthetics given by surgeons and 42.1% by anaesthetists, including 4.5% general anaesthesia (GA) with or without LA. However, there are concerns that this data may not be robust; For example, the consultant might be supervising a more junior person who actually performed the block. Nevertheless, complication rates were similar for the various professional groups and grades of doctors delivering LA.

Anticoagulants and antiplatelet drugs
Aspirin use is widespread in the UK and fewer patients take warfarin, clopidogrel or dipyridamole. Dipyridamole is more often used in combination with aspirin. In a UK survey of 48,862 cataract operation,[7] 28.1% of patients were using aspirin, 5.1% warfarin, 1.9% clopidogrel and 1% dipyridamole. Clopidogrel or warfarin use was found to be associated with a significant increase in minor complications of sharp needle and ST block but was not associated with a significant increase in potentially sight-threatening local anaesthetic or operative haemorrhagic complications such as choroidal/suprachoroidal haemorrhage and hyphaemia. An unexpected finding in the clopidogrel group was an increased incidence of posterior capsular rupture (3.23% vs 1.77% for non-users). More importantly, there was no increased risk of serious haemorrhagic complications in patients using any antiplatelet or anticoagulant medication.

This series was large in terms of the number of patients (48,862) with a complete drug history. However, the actual numbers taking antiplatelet or anticoagulant drugs was small; 94 patients were taking warfarin plus aspirin, 190 aspirin plus clopidogrel and 317 aspirin plus dipyridamole.

No information was recorded about the doses of drugs used, which is common in reported studies. The dose may have an important impact on the results of these studies as for example, one could postulate a real difference in antiplatelet effect between 75mg aspirin and 300mg aspirin.

Risks and benefits
In a study of 19,283 cataract operations[8] in patients over 50 years of age, patients were observed intra-operatively and for the first 7 days post-operatively for retrobulbar haemorrhage, vitreous or choroidal haemorrhage, hyphaema, transient ischaemic attack (TIA), CVA, deep venous thrombosis (DVT) and myocardial infarction (MI). 24.2% of patients used aspirin regularly and 4.0% took warfarin regularly. 22.5% in the aspirin group and 28.3% in the warfarin group discontinued the drugs pre-operatively.

Ocular haemorrhagic events and rates of retrobulbar haemorrhage were similar in patients who were not routine aspirin users and those routine users who continued its use within 2 weeks of surgery. There were no ocular haemorrhages among any warfarin users whether the use was routine or not and whether they continued or discontinued use within 4 days of surgery. Rates of CVA, TIA or DVT were 1.5 per 1000 among non-users and 1 in 1000 in those who stopped aspirin pre-operatively but there were no episodes in those who stopped warfarin preoperatively. The incidence was 3.8 per 1000 among those who continued the drugs until surgery. Rates of MI or ischaemia were 5.1 per 1000 in the aspirin group and 7.6 per 1000 in the warfarin group of those who were

routine users and who continued medication. These users probably represent a higher cardiac risk group than non-users. There was no statistical difference between those who continued and those who discontinued medication.

The authors concluded that the risk of medical or ophthalmic events associated with cataract surgery is so low that absolute differences in risk associated with changes in aspirin or warfarin use are minimal.

In a study of patients with prosthetic heart valves undergoing non-cardiac surgery, patients were converted from warfarin to heparin ("seamless anticoagulation") or had warfarin stopped and restarted post-operatively, or continued with warfarin anticoagulation throughout.[9] 235 patients (mean age 63 years) were included in the study (none ophthalmic). Thromboembolic and haemorrhagic events included 5 CVA, 11 peripheral emboli, 10 wound haematoma and 8 increased bleeding. Most thromboembolic complications were seen in patients with mitral valve disease and atrial fibrillation (AF). Most complications occurred *after* surgery within 10 days of restarting oral anticoagulants. This paper stresses that thromboembolism may occur up to *1 month* following surgery *despite a "therapeutic" international normalized ratio (INR*) and that minor surgical procedures can be performed safely without discontinuing anticoagulation.

There is no doubt that patients with prosthetic heart valves or recently stented coronary arteries are at high risk of possibly fatal thrombosis if their medication is stopped.[10, 11]

It is more difficult to support absolutely continuous antiplatelet therapy in those with a history of TIA or CVA but the relative risk of continuing the medication is small and confined to the eye.

The risk of operative haemorrhage affecting sight appears to be small. Evidence from the large studies suggests that there is no significant difference between sharp needle techniques in common use, and sub-Tenon's block (but this may exclude retrobulbar, intraconal block). However, even these large studies have insufficient power to detect rare adverse events (0.5% or less).

The range of ophthalmic surgery involves operations other than cataract. The risk of complications in these other ophthalmic procedures may be very different and the available studies too small to quantify this. We should not extrapolate data from cataract surgery to other types of operation. The joint Royal Colleges' guidelines "*Local Anaesthesia for Intraocular surgery*" are largely based on experience from *cataract surgery*. There is some evidence that consideration must be given to other risk factors in more complex surgery such as glaucoma operations.

Discussion

Most studies are too small to detect real differences between groups taking anti-platelet drugs or anticoagulants (such as warfarin) and those who are not. Complications reported, even in large studies, were usually minor. Severe sight - threatening haemorrhagic events are rare, of the order of 2 or 3 per 10,000 operations. It is important to distinguish between the nature of haemorrhagic complications as the outcome is very different. Retrobulbar haemorrhage, even if severe enough to cause

proptosis, is usually associated with a good visual outcome[12] whereas suprachoroidal haemorrhage is associated with a high rate of permanent visual deficit. Fortunately, the incidence of suprachoroidal haemorrhage appears to be much lower than that of retrobulbar haemorrhage.[6]

Evidence suggests that stopping antiplatelet or anticoagulant medication, particularly in patients with atrial fibrillation, prosthetic heart valves or recent coronary stent carries a high risk of thromboembolic sequelae. *This risk greatly outweighs the risk of intraocular or extraocular haemorrhage.*

Warfarin has a biologic half-life of 36 to 42 hours. Following commencement of warfarin therapy, it takes approximately 3 to 4 days for the (international normalised ratio) INR to rise above 2.0 and on cessation of therapy it requires several days for the INR to fall below 2.0. In addition, there is also concern regarding life-threatening rebound hypercoagulability following the abrupt cessation of anticoagulation.[13] The joint guidelines from the Royal College of Anaesthetists and the Royal College of Ophthalmologists recommends that in patients on warfarin scheduled for sharp needle or sub-Tenon's block, the INR should be known and that the level should be within the recommended therapeutic ratio for the condition for which the patient is being anticoagulated. It is recognised that several medications and foods interact with warfarin generally potentiating its effects. These include antimicrobials (macrolides, quinolones, and "azoles"), lipid-lowering agents, NSAIDs, selective serotonin reuptake inhibitors, cimetidine, amiodarone, omeprazole, fluorouracil, chloral hydrate, anabolic steroids and herbal supplements. Holbrook et al (2005)[14] recommend frequent INR testing during the 2 weeks of the onset or discontinuation of treatment with other medications. Should every patient who is on warfarin have their INR checked on the day of surgery? From a practical point of view, preoperative INR should be tested as close to the time of surgery as possible and if there have been any recent changes in the patient's diet or routine medication or its compliance, then it would seem sensible to re-check the INR on the day of surgery.

The type of anaesthetic block and surgery also need consideration. There is no statistically significant difference demonstrated between peribulbar and sub-Tenon's block with respect to sight-threatening haemorrhage, but with sharp needle techniques overall (peribulbar plus retrobulbar) there is a higher risk of haemorrhagic complications (El Hindy 2009). Both peribulbar and sub-Tenon's anaesthesia are widely practised in the UK and are associated with a very low rate of complications. There may be an advantage to be gained by using 'short' (13-16mm) needles for peribulbar block, thus avoiding major blood vessels, but there is as yet no large published evidence base to support a recommendation for this. However such 'short needle' techniques may be gaining popularity amongst some ophthalmic anaesthetists (personal communications).

RECOMMENDATIONS

Grades of recommendations

[A] Based on at least one randomized controlled trial as part of a body of literature of overall good quality and consistency addressing the specific recommendation.

[B] Based on the availability of well conducted clinical studies but no randomized controlled trials on the topic of recommendation.

[C] Based on evidence from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates an absence of directly applicable clinical studies of good quality.

Good practice points

[✶] Recommended best practice based on the clinical experience of the guideline development group.

1 In general patients with prosthetic heart valves and coronary stents should not have anticoagulant or antiplatelet agents discontinued for cataract surgery **[A]**.
2 We recommend continuing warfarin for routine cataract surgery. The international normalized ratio (INR) must be checked and the INR should be within the range that is determined by the condition for which the patient is being anticoagulated **[B]**.
3 Patients who self medicate or receive prescribed low dose aspirin may have a slightly increased risk of haemorrhage but the benefit to be derived from stopping aspirin is, at best, questionable. It is therefore recommended that low-dose aspirin should not be stopped prior to cataract surgery under LA **[B]**.
4 Patients on clopidogrel, dipyridamole or combinations of these with aspirin are usually on these drugs for sound medical reasons. Withdrawal of the drugs in these circumstances may lead to dangerous thromboembolic events. It is therefore recommended that these drugs should not be stopped **[B]**.
5 Evidence is lacking to allow a firm recommendation to be made with regard to technique. In particular, a recommendation for sub-Tenon's block over needle block cannot be supported by weight of evidence at this time **[B]**.
6 The use of short (less than 25mm) needles may be inherently safer but there is as yet no published evidence to support this.
If appropriate, topical-intracameral local anaesthetic or topical alone is a safer alternative than needle or subtenon's block by cannula with regards to haemorrhagic complications related to anaesthetic technique.
For operations on patients unsuitable for topical or topical-intracameral anaesthesia, the risk/benefit of a needle or cannula technique vs. general anaesthetic must be considered individually for each patient. **[✶]**
7 If indicated, a fresh INR result should be obtained on the day of surgery, prior to anaesthetic/surgical intervention **[✶].**
8 In general, whenever there are any specific concerns (e.g. complicated surgery, only eye surgery) there should be discussion between anaesthetist, surgeon and patient (and where appropriate, the patient's cardiologist) regarding the risks and benefits of continuing anticoagulants and antiplatelet drugs to agree an acceptable approach **[✶].**

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Appendix

Anticoagulation and vitreoretinal, glaucoma and oculoplastic surgery

In recent years there has been an expansion of rather complex and invasive vitreoretinal glaucoma and oculoplastic surgery being done under local anaesthesia. Unfortunately, there is a paucity of firm evidence in the literature looking at the issues of anticoagulation and local anaesthesia for these types of procedures. There is however a risk that the guidelines for routine 'ambulatory cataract surgery' may be applied to what is much more intricate work. What follows is a review of the literature for overall care of patients on anticoagulant and antiplatelet therapy (rather than just local anaesthesia) for these procedures.

A Vitreoretinal surgery

Although anticoagulant therapy may safely be continued for patients scheduled for vitreoretinal surgery, the literature does report complications. *Subretinal haemorrhage* is one such complication associated with external drainage during scleral buckling procedures. This may occur due to trauma to choroidal vessels, or acute hypotony.

Raj et al[1] have reported a spontaneous massive subretinal bleed in a patient with background diabetic retinopathy and on treatment with warfarin.

In a study by Fu AD et al[2] 25 patients on systemic anticoagulation with warfarin (international normalized ratio 1.5 to 3.1: median 2.0) had vitreoretinal surgery. No intraoperative complications were observed except in one patient. This patient had an intraoperative subretinal haemorrhage associated with scleral buckling and the drainage procedure.

In another study[3] 60 patients (mean age 73 yrs) had vitreoretinal surgery under sub-Tenon anaesthesia. Twenty-two (36.7%) were on vitamin K antagonists and 38 (67.3%) on antiplatelet agents (clopridogel or aspirin). One patient who underwent a major procedure for a complicated retinal detachment had an intraoperative subretinal haemorrhage requiring retinectomy. No other complications occurred.

Narendran and Williamson[4] studied seven patients undergoing vitreoretinal surgery while on anticoagulation with aspirin and warfarin. Two of the seven suffered hemorrhagic complications, including one postoperative hemorrhagic choroidal detachment and one recurrent vitreous haemorrhage. The authors concluded that warfarin anticoagulation was associated with an increased risk of haemorrhagic complications.

Degree of anticoagulation

This may have a bearing on the overall outcome of the procedure. A retrospective study[5] of 1737 patients undergoing pars plana vitrectomy identified 54 patients on warfarin who underwent 57 vitreoretinal surgical procedures. These patients were grouped into categories depending on the INR. Group S (subtherapeutic) 1.2 to 1.49. Group B (borderline therapeutic) 1.5 to 1.99. Group T (therapeutic) 2.0 to 2.49. Group HT (highly therapeutic) had INRs of 2.5 or greater.

There were no anaesthesia-related or intraoperative haemorrhagic complications. Four patients (7.0%) however suffered postoperative haemorrhage. Two of 26 eyes (7.7%) were in group S and two of 12 eyes (16.7%) in group HT (one patient had an INR of 2.68, another 2.69).

Combination therapies

Drug combinations may pose additional concern. Antiplatelet agents are increasingly prescribed in combination or taken with non-steroidal anti-inflammatory drugs (NSAIDs), which potentiate their action. Herbert[6] et al have reported four cases of intraocular haemorrhage associated with these combinations.

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B Glaucoma surgery

Chronic anticoagulant and antiplatelet therapy are associated with a statistically significant increase in the rate of hemorrhagic complications in patients undergoing glaucoma surgery. Perioperative anticoagulation and a high preoperative intraocular pressure are potential risk factors for hemorrhagic complications in these patients.

In a study by Law et al[1] three hundred and forty-seven patients (eyes) who were on anticoagulant therapy (ACT) or antiplatelet therapy (APT) prior to glaucoma surgery were studied. The haemorrhagic complications were higher in this group than 347 control patients (10.1% vs 3.7%, respectively, P = .0002). Patients on ACT had a higher rate of hemorrhagic complications than patients on APT (22.9% vs 8.0% respectively, P = .003). Patients who continued ACT during glaucoma surgery had the highest rate of hemorrhagic complications (31.8%) when compared to patients who discontinued ACT prior to surgery or patients who used APT alone (P = .001).

Currently there is no definitive evidence or guideline available for management of patients on anticoagulant or antiplatelet therapy undergoing glaucoma surgery. In a questionnaire survey of glaucoma surgeons in England[2], diversity was observed with regard to continuation of anticoagulation therapy. The majority of surgeons do not stop warfarin or aspirin prior to glaucoma surgery.

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C Oculoplastic Surgery

Serious haemorrhagic complications have been reported with oculoplastic procedures. Fortunately the incidence remains low. In a prospective study in patients undergoing oculoplastic surgery[1] intraoperative bleeding prolonging surgery was reported in 9.2% of cases. Severe bleeding affecting surgical outcome occurred in 0.4% of patients. A history of previous stroke was linked with increased risk of postoperative bleeding. Age >60 years, history of hypertension and recent discontinuation of aspirin therapy were associated with increased risk of postoperative bruising. There was no statistical difference between the incidence of haemorrhagic complications among patients on ACT/APT therapy and those who were not. Cessation of continuation of these therapies made no statistically significant difference.

The authors suggested individualisation of patients with respect to discontinuation of antiplatelet or anticoagulant medications before surgery and concluded that selected procedures may be safely performed without stopping these medications.

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Conclusion

As the surgical outcome following vitreoretinal, glaucoma and oculoplastic procedures may be directly influenced by the haematological status of the patient, it is important that separate attention be given to these procedures. There is a need for individualisation of patients with respect to anticoagulation, anaesthetic and surgical management.

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ARTICLES
Continuous intra and postoperative ketamine administration reduces the analgesic consumption in eye amputation

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Abstract

Background
Eye amputation (evisceration and/or enucleation) requires high doses of peri and postoperative analgesics compared to other ophthalmic procedures. Ketamine was shown to reduce anaesthetic needs in different types of surgery. We thought that adding a low dose continuous intravenous ketamine infusion would reduce perioperative opioid and non opioid requirement in patients with eye amputation.

Method
A retrospective study was performed in a 40 bed ophthalmic surgery department of a tertiary care hospital for a period of 2 years (January 2007- December 2008). The ketamine protocol was introduced in January 2008 and it consists of a bolus of 0.5mg $.kg^{-1}$ at induction, followed by intraoperative infusion of 0.1 mg. kg^{-1} $.h^{-1}$for the first 24 h postoperatively. Demographic and clinical data, duration of surgery, intra and postoperative (24h) analgesic consumption were recorded. Paracetamol and ketoprofen are prescribed systematically. A visual analogue score (VAS) >7 provided nefopam and, if persistently high, nalbuphine administration.

Results
Forty–seven adult patients were included in the study, 22 in the non-ketamine (NK) and 25 in the ketamine (K) group, respectively. There was a statistically significant difference between intraoperative sufentanil (0.53 vs. 0.31µg$.kg^{-1}$, p=0.02) and postoperative nefopam (0.9 vs. 0.2 mg $.kg^{-1}.24h^{-1}$, p=0.01) and nalbuphine (280 vs. 90 µg $.kg^{-1}.24h^{-1}$, p=0.01) consumption between the two groups.

Conclusion
The administration of a low dose continuous ketamine infusion reduces the total peri and postoperative analgesic administration in patients undergoing eye amputation.
Key words: eye amputation, ketamine infusion, analgesic consumption.

Introduction
Among ophthalmic surgical procedures, eye amputation (enucleation and /or evisceration) is one of the most painful, requiring high doses of peri and postoperative analgesics[1]. Although some techniques of local anaesthesia were described for this type of surgery[2], general anaesthesia (GA) remains the most used in these patients. The latter provides more comfort for relatively young and distressed patients undergoing eye amputation. Multimodal analgesia is used for these patients in the postoperative period.

A low–dose infusion of ketamine has been used as an adjuvant to opioids in different type of surgery, such as: orthopaedics, traumatology, cardiac and abdominal surgery[3,4]. A decrease in the use of opioids and postoperative administration of nonopioid analgesia was associated with low-dose ketamine. Moreover, low-dose ketamine is reported to be neutral for changes in intraocular pressure (IOP), in contrast to anaesthetic doses which are recognised for their effect in increasing the IOP.

We thought, therefore, that adding a continuous low-dose infusion of ketamine, would reduce the perioperative use of opioids along with the postoperative requirements for nonopioid analgesics in patients undergoing eye amputation.

Method

A retrospective study was performed in a 40 bed ophthalmic surgery unit of a tertiary care hospital, between January 2007 and December 2008. The low-dose ketamine protocol was introduced in January 2008 and consists of the administration of a bolus of $0.5mg \cdot kg^{-1}$ at induction, followed by intraoperative $0.1\ mg \cdot kg^{-1}h^{-1}$ and for the first 24 h postoperatively. Propofol (2mg/kg) and sufentanil (0.25 µg /kg) were used for GA induction and desflurane for maintainance. A 15% increase in mean arterial pressure required sufentanil readministration ($0.1\mu g \cdot kg^{-1}$). Before the implementation of this protocol, postoperative analgesia relied on the use of a combination of paracetamol and ketoprofen prescribed systematically. When the visual analogue scale (VAS) was higher than 7, nefopam was administered, and if VAS remained > 7, nalbuphine was prescribed.

Demographic and clinical data, duration of surgery, intra and postoperative (24h) analgesic consumption and the presence of postoperative nausea and vomiting (PONV) were recorded for each patient.

Statistics

A student T– test was performed to compare the two groups, with a p value <0.5 considered as statistically significant.

Results

Forty–seven adult patients were included in the study, 22 in the non-ketamine (NK) and 25 in the ketamine (K) group, respectively. There was no difference in age, gender, ASA score and duration of surgery, but the sufentanil consumption was lower in the K compared to the NK group (Table 1.). There was also a statistically significant difference between nefopam and nalbuphine administration in the postoperative period (Table1.).

Six patients in the K group and 9 in the NK group received the PONV prevention protocol[5]. Only 2 patients in the K group and 5 patients in the NK group had PONV, which made the comparison between the two groups not feasible.

Discussion

Our study shows that the administration of a continuous low dose- ketamine infusion decreases the requirements for intraoperative opioids and postoperative nonopioids in patients undergoing eye amputation.

Used as an efficient anaesthetic in high-doses and as a potent analgesic at low doses[6], ketamine was recognised in the last decades as an opioid adjuvant in various types of

surgery. Indeed, Chapman *et al* described a sparing effect of low dose ketamine on opioid administration up to 50%, as well as the superior pain relief of the combination compared with opioid use alone[7]. This effect was described in abdominal, orthopaedic and cardiac surgery, as well as in chronic pain treatment[3]. Ketamine was also added as an adjuvant to epidural and patient controlled analgesia (PCA) opioid administration[3]. Nevertheless, there are several studies showing that associating ketamine with opioids did not decrease the intraoperative opioid consumption, nor improve postoperative pain[3].

In our study, we were able to show that bolus administration followed by continuous low dose ketamine infusion, had a sparing effect on intraoperative opioid consumption and on postoperative nonopioid analgesic use. To our knowledge, this is the only study focused on the use of ketamine for analgesia in ophthalmic surgery. Although we applied a technique mainly used for "heavy" and very painful types of surgery, a comparison between the results obtained in our study and those performed on abdominal, orthopaedic or cardiac surgery is not reasonable. Nevertheless, in ophthalmic surgery this association had beneficial effects for postoperative analgesia, and it was not associated with notable side effects, except in one case in which we had to stop the continuous infusion after 4h due to patient agitation.

Although the effect of ketamine on postoperative analgesic consumption was obvious, a critique that might be addressed to our study is that for the first 24h after surgery the patient remains " bed arrested" due to the continuous infusion. The question of the efficacy of short time ketamine administration on postoperative nonopioid analgesia will be addressed in a future study.

Table 1. Characteristics of the patients in the two groups.

Variable	**Group NK** N=22	**Group K** N=25	**P value**
Age	51	56	NS
Gender M/F	20/31	21/35	NS
ASA score	1 (1-3)	1(1-3)	NS
Intraoperative parameters			
Propofol ($mg./kg^{-1}$)	3.5(2-5)	3.2(2.3-5)	NS
Sufentanil consumption ($\mu g./kg^{-1}$)	0.53(0.26-0.92)	0.31(0.19-0.62)	0.02
Operative time (min)	86 (70-123)	82(75-125)	NS
Postoperative parameters			
Nefopam consumption $mg./kg^{-1}./24h^{-1}$	0.9 (0.5-1.2)	0.2(0.05-0.6)	0.01
Nalbuphine consumption $\mu g./kg^{-1}./24h^{-1}$	280(150-420)	90 (60-250)	0.01

Values expressed in median (range).

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A novel method of reducing subconjunctival haemorrhage after sub-Tenon's block

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Introduction
The incidence of subconjunctival haemorrhage following Sub-Tenon's block is known to vary from 30-100% [1, 2, 3, 4, 5, 6, 7]. Various methods including handheld cautery and topical epinephrine have been tried but at present, no full proof technique is known to be effective.

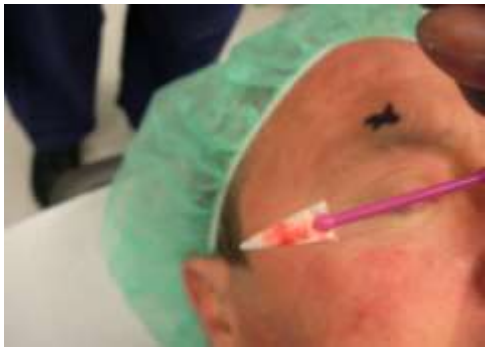
Aim
Reduce the incidence of subconjunctival haemorrhage after sub-Tenon's block.

Method
In a prospective observational study which included more than 2500 subjects age range 18 -75 but mostly between 25 and 60 undergoing clear lens exchange by phaco and phakic intra ocular Lens (IOL) implant, patients received sub-Tenon's block in the infero nasal quadrant after incision and dissection with Wescott scissors and Colibri forceps. Sub-Tenon's block was performed by an anaesthetist who has extensive experience involving over 5000 such blocks.

A volume ranging from 2-3 ml of 2 % lidocaine with 15 IU/ml and without adrenaline was injected into the sub-Tenon's space with the help of a plastic 22 G cannula made of Polyurethane (PUR). The plastic part of a common 22 G "IV indwelling cannula (B/Braun: Introcan Certo/PUR 22G x 1" 0.9x25mm Ref 4251318)" was used.

After injection of the local anaesthetic an eye sponge (e.g. BD Visipear 70 mm REF 581089) was applied from the nasal direction under direct vision covering the area of dissection.

This first sponge remained in the eye without any pressure underneath the closed lids for 2 minutes.



After 2 minutes the sponge was retracted and visually checked for the bleeding intensity. Based on this result a decision about the remaining time for the second sponge to be applied was made. The second sponge remained on top of the incision as long the individual bleeding time lasted (3 up to 7 minutes). Presence or absence of subconjunctival haemorrhage was noted immediately and the day after as reported at follow up.

Results

The draining of the released blood caused by the conjunctival incision in the area of dissection with an eye sponge as long as the patients bleeding time lasts, reduced the incidence of subconjunctival haemorrhage to less then 5-2 %. The incidence depends on the anaesthetist's experience and patience (bleeding time) and *not* on the patient's condition. The technique offers an immediately preoperative clinical bleeding time check as a secondary result.

Conclusion

The application of a native absorbent eye sponge in the dissected area after sub-Tenon's block reduces the incidence of subconjunctival haemorrhage dramatically if the block provided is performed by an experienced individual.

International Normalised Ratio (INR) Monitoring in Patients Undergoing Ocular Surgery: A Survey

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Introduction
Anticoagulated patients are at increased risk of haemorrhagic complications during sub-Tenon's and sharp needle regional anaesthetic techniques. The Joint Colleges Working Party guidelines recommend that warfarinised patients have their INR checked prior to ocular surgery and that their INR is kept within therapeutic range[1]. It is generally accepted that the INR be 2.5 or less prior to performing peribulbar blocks. A recent national UK survey of consultant ophthalmic anaesthetists showed that most would accept an INR 3.5 or less prior to performing sub-Tenon's blocks[2].

Current national guidelines do not stipulate how soon before surgery the INR should be checked. Since warfarin and hence INR can be affected by many drug interactions (prescription, over-the-counter and herbal supplements), intercurrent illness as well as dietary changes it is not unreasonable to suggest that the gold standard should be checking INR on the day of surgery.

At Birmingham and Midland Eye Centre (BMEC), INRs are checked on the day of surgery either by; 1. A venous blood sample, or 2. A bedside anticoagulation testing device (Roche CoaguChek).

The ward nurses are responsible for taking the venous blood sample when the patient arrives on the ward. The sample is then taken by the porters over to the main hospital site to be processed by the pathology laboratory. The ward nurses telephone the laboratory to obtain the INR result.

The bedside testing service is run by the hospital pathology department. It is performed by specialist anticoagulation nurses when a bedside INR is requested by the ward nurses. Unfortunately this service is only available during office hours and is subject to nursing availability.

It has been observed that with the current systems, preoperative INR results were often unavailable causing frustration, changes in theatre list order, delays, cancellations, complaints, not to mention the financial ramifications of inefficient use of theatre time. The aims of this study were to identify inefficiencies in the current system for checking INRs at BMEC, to identify the time taken to obtain an INR result on the day of surgery and to suggest ways to improve current system,

Method
A prospective survey of INR monitoring for patients scheduled for ocular surgery was performed over a three month period. We recorded the method of INR testing, the length of time it took to receive the result, the anaesthetic technique used for the surgical

procedure, as well as the reasons and consequences that resulted from any delayed INR results.

Results
26 warfarinised patients scheduled for surgery were identified within the three month period. As expected the majority of patients had regional anaesthesia for their surgery.

58% (15) of INRs were checked by the bedside testing device and 42% (11) by venous sampling. (Figure 1)

65% (17) had sub-Tenon's block, 19% (5) had peribulbar, 12% (3) had general anaesthesia, and 4% (1) had topical anaesthesia (Figure 2).

The range of time taken from requesting INR to getting the result was with the traditional venous sampling was 43 – 810 minutes (avg. 200 min) and that with the point of care bedside service run by the haematology department was 3-270 minutes, mean 40 min (table 1)

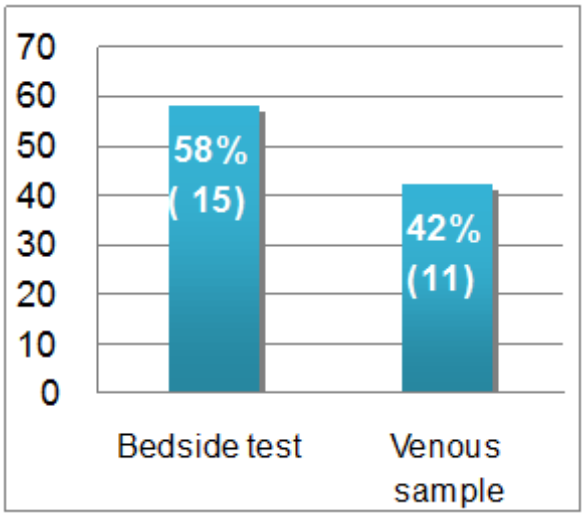

Fig 1 Method of INR testing

Time taken	Range (min)	Mean Time (min)
Venous sample	**43-810**	**200 (3hrs 20min)**
Bedside test	**3-270**	**40**

Table 1 Time taken to obtain INR result

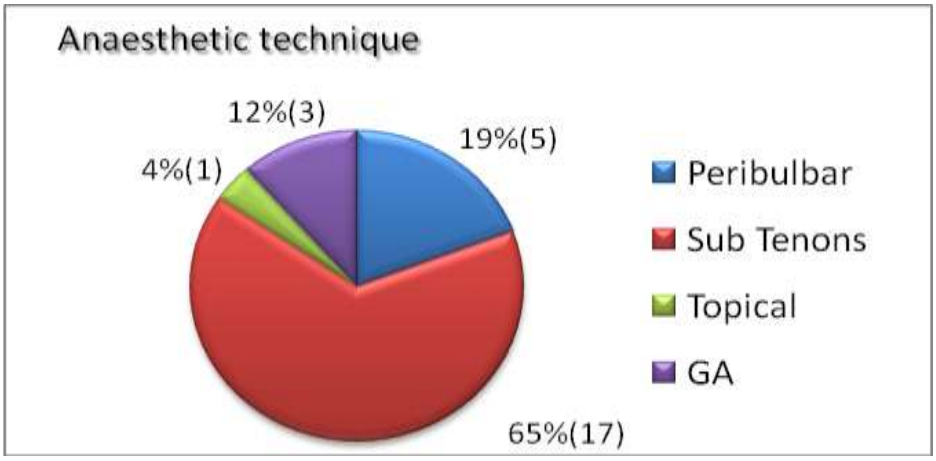

Fig 2 Anaesthetic technique

Reasons for delays
The main reasons for delays with *venous sampling* included nursing staff being too busy to take the blood sample, lost samples and problems with the portering service. Other reasons were that the pathology laboratory had not processed the sample as a priority or had not informed the ward of problems with the samples.
The reasons for delays with the *bedside testing* service were mainly due to the lack of availability of the anticoagulation nurses since they only work from 9am to 5pm and had other clinical commitments and were unable to attend the ward when requested.

Effect of delayed INR results on theatre list management:
Waiting to obtain INR results led to surgical delays and required alterations in list order in 30% (8) cases. Of these delays 75% (6) were due to problems with venous sampling. There were no cancellations as a result of delayed INR results.

Discussion
The results of this study showed that the current INR monitoring system at BMEC could be significantly improved. Inefficiencies in the system were causing considerable delays, discomfort to patients and disruption to theatre lists.
The traditional venous sampling took longer, was more labour intensive and caused noticeably more delays than bedside testing. On an average it took nearly three hours to obtain the INR value. The delay with the point of care bedside testing although small, still took nearly 40 minutes on average.

On cost benefit analysis, it appeared that the average cost of one bedside INR test (£2.60) versus the cost of venous sampling (£0.50) was acceptable since the hidden costs of consumables, nursing, porters and laboratory technician time, patient discomfort and the cost of cancellations and lost operating time were not included in the cost of a venous sample.

The bedside INR tests are as accurate as venous sampling,[3] quicker and easy to use, convenient for staff, more comfortable for patients and avoid processing and transport delays.

In order to make the INR testing system at BMEC more efficient it was clear that bedside testing should be used in preference to venous sampling. Unfortunately since the service was dependent on the haematology nurses (who were only available within office hours and had other commitments) the delays were still creeping in. The only way of avoiding this delay was to gain independence. We therefore decided to obtain an independent bedside anticoagulation device for the BMEC. A business plan to buy the device has recently been approved. Plans are afoot to teach and train the ward nurses in its use and maintenance. The aim and hope of the authors is to reduce the time taken to receive an INR result to less than ten minutes, and eliminate the delays and cancellations resulting from traditional ways of INR monitoring.

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Intra-vitreal injection of local anaesthestic agent improves the quality of peribulbar block in patients undergoing evisceration surgery

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Introduction

Evisceration surgery of the globe entails removal of intraocular contents leaving the sclera shell intact. This surgery is usually performed under general anaesthesia but has also been successfully performed under peribulbar block[1,2] Using the latter technique, it is not unusual for the patients to experience intraoperative discomfort during surgery. Monitored anaesthesia care with sedation has been proposed as a method for managing this pain[3].

We have performed evisceration surgery in our clinical practice under peribulbar block and many patients reported intraoperative pain. Perforation of or damage to the globe during performance of the peribulbar block and evisceration surgery is of little concern. we postulated that deliberate injection of 1 ml of local anaesthetic into the vitreous gel can relieve intraoperative pain. This hypothesis was supported by a subsequent pilot study whose aim was to compare the use of peribulbar block with or without deliberate intravitreal injection of local anaesthetic agent in patients undergoing evisceration of the globe.

Patients and methods

After obtaining the approval of the institutional ethics committee and written informed consent, 100 patients scheduled for elective evisceration surgery were enrolled in this study. We estimated our sample size using the method described by Lerman[4]. A sample size of 45 was estimated to be sufficient to detect a 20% difference between groups; this will give an alpha value of 0.05 with a power of 80%. With a fall-out rate of approximately 19%, we increased the number of patients in each group to 50.

All patients were fasted. They were randomly allocated to one of two groups using the closed envelope method. Group I (n=50) received peribulbar block alone whereas group 11 (n=50) received peribulbar block and intravitreal injection of local anaesthetic. Before the administration of anaesthesia, a peripheral vein was cannulated ECG, pulse oximetry and non-invasive arterial blood pressure were monitored.

Peribulbar block was performed with a 25 gauge, 25 mm sharp disposable needle using the three injections technique (extreme inferotemporal, medial and superonasal) with the globe in the neutral gaze position to ensure complete anaesthesia. Each injection was performed with a 3 ml of local anaesthetic solution consisting of equal volumes of 0.5% isobaric bupivacaine and 2% lidocaine with 30 iu /ml of hyaluronidase.

Group II also received an intravitreal injection of 1 ml of the above local anaesthetic mixture. The ophthalmic surgeon injected the intravitreal solution at the inferotemporal quadrant 4 mm behind the limbus. Akinesia and anaesthesia were assessed every 5 minutes. Complete or near akinesia was required before proceeding to surgery.

Adequacy of anaesthesia was checked by grasping the conjunctiva at the limbus area in various quadrants using Castroviejo 0.12 tissue forceps.

Surgical procedure

A 360 degree conjunctival incision around the limbus (periotomy) was performed followed by a stab incision at the limbus. A spatula was then introduced to separate the uveal tissues from the sclera. The intraocular contents (iris, ciliary body, choroid, vitreous, retina and lens) were removed using a scoop and aided by suction. The inside of the scleral shell was carefully scraped to remove any adherent pigments and the scleral shell washed with hydrogen peroxide solution to dislodge any adherent ocular pigments as well. Any bleeding coming from the vortex veins was cauterized. Special attention was also given to the vessels at the optic disc and application of direct pressure for 2-3 minutes was sufficient. Direct cauterization of the disc vessels was carried out if necessary.

A simple pain scoring system was used: no pain = 0, discomfort = 1, pain = 2.
Pain was subjectively reported by the patient. The scoring was done at various stages of surgery: stab incision at limbus, separation of uveal tissues from sclera, removal on intraocular contents and pressure on the disc vessels. If the pain score was 0 or 1, no further management was required. However, if the pain score was 2 at any stage, 20 ug of fentanyl and 1 mg of midazolam were given.

Parametric data were analyzed using Student's t-test and non parametric data were compared using the Chi-square x2 test. A p value of <0.05 was considered statistically significant.

Results

There was no significant difference between the patient characteristics of the two groups (table1).

There was no significant difference in pain scores during stab incision between the two groups. 11 patients in group 1 reported pain (pain score =2) during separation of uveal tissues compared to 1 patient in group 2 ($p<0.0001$). 13 patients reported pain (pain score=2) in group 1 during removal of ocular tissues compared to 2 patients in group 2 ($p<0.0001$). 16 patients in group 1 reported no pain (pain score=0) during pressure and cauterization of disc vessels compared to 36 in group II ($p<0.0001$). Pain scores at each stage of surgery are shown in table 2.

Discussion

The globe is made up of three layers. The outer layer consists of cornea and sclera and is very sensitive to local anaesthetic injection. The inner layer is relatively insensitive and consists of the retina. The middle layer consists of iris, ciliary body and choroid. It is very vascular, contains sensitive neurons and is very sensitive to pain. Most of the patients feel discomfort or even pain when the middle layer is touched even within a fully functional peribulbar block. For this reason many surgeons prefer general anaesthesia.

We observed that the deliberate injection of 1 ml of local anaesthetic solution alleviated this pain and improved the quality of anaesthesia and analgesia in most patients.

Injection of local anaesthetic into the vitreous can be associated with ocular explosion. Ocular explosion has been reported during cataract surgery if approximately 3ml of local anaesthetic is injected accidentally into the vitreous during needle block because the intra-orbital pressure increases to a dangerous level[5]. Globe explosion has been reported after intravitreal injection of triamicinolone acetonide[6]. Intravitreal injections have become popular for the treatment of retinal disorders, however an increase in the intraocular pressure has been reported[6]. Globe rupture has been reported after simple digital pressure following peribulbar block in a 75-year- old woman[7]. This reinforces the view that any rise in intraocular pressure is of concern when an ocular block is performed.

We are not aware of any adverse event when 1 ml of local anaesthetic is injected into the vitreous. We believe that the rise in intraocular pressure will not be high enough to cause any damage to the globe. Our study shows that this small amount of deliberate intravitreal injection improves the quality of anaesthesia and analgesia in patients undergoing evisceration surgery with a peribulbar block and only a very insignificant number of patients felt any pain as shown in table 2.

Conclusion

We conclude that a deliberate intravitreal injection of 1 ml of local anaesthetic agent improves the quality of periblubar block thus making the intraoperative procedure much more acceptable to patients, avoiding general anaesthesia.

Table 1 Patient characteristics weight: mean (SD) age: mean (range)

Group I Peribulbar block n=50	Group II Peribulbar block + intraocular anaesthesia n=50
Men/Women	
30/20	35/15
Mean age(range)(yr)	
25(18-37)	24(19-38)
Mean weight (SD)(Kg)	
75(18-37)	68(10.8)
ASA 1 (n)	
50	50

Table 2 Numbers of patients with a specific pain score at different stages of the operation. Data were analyzed using the Chi-square test. *P <0.0001 between groups.

Group I Peribulbar block n=50			Group II Peribulbar block + intraocular anaesthesia n=50		
No pain	discomfort	pain	No pain	Discomfort	pain
Stab incision					
47	3	0	49	1	0
Separation of uveal tissues					
17	22	11 *	31	18	1
Removal of ocular tissues					
14	23	13*	30	18	2
Pressure & cauterization of disc vessels					
16	27	7	36*	11	3

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Two-quadrant high volume sub-Tenon's anaesthesia for vitreoretinal surgery: a randomized controlled trial

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Abstract
The total volume of a standard single inferonasal injection of local anaesthetic for a sub-Tenon's block is limited by an increase in intraocular pressure and commonly requires the operating surgeon to top up the block intraoperatively. This study compares the efficacy and safety of a two-quadrant technique which allows the use of a higher volume of local anaesthetic.

Methods
Fifty-four patients undergoing vitreoretinal surgery were randomized into two groups. The control group (n=27) received a standard 5ml single infero-nasal sub-Tenon injection of a 50:50 mixture of 2% lidocaine and 0.5% bupivacaine with 150 IU hyaluronidase. The study group (**n**=27) received a 5ml inferonasal injection and a 5ml superotemporal injection of the same mixture (10ml total). The primary outcome measure was the number of intraoperative top ups required. Secondary outcome measures were: intraoperative pain score, postoperative pain scores, intraocular pressure, block onset time, ocular akinesia, eyelid akinesia and chemosis.

Results
Two-quadrant sub-Tenon's anaesthesia using 10 ml of a 50:50 mixture of 2% lidocaine and 0.5% bupivacaine with 150 IU hyaluronidase significantly reduced the need for an intraoperative top up during vitreoretinal surgery ($P<0.001$) without a significant increase in intraocular pressure. Block onset time was shorter and eyelid akinesia was improved in the two-quadrant high volume group. Mean pain scores were significantly lower in the study group compared to the control group immediately postoperatively and at 0-2 hours, 4-6 hours, 10-14 hours and 20-24 hours postoperatively.

Conclusions
Two-quadrant sub-Tenon's anaesthesia using 10 ml of a 50:50 mixture of 2% lidocaine and 0.5% bupivacaine with 150 IU hyaluronidase seems to be more effective than a standard inferonasal approach in preventing perioperative and postoperative pain during vitreoretinal surgery under local anaesthesia.

Introduction

Sub-Tenon's block has been described as a safe and effective method to achieve local anaesthesia for vitreoretinal surgery.[1-9] A perceived advantage is the avoidance of sharp needles and a reduction in their associated complications such as retrobulbar haemorrhage, globe perforation and optic nerve damage.[6 7 10-13] However, the variable quality of ocular akinesia and short block duration with subsequent need for an additional sub-Tenon's block to be performed by the operating surgeon intraoperatively is not ideal and may be a limiting factor in its popularity for vitreoretinal surgery. Total volume and local anaesthetic mixture used varies and has an effect on block onset time, quality and duration.[14 15] Local anaesthetic concentration is limited by the risk of myotoxicity to the extra-ocular muscles whilst total volume of local anaesthetic used is limited by an increase in intraocular pressure and chemosis. [16 17] A common technique is a single 5ml injection of a 50:50 mixture of lidocaine 2% and bupivacaine 0.5% via the inferonasal quadrant which allows for a short onset time and reliable ocular akinesia but frequently still requires the need for further intraoperative top ups.[7 9 14] The aim of this study was to compare the efficacy and safety of a high volume two-quadrant sub-Tenon's technique compared to the usual low volume single quadrant approach for vitreoretinal surgery.

Method

After local ethics committee approval and written informed consent, 54 patients (aged 30-81 yr and ASA grade I-III) undergoing vitreoretinal surgery (vitrectomy +/- laser +/- cryotherapy +/- gas exchange) for retinal detachment were recruited into this prospective, randomized study. Patients allergic to local anaesthetics or hyaluronidase, with communication difficulties or with a scleral buckle present were excluded.

Using a random number generator, a batch of numbered sealed envelopes containing each randomization was produced and kept in a designated area. At recruitment, each patient was allocated a sequential envelope to be opened in the anaesthetic room only by the anaesthetist performing the block. All blocks were performed by a single anaesthetist experienced in both types of blocks. Patients were randomized to one of two groups. The control group received a 5ml single inferonasal sub-Tenon injection of a 50:50 mixture of 2% lidocaine and 0.5% bupivacaine with 150 IU hyaluronidase[19-21] The study group received a 5ml inferonasal injection and a 5ml superotemporal injection of the same mixture. The principal investigator was masked to which block had been administered.

In the anaesthetic room monitoring included ECG, pulse oximetry and non-invasive arterial pressure. No sedation was given. The conjunctiva and cornea was initially anaesthetised with topical drops of proxymetacaine 0.5% followed by tetracaine 1% and sterilised with drops of 5% aqueous iodine solution. The surrounding skin was sterilised with 10% aqueous iodine solution. Using non-toothed Moorfield forceps to grip the conjunctiva and Tenon's capsule, with Westcott scissors, a small incision was made to expose the white sclera in the inferonasal quadrant only (control group) or inferonasal and superotemporal quadrants (study group). After injection using a blunt 19G, 25mm long curved Visitec sub-Tenon's cannula the principal investigator then assessed the block. Ocular akinesia was assessed at 1,3,6,9,12,15 and 18 min after injection using a scoring system as described by Brahma,[22] in which globe movement is scored either 0, no movement; 1, a flicker of movement; 2, partial movement; or 3, full movement; in the secondary directions of gaze (abduction, adduction,

elevation and depression). An immobile eye scored 0 and a fully mobile eye scored 12.

	Single-Quadrant (*n*=27)	**Two-Quadrant (*n*=27)**
Age (yr)	62.8 (11.2)	63.6 (10.4)
	11	15
Sex		
M	16	12
F		
Vitrectomy	27	27
Cryotherapy	19	23
Gas	19	25
Laser	9	6
Op Time (min)	74.2 (20.7)	74.4 (17.6)
Prev Surgery		
ant chamber	9	9
post chamber	7	5

Table 1 Patient characteristics, type of operation, duration of operation and type of previous surgery. Results are n or mean (SD).

Patients were deemed ready for surgery when the score was 4 or less. Chemosis was assessed on the number of quadrants affected. No quadrants affected scored 0 and all four quadrants affected scored 4. Intraocular pressure was measured at 1,3,6,9,12,15,18 min using a Tonopen.[23 24] At the end of the operation, type of surgery, duration of surgery and the timing of any intraoperative top ups (3ml of bupivacaine 0.5%) were recorded. The operating surgeon was also asked to score perioperative eyelid movement from 0 to 2. 0, no movement; 1, partial function and 2, full function.[25] Pain scores were taken post injection and postoperatively using an 11-point (0-10) numerical visual analogue scale (VAS).[26] Patients recorded pain scores and analgesia taken at four intervals within the first 24 hours after surgery; at 0-2 hours, 4-6 hours, 10-14 hours and 20-24 hours. Age, gender, ethnic origin, previous operations and postoperative complications were also recorded.

Statistical analysis

The primary outcome measure was the requirement for an intraoperative top up. On the basis of previous studies it was assumed that the proportion of patients who require a top up after a 5 ml injection is 60 % and that the proportion of patients who require a top up after a 10 ml injection is 10 %.[7-9] From this it was calculated that 25 patients would be required per treatment group to detect a difference with 95% power (two-tailed alpha of 0.05). The numbers were then increased by 5% in each group to allow for drop out, resulting in 2 extra patients per treatment group so that the final number in each group was 27.

Results

The groups were similar in respect of patient characteristics, previous surgery, type and duration of surgery (Table 1). Mean operating time for the control group was 74.2 +/- 20.7 minutes and 74.4 +/- 17.6 minutes for the study group. Within the control group twenty-three

patients (85.19%) required a single top up at a mean time of 50.8 +/- 11.8 minutes and one patient (3.7%) required two top ups. No patients required a top up in the study group (*P*<0.001). Block onset time was significantly lower for the study group. Median time to an akinesia score of 4 or less was 9 minutes for the control group compared to 3 minutes for the study group. Median eyelid akinesia score was 2 for the control group and 0 for the study group. There was no significant difference in the changes in mean IOP with time between the two groups.

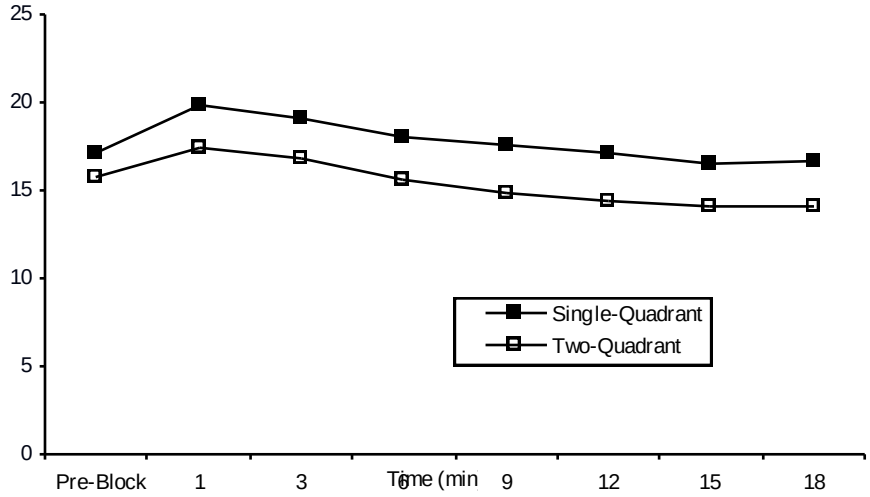

Fig 1 Mean intraocular pressure (IOP) measured in mmHg at 1,3,6,9,12,15 and 18 min after block performed.

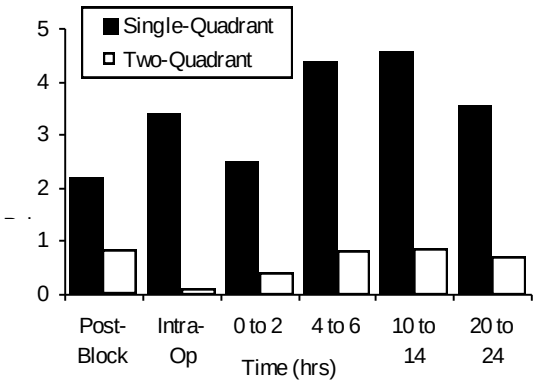

Fig 2 Mean intraoperative and postoperative pain scores.

	Single-Quadrant (*n*=27)	Two-Quadrant (*n*=27)
None	2 (7.4%)	12 (44.4%)
Paracetamol	3 (11.1%)	14 (51.9%)
Codeine Phosphate	22 (81.5%)	1 (3.7%)

Table 2 Postoperative analgesic requirements within the first 24 hours

Maximum IOP measured was 32 mmHg in the control group and 28 mmHg lower in the control group at 33.3% compared to 52% in the study group. Mean pain scores were lower for the study group compared to control group at injection (0.8 vs. 2.2), immediately postoperatively (0.1 vs. 3.4) and at 0-2 hours (0.4 vs.2.5), 4-6 hours (0.8 vs. 4.4), 10-14 hours (0.9 vs. 4.6) and 20-24 hours (0.7 vs. 3.6) postoperatively (Fig. 2). The need for rescue analgesia within the first 24 hours postoperatively was less in the study group (Table 2). In the control group 2 patients (7.4%) required no analgesia and 22 patients (81.5%) required codeine phosphate 30-60mg. In the study group 12 patients (44.4%) required no analgesia and only 1 patient (3.7%) required codeine phoshate 30-60mg. There were no complications in either group.

Discussion

This study shows that two-quadrant sub-Tenon's anaesthesia using 10ml of a 50:50 mixture of lidocaine 2% and bupivacaine 0.5% with 150 IU hyaluronidase via the inferonasal and superotemporal quadrants significantly increases block duration and reduces the need for an intraoperative top up during vitreoretinal surgery without any significant increase in intraocular pressure. In addition, intraoperative pain, postoperative pain and the need for rescue analgesia postoperatively are all significantly reduced when compared to a single 5ml injection of the same mixture in the inferonasal quadrant. Quality of block as assessed by the onset of ocular akinesia and perioperative eyelid movements are also significantly improved. Our findings for the low volume (control) group are similar to previous reported studies. Kwok and colleagues[7] used a 4ml single inferonasal injection of a 50:50 mixture of lidocaine 1% and bupivacaine 0.5% with 1,200 IU of hyaluronidase. 77% of patients in their study needed one or two top ups at a mean time of 50 +/- 46 minutes compared to 89% in our study at a similar mean time of 50.8 +/- 11.8 minutes. Lai and colleagues[9] reported 37% of patients receiving a 5ml single inferonasal sub-Tenon's injection of a 50:50 mixture of lidocaine 4% and bupivacaine 0.75% requiring a top up (times of top up not mentioned). Their use of a stronger anaesthetic mixture may account for the lower top up rate. The mean intraoperative pain score in our control group was 3.4 compared to 1.17 and 2.1 in the above studies. However all the patients in these studies were sedated with varying combinations of midazolam, alfentanil or fentanyl and propofol. None of the patients in our study were sedated. This may explain the higher top up rate and mean intraoperative pain scores in the control group compared to previous studies. Nevertheless anaesthesia was significantly more effective in the high volume (study) group with no one requiring a top up compared to 89% requiring a top up in the low volume (control) group. Anaesthesia

continued for up to 24 hours postoperatively in the high volume group, providing adequate analgesia without the need for rescue analgesia in 44.4% of patients compared to 7.4% not requiring any rescue analgesia in the low volume group.

Cryotherapy was the most stimulating procedure performed within our study followed by laser therapy and then gas exchange. The type of surgery performed in both groups was not significantly different. 23 patients underwent cryotherapy in the high volume group compared to 19 patients in the low volume group. Patients who have had previous ocular surgery have tissue adhesions which may limit diffusion of the local anaesthetic agent and thus efficacy. Both groups were similar with no significant difference between the groups with respect to previous ocular surgery. Previous studies have demonstrated sub-Tenon's anaesthesia is a safe and effective technique to achieve local anaesthesia for vitreoretinal surgery.[1-9] The risk of globe compression and consequent increase in intraocular pressure (IOP) associated with an injection of a volume of local anaesthetic agent into the fixed orbital space has limited the maximum volume used for sub-Tenon's anaesthesia. IOP is known to rise with increasing volume of local anaesthetic agent used for peribulbar and retrobulbar anaesthesia techniques.[27] There are few studies investigating the relationship between volume and IOP after sub-Tenon's anaesthesia.[17 18] IOP may rise slightly after injection of up to 5ml of local anaesthetic into the sub-Tenon space.[17] No comparative data observing the effect on IOP of injecting more than 5ml of local anaesthetic into the sub-Tenon space exists in the current literature. An important new finding in this study is that injection of 10ml of local anaesthetic agent into the sub-Tenon space did not cause any significant rise in IOP. In fact we observed a small gradual reduction in IOP up to 18 min after injection. One previous study has identified this phenomenon.[17] The reduction in IOP may be a direct pharmacological effect of the local anaesthetic agent on ocular blood flow, or secondary to a reduction in aqueous production due to an effect on the ciliary ganglion, or possibly because of a reduction in extraocular muscle tone.

Block quality as assessed by onset time and eyelid akinesia was also improved in the two-quadrant high volume group. A median reduction in block onset of 6 min may not be clinically important but continual intraoperative eyelid movements are distracting for the surgeon, interfere with surgery and may interfere with clinical outcome.

The incidence of chemosis increases as the volume of local anaesthetic injected into the sub-Tenon space increases.[4 13 14] Our findings are consistent with this and the incidence of 52% in the high volume group is within the range of 25 to 60% reported by previous studies using a lower volume of local anaesthetic agent.[6] However this is not clinically significant. Chemosis interferes less with vitreoretinal surgery compared to anterior segment surgery and usually resolves after the application of digital pressure.

In conclusion, our study has shown that 10ml of local anaesthetic agent may be injected via the inferonasal and superotemporal quadrants into the sub-Tenon space without significantly increasing intraocular pressure. A 50:50 mixture of lidocaine 2% and bupivacaine 0.5% with 150 IU hyaluronidase provides significantly better block quality, perioperative anaesthesia and postoperative analgesia for vitreoretinal surgery when compared to a standard single-quadrant low volume (5ml) technique using the same mixture. Further studies are required to resolve whether this is due to an increased dose of local anaesthetic agent, increased diffusion secondary to an increase in volume of local anaesthetic or due to increased diffusion associated with the anatomy of a two-quadrant approach.

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Prospective evaluation of deep topical fornix nerve block versus topical anaesthesia in patients undergoing phacoemulsification and intraocular lens implantation

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Introduction

General anaesthesia may be hazardous in many patients undergoing ophthalmic surgery, as most of them are elderly with systemic disease receiving multiple medications. This is especially true for diabetic patients in whom local anaesthesia is preferable as it reduces to a great extent the endocrine response to surgery[1].

Traditionally, retrobulbar injections were performed deep into the orbit, but it is now accepted that peribulbar injections using shorter needles are safer. In the last few years, continuing concern over the rare but serious complications of sharp needle blocks has led to increasing interest in the use of sub-Tenon`s blocks utilizing a blunt cannula[2,3,4,5]. Even with the use of blunt canulae sub-Tenon`s block serious problems can still occur. With advances in cataract extraction using the technology of phacoemulsification, topical anaesthesia has been used successfully[6].

Topical anaesthesia has several advantages over regional infiltrative techniques, the foremost of which is the abolition of any risk of inadvertent injury of the globe or orbital contents [7,8]. It has a high rate of patient satisfaction, but still there some patients that experience intraoperative discomfort.

Deep topical fornix nerve block anaesthesia (DTFNB) is done by placing two small sponges soaked with 0.5% bupivicaine in the conjunctival fornices. It has the advantage of a needle free technique with patient satisfaction[9]. In this study we compared topical anaesthesia with DTFNBA in patients undergoing phacoemulsification cataract surgery.

Patients and methods

One hundred patients scheduled for elective phacoemulsification cataract surgery were enrolled in this study after obtaining approval from the institutional ethical committee and written patient` consent. We estimated our sample size based on a method described by Lerman[10]. A sample size of 45 will detect a 20% difference between each group; this will give an alpha value of 0.05 with a power of 80%. With a fall-out rate of approximately 19%, we decided to increase the number of patients in each group to 50. All patients were assessed and only those who were deemed suitable for topical and DTFNBA were included in the study.

Selection criteria of patients are essential for the above technique which includes full cooperation of the patient. The level of patient anxiety is another important indicator of

success of non-akinetic anaesthesia. Very anxious patients were omitted from the study. All the operations were done by one experienced surgeon.

Patients were randomly allocated to one of two groups (closed envelope method). Group I (n=50) received topical anaesthetic drops and Group 2 (n=50) received DTFNBA. Before giving the anaesthetics, a peripheral vein was cannulated and heart rate, oxygen saturation and non-invasive arterial blood pressure were monitored.

Topical anaesthesia was done with 2% tetracaine local anaesthetic drops and DTFNBA was performed using two sponges (2x3mm) soaked with 0.5% bupivicaine, applied deep in the conjunctival fornices after anaesthetising the conjunctiva with tetracaine local anaesthetic drops[9]. The sponges were removed after 15 minutes. The anaesthetic effect was tested by grasping the limbus with Castroviejo 0.12 tissue forceps.

Pain was estimated by the patient using a simple pain score: no pain =0; that does not interfere with the surgical technique, discomfort=1; the surgical technique is performed with difficulty, pain=2; the surgeon is unable to continue the surgical technique. The scoring was done during different stages of surgery: lid retraction while inserting a speculum, tolerance to the microscope light, corneal incision, phacoemulsification, irrigation and aspiration, and intraocular lens insertion.

The surgical technique was performed through a clear corneal 3mm tunnel incision, followed by capsulorrhexis under sodium hyalurounate. The nucleus was removed by the stop and chop technique followed by bimanual irrigation aspiration of the cortex. Finally, implantation of a foldable acrylic intraocular lens in the capsular bag with wash of the viscoelastic and hydration of the side ports. The total operative time was recorded for every case.

If the pain score was 0 or 1, no further management was required but if the pain score was 2 at any stage, 1% preservative free lidocaine was injected intracamerally.

Parametric data were analyzed using Students t-test; non parametric data were compared using the Chi-square test. A P value of <0.05 was considered statistically significant.

Results

There was no significant difference between the patient characteristics of the two groups (Table1).

About 50% of patients receiving topical anaesthesia only reported pain - especially with speculum application, phacoemulsification. Furthermore, they reported severe pressure sensation which required the use of intracameral lidocaine. The other 50% reported varying degrees of discomfort that was tolerated without the need for intracameral lidocaine. Most patients in group 2 (DTFNBA), tolerated the operation well, Slight discomfort was noted as a sensation of heaviness reported by some patients during the introduction of the phacoemulsification probe inside the eye and during irrigation/aspiration. Another moment of discomfort occurred with the IOL implantation. However none of the patients had pain strong enough to require intracameral injection of lidocaine.

The number of patients in each group with different pain scores at each stage of surgery are shown in Table 2.

Table I Patient characteristics. Age is mean (range) and weight is mean (SD)

	Group 1 Topical	Group II DTFNBA
Men/Women	30/20	35/15
Mean age(range)(yr)	25(18-37)	24(19-38)
Mean weight (SD)(Kg)	75(18-37)	68(10.8)
ASA 1	9	10
ASA 2	31	30
ASA 3	20	20

Table 2 Number of patients in relation to pain score at different stages of the operation. Data were analyzed using the Chi-square test. *P < 0.0001 between groups

	Group I Topical n=50			Group II DTFNBA n=50		
	No pain	Discomfort	Pain	No pain	discomfort	Pain
Lid retraction	0	50*	0	28*	22	0
Tolerance to light	0	50*	0	35	15	0
Keratotomy (corneal incision)	30	20*	0	50	0	0
Phacoemulsification	11	29	10	41*	9	0
Intraocular lens insertion	0	30	20*	10	40	0
Irrigation and aspiration	14	27	9	39*	11	0

Discussion

Topical anaesthesia has gained popularity over the last few years as it is safer than the traditional peribulbar and sub-Tenon`s block especially with the advanced phacoemulsification machines. It has a high rate of patient satisfaction with immediate visual rehabilitation in most cases [7]. Topical anaesthesia has the advantage of having a softer globe during surgery with minimal positive vitreous pressure compared to peribulbar blocks.

However, some patients squeeze orbicularis oculi muscle (squeezers), which is a potential problem with either no or inadequate lid block. Administration of fascial blocks is a potential solution and results in loss of time, additional expense, complications and pain. Patients can be intolerant of the microscope light which makes them squeeze their eyes more, obscuring the surgical field for the surgeon. Moreover there is always a degree of discomfort (ranging from slight to severe) at the time of phacoemulsification, irrigation and aspiration and finally intraocular lens insertion. Topical anaesthesia was compared to needle blocks with contradictory results proving that topical anaesthesia alone is still not the method of choice for elective phacoemulsification cataract surgery [11,12].

With DTFNBA patients did not squeeze their eyes and their tolerance to the microscope light was better. Patients experienced no pain or slight discomfort during phacoemulsification, irrigation/aspiration and during intraocular lens insertion. No patients felt discomfort or pain on the pain scale which makes DTFNBA superior to topical anesthesia in phacoemulsification.

In DTFNBA, placing the anaesthetic in the fornix is more neuro-anatomically and pharmacologically sound as the fornix is contiguous with the peribulbar space. Placement of the sponges in the fornices allows absorption by the nerve trunks sub serving the conjunctiva. At the same time, by being absorbed posteriorly into the peribulbar space, the posterior cilliary nerves, which supply the anterior sclera, anterior conjunctiva and limbus as well as the iris and ciliary body are anaesthetised at their nerve roots [13,14,15]. The fornix is also a logical space for direct absorption across the

Tenon`s capsule. There is in addition likely absorption into the lid, producing some degree of lid akinesia.

The presence of lid hypokinesia, the ability to manipulate the iris freely without pain and the few case of incidental superior rectus pariesis suggest an anaesthetic effect that goes beyond its topical anaesthesia. In group 2 where DTFNBA was used, tolerance to microscopic light was much better. It has been suggested that nerve endings responsible for temperature sensation in the cornea lies deeper in the stroma and therefore more difficult to block than pain fibres (16), suggest that DTFNBA provide a profound degree of anaesthesia than topical anaesthesia.

However, proper selection of patients as well as experienced surgeons is the main secrets of success of using non-akinetic anaesthesia for phacoemulsification (17).

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Notification of Council Vacancy

Three members of Council of the British Ophthalmic Anaesthesia Society will complete their elected terms of Office in June 2010. Two of these colleagues are eligible for re-election. This is to notify all members of BOAS of the three vacant seats (one surgical and two anaesthetic) on Council in June next year and to invite nominations for BOAS members to stand for election to Council.

Nominations must be made in writing.

Nominations must have the prior consent of the nominee.

Nominees must provide a brief personal statement about their background, reasons for standing for election and how they intend to contribute to the work of BOAS (maximum 200 words).

Nominations should be addressed to the Honorary Secretary and sent by post or email and must be received no later than 30th April 2010.

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Post market surveillance study of BIS® use in orbital and vitreo-retinal surgery

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Background
Modern anaesthesia is a balance between drug induced unconsciousness and surgical stimulation. Imbalance of either of these factors can lead to serious complications of surgery and the risk of patient movement or even awareness during the procedure.

During ophthalmic surgery there can be huge variety in the level of surgical stimulation making titrating the level of anaesthesia very difficult. In an effort to avoid this there can be a tendency to use overly deep anaesthesia. This increased use of anaesthetic has consequences for recovery from anaesthesia and time to discharge from the recovery room.[1,2] The other major concern is that a large surgical stimulus could lead to anaesthetic imbalance and then onto patient movement or awareness. Particular to ophthalmic surgery, even a small movement can have catastrophic effects on outcome. (There have been 2 cases of patient movement recently in our unit).

There have been no studies to date evaluating the use of depth of anaesthesia monitors in ophthalmic surgery. There are concerns that ophthalmic surgery may interfere with the function of these monitors. We were interested to see if these monitors have clinical utility in this field, furthermore, if their use can decrease the risk of patient movement.

Depth of anaesthesia monitors have been available since 1996, using signals from the electrical activity of the brain, to further inform the anaesthetist to the patient's plane of anaesthesia. One such commercial monitor is BIS® which has been extensively evaluated and its benefits are well documented.[3,4,5] These include decreased risk of awareness, decreased use of anaesthetic drugs, faster awakening, and faster recovery time.

Methods
From 1/11/07 to 1/11/08, patients undergoing vitreo-retinal (VR) surgery, orbital decompression, enucleation and evisceration were invited to participate. All patients received a standardised anaesthetic, (Table 1) and a surgically placed local anaesthetic block. Standard monitoring as per Royal College of Anaesthetists guidelines was used. Prior to induction the BIS® electrodes were placed on the forehead according to manufacturer's instructions. This provided a baseline record of the awake BIS number. All patients were then pre-oxygenated.

Detailed notes were taken throughout the procedure and recorded on a separate data collection form along with a photocopy of the anaesthetic record. The information collected included: HR, NIBP, SaO2, concentration of sevoflurane, remifentanil dose, BIS levels throughout the procedure, and timing of surgical insults (e.g. knife to skin, cryotherapy, gas insufflation).

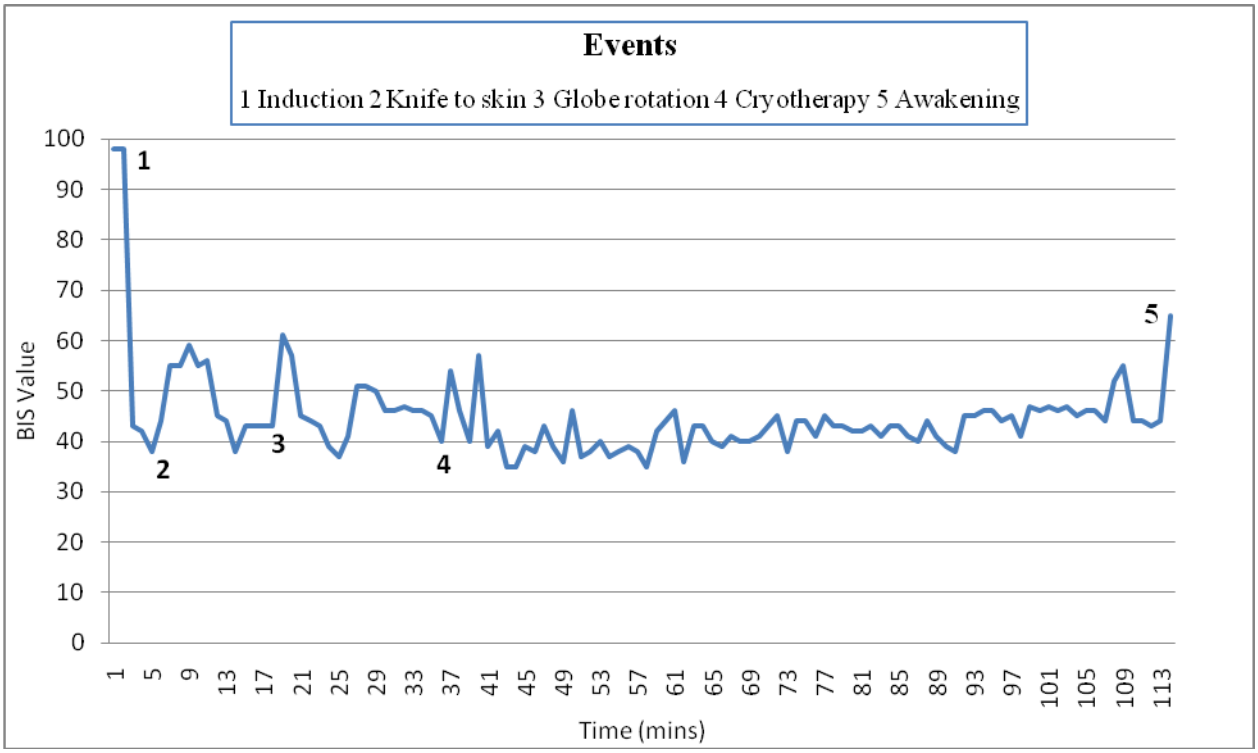
Table 1: Standardised Anaesthetic

Induction	Remifentanil 0.3mcg/kg/min, Propofol 2-4mg/kg, Rocuronium 0.5mg/kg
Maintenance	Remifentanil 0.1-0.15mcg/kg/min, Sevoflurane. Age adjusted MAC 0.8
Analgesia	Paracetamol 1g, Paracoxib 40mg (Unless contraindicated)
Anti-emetics	Ondansetron 4mg
Reversal	Neostigmine 2.5g / Glycopyrrolate 500mcg

Results

Data was collected for 21 patients. The mean age was 48 years (range 22-81). There were 13 females and 8 males. The median ASA was 2(range 1-3). The mean BIS awake was 98. (range: 97-99) The mean post induction BIS® was 44. The mean BIS reading intra-operatively was 48. The standard deviation of the BIS was 5.5. As expected, the BIS values varied during surgery and more so during surgical stimulation. There were minimal artefacts / interference during surgery. The variation in BIS values correlated positively to some surgical insults.

A Typical BIS® trace during anaesthesia for VR surgery



Discussion

We have demonstrated that the BIS® monitor can be used successfully in ophthalmic surgery. We believe that its routine use in ophthalmic surgery should be encouraged in an aim to reduce the risk of awareness and decrease the risk of movement during

surgery. It allows for an improved titration of hypnotic agent requirement and may lead to a reduced agent use and improved recovery. It has been recommended to use long acting neuromuscular blocking agents to decrease the risk of movement [6], however their use exposes the patient to an almost doubled increased risk of awareness (0.18% when muscle relaxants used, 0.10% when not used) [7].

The Future

There has been recent interest in the correlation of analgesic state and variability of BIS® during anaesthesia [8]. This has implications for both the perioperative and critical care settings. Perioperatively, being able to accurately titrate analgesia to BIS® variability would have many advantages (less side effects, better pain relief, more cost effectiveness, faster recovery etc). In the critical care setting, BIS monitoring may be useful for guidance of sedation and BIS® variability may provide a window into assessing an unconscious patients' analgesic state allowing better titration of analgesics. Finally, as a follow on from this study, we are now completing a randomised controlled trial investigating variability using bilateral BIS® in vitreo-retinal surgery.

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Personal view

The uncooperative patient: the surgeon's nightmare. How does the anaesthetist manage?

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Our eye hospital is primarily a referral centre. We come across patients with many systemic complications such as diabetics with end stage renal disease, ischaemic heart disease or heart failure, chronic bronchitis etc. We perform approximately 25,000 cataract operations under peribulbar anaesthesia in a year.

Once surgery has been advised, patients undergo a complete physical examination by our house physicians, with routine lab investigations (complete haemogram, blood sugar, ECG for patients 40 years and above and urine examination). Usually, the anaesthetist examines the patient on the day of surgery. If the patient is classified as high risk (ASA III) for surgery under local anaesthesia, then he is admitted as an inpatient so that the anaesthetist examines the patient a day before surgery is planned. The above protocol is followed routinely at our institution for all patients. Despite these measures, occasionally we come across complications for example pulmonary oedema resulting from acute left ventricular failure, or acute asthma.

However the most challenging and not infrequently encountered problem during surgery is sudden lack of co-operation by the patient – every surgeon's nightmare for several reasons, for example the high risk of expulsive haemorrhage or suprachoroidal haemorrhage. In this article we would like to share our experiences regarding the causes which might lead to a patient becoming uncooperative half way through the procedure and how we manage these problems on the operating table.

***A**nxiety:*
If a patient is found to be anxious during physical examination, our physicians usually advise them to have oral anti-anxiety tablets the night before surgery. Preoperatively if the anaesthetist finds the patient to be very apprehensive about the local anaesthetic procedure, midazolam 0.5-1mg is given intravenously. Most patients respond to this line of management. However there are occasions when despite these measures, an acute anxiety attack can occur in some patients causing tense moments for the surgeon. Holding the patient's hand and gently reassuring him helps to ease anxiety.

***B**reathing difficulty:*
Some patients can experience difficulty in breathing due to plastic drapes sticking to both the nostrils. To avoid this *iatrogenic* cause of breathing difficulty we have devised indigenous frames for normal (Figure 1) and obese (Figure 2) patients, who are operated upon under local anaesthesia. These frames help to lift the drapes away from the face so that the patient can breathe easily.

C*laustrophobia:*
For a patient with a history of claustrophobia we conduct a trial of draping over the patient's face preoperatively and advise the patient's attendant to do the same at home so that the patient can be mentally prepared for this necessary intervention at the time of surgery. In the past thick cloth drapes were used for draping. These have been replaced since by thin transparent plastic drapes which are more "patient compatible"..These drapes are permeable to both air and light, thus making the patient more comfortable during surgery. We have, in addition, indigenously designed a frame (Figure 3) which we found to be useful in patients with claustrophobia.

It is not entirely uncommon for a patient to become claustrophobic in the middle of surgery. With reassurance, a little bit of sedation with midazolam and lifting the drapes further away from the face, we were able to successfully complete the procedure. Sometimes we have even tied the drape ends to the intravenous stand, (Figure 4). Rarely we were forced to cancel surgery for a patient after advising the surgeon to do the procedure under general anaesthesia at another time.

D*ifficulty in voiding urine:*
Normally we advise the patient to empty their bladder before transfer to the operating theatre. Some patients, especially the elderly, those patients who are on diuretics and those with a history of prostatic hypertrophy do complain of bladder fullness in the middle of surgery and this in turn makes them uncomfortable and unable to lie still on the operating table. Rarely some patients find it difficult to void because of their supine posture. We once had a patient who suddenly became uncooperative in the middle of surgery, because of bladder fullness and refused to use the urine can. Surgery had to be stopped, the eye patched with sterile gauze and the patient was allowed to void in his own natural way, following which surgery was completed uneventfully!.

E*motional upset:*
Patients may be mentally or emotionally disturbed due to personal conflicts and are often not forthcoming with their problems unless presented with an opportunity to 'pour their hearts out'. In such a functionally disordered frame of mind if a patient presents for surgery, especially, as in our experience, for eye surgery, he may be more prone to being uncooperative. Only a detailed and thorough history, both with the patient and their attendant can reveal problems.

F*ailure of the heart:*
Acute cardiac failure with pulmonary oedema can cause dyspnoea and restlessness. The patient with heart failure finds it difficult to lie down flat. While treating the patient symptomatically, we advise the surgeon to complete the surgical procedure as soon as he is able.

G*lucose level decreased:*
Hypoglycemic attacks can produce excessive sweating, restlessness and discomfort to the patient. If these are the symptoms present, we check the random blood sugar level. If it is low we administer 25% glucose intravenously.

H*ard of hearing:*
It is not uncommon for elderly patients to be hard of hearing. If they do not use a hearing aid this could lead to communication problems, especially if verbal commands

are given by the surgeon or anaesthetist. Hence we allow the patient to use a hearing aid during surgery.

I*nadvertent injection of local anaesthetic systemically or into the CNS:*
Accidental inadvertent vascular or dural sheath injection of local anaesthetic can produce cardiovascular or central nervous system toxicity. Toxic manifestations range from twitching, restlessness, bradycardia and hypotension to respiratory arrest. These can occur either immediately after the block or even after draping the patient. Monitoring vital signs at regular intervals and maintaining verbal contact with the patient during the block can help to detect signs of toxicity and so prevent further complications as a result. We generally treat the toxic signs and symptoms symptomatically. Rarely, we have intubated the patient with apnoea.

L*anguage barrier:*
The preoperative visit helps us to find out if there is likely to be a communication problem with the patient due to differences in language. If both the surgeon as well as the anaesthetist is not well versed with the language spoken by the patient, then naturally it will be difficult for him to respond to our verbal commands. In such a situation we normally allow an attendant / translator to be with the patient in the theatre at the time of surgery.

M*entally challenged:*
Patients who are mentally challenged (Down's syndrome, dementia) also present for eye surgery. Managing these patients under local anaesthesia is possible and challenging. If there is a degree of understanding between patient, anaesthetist and surgeon, the procedure of local anaesthesia can be explained to the patient including the need to drape during surgery. A trial of draping can be performed before surgery. The presence of the patient's attendant in the operating theatre at the time of surgery also helps. We have successfully operated on patients with Down's and the elderly patient with dementia using this strategy.

P*ain:*
Inadequate block resulting in pain during surgery can cause anxiety, stress, sweating and restlessness. Always encourage the patient to communicate with the surgeon if there is any pain during surgery. When possible a parabulbar injection of local anaesthetic could provide adequate pain relief to the patient.

W*hispering:*
Remember that the patient for cataract surgery is usually under local anaesthesia The eye is blocked and not the ears! Whispering words like high blood pressure, bleeding inside the eye etc can cause a patient to become anxious, afraid and make them restless too. Hence if any event or occurrence has to be communicated among the team in the operating theatre, try to maintain communication with your surgical colleagues using hand symbols and not verbally.

Conclusion
From the above causes cited ("**ABCD EFGH ILMPW"**), for which a patient presenting for cataract surgery can become unco-operative, we feel that in most instances they are iatrogenically induced. Hence for surgery to be completed uneventfully, maintain a good rapport with the patient, ascertain the native language of the patient beforehand, spend more time with them in the preoperative area and explain clearly about the procedure

you are going to perform (block). Advise the patient to void before transfer to the theatre, encourage them to use their hearing aid, maintain verbal communication with the patient during the block and after draping. If necessary sedation can be given but reassurance is essential. Monitor vital sings at regular intervals.

It is not enough to listen to the murmur of the heart; listen to the murmur of the patient too, to avoid any murmur from your surgical colleagues.

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Tracheal Stenosis in Wegener's Granulomatosis: Managing Orbital surgery

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Abstract
Wegener's granulomatosis (WG) is a rare autoimmune vasculitis characterized by a generalised disease, associated with a necrotizing glomerulonephritis and high mortality, and by a more limited form, associated with respiratory tract, nasal, oral, or orbital inflammation[1-2]. The incidence of this immunopathological disease is approximately one in 20000. Tracheal and subglottic stenosis (SGS) occurs in 12-23% of these cases[3-4]. Eye involvement occurs in 52% of patients and varies from mild conjunctivitis, episcleritis, nasolacrimal duct obstruction to proptosis, retinal vasculitis and optic neuropathy[5]. We report two patients with WG who presented to our ophthalmic unit for surgery under general anaesthesia.

Case 1
A 48 year old lady presented with proptosis, severe pain and poor vision in the right eye. She had a 9 year history of WG with severe subglottic stenosis which had been managed by CO_2 laser therapy. CT scan of the right orbit revealed an extensive right pseudotumour of the orbit. She developed antibiotic-resistant orbital cellulitis and surgery for an orbital enucleation or exenteration was planned as a joint case with ENT surgery. An arterial line was inserted and an intravenous propofol, fentanyl, atracurium technique was used for induction of anaesthesia. She was intubated with a size 4 microlaryngeal tube (grade 1 laryngoscopy) and remifentanil with sevoflurane was used for maintenance. Dexamethasone steroid cover and multimodal analgesia were used. Surgery lasted for about three hours, was uneventful and she was extubated and transferred to the high dependency unit (HDU) with patient controlled analgesia. She was discharged from HDU the subsequent day.

Case 2
A 45 year old lady presented with recurrent nasolacrimal duct obstruction. She had a 5 year history of a limited form of WG (renal-sparing) but had limited exercise tolerance predominantly due to severe subglottic stenosis. She had undergone tracheal dilatations 5 times in 12 months. She was assessed and referred for a repeat dilatation 1 week prior to Dacrocystorhinostomy. Again after a thorough preoperative assessment she was anaesthetised with ENT back up in theatre. Total intravenous anaesthesia using remifentanil and propofol was used for induction and maintenance of anaesthesia. After checking mask ventilation she was paralysed with atracurium and the airway was secured using a size 3 reinforced laryngeal mask (LMA). Surgery lasted just over three hours and the intraoperative course was uneventful. Post operatively the LMA was removed when she was awake and she was sent back to the ward.

Discussion

Anaesthetic management of patients with WG presents a challenge to the anaesthetist due to multisystem involvement resulting in potential abnormalities of the airway, respiratory, circulatory, renal, ophthalmic and central/peripheral nervous systems. A multidisciplinary approach should be used in the anaesthetic management of these patients especially those presenting with signs and symptoms of upper airway obstruction. The preoperative anaesthetic assessment should focus on the upper airway evaluation, chest X-ray, an ENT review and pulmonary function tests if required which could also include a CT thorax. Other systems would need to be evaluated depending on their involvement and additional considerations relate to the use of Immunosuppressants and corticosteroids in the management of this condition.
Both our patients had tracheal stenosis resulting from granulomata with repeated episodes of stridor and both had an airway intervention from the ENT surgeons before they actually presented for the ophthalmic surgery. The airway of choice in this group of patients would vary depending on the condition of the patient, severity of upper airway obstruction and an elective or emergency scenario at the time of presentation. The aim in these patients is to avoid hypoxia and hypercarbia and protect the airway but at the same time avoid any damage to vocal cords, trachea or precipitating any bleeding from granulomata within the tracheo-bronchial tree.

The airway options here vary from local anaesthesia, sedation or anaesthesia with a nasopharyngeal airway and oxygen insufflation[6], general anaesthesia with an endotracheal tube or a supraglottic airway device, jet ventilation or an elective tracheostomy. In view of the extensive nature of the surgery and patient choice, general anaesthesia was chosen for both the techniques. Jet ventilation was avoided as we were concerned about the risk of pneumothorax. Tracheostomy with an ENT surgeon standing by for this procedure was kept as a last option in case we had a problem in theatre.

There is paucity of literature regarding which is the best airway device to manage the airway of these patients. Our first patient was intubated as she was going to have an extensive orbital exenteration. The intubation or the extubation did not pose any problems but as there was a risk of precipitating airway oedema she was sent to HDU with steroid cover. The laryngeal mask airway has been used as an alternative to an endotracheal tube (ETT) and there is some evidence that it does result in less vocal cord damage when compared to an ETT[7] as well as protecting against airway contamination during nasal / paranasal surgery[8]. It also has the advantage that we can pass other airway adjuncts and even an ETT via it. Also there would theoretically be less chance of precipitating bleeding from the tracheal granulomata as it avoids infraglottic intervention. The second patient had a reinforced LMA inserted without any problems and was discharged to the ward after an uneventful surgical procedure thus avoiding an overnight HDU admission.

Overall we can conclude that a good preoperative evaluation, a multidisciplinary approach with an ENT review, and both an infra or a supraglottic airway device can be safely used in managing this group of complicated patients when they present for ophthalmic surgery.

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Case report
Severe Pulmonary Hypertension and Anaesthesia

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Introduction

Mr C a 57-year-old gentleman with severe pulmonary hypertension (PHTN) presented requiring surgery for a blind and increasingly painful left eye. Mr C suffered a fall whilst on sildenafil, a pulmonary vasodilator for his PHTN. He also had portal pulmonary hypertension secondary to liver cirrhosis from alcohol consumption. Cardiac catheterisation 2 years prior (at diagnosis) revealed mean pulmonary artery pressure (MPAP) of 53 mmHg, right atrial pressure of 13 mmHg, CI of 2.2 L/min/m2 and pulmonary vascular resistance of 985 dyne.s/cm5. On 6 minute walk test he could manage 330m but desaturated from 98% to 87%. This had improved from 200m once specific PHTN medication was started. He was classified as NYHA II-III. Additionally, his past medical history included ischaemic heart disease (and stent insertion), chronic atrial fibrillation, hypertension, obesity (BMI 33) and he continued to smoke.

Pulmonary hypertension

Pulmonary hypertension (PH) is defined as a MPAP >25mmHg at rest or >30mmHg on exercise[1,2,3,4,5]. It is difficult to diagnose, the initial symptoms being non-specific. Symptoms of dyspnoea and fatigue progress to palpitations, angina, syncope, leg swelling, weakness and abdominal fullness. There can be a delay of up to 3 years from the onset of symptoms to diagnosis. The 5-year survival has improved from 27% to 54% in patients with severe disease[1]. Therefore a rising number of patients with PHTN will be presenting for surgery.

The WHO classification states there are 5 main groups of PHTN;

1 Pulmonary arterial hypertension
2 Pulmonary hypertension with left heart disease
3 Pulmonary hypertension associated with lung diseases and/or hypoxaemia
4 Pulmonary hypertension due to thrombotic and/or embolic disease
5 Miscellaneous group

The importance of this classification is regarding treatment. Patients in groups 2 and 3 do not require specialist treatment and their treatment is best aimed at the underlying disease[1]. Group 4 require lifelong anticoagulation and can potentially be cured by surgery whereas group 1 can be treated with selective pulmonary arterial vasodilators[1]. In general, as the pulmonary vascular resistance (PVR) increases the right heart is put under greater strain. The right ventricular afterload is normally only ¼ to 1/5th that of the left ventricle and the left and right ventricles are interdependent. Therefore as the right ventricle is exposed to higher than normal pressures it becomes increasingly like the left ventricle. As the right ventricle hypertrophies it can affect the function of the left ventricle. The right coronary blood supply is normally throughout systole and diastole

but as the right ventricle enlarges the coronary artery blood supply mimics that of the left. The blood supply only flows during diastole and is dependent on the coronary artery perfusion pressure and therefore the systemic vascular resistance (SVR).

Eventually with increasing pulmonary vascular pressures the right heart will fail. This leads to the symptoms of right heart failure but also to a decrease in cardiac output (CO) and finally bi-ventricular failure.

A number of investigations should be carried out. Simple non-invasive tests include: ECG (tachycardia, right ventricular hypertrophy and strain), CXR (prominent pulmonary arteries, peripheral pruning of vessels and cardiomegaly), Lung Function test (reported breathlessness is disproportionate to the results) and Echo. The gold standard investigation is cardiac catheterisation with direct measurement of cardiac pressures and output and calculation of pulmonary vascular resistance. The 6 minute walk test is very important to assess function but also any improvement with treatment.

Treatment as mentioned earlier is directed to the underlying disease in the majority of groups according to WHO classification. Pulmonary arterial hypertension is controlled with vasodilators. Chronic treatment includes subcutaneous, intravenous or inhaled prostacyclin and its analogues, calcium channel blockers, phosphodiesterase inhibitors and endothelin receptor antagonists. The right ventricle has a huge potential to remodel if the PVR is reduced[1]. Treatment for these patients should be instituted in a specialist centre

Case

In regard to Mr C, after correspondence with his PHTN specialist, who stated he would be a "significant risk with general anaesthesia" and if possible a local anaesthetic technique would be preferable, the latter option was taken. In the anaesthetic room oxygen was administered and he was sedated with propofol (0.8-1.6 mcg/ml) and remifentanil (0.03-0.05 mcg/kg/min) and a peribulbar block (12ml 50:50 2% lignocaine + 0.5% bupivacaine) was performed. During the operation there was a period of desaturation to 80% associated with a drop in systolic blood pressure. This recovered with his blood pressure. He made an uneventful recovery following his surgery with a good result.

Anaesthetic Management

Patients with PHTN are difficult to manage. They are a significant perioperative risk for major complications and a good understanding of normal physiology and the pathophysiology of the disease are necessary.

As mentioned earlier it is important to prevent increases in PVR and to maintain SVR. Factors that increase PVR are hypoxia, hypercapnia, acidosis (respiratory or metabolic), noxious stimuli e.g. pain or airway instrumentation and over or under distension of the lungs. Increases in PVR can lead to right heart failure. Maintenance of SVR is important as it maintains the coronary perfusion pressure.

Mortality and morbidity rates are increased in this group of patients. Mortality rates (in non-cardiac surgery) of 7%[2] to 18%[3] have been published and up to 42% experiencing one or more short-term morbid events[3].

Current PTHN treatment should be continued as sudden withdrawal can be detrimental[4]. If PHTN is discovered in the preoperative period then it may be worth delaying elective surgery to start treatment. Maintenance of sinus rhythm is just as important as with left heart disease[5] and recognition that these patients may have a fixed cardiac output.

Local anaesthetic blocks (as in this case) including peripheral nerve blocks are very useful if the surgery permits[4]. Epidurals have been used, mostly in the obstetric population, with success but care must be taken with the induction to prevent rapid haemodynamic changes and treatment of a pulmonary hypertensive crisis must be available. Spinals have been used but are not the ideal anaesthetic because of the rapid haemodynamic changes.

Sedation needs to be administered cautiously. These patients can be very sensitive to sedation and with an unprotected airway can lead to hypoxia and hypercapnia.

For a general anaesthetic no single anaesthetic technique has been shown to be superior[4,5]. Induction has been carried out with all agents but thiopentone is not advocated. It is important to carry out a balanced anaesthetic technique, using opiates and benzodiazepines to reduce the amount induction agent required and to maintain haemodynamic stability. Volatile agents (mostly sevoflurane and isoflurane) and total intravenous anaesthesia (TIVA) have been used with success. Opiates or lignocaine are recommended to cover the stimulation of airway instrumentation[4]. Muscle relaxants that avoid histamine release are preferable. Additionally, invasive monitoring is at the discretion of the anaesthetist depending on the patient, surgery and anaesthetic. Cardiac output monitoring is advised for major surgery.

Pulmonary Hypertensive Crisis is a life-threatening situation and can occur in theatre or during the days following surgery. A rapid rise in PVR leads to right heart failure, this dramatically reduces the cardiac output and therefore decreases coronary perfusion to a hypertrophied and failing ventricle. Ultimately it produces biventricular ischaemia and failure and potentially death. Treatment involves decreasing the PVR, increasing the SVR and increasing the cardiac output. Initially treating any of the known causes of increased PVR by hyperventilating with 100% oxygen, correcting a metabolic acidosis (pH >7.4), recruitment manoeuvres (avoid V/Q mismatch), avoiding over distension of alveoli, avoiding catecholamine release (noxious stimuli) and avoiding shivering[5]. Cautious fluid administration can be given if the patient is under filled or diuretics if over filled.

Drug treatment of a crisis includes inhaled nitric oxide (iNO) or inhaled prostacyclin as specific pulmonary vasodilators. Alternatively intravenous vasodilators (dobutamine, prostacyclin, phosphodiesterase inhibitors) can be utilised but with the unfortunate side effect of peripheral vasodilation. To maintain SVR a vasoconstrictor may be needed (noradrenaline or phenylephrine).

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