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EDITORIAL

We have had problems in our hospital recently with topically applied vaso-active substances. This is not new. I have been involved in ophthalmic anaesthesia for over 20 years now and it has been a recurring problem. In fact I have had one near-death experience with a patient who developed acute pulmonary oedema after 10% phenylephrine drops.

Everyone knows it is established practice to give sympathomimetics and anticholinergics to dilate the pupil, but how much consideration is given to the *dose?*

We usually use 2.5% phenylephrine drops but occasionally I catch someone applying large quantities – sometimes a whole minim – of 10% phenylephrine in an attempt to force the dilatation of a reluctant pupil, or indeed to speed up the dilatation of a normal one.

One drop is enough. Common sense tells us that excess solution, far from being absorbed into the eye, will run down the naso-lacrimal duct into the nose, there to be absorbed through the richly vascularised mucosa into the circulation, although use of a viscous solution may reduce this..

When I challenge the person they say "it's only a drop", but in reality it was more than one drop – it was several drops, indeed it is sometimes flooding of the eye. This excess of potent vasoconstrictor will not speed the dilatation of the pupil any more than one drop would have done, but it surely will have an effect on the blood pressure. What kind of dose is it? Well, it depends on the size of the drop, but one could expect 30 to 50 micrograms of phenylephrine per drop. 100 or more micrograms absorbed rapidly into the circulation is more than enough to bump up the blood pressure to worryingly high levels.

Several studies have shown statistically significant rises in blood pressure, more so after 10% than 2.5% phenylephrine. This is maximal 10 – 20 minutes after administration[1]. We don't often take the blood pressure more than once in the ward or the reception area but we may take it when the patient comes to theatre, just before we perform a block . We certainly will before a general anaesthetic.

Sometimes the adverse effects are only noticed when the patient complains of headache, angina or is short of breath.

We can see the time course of the effect on the blood pressure during general anaesthesia because the blood pressure is frequently recorded. Table 1 shows such a series of readings from a patient in which the blood pressure almost doubled (phenylephrine drops were applied about 1345h)

Quite apart from the rise in mean arterial pressure having consequences for choroidal haemorrhage during intra-ocular surgery, I would be seriously worried about this patient's coronary and cerebral circulation with such high systolic blood pressures.

In cataract cases perhaps we could just accept the need for iris hooks?

Table 1 data courtesy of A. Rubin

Time	HR	SpO_2	NIBP	NIBP mean (mmHg)
12:35	58	100	127/68	91
12:40	59	100	131/67	91
12:45	50	99	101/54	74
12:50	54	99	103/54	76
12:55	50	99	101/51	73
13:00	46	99	85/44	64
13:05	45	99	80/43	60
13:10	45	99	81/41	59
13:15	56	99	98/59	79
13:20	47	99	93/48	68
13:25	47	99	84/45	62
13:30	47	99	85/43	62
13:35	49	99	94/48	69
13:40	48	99	92/47	67
13:45	65	99	119/66	89
drops applied				
13:51	69	99	204/120	151
13:53	59	99	209/102	143
13:55	52	99	182/80	116
13:58	44	99	137/62	91
14:00	47	99	132/60	88
14:01	49	99	118/59	83

Sometimes we have problems in the other direction. The long term use of topical beta blockers such as timolol can lead to systemic beta blockade which we have to take account of during anaesthesia, particularly general anaesthesia. So we all have to be aware of the pharmacology, pharmacokinetics and pharmacodynamics of these agents, and how our personal interventions impact on others.
In this edition of *Ophthalmic Anaesthesia News*, Berrin Gunaydin presents a timely review of the hazards of topically applied medication.

There has been some discussion recently around the Joint Royal Colleges' guidelines "*Local Anaesthesia for Cataract Surgery*". BOAS Council have debated whether the guidelines need to be updated because the recommendations published by the Royal Colleges are now several years old. Of more concern, however, is that these guidelines are now widely applied to all forms of regional orbital anaesthesia for many different ophthalmic procedures, in many differing institutions. It is worth remembering that the guidelines were originally conceived for use within the UK National Health Service, in a comprehensive hospital setting.

Council member Shashi Vohra writes:

" I am particularly concerned about the following statements that put sub-Tenon's blocks in the same category as sub-conjunctival and topical blocks:

'<u>6.4.2 Staff and monitoring requirements for each LA technique</u>

If an anaesthetist is not present, topical, subconjunctival or sub-Tenon's block techniques are recommended. When peribulbar or retrobulbar techniques are used an anaesthetist should be available.
If an anaesthetist is not available, peribulbar or retrobulbar LA techniques should not be used.'

I recently conducted a survey of the BOAS membership on the use of ophthalmic local anaesthesia and in particular sub-Tenon's blocks. The results have shown some interesting facets of practice.
My survey revealed several cases of potentially life and sight threatening complications such as dysrhythmias and faints in addition to other local complications. This is probably just the tip of the iceberg as not all complications get reported. Since there is no national database it is difficult to judge the scale of the problem. The survey too was just a snapshot of practice, nevertheless quite revealing. Recently there has been one reported death following a sub-Tenon's block[2].
Another problem that has surfaced from the survey is the attitude to monitoring of the cases.

<u>'6.4.1 Methods of monitoring</u>

All theatre personnel should have regular training in Basic Life Support (BLS), and there should be at least one person present with Advanced Life Support (ALS) or equivalent qualification.'

A number of respondents in the survey stated that in their institutions the patients were monitored by non-ALS trained staff, although the guidelines clearly advise the presence of an ALS trained person. This could be due to the misplaced belief that these blocks are so safe that they do not warrant the same input as the sharp needle orbital blocks. The current financial constraints do not help and may only worsen the situation in the future.

I sincerely believe that sub-Tenon's blocks should have the same status as the routine sharp needle blocks especially as they are no longer being used just for ambulatory cataract surgery. There is clearly a need for discussion, guidance and new recommendations for monitoring as well as for precise technical aspects particularly in the light of emerging evidence".

If the situation outlined above is widespread in ophthalmic anaesthetic practice, then perhaps now is the time to conduct a national survey. Many hospitals use the

Medisoft electronic record system , indeed we do in my own institution, but the detail recorded for anaesthesia is minimal, and quite often wrong, being a “default” record entered by the surgeon, or a minimal record made by the anaesthetist. Transient bradycardia or unwell feelings are almost never recorded. This means we get a false picture. We seem to only record major adverse events. It also means, unfortunately, that at present we cannot use historical data on *Medisoft* to get an accurate representation of what is happening.
If BOAS members are willing to participate in a truly national survey of complications, recording *all* complications, this would be a major contribution to our understanding of how safe our interventions really are. Complications are, fortunately, rare, so we will need a very large dataset. BOAS could be the vehicle through which we might enable a co-operative attempt to succeed.

As a “short needle” man myself, using only 13 to 16mm needles for orbital blocks, I was particularly interested in Dr Riad’s paper on minimally invasive peribulbar block, using a percutaneous technique, published in this issue. My experience of using such short needles is that one inevitably has to use large volumes, often 9 or 10 mls. This does not, however, seem to create any problems with raised intraocular pressure or “bulging forward” of the vitreous. Such a technique does not seem to make cataract surgery more difficult.
As always, we would appreciate the views of our members on different techniques. For example, do you use one or more injection points if you use short needles? Transcutaneous or transconjunctival?
You don’t have to wait a year for the next edition of *Ophthalmic Anaesthesia News*. Let us know what you think and we’ll put it on the web site. I feel some blogging coming on….

Steve Mather

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THE 2[ND] WORLD CONGRESS OF OPHTHALMIC ANAESTHESIA, CAIRO FEBRUARY 2008

Some people enjoy travelling as much as arriving. I am not one of those people. I put air travel in the same box as trips to the dentist and being strangled. However, I couldn't walk, cycle or swim to Cairo, so flying was the only sensible option. My ticket informed me that my hand luggage shouldn't include a machete, fireworks, flares, ammunition or explosives. It was going to be a pretty dull flight. Fortunately, I was able to pass the time watching the cabin crew trying to unblock the toilet, and I can report that if you ever need to salvage an impacted loo at 37,000 feet then you need to get your hands on a bottle of coca-cola. You'll only need a couple of hundred mls, so if you're completely bonkers you can have the rest yourself afterwards (bonkers because if it unblocks toilets, goodness knows what it could unblock in you).

Anyway, after a brief 14 hour delay in Frankfurt I was on a plane again and soon arrived in Cairo. Professor Azziz's perfect organisation was obvious from the moment we touched down. Despite the delays and unpredictable arrival time, a driver was waiting for us and whisked us through rush hour Cairo to the hotel. The Marriott is an old palace sitting on the banks of the Nile. From the outside you can hear the kamikaze traffic all around, but once you step into the lobby you know you've arrived in an oasis of calm - the perfect setting for the 2[nd] World Congress of Ophthalmic Anaesthesia.

The meeting started with a brief talk by Professor Ezzat Samy Aziz, the Congress General Secretary. Using languages from each country, he welcomed delegates and faculty from all over the world. He pointed out that although the start time had drifted on to 'Egyptian time' the sessions would be following the published schedule, and he would be asking the Chairperson for each session to be ruthless about time keeping. For emphasis he showed us the digital stop watch that would be quietly counting down the seconds as the speaker was talking. This was going to be good. Step over the time line and the electronic counter would sound an alarm as Egyptian heavies stormed the room and carted the speaker off – brilliant. Keeping carefully to time, Professor Chris Dodds, in his role as Congress President, took to the podium to officially open the meeting. He thanked Ezzat for all his hard work and pointed out where the fire exits and toilets were.

The first session entitled 'Past, present and future' was chaired by the one of the internationally renowned patriarchs of ophthalmic anaesthesia, Professor Chandra Kumar, and Professors Ezzat Aziz and Medhat Shalaby from Egypt. The first talk was an entertaining romp through the history of ophthalmic anaesthesia from Karl-'coca cola'-Koller to modern day techniques, by Steve Gayer. His talk was educational and amusing as always, and littered with superb photographs harvested from the Bascomm Palmer Institute Ophthalmic Library, which contains every text from human history which includes the words 'eye' and 'dollar' (*actually the last bit of that sentence is a lie – sorry Steve*). Next up was Professor Hannes Loots from South Africa. He spoke on the subject of Governance and Ophthalmic Anaesthesia, teaching us about the 5 focal virtues which will help us become better doctors, the essence, like that for becoming a prize winning taxi driver, is that we need to simply 'care for our patients'. It seems straightforward and over-simplified, but the underlying message has the ring of truth. If we care about what happens to our patients, we will deliver better care for them. The session was closed by Chris Dodds who indulged in some crystal ball gazing to give us a sneak preview of the scientific advances which are within reach and could impact on anaesthesia. These included nanotechnology, to create minute probes and new stem cell technology which promises eternal life. Having solved the problem of death, he outlined that it could also be used to grow new organs like eyes for transplantation – yes, more transplant surgeons in the ophthalmic theatres ! Quick, collect your children and run for the hills ! An additional bonus during this talk was a hugely informative image of Dr K-L Kong dressed casually as a housemaid. A salutary lesson in instructing your children not to release private family photographs to complete strangers or strange familiars! The image of K-L recognising the photo, clasping both hands over his mouth and then bringing his knees up to the sides of his ears will stay with me for a long time.

The second session, entitled “Science” opened with an overview of the use of vasoconstrictors in ophthalmic anaesthesia by Dr Hamish McLure from Leeds, UK, principally with regard to their use in local anaesthetic mixtures. He was followed by an examination of the use of hyaluronidase – actually both use and abuse - by Professor Jaques Ripart from Nimes, France. Hyaluronidase is still widely used throughout the world, seemingly safely, but the optimal dose is unknown and various problems have been ascribed to it, from local reactions to pseudotumours.
Next Dr Uday Goraksha from India gave a comprehensive talk on the management of intraocular pressure, always a subject guaranteed to interest anaesthesiologists and surgeons alike.
The final talk of the session, by professor Berrin Gunaydin from Turkey was on the subject of topical drug administration to the eye. She outlined the potential hazards to be aware of when using drugs from many groups, but particularly topical vasoconstrictors. An expanded version of this talk appears in this edition of *Ophthalmic Anaesthesia News.*
Session 3, entitled ‘Clinical Practice’, was chaired by Dr K-L Kong from Birmingham with Professors Adel Awara and Amr Matar from Egypt. The first talk on sedation was delivered by Dr Manuel Galindo from Columbia. He described practice in his own institution where 99% of the work was performed in an ambulatory setting – the UK Department of Health would be proud ! He detailed a vast number of sedative recipes for us to take home and try out, but cautioned that all had significant side effects if performed without care.

The next speaker was Dr Oya Yalcin Cok from Ankarra in Turkey. She spoke eloquently on the problems of anaesthesia for ophthalmic examinations which may be brief, but required adequately deep levels of anaesthesia and which may unpredictably progress on to much longer more complex procedures. Dr Stephen Mather from Bristol, UK followed with a detailed and informative lecture on the causes and preventative strategies for PONV following strabismus surgery. He emphasised the multi-factorial aetiology and the requirement for a multi-stranded technique to minimise PONV. At last I’ve got a reason to tell the surgeon that these operations must not be more than 30 minutes in length otherwise they’ll get PONV !

The final talk in this section was delivered by Mr Tom Eke, a surgeon from Norwich. He discussed the local anaesthetic techniques which can be used for glaucoma surgery, pointing out that the lidocaine may interfere with the remodelling and formation of the scleral flap. His personal favourite involves a combination of topical and intracameral local anaesthetic. He showed his own results which were fantastic. Looks like we anaesthetists may have to find alternative things to amuse us when the glaucoma theatre follows his lead.
The evening entertainment was a Gala meal on a Nile Cruise boat. What an experience. Delicious food, a whirling dervish and a Cleopatra who turned into a belly dancer then posed next to Chris Dodds - who also posed - for photos. I have a feeling that we will all be enjoying those photos for many years to come.

On Day 2 the 6th session was kicked off by Dr Marc Rozner who gave a spirited lecture on the problems of anaesthetising patients with pacemakers. If you don't know what type it is there are a wealth of clues on the chest X-ray. He also pointed out that we need to watch out for respiratory rate monitors which can fool some pacemakers and inappropriately increase their heart rate. Also, if you have a patient with an implantable cardioverter then you must switch it off to shock therapy during the procedure. Chris Dodds was obviously feeling that he hadn't spoken for far too long so he rose to give the next lecture on Ophthalmic Anaesthesia in the elderly. He pointed out that we need 2.2 births for every death so we can keep paying for care for the elderly. The 0.2 of a birth sounds good to me – shouldn't need an epidural for that. Phil Guise followed Chris, speaking about the relative risks of stopping or maintaining anticoagulant therapy in the perioperative period. Current advice for most ophthalmic surgery seems to be to keep it going. Finally, Dr Daniel Espada Lahoz from Brazil gave a superbly detailed lecture on the different techniques of facial blocks. Each technique was accompanied by cartoons and video footage .

The Free Paper presentations were chaired by Dr Ashish Sinha and Dr Marc Feldman. Tom Eke presented two excellent papers, one on a 'no-scissors, no speculum' technique for sub-Tenon's anaesthesia (which requires a 21G triport cannula and follows on from his 'no anaesthetist, no problem' technique), and the other on his 'face to face' positioning for cataract surgery (which requires perfect balance and nerves of steel). This was followed by Dr Carniro who described a CT study looking at orbital dispersal of local anaesthetic following retrobulbar block. The CT images showed that the local anaesthetic doesn't always move from the extraconal into the intraconal space. Dr Nagi then told us about his study comparing sevoflurane and ketamine for IOP measurements. The sevoflurane caused a 30% drop in IOP ! The final presentation of the session was by Dr Kahn who had compared single with multiple injections for sub-Tenon block. The single shot gave a better block which should save us all plenty of time !

The next session of the day in the main auditorium was chaired by an international committee consisting of Professor Mounir Afifi from Egypt, Dr Hannes Loots from South Africa and Mr Tom Eke from the UK. Dr Sinha started with a lecture about eye trauma showing some gruesome photos. Professor Aziz pointed out that in future this lecture wouldn't be scheduled immediately after lunch. Next, Steve Gayer

expounded on the further use of ultrasound for ophthalmic anaesthesia. Then Dr Taylor Guillaume told us about the problems with postoperative diplopia, which they cured by changing from bupivacaine and lidocaine to mepivacaine . The final talk of this section was by Dr Roger Slater who described the anaesthetic technique for enucleation and evisceration, emphasising the importance of having a plan for postoperative pain management. Again more gruesome photos !
The final session of the meeting covered opinions in ophthalmic anaesthesia and was chaired by Professor Amr Montaser from Egypt and Dr Roger Slater and Dr Shashi Vohra from the UK. Dr Marc Feldman discussed references and patient choice in anaesthesia. He noted that for a trainee every patient presents an opportunity to perform a new and exciting procedure (every patient looks like an epidural space !). He discussed the requirement for having an anaesthetist present as inevitably some patients would have life threatening events, but that currently it was impossible to predict who they were. Dr Waleed Riad from Riyadh then described a minimally invasive blockade technique using a half inch (13mm) needle to inject 10mls of local anaesthetic in the inferotemporal space accompanied by constant digital pressure to disperse the solution. Dr George Ghaly gave the next lecture on the advantages, disadvantages and limitation of Day Care surgery which are a problem to all in the UK as the Department of Health strives to increase the proportion of procedures done as day cases. The final presentation was by Professor Stephen Gatt from Australia. He described some of the data from the Australian Adverse Event Study in which 4.6% of adverse events were related to eyes. He emphasised the need for anaesthetic presence in risky situations and went on to outline the changes in the legal system which now emphasise that although a practitioner need not have the highest expert skill they must be acting in the best interest of the patient. He detailed the identifying characteristics of “low risk anaesthetists” and gave us a list of activities which will ensure we stay contented and safe. I seem to remember him mentioning that we must get plenty of sex. Well, if it’s in the patient’s best interests ….

On the plane back to the UK (only a 6 hour delay in Frankfurt, toilets fine) I reflected on what had been a superb meeting. The setting was wonderful, the atmosphere enthusiastic and supportive, and the presentations were relevant and interesting. Professor Aziz had organised one of the best meetings I’ve ever attended. The next World Congress will be in Turkey and I can’t wait. However, I will be walking to that one!

Hamish McLure

ARTICLES

HAZARDS OF TOPICAL OPHTHALMIC DRUG ADMINISTRATION: WHY DO WE CARE?

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Topical ophthalmic drug administration is not free from the risks of serious systemic adverse events. Such events are usually underestimated by anaesthesiologists and ophthalmologists. Many side or adverse effects occur because of systemic absorption and this is observed at an intermediate rate between intravenous (i.v.) and subcutaneous injection. One of the primary reasons for systemic toxicity is the use of high concentrations because of the low ocular bioavailability, resulting in high systemic absorption since only 1% is absorbed by the eye and the remaining 99% is considered to be systemically absorbed via the conjunctiva, through the nasolacrimal duct and nasal route. Secondly, use of non-selective drugs. However, hazards of topical ocular drugs are not necessarily a consequence of a particular group of drugs. There are other contributing factors such as comorbidity or pre-existing medical conditions (cardiovascular, pulmonary and endocrine diseases) that may interfere with these drugs. Additionally, the dose of a topically administered drug can rarely be measured and as far as the local anaesthetics are concerned, mucous membranes do not have adequate buffer capacity providing a route for diffusion of the base form of local anaesthetic [1]
Most of the ophthalmic topical drugs show their effects via adrenergic (contraction of iris radial muscle via α1) or cholinergic (contraction of iris sphincter muscle via M3) receptors. There is a rich supply of adrenergic receptors in the iris, while beta receptors mostly spread in ciliary, retinal and choroidal vasculature. Muscarinic receptors (particularly M3) are present both in the iris and ciliary muscle and epithelium [2] Therefore, topical application of cholinergic, anticholinergic, adrenergic drugs and local anaesthetics are of interest. The potential hazards of topically used ophthalmic drugs are mainly related to their mechanism of action and their interaction with local or general anaesthetics . The reasons why these are important will be addressed.

I. Cholinergic drugs

Systemic effects of cholinergic topical ophthalmic drugs (e.g. pilocarpine) used for lowering intraocular pressure (IOP) are bradycardia, increased salivation, hypotension and bronchospasm which need reversal with i.v. atropine. Vagotonic anaesthetics like halothane can accentuate the effects of cholinergic drugs[3] Most anaesthesiologists now prefer newer agents like sevoflurane or desflurane instead if a volatile agent is used for maintenance of general anaesthesia. The long acting miotic agent, ecothiopate, which is rarely used today, can cause prolonged apnoea and bronchospasm after an average dose of succinylcholine used for facilitation of endotracheal intubation [4] .

II. Anticholinergic drugs

Anticholinergic drugs (atropine, cyclopentolate, tropicamide, homatropine, scopolamine) produce mydriasis by relaxing the ciliary body and iris[5] Overdose of the centrally acting anticholinergic drug atropine given as 1% eye drop might cause central anticholinergic syndrome. Systemic manifestations of that syndrome include agitation, delirium, dry mouth, tachycardia, and flushing and fever especially in paediatric patients, but the tachycardia can lead to adverse events such as angina in the elderly. The centrally acting cholinesterase inhibitor (cholinergic), physostigmine is the agent of choice for treatment [6] Excessive systemic absorption of cyclopentolate might cause toxic effects like disorientation, psychosis and convulsions similar to those associated with atropine overdose. Central nervous system dysfunction is more likely with a 2% than 1% solution of cyclopentolate. Young and elderly patients are particularly susceptible to the systemic effects of the drug. Convulsions might occur in children, therefore 0.5 to 1% solutions are recommended[3]

III. Adrenergic drugs

Topical adrenergic drugs (agonists or antagonists - selective or non-selective) are commonly used in ophthalmology.

1. Adrenergic agonists

A. Adrenaline (epinephrine), a non-selective sympathetic agonist, acting at α1,2 and β1,2 receptors is used for conjunctival decongestion, mydriasis and reducing IOP. Its systemic absorption may cause significant symptoms like hypertension, tachycardia and headache. Therefore, caution should be taken in patients anaesthetised with halogenated hydrocarbons which sensitize the myocardium to sympathomimetics[3,6]

B. Phenylephrine, a direct acting adrenergic agonist at the α1 receptor, dilates the pupil and produces capillary decongestion. Significant absorption after topical administration may result in hypertensive crisis, tachycardia, reflex bradycardia, ventricular arrhythmias, myocardial infarction, and cardiac arrest. Additionally, dangerous interaction might develop with monoamine oxidase (MAO) inhibitor drugs. MAO is one of the responsible enzymes for the breakdown of catecholamines. Children and the elderly are particularly at risk for toxic effects of this drug as well[3,6]

Several adult and paediatric case reports involving phenylephrine eye drops and pledgets have been presented . After administration of 2-5 drops of 10% aqueous phenylephrine for pupil dilatation prior to incision in an 8 year-old boy scheduled to undergo retinal detachment surgery under sevoflurane anaesthesia, sinus bradycardia developed due to extraocular muscle traction and was treated with glycopyrrolate. Then, the ECG displayed multifocal atrial and ventricular ectopic beats. Increased systolic blood pressure and heart rate were treated with labetalol[7] In another case, a 77 year-old patient with diabetic retinopathy, following topical phenylephrine eye drops an unusual episode of angina resulting in septoanterior and anteromedial hypokinesia on echocardiography with ST changes on the ECG was reported[8] In a case series including children and adults, adverse systemic reactions like severe headache, light headedness, hypertension, subarachnoid haemorrhage, cerebrovascular accident, convulsion, ventricular fibrillation, and cardiac arrest have been reported with topical ocular phenylephrine 10% applied by pledget [9]

In contrast to these case reports, patients scheduled for phacoemulsification under peribulbar anaesthesia were allocated into two groups to receive either phenylephrine 10% or placebo (0.9% NaCl). Mean arterial pressure and heart rate recorded before mydriatic (tropicamide) instillation and peribulbar anaesthesia, during surgery and 1 hour after surgery did not significantly change between the groups. According to these results, phenylephrine 10% was found to be safe for topical ocular application in adults[10] However, a 4 year-old child who underwent bilateral myringotomies and adenoidectomy died due to the instillation of an unmeasured amount of 0.5% phenylephrine to control bleeding,

Guidelines on the topical use of phenylephrine in the operating room have been developed. According to these guidelines, initial topical phenylephrine dose should not exceed 0.5 mg for adults and 20 µg/kg for children up to 25 kg [11] It is strongly recommended that blood pressure and heart rate should be closely monitored after phenylephrine administration in the susceptible population throughout surgery under anaesthesia [12]

C. Clonidine (apraclonidine, brimonidine), a selective α2 adrenergic agonist, effectively reduces IOP at low topical doses with minimal effect on systemic blood pressure[13] but caution should be exercised in patients with serious cardiovascular system disease and taking MAO inhibitor drugs or tricyclic antidepressants which inhibit reuptake of noradrenaline into the presynaptic nerve ending[2]

2. **Adrenergic antagonists**

A. Beta receptor antagonists

Beta blockers have been the mainstay of first line drug therapy in glaucoma treatment to decrease IOP by reducing aqueous production. After ocular instillation to the conjunctival epithelium, beta adrenergic antagonist drugs rapidly drain via lacrimal channels , nasal mucosa and gastrointestinal tract to reach the systemic circulation. Then, systemic effects of beta antagonism occur mainly on the heart, vasculature, lungs and kidneys[14,15]

a. Timolol maleate (Timoptic/ Timoptol ophthalmic solution), a non-selective beta-adrenergic antagonist (β1 and 2) used to be a popular antiglaucoma drug, and should be cautiously used in patients with chronic obstructive airway diseases, congestive heart failure, 2nd or 3rd degree heart blocks and diabetes. Timolol reaches therapeutic plasma levels approximately 1 hour after topical administration because an estimated 80% of the eye drop is absorbed systemically[16] Eventually, β1 blockade produces negative inotropy and chronotropy and decreases renin secretion, while β2 blockade causes bronchoconstriction, peripheral constriction and inhibition of glycogenesis. All beta blockers mask tachycardia associated with hypoglycaemia, which is the earliest physiologic response to hypoglycemia. Moreover exacerbation of myasthenia gravis and development of postoperative apnoea in neonates and young infants have been reported. If symptoms of slow or irregular heart beat, difficulty in breathing, sudden weight gain, swelling of the feet or lower legs, and fainting occur, timolol should be discontinued. Additionally, systemic side effects of timolol are increased in the elderly who often have lax distensible conjunctival fornices that permit greater retention of the drug[16]

Efficacy and systemic side effects of topical 0.5% timolol aqueous solution versus 0.1% timolol hydrogel were compared. Mean peak heart rate during exercise after timolol hydrogel treatment did not significantly change while a significant reduction in heart rate was observed with timolol aqueous solution. This finding was confirmed with determination of lower plasma concentrations of timolol after hydrogel with respect to aqueous solution. It has been concluded that use of hydrogel reduced systemic absorption without affecting ocular efficacy[14]

Beta blockers are metabolized by cytochrome P450 (particularly CYP2D6 genotype). Genetic polymorphism of CYP2D6 genotype is based on 4 types: Poor Metabolisers (PM), Intermediate Metabolisers (IM), Extensive Metabolisers (EM) and Ultra rapid Metabolisers (UM) . Since pharmacokinetics of ophthalmic timolol dependent on CYP2D6 genotype is particularly evident when 0.5% aqueous solution is used, PM may be more prone to bradycardia than EM. Therefore, routine genotyping is becoming more readily available in many clinical centres[17]

b. Betaxolol HCl (Betoptic ophthalmic solution) with selective beta-1 blocking properties has minimal systemic effects. Patients receiving oral beta blocker therapy should be observed for potential additive effects. Caution should be taken in patients receiving catecholamine depleting drugs and excessive restriction of pulmonary function despite minimal systemic effects in obstructive airway disease. Betaxolol is also contraindicated in sinus bradycardia, congestive heart failure, heart block greater than 1st degree, cardiogenic shock and overt myocardial failure. Although it is cardioselective (β1 receptor antagonist), it is well known that even cardioselective beta blockers would block β2 receptors at higher doses. They should be used with caution as well because catecholamines utilize β2 receptors to promote glycogenolysis and glucose mobilization[2,18]

Beta-blocker therapy is associated with an increase in the severity and incidence of acute anaphylaxis which may be protracted and resistant to conventional treatment because of the beta-adrenergic blockade. Severe or fatal attacks have been triggered by insect stings, the ingestion of allergenic foods or drugs, and injections of radiocontrast media, antisera or immunotherapy antigens. Although these are probably infrequent, the need for aggressive and prolonged support in patients who experience anaphylaxis while receiving beta-blocker therapy should be kept in mind. Allergy skin testing or immunotherapy is inadvisable in patients taking a beta-blocker in the form of ophthalmic eye drops[19].

IV. Local anaesthetics

Topical local anaesthetics currently used in ophthalmology - proparacaine, oxybuprocaine (benoxinate), lidocaine - are almost free of complications. Tetracaine can produce corneal epithelial eruption. No systemic side effects have been documented with them. However, inappropriate use by patients might cause corneal ulceration and perforations. Known hypersensitivity to a local anaesthetic drug itself or its preservative is a contraindication for topical local anaesthetic use[20,21].

In conclusion, we should be aware of the possible adverse reactions to topical ocular drugs and not underestimate their systemic absorption. Available dilute solutions and hydrogel forms are recommended particularly in patients at risk. Several techniques have been advocated for reducing systemic absorption and the associated haemodynamic effects. These include eyelid closure, lacrimal punctum occlusion and blotting away excess drops after drug administration. Whatever the reason for using topical ocular drug, either for treatment or diagnosis, some of these drugs are potentially hazardous because of their systemic side or toxic effects that may occur occasionally which requires good management in order to avoid catastrophies.

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IMPROVING THE PATIENT EXPERIENCE FOR EYE SURGERY: POSITION AND COMFORT IN THE OPERATING CHAIR

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In these modern times, patients expect good outcomes for their eye surgery. They also (rightly) expect the whole experience of surgery to be as pleasant as possible. Pain, anxiety, discomfort and inconvenience should be kept to a minimum, and we should strive to improve the overall experience for each of our patients.

One aspect of this is the position that the patient is asked to adopt for surgery. Surgical tradition requires the patient to lie flat, facing the overhead microscope. However, in many operating theatres, the traditional flat 'anaesthetic trolley' has been replaced by reclining 'dentist's chairs'. This simple change has facilitated a big improvement in the patient experience for eye surgery.

My own preferred practice is to seat the patient in the reclining chair, with the chair-back elevated to a comfortable position. The head-rest is adjusted such that the patient is comfortable, with the face in the horizontal position, so that the eye looks toward the overhead microscope. A soft pad or towel is placed on the head-rest, for maintained comfort during longer procedures. Patients usually appreciate a pillow placed under the knees: one lady found this so comfortable that she started doing the same thing at home, and reports that she now sleeps soundly all night for the first time in years.

Most patients who have eye surgery are elderly, and these patients generally prefer not to lie completely flat. For example, many will sleep with two or more pillows under their head. Given the choice, most patients prefer to be sitting up a bit, rather than lying horizontally supine for their surgery. We quantified this in a small study that was presented at the 2006 BOAS conference: 125 consecutive patients who had cataract surgery were initially laid flat in the reclining chair, then patients were than asked if they wished for the chair-back to be raised. The chair-back was elevated until the patient was happy. We found that only 27% patients were content to lie flat, and the other 73% preferred a degree of elevation. Most chose a relatively small elevation (less that 30^0 above horizontal), and this was simply for comfort or personal preference. For those patients with a higher elevation of the chair-back (30^0 or higher), there was usually a 'medical' reason for this: orthopnoea (3%- 4 patients), back pain (5%- 6 patients), anxiety (2%- 2 patients), Menieres disease (1%- 1 patient).

For those few patients who really do need to sit up a lot, the surgeon may need to alter their technique. Most patients will be able to extend their neck while seated, so that their face remains in the traditional horizontal position, facing the overhead microscope. Because the patient's head is higher up than usual, the surgeon will need to adjust their stool or even stand up to do the surgery. Not all surgeons are happy to do this: A 2005 survey of UK consultant ophthalmologists found that only

50% had ever done ‘standing’ phacoemulsification (Chandradeva, J Cataract Refract Surg 2006). However, the surgery itself is the same: the only adjustment needed is a compensatory increase of the ‘bottle height’ for the phaco fluids. I find that it is simply a matter of standing with the foot-pedal in a comfortable position, and taking most of the body’s weight with the other leg.

In more extreme cases, the patient may be unable to face the overhead microscope at all, because of a physical problem. I have experienced this in cases of ankylosing spondylitis, Meniere’s disease, morbid obesity, and patients who have orthopnoea combined with neck kyphosis – all cases which are ‘high risk’ for general anaesthesia. For these cases, I have adopted the ‘face-to-face’ position, with local anaesthesia. In this technique, the patient sits with the chair-back elevated to a comfortable position: they can be sitting completely upright if necessary. The surgeon sits (or stands) facing the patient, with the operating microscope rotated about 60 degrees from vertical. Phaco surgery is done thorough an inferior, temporal or nasal incision, according to the axis of astigmatism and ease of access. Topical-intracameral anaesthesia allows the patient to fixate on the microscope light, which keeps the eye still and in line with the microscope, giving a good red-reflex for safe surgery. It may help if the patient can turn their face toward the surgeon. Again, the ‘bottle height’ must be raised. With more extreme elevations of the patient chair-back, the microscope must be rotated further from the vertical, meaning that the surgeon’s arms must be more outstretched. This can make surgery feel less controlled; in these cases I prefer to use a straight side-instrument rather than an angled chopper, for safety. I first described this technique at the BOAS meeting in 2005; I have now done 14 cases of ‘face to face’ phaco surgery over four years, with no complications. The most extreme case had the chair-back virtually upright, at 80 degrees above horizontal. ‘Face to face’ positioning is a good option for patients who are otherwise at high anaesthetic risk.

Patient positioning is just one small aspect of the overall experience of surgery. I believe it contributes to safe surgery in addition to patient satisfaction: logic dictates that a comfortable ‘head-up’ patient will breathe more easily, be more likely to lie still, and with less ‘bulgy eye’ from venous pressure on the choroid. With motorized reclining surgical chairs, the amount of extra work for theatre staff is minimal. Careful positioning should lead to fewer surgical complications, fewer per-operative medical problems, and greater patient satisfaction.

This paper is a personal view of “how to do it” and is therefore not referenced.

Editor

EXTERNAL DACRYOCYSTORHINOSTOMIES - LOCAL ANAESTHESIA AND SEDATION

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Traditionally dacryocystorhinostomies (DCRs) are performed under general anaesthesia. The main immediate complication of this procedure is haemorrhage and indeed in our institution we have in the past had to abandon bilateral procedures on two separate occasions due to excessive blood loss (personal communication). The majority of patients were either intubated or managed with a laryngeal mask airway with a throat pack and were in hospital overnight.
DCRs have been performed on an ambulatory basis for some years[1] and a technique of local anaesthesia and sedation has previously been described with good results for both external and endoscopic surgery [2,3,4].

Two years ago we devised a method of performing these cases under local anaesthesia and sedation as follows:

Preoperative management:

- Patients are preassessed for theatre as for general anaesthesia and investigations performed in accordance with NICE guidelines [5]
- A full explanation of the anaesthesia is made emphasising conscious sedation
- Otrivine (xylometazoline) nasal spray is applied to the ipsilateral nostril – 15minutes preoperatively

Intraoperative Care:

- Full monitoring in accordance with AAGBI guidlines[6]
- Intravenous access – 20g dorsum of hand
- Cocaine 5% spray to ipsilateral nostril via atomiser up to 1.5mg/kg
- Tetracaine 1% drops to ipsilateral conjunctiva
- Intranasal Oxygen at 2-4l/min via a nasal sponge
- Conscious sedation
  - o Propofol bolus – 0.25-0.5mg/kg (approximately 15-30mg)
  - o Propofol infusion – 2-3mg/kg/hr
- Local anaesthesia performed by the surgeon – Septanest (Articaine 4% with adrenaline 1 in 100000) 4-5ml total (maximum recommended dose 7mg/kg)
- Alfentanil boluses 250micrograms prior to local anaesthetic infiltration & immediately prior to (rhinostomy) bone resection

- Paracetamol 1g IV
  The procedure takes 45 minutes on average

Postoperative Care:

- Routine recovery care
- Discharged with analgesia (cocodamol +/- NSAID) and antiemetic (cyclizine or ondansetron as appropriate)
- All patients are discharged with a feedback questionnaire that they return on their follow-up appointment

To date we have performed over 80 such procedures with negligible blood loss, no unexpected overnight admission and excellent patient feedback.
This is a relatively simple change to our management plan for this group of patients, but it has significantly improved the patient experience plus the utilisation of both theatre and ward time.

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THE ANAESTHETIST'S ROLE IN INTRAOCULAR PRESSURE CONTROL

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Intraocular pressure (IOP) can be defined as the pressure exerted by the fluid in the eye against the walls of the eye ball. The average value of intraocular pressure is 16 ± 5 mm Hg.
The control of intraocular pressure (IOP) is important to the anaesthetist for the following reasons:

1. Patients with acutely or chronically raised IOP may present for glaucoma surgery
2. Patients may present with penetrating globe injury
3. Patients with chronically raised IOP may present for non-ophthalmic surgery
4. Inappropriate administration of anaesthetic drugs or unorthodox anaesthesia practice may cause a deleterious rise in IOP, which can cause expulsion of intraocular contents either through a surgical or traumatic opening during eye surgery.

Retinal artery occlusion or ischaemia can occur in patients undergoing non-ophthalmic surgery.Hence IOP control is important not only for an anaesthetist practicing ophthalmic cases but also for an anaesthetist practicing non-ophthalmic cases.
In ophthalmic surgeries of the intraocular type such as phacoemuslification cataract surgery, extracapsular cataract extraction with or without intraocular lens implantation, small incisional cataract surgery, trabeculectomy and vitrectomy it is important to prevent any rise in IOP before a surgical incision is made. As soon as the sclera is surgically incised, IOP equates to atmospheric pressure. If the pressure is high at the time of incision, the intraocular contents, namely the iris, lens, vitreous and retina, may be expelled through the wound [1]. Sudden decompression of a hypertensive eye may also increase the likelihood of rupture of a sclerotic short posterior ciliary artery in the choroid, thus producing an expulsive haemorrhage in the eye [2]. It is therefore the role of the anaesthetist to have a basic understanding of the various physiological and pharmacological factors that influence the IOP during the perioperative period in order to ensure that IOP is maintained at a low-normal level before a surgical incision is made.

The three main physiological factors affecting IOP during surgery [2] are:

1. Aqueous humour dynamics
2. Blood volume in the eye
3. Extraocular muscle tone and vitreous volume.

Aqueous humour fluid dynamics
The major controlling influence on IOP is the dynamic balance between aqueous humour production and its drainage from the eye.

Production of aqueous fluid:

About 80% of aqueous is formed in the posterior chamber by the epithelial cells of the ciliary body via an active transport mechanism. The remaining 20% is formed in the anterior chamber by simple ultrafiltration of plasma through the anterior surface of the iris [3].

Drainage of aqueous fluid:

About 85-95% of aqueous resorption occurs through the trabecular network and Schlemm's canal in the angle between the iris and the cornea, termed as canalicular outflow. The remaining 5-15% of aqueous resorption occurs directly through the scleral interstitium known as the uveoscleral route or extracanalicular pathway.
The pharmacological agents which affect IOP by influencing either aqueous humour production or drainage are acetazolamide (by inhibiting carbonic anhydrase), topical drugs with sympathetic and parasympathetic effects, beta blockers, and general anaesthetic agents [4]

Blood volume in the eye
The choroidal circulation accounts for about 90% of total ocular circulation. The choroidal blood volume depends on a balance between the rate of arterial blood inflow to and the rate of venous blood outflow from the eye. Apart from this, the baseline intraocular blood volume depends on the tone of the intraocular blood vessels.

Effect of Change of Systemic Arterial Pressure on IOP:

The choriocapillaries have the ability to locally autoregulate and thus the choroidal blood flow remains constant through a range of perfusion pressures. But this autoregulation is a slow process, hence a sudden increase in systolic blood pressure produces a transient acute rise in IOP. Moderate decrease in arterial pressures have little effect on IOP, but below a mean pressure of 90 mmHg a marked reduction in IOP tends to occur.

Effect of Change in Venous Pressure on IOP:

Normally, the aqueous venous pressure (15mmHg) inside the globe is higher than the episcleral venous pressure (10mmHg) outside the globe. This pressure gradient helps in draining the choroidal venous plexuses in the eye. If episcleral venous pressure increases due to obstruction of the central venous return then the above pressure gradient falls and blood begins to pool within the orbit thus resulting in increase in the choroidal volume in the eye.

Causes for Increased Central Venous Pressure:

The following factors can cause an increase in central venous pressure:

Under local anaesthesia
(remember the mnemonics "**ABC VSR**")

Anxiety
Bladder fullness
Cough
Vomiting
Straining and
Restlessness.

Under general anaesthesia:
(remember the mnemonics "**ABC EFR**")

Airway obstruction
Bucking on ETT
Cough
ETT secured with tape or bandage too tightly (venous occlusion)
Face mask held during preoxygenation and
Retching.

Intraocular vascular tone and IOP:

Intraocular vascular tone is predominantly affected by $PaCO_2$, PaO_2, systemic pH and body temperature [2]. A linear correlation exists between $PaCO_2$ and IOP. Thus respiratory acidosis increases IOP, whereas respiratory alkalosis decreases IOP. On the other hand, metabolic acidosis causes reduction in IOP while metabolic alkalosis increases IOP. Hyperbaric oxygen tensions are associated with profound choroidal vasoconstriction and hence this decreases IOP. Hypoxaemia induces choroidal vasodilatation which elevates IOP. Systemic hyperthermia has been shown to increase IOP in humans. Hypothermia induces a significant reduction in IOP due to decreased aqueous production and associated vasoconstriction.

Extraocular muscle tone and vitreous volume
The central nervous system has been found to influence IOP directly through neurogenic control of extraocular muscle tone from central diencephalic control centres. IOP increases markedly following contraction of the extraocular muscle. General anaesthetic drugs decrease IOP partly by depressing these neurogenic centres.

The vitreous is an unstable gel, consisting mainly of water, whose volume can be radically altered by changing the osmolarity of the blood reaching it. Thus, acute reduction in IOP can be achieved by infusing 20% Mannitol 1.5g/kg IV.

IOP in Regional Eye Blocks
Peribulbar and Retrobulbar block:

In a peribulbar block, when local anaesthetic is injected into the peribulbar space outside the muscle cone confined by the bony walls of the orbit, the intraorbital pressure increases. This pressure rise is in turn transmitted to the globe and thus IOP tends to increase. There is a large and individual variable rise in IOP following peribulbar block [5,6]. The degree of IOP elevation depends on the following: volume of local anaesthetic injected, tightness of the orbital septae and type of local anaesthetic used. The lowest IOP elevation occurs with bupivacaine, a more marked effect is seen with lidocaine and the highest elevation occurs after mepivacaine injection [7].
Compared to retrobulbar block, in peribulbar anaesthesia a much larger volume of local anaesthetic is required, as this has to diffuse through the orbital connective tissue septa and the muscle cone to block the motor and sensory nerves in the eye. A larger drug volume in turn raises the IOP to a greater extent compared with a retrobulbar technique where relatively less volume of the drug is required, as this is injected directly inside the muscle cone [8,9].
Sub-Tenon's block does not cause significant increase in IOP. However, a reduction in IOP was found to occur soon after sub-Tenon's injection, possibly due to reduction in muscle tone [10].

Oculocompression
A soft (normotensive) eye is preferred during cataract surgery, as in this state the vitreous phase will remain concave after lens extraction and minimize intraoperative complications. Hence to aid the diffusion of the drug more uniformly and also to make the globe softer, some form of ocular compression is desirable following a regional block around the eye.

Mechanisms by which ocular compression helps to decrease IOP[11]:

1. By decreasing the volume of the vitreous, which is about 50% water in elderly patients.
2. By decreasing the volume of the orbital contents other than the globe by increasing the systemic absorption of orbital exracellular fluid, including, presumably, injected fluids such as local anaesthetics.
3. Increasing the aqueous outflow facility mechanism.
4. Emptying the choroidal vascular bed.

Methods of Ocular Compression:

1. The *Super pinky* is a hard hollow rubber ball, placed directly over the patient's eye with the help of an elastic strap that is threaded through it.
2. *Digital ocular compression* can be done with the help of the middle three fingers placed over a sterile gauze pad on the upper eye lid with the middle finger pressing gently on the eye ball. For every 30 seconds pressure would be released for 5 seconds to allow for vascular pulsations to occur. The disadvantage in both the above methods is that the pressure applied is not known.
3. One of the most popular methods of ocular compression worldwide remains the *Honan balloon*, officially known as the Honan Intraocular Pressure Reducer. This device has several advantages. It is easy and reliable to use. It allows the user to set a known and steady level of pressure. Normally the Honan balloon is applied for up to 20 minutes at a pressure of 30mmHg following an orbital block.

Control of IOP during Eye surgery

Though the anaesthetist ensures that the eye is soft (normotensive) before a surgical incision is made, IOP could increase intraoperatively causing technical problems to the surgeon especially during implantation of the lens. It is the role of the anaesthetist to determine the cause for rise in IOP and treat it appropriately. Squeezing of the eye due to contraction of the orbicularis oculi following an inadequate block would result in a rise in IOP during surgery. Supplementation of the block with a facial nerve block (eg van Lint block) or infiltration into the eyelid would help in preventing this. Lid retractors may press on the eye and cause bulging of the intraocular contents [12]. To reduce this extraocular pressure effect, loosening the speculum and eyelid sutures would help. The patient may strain due to fullness of the bladder, especially seen in elderly patients. Restlessness due to anxiety/phobic attacks can increase the IOP. Reassurance and sedation may help these patients. Posture of the head also influences the pressure inside the eye. A head-up tilt of 15^0 enhances venous drainage in the eye and a head down tilt produces venous engorgement resulting in raised IOP. So during surgery the patient's head must be appropriately positioned to avoid undue changes in IOP. Inspite of the above remedial measures, if the posterior capsule is bulging during surgery, then consider 20% Mannitol 1-2 g/kg IV. Mannitol acts by reducing the volume of vitreous. The mechanism of vitreous shrinkage is commonly considered to result from an osmotic gradient between the blood and ocular tissues, which initially pulls fluid from the eye. Its onset of action is within 20-30 minutes.
For immediate reduction of IOP during surgery, lidocaine IV 0.5-1.5 mg/kg given over 15-20 seconds was found to reduce the IOP in about 60-90 seconds with a peak effect in 8-12 minutes after which the effect gradually wore off[13].

Thus by these techniques anaesthetists can control the IOP both preoperatively and intraoperatively and this helps ophthalmologists to complete the surgical procedure successfully under regional anaesthesia.

IOP in General Anaesthesia
Effect of drugs used in general anaesthesia[14]:

Drugs used for premedication
No changes in IOP

Induction agents
All induction agents (except ketamine), opioids and volatile agents cause a decrease in IOP.

Neuromuscular blocking agents
Depolarising muscle relaxant
Succinylcholine was found to increase IOP within 1 minute after IV administration, reached a peak at 2-4 minutes and subsided within the sixth minute. The cause for the rise in IOP has been ascribed to the "tonic" contraction of the extraocular muscles. Section of the rectus muscles failed to prevent the rise in IOP following succinylcholine administration. The other possible mechanisms postulated for the increase in IOP are contraction of the orbital smooth muscle,[4] effect on choroidal blood volume or influence on aqueous humour formation or drainage.

Non-deparising muscle relaxants
Atracurium and vecuronium have been shown to produce little change or to reduce IOP, principally due to paralysis of the extraocular muscles[14].

Effect of anaesthetic manoeuvres on IOP:
Laryngoscopy and intubation:

IOP has been found to increase following laryngoscopy and tracheal intubation secondary to increased sympathetic activity[15]. Adrenergic stimulation by causing vaso and venoconstriction increases central venous pressure and also increases the resistance to outflow of aqueous humour in the trabecular meshwork.

Laryngeal mask insertion:

Insertion of an LMA provokes less sympathetic response and catecholamine release because it requires neither the visualization of the vocal cords nor penetration into the larynx [15]. Due to this diminished stress response, the mean maximum increase in IOP is significantly higher in patients after endotracheal intubation compared with LMA insertion[15].

Spontaneous or controlled ventilation:

A deep level of anaesthesia is needed during spontaneous ventilation to prevent the patient form bucking on an endotracheal tube (ETT). The subsequent hypotension and hypercapnia which can occur in turn can produce adverse effects on visual outcome following eye surgery. Though IPPV produces a small increase in venous pressure secondary to increase in the mean intrathoracic pressure, it is generally preferred to spontaneous ventilation because of the better control of $PaCO_2$.

Extubation

Emergence from general anaesthesia is often associated with straining/bucking on an ETT, coughing, restlessness and breath holding [16]. Tracheal extubation thus causes a marked rise in IOP. Cough could increase the IOP up to 50mmHg[17]. The Valsalva effect produced by coughing can lead to vessel wall rupture due to a sudden increase in venous pressure resulting in suprachoroidal haemorrhage (SCH), a serious complication following eye surgery[18]. Cases of delayed non-expulsive type SCH have been reported after trabeculectomy following straining and bucking at the time of extubation[19].

Intravenous and prior topical administration of lidocaine have been used to help diminish cough during emergence from general anaesthesia[20,21]. Recently studies have shown that smooth emergence from general anaesthesia can be obtained by filling the ETT cuff with buffered lidocaine[16,22-24] . The cough receptors in the tracheal mucosa are blocked by the non-ionised form of the drug which diffuses across the hydrophobic polyvinyl chloride walls of the ETT cuff[17,22,23,25].

Role of the anaesthetist in specific eye procedures under general anaesthesia

Retinal detachment:

Intravitreal injection of gases such as sulphur hexafluoride (SF_6) mixed with air are used to tamponade the retina against the choroid. When SF_6 is injected into the vitreous cavity in the presence of nitrous oxide N_2O, the more soluble N_2O from blood and tissues will diffuse into the bubble much more rapidly than SF_6 can diffuse out. This increases the volume of bubble and a secondary increase in IOP occurs. On discontinuation of N_2O administration the reverse take place, thus decreasing the volume of the bubble, impairing the outcome of the surgery[14]. Intravitreal gases may remain for as long as 21-28 days. N_2O should be avoided for any patients returning for surgery within 3-4 weeks of underoing intravitreal injection of gas. A second exposure of N_2O could cause reexpansion of the bubble and could elevate IOP, resulting in retinal artery occlusion and loss of vision.

Perforating Keratoplasty (PK):

In this type of ocular surgery, it is very important to prevent an acute rise in IOP especially in the “open-sky” situation, where the patient’s diseased cornea is being replaced with donor graft. IOP is normally controlled by hyperventilating the patient. 20% Mannitol can also be given intravenously in the preoperative period.

Open Globe Injury:

IOP equates atmospheric pressure following globe rupture. The anaesthetist plays a crucial role in the management of such globe repairs. If no difficulty is anticipated in intubation, a short or intermediate acting non-depolarising muscle relaxant with rapid sequence induction can be used. If a difficult intubation is anticipated and ventilation with a face mask is not efficient then the resulting hypoxaemia and hypercapnia can cause more damage to the eye than a single dose of succinylcholine. Succinylcholine resulting in expulsion of intraocular contents was found to be quoted in anecdotal personal communications from surgical colleagues by Claude *et al*[26]. Upto date there are still no well-documented case reports in the literature. Hence if the airway is difficult and if the eye is salvageable, succinylcholine can be used provided an appropriate fitting face mask, pretreatment with IV lidocaine, adequate doses of induction agents and opioids are used.

Anaesthetist's Role in IOP Control in Non-Ophthalmic Surgery:
Post-operative visual loss has been reported as a complication following non-ophthalmic surgeries like spine, cardiothoracic, general surgical abdominal procedures, craniotomies etc [27]. The main cause was found to be ischaemic optic neuropathy[26]. Multiple preoperative risk factors include diabetes, hypertension, atherosclerotic blood vessels, anaemia, smoking and obesity.

During the preoperative evaluation of a patient, it bodes well (for the patient and the anaesthetist!) if the anaesthetist also includes in his evaluation, the question regarding a history of glaucoma. It is worth emphasizing that patients with a chronically raised IOP due to reduced capacity for aqueous humor drainage (chronic open angle glaucoma) have a reduced capacity to compensate for an acute rise and are therefore at an increased risk of having a marked rise in IOP[3]. Also it is important to find out beforehand whether the patient has undergone any intravitreal gas injection in the eye, in the recent past, so as to avoid the use of nitrous oxide during surgery under general anaesthesia.

The venous pooling of the blood in the eye due to postural effects and ischaemia due to prolonged induced hypotension should be avoided. It is likely that a combination of mild to moderate hypotension and increased IOP secondary to being in the prone position, contribute to reduction in perfusion pressure to the optic nerve intraoperatively [28]. Good alveolar ventilation with $PaCO_2$ around 30-35 mmHG helps in maintaining normotension in the eye. The emergence from general anaesthesia should be smooth, to prevent a valsalva effect occurring in the eye that is produced by coughing or bucking on an ETT. Finally, meticulous avoidance of postoperative pain and vomiting are also important.

Conclusion:
Even though there are many physiological and pharmacological factors that influence the IOP during anaesthesia, it is the technique and the experience of the anaesthetist practising ophthalmic anaesthesia, the skill of the ophthalmologists and team work that determines the visual outcome of eye surgery.

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Don't forget ....

COMPLICATIONS OF SUB-TENON'S BLOCK

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Sub-Tenon's was re-introduced into clinical practice as a simple, effective and safe alternative to commonly used needle blocks [1]. In this technique, local anaesthetic agent is deposited under the Tenon's capsule through a blunt cannula thus avoiding the dangers of a sharp needle. During early uses of sub-Tenon's block in clinical practice minor and rare complications were reported and the technique was perceived to be extremely safe. As the technique became popular, cases of sight and life threatening complications were reported [2]. Although the nature of reported complications is very similar to needle block the incidence and severity appear to be comparatively fewer and less devastating [3]. Comparative data is not available to predict the exact incidence of complications of sub-Tenon's block. Complications are reported as cluster of cases, case reports, personal case series, audit and survey reports.

Complications arising from sub-Tenon's block are not limited to the orbit and its contents. Sometimes systemic reactions occur [2,4,5]. Some complications arise immediately while others are delayed. Some complications are minor while others are life and sight threatening and are related to the technique, local anaesthetic agent and adjuvant if used. Other medical adverse events unrelated to the block are also known to occur.

Minor complications

Pain during injection

Minor to moderate pain during injection is reported in approximately 46% of patients[1]. The severity of pain is usually less than 3 when questioned using a Verbal Rating Score.

All injectable local anaesthetic agents produce mild sting or burning sensations on injection and this is interpreted as pain by some patients. Some authors believe that the introduction of a cannula through a potential space (posterior sub-Tenon's space) produces a feeling of pressure [5]. Widening and stretching of the potential space following injection may lead to stretching of nerves and cause pain [2,4,5]. Pain is not likely to be completely abolished but its severity may be reduced by gentle insertion of the cannula, slow injection of warm local anaesthetic agent and reassurance.

Chemosis

Chemosis is swelling of the conjunctiva and this occurs due to anterior spread of the local anaesthetic agent after injection. Mild to severe chemosis occurs after sub-

Tenon's block and the incidence varies between 25 to 100% depending on the length of the sub-Tenon's cannula used [1,6].
Chemosis is unpredictable and more likely to occur if the dissection of Tenon's capsule (scissors or hydrodissection) is inadequate or a higher volume of local anaesthetic is injected. Chemosis is usually limited to the site of injection but has been seen to spread to other quadrants of the globe.
The presence of chemosis usually does not interfere with cataract surgery but some glaucoma surgeons may not be satisfied. Simple measures such as gentle pressure on the globe may reduce the swelling or limit its spread.

Subconjunctival haemorrhage
A red-looking eye is a common feature following sub-Tenon's block. Redness may be due to handling of the conjunctiva or damage to small blood vessels during dissection resulting in hyperaemia and subconjunctival haemorrhage.
The incidence of redness varies from 20-100% depending on the length of cannula used [1, 6]. Assessment of subconjunctival haemorrhage is subjective hence it is subject to various interpretations and an objective method of assessment comparing photographs has been proposed [7]. The haemorrhage may be limited to the area of dissection or may spread to other quadrants. The incidence of conjunctival haemorrhage is higher in patients receiving anticoagulants such as warfarin, and antiplatelet drugs such as aspirin and clopidogrel [8].
Unsubstantiated concerns are raised that subconjunctival haemorrhage may compromise the outcome of glaucoma surgery [9].
Subconjunctival haemorrhage can be minimised by careful dissection thus avoiding damage to fine vessels. Although not proven adrenaline-containing local anaesthetic agent or application of a cotton bud soaked with vasoconstrictor containing solutions may reduce the incidence [2, 5,10]. The use of a diathermy by ophthalmologists may reduce the incidence of conjunctival haemorrhage[11,12] but no such benefit was obtained when disposable diathermy was used by anaesthesia personnel [13].
Application of gentle pressure on the globe may limit the spread of haemorrhage.
Patients should be informed that the eye may look red in the immediate postoperative period [4,5].

Akinesia and eye lid movements
Blockade of motor nerves is essential for akinesia of the eye muscles. Globe and eyelid movements are variable, unpredictable and usually delayed compared to needle block [3,5,6].

Akinesia is volume dependent and if 4-5mls of local anaesthetic is injected, a large proportion of patients develop akinesia [6]. Superior oblique muscle and lid movements may remain active in a significant number of patients.

Akinesia is not essential for modern phacoemulsification and surgery is usually performed without problems but trainee surgeons may prefer akinesia at least during their initial training.

Major complications
Sight and life threatening complications have been described as case reports.

Orbital and retrobulbar haemorrhage have been reported [14,15,16]. The cause of bleeding is usually not clear but clearly trauma to the blood vessels is likely to be the main reason. Cases of orbital haemorrhage are seen to be associated with the use of metal blunt cannulae.

Rectus muscle paresis & muscle damage resulting in ptosis and diplopia have also been reported and these cases again appear to be have been caused by direct trauma by the blunt cannula [17,18,19,20,21].

Anecdotal cases of orbital swelling have been reported following all orbital anaesthetic techniques including sub-Tenon's block [22,23,24,25,26,27]. Inflammation is suspected as the primary cause in most cases. Excessive dose of hyaluronidase, allergy to hyaluronidase or allergy to local anaesthetic agent may also play a role.

Cases of central spread of local anaesthetic [28] and death associated with sub-Tenon's block have been reported [29] but the exact mechanism of spread is not known. It is postulated that if there is an unintentional posterior perforation of the Tenon's capsule during dissection or during injection with a long metal cannula. Local anaesthetic agent may be deposited into the intraconal compartment and further spread to the central nervous system through one of the foramena of the skull might occur[4,5]. Spread of local anaesthetic along the optic nerve sheath if it is damaged is also a remote possibility [4,5]. The cause of a recently reported death associated with sub-Tenon's block [29] was unclear but the above mechanism might have played a role.

Other complications such as globe perforation [30], retinal and choroidal vascular occlusion [31], optic nerve problems (dilated pupils, loss of accommodation, and optic neuropathy) [32,33,34], conjunctival inclusion cyst [35], intractable glaucoma [36] and cutaneous hypopigmentation [37] have also been reported. The exact cause of these complications is not known.

It is very clear from the published literature that sight and life threatening complications of sub-Tenon's block appear to be associated with the use of faulty technique or deep insertion of a metal long posterior sub-Tenon's cannula [38]. Simple measures such as careful dissection and introduction of the cannula not too deep into the posterior sub-Tenon's space without force is advocated and may reduce many serious complications [2, 38]. If there is any resistance met during the insertion of a cannula, it should be reintroduced and repositioned [4,5]. It is the author's personal view that smaller and flexible cannulae will offer benefits [39] but with increased incidence of chemosis and conjunctival haemorrhage [40].

Other adverse medical events
A large prospective audit involving 6000 patients conducted in Auckland [41] reported no serious complications related to sub-Tenon's block but some patients suffered from cardiovascular complications unrelated to the block.

Summary
Local anaesthetic eye drops instilled before sub-Tenon's block provide surface anaesthesia of the cornea and conjunctiva. Local anaesthetic agent injected during sub-Tenon's block spreads around the globe and partly diffuses into the intraconal area. The spread of local anaesthetic agent around the globe results in the blockade of sensory nerves converging on the orbit which augments surface anaesthesia produced by topical local anaesthetic. Akinesia results from the blockade of motor nerves by diffused local anaesthetic agent in the intraconal area. Anterior segment surgery such as cataract surgery is increasingly performed under topical anaesthesia without the need for akinesia. It is logical that if a sub-Tenon's block is required for anterior segment surgery, the use of topical anaesthesia and injection of low volume local anaesthetic agent through a small or flexible cannula in the inferonasal quadrant is the way forward and hopefully the incidence of sight and life threatening complications will be reduced.

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Don't forget ....

TRANSCUTANEOUS PERIOCULAR ANAESTHESIA FOR PHACOEMULSIFICATION SURGERY

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Summary
In many parts of the world peribulbar blockade continues to be widely practised for anterior segment procedures. The technique has undergone several modifications in order to decrease the risk of sight and life-threatening complications. Needle length is an important consideration for the safe performance of ophthalmic blocks. Shorter needle length will reduce the incidence of injury to the important structures in the mid and posterior orbit. The one inch (25mm) needle is most commonly used to perform the block. However, minimally invasive blockade could be done using a half inch (13mm) needle that is placed only in the anterior orbit. The described technique involves insertion of 13mm, 27 gauge needle percutaenously in the infero-temporal quadrant. Digital pressure applied during injection by the thumb and index fingers around the needle hub prevents it from being pushed more posteriorly during the injection and prevent accumulation of local anaesthetic in the lower eyelid. Local anaesthetic solution is injected until total drop of the upper eyelid is achieved followed by application of a pressure reducing device. Ocular movement was assessed 10 minutes after the block. If it was inadequate for surgery, supplementary anaesthesia was provided using the same needle. In our series, using a 13mm needle for peribulbar blockade showed satisfactory results. No local or systemic major complications were recorded. This technique is effective for phacoemulsification surgery.

Introduction
Despite the increase in popularity of topical anaesthesia, peribulbar blockade continues to be an acceptable technique for phacoemulsification surgery. Potential complications of this technique include central spread, globe perforation and retrobulbar hemorrhage. The anterior orbit is the space between the lids and the sites of attachment of the extraocular muscles to the periorbit and sclera. It ends 2-5 mm anterior to the equator of the globe and it is mainly filled with adipose and connective tissue. If the needle placed in this area, theoretically there will be no injury to important structures. A 13mm (half inch) needle introduced into the anterior orbit can not pass further posteriorly. The 25mm (one inch) needle is the most common needle used to perform the block. The aim of this study was to demonstrate the efficacy of 13mm needle length in performing peribulbar blockade for phacoemulsification surgery.

Material and methods
After obtaining hospital Research and Human Ethics Committee approval and informed patient consent, one hundred fifty patients undergoing the

phacoemulsification procedure under local anaesthesia were enrolled in this descriptive study. Peribulbar blockade was performed with a 27G, 13mm (half inch) needle. The needle was inserted transcutaneously through the lower eyelid as far as lateral in the inferotemporal quadrant.

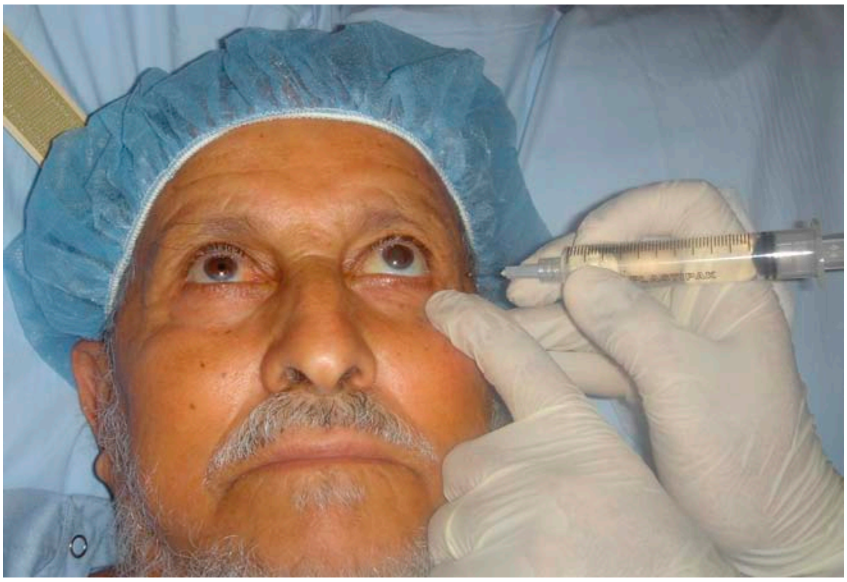

Figure (1): Determination of Entry point

Digital pressure was applied by the thumb and index fingers around the needle hub to prevent accumulation of local anaesthetic in the lower eyelid space and also prevent the needle from being pushed more posteriorly during the injection.

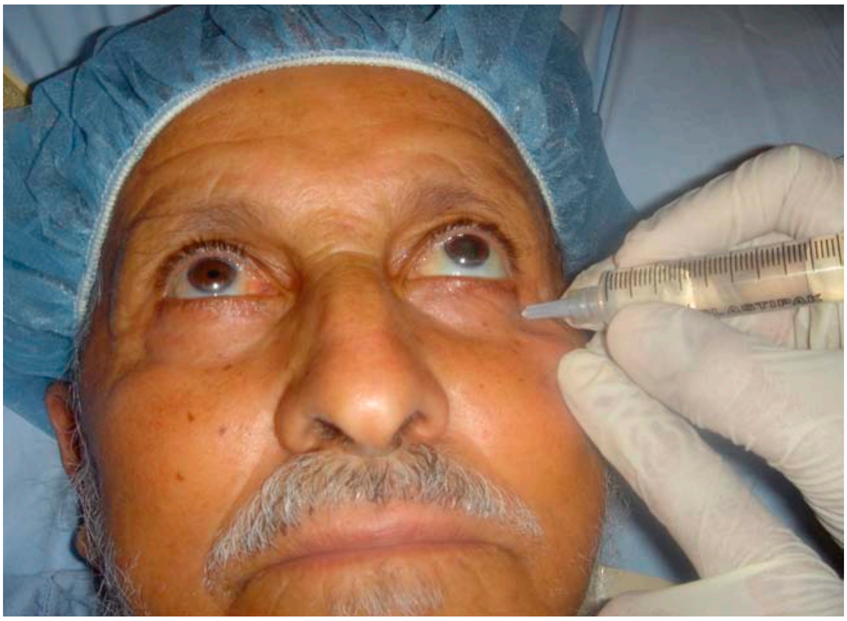

Figure (2): Introduction of the needle

After negative aspiration, 7-10 ml of local anesthetic solution (bupivacaine 0.5%, lidocaine 2% and hyaluronidase mixture) was injected until total drop of the upper eyelid was achieved followed by application of Honan's balloon.

Figure (3): Application of digital pressure during injection

Ocular akinesia was assessed 10 minutes after the block using the Simple Akinesia Score. A score of 3 or less was accepted to provide adequate conditions for the surgical procedure to be performed. If after 10 minutes the block was inadequate for surgery, supplementary anaesthesia was provided using the same needle.

Figure (4): Successful block

Results

Table [1] presents the data of this descriptive study. Adequate analgesia after the first injection was reported in 90.6% of the patients while 9.4% required supplementary anaesthesia. There were no major sight or life threatening complications.

Conclusion

Using a 13mm (half inch) length needle for peribulbar blockade showed satisfactory results. This technique is effective for phacoemulsification surgery. Larger studies are needed to prove the safety of the technique.

Table (1) Clinical data

Observation	blockade using ½ inch needle
Initial Volume injected (ml)	9.6 ± 0.75
Total volume injected (ml)	10.5 ± 2.93
Acceptable akinesia after first injection (Score 3 or less)	136 (90.6%)
No. of patients requiring supplementary injection	14 (9.4%)
Total No. of supplementary injections	16

Data expressed as a mean value and standard deviation or number and percentages

This paper is presented as an account of a practical procedure and is not referenced.

Editor

PSYCHIATRIC PROFILE OF PATIENTS UNDERGOING RETINAL DETACHMENT SURGERY UNDER REGIONAL BLOCK

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Summary
The aim of this study was to investigate whether patients undergoing retinal surgery are more prone to perioperative anxiety and/or depression, to determine the relation between pre- and postoperative emotional upset and also to find the relation between severity of visual impairment and psychological dysfunction.
Forty patients with retinal detachment (RD) undergoing pars plana vitrectomy were enrolled in this descriptive study. Regional block was performed using a peribulbar technique in order to avoid the confounding psychological effects of general anaesthesia. The patients were tested for anxiety and depression using Hamilton Anxiety Rating Scale (HARS) and Beck Depression Inventory (BDI) one day before surgery and before discharge.
Psychological disturbance was reported by 17.5% of the studied patients. Preoperatively 71% of them showed mild to moderate anxiety. After the procedure, all anxious patients maintained or experienced a decreased level of anxiety. In addition to anxiety, 20% of anxious patients developed postoperative mild depression. 14% of the psychologically disturbed patients had moderate depression before surgery which became milder after it. Another 14% showed severe anxiety and moderate depression only postoperatively. Severe visual impairment was reported by 86% of psychologically disturbed patients.
Our patients with RD undergoing retinal procedures infrequently suffered anxiety and/or depression. Preoperative psychological disturbances were a good predictor of postoperative emotional upset. Perioperative psychological disturbances were related positively to the severity of visual impairment

Key words anxiety, depression, retinal detachment, peribulbar anaesthesia

Introduction

Seriously ill patients frequently suffer from psychological disturbances secondary to their physical illness. These disturbances are usually in the form of depression and anxiety symptoms, which possibly acted as a defence against the threat of the disease[1]. Vision provides the fundamental basis for social adjustment and normal psychological development. It has long been recognized that emotional disturbance accompanies visual loss[2]. There is little information available concerning emotional distress among Saudi visually impaired individuals.

Patients undergoing surgery commonly experience anxiety. It is assumed that major surgery or that with an unknown outcome produces more anxiety[3]. Perioperative anxiety is also influenced by the patient's concern about his or her general health, uncertainty regarding the future, type of anaesthesia to be performed, post operative pain[4], loss of independence, and fear of death[5].

Many patients also experience depressive symptoms presurgically which has been thought to increase after the operation[6]. Researchers correlate between the degree of preoperative psychological stress and recovery, stressing the importance of emotional factors in treatment[7].

The quality of life rather than longevity is a significant consideration for human beings. Ocular diseases have a major impact on the quality of life because visual impairment potentially affects so many different aspects of function[8].

The primary aim of this descriptive study was to investigate whether patients with retinal detachment undergoing retinal surgery are more prone to perioperative anxiety and/or depression. The secondary aim was to determine the relation between pre- and postoperative emotional upset and also to find the relation between severity of visual impairment and psychological dysfunction.

Methods

After obtaining the approval of the hospital's Research and Human Ethics committees and informed patient consent, forty Saudi adult patients of both sexes were enrolled in this descriptive study. All patients had retinal detachment and were scheduled for pars plana vitrectomy under regional anaesthesia in King Khaled Eye Specialist Hospital. Exclusion criteria included patients with current use of any psychiatric medication or cognitive impairment that might affect the psychometric assessment. Subjects who were known to have a chronic uncontrolled disease such as cardiac disease, diabetes mellitus, cancer, cerebrovascular accident, and renal disease were also excluded. These diseases were selected because they have a major effect on emotional status[9].

Following the ophthalmologist's examination, primary ocular diagnosis, ocular involvement, duration of ocular disease, previous procedure and best-corrected visual acuity were recorded. Visual impairment was classified according to visual acuity (VA) into mild (VA greater than 20/44), moderate (VA from 20/44 to 20/125) and severe (VA less than 20/125)[10].

Psychological assessment was performed by Beck Depression Inventory [11] (BDI), revised version, and Hamilton Anxiety Rating Scale (HARS)[12] for depression and anxiety respectively. Those psychological tools were chosen because they are the best-known survey instruments for identifying symptoms of depression and anxiety. They are easy to operate, time saving and results are easily scored, analyzed and recorded. They are adequate indicators for surgically related stress[13]. The scales were conducted in person by a research assistant who was well trained in the administration of these questionnaires. The patients were tested one day after admission and one day before discharge. For the scales to be conducted in the postoperative period, the patients had to be fully conscious and orientated to time and place. All cases were evaluated by a psychiatrist on the basis of the Structured Clinical Interview for DSM-IV (SCID-1)[14].

It is well known that general anaesthesia causes postoperative congnitive dysfunction[15].

In order to eliminate this effect, surgery was done under local anaesthesia. Regional block was performed using a peribulbar technique. The anaesthetic agent used in this study was a mixture of lidocaine 2% and bupivacaine 0.5% 2:3 with 5 units of hyaluronidase per ml of anaesthetic solution. After negative aspiration up to 10 ml of local anaesthetic solution was injected.

Results

The study was carried out on 40 Saudi patients. Socio-demographic variables and ophthalmic data are listed in tables 1 and 2 respectively.

Patients with psychological disturbances are displayed in Figure (1). They were only 7 patients (17.5% of the studied sample). Preoperatively 71% of these (5 patients) had mild to moderate anxiety. After the procedure, all anxious patients maintained or experienced a decreased level of anxiety. In addition to anxiety, one patient (20%) developed postoperative mild depression. From the psychologically disturbed patients 14% (1 patient) had moderate depression before surgery which became milder after surgery. Another 14% (1 patient) showed severe anxiety and moderate depression only postoperatively.

Moderate to severe visual impairment was reported by 97.5% (39 patients) of the studied population. However, severe visual impairment was documented in 86% (6 patients) of psychologically disturbed subjects.

Discussion

This study showed a lower incidence of perioperative anxiety and depression in Saudi patients with retinal detachment undergoing surgical procedures. Many patients with preoperative psychological disturbance retained a variable degree of the disease postoperatively. Severe visual impairment is a common feature of most of the psychologically disturbed patients.

Blumenfield and Thompson proposed that psychological responses exhibited by a patient as a reaction to physical illness-depend on the nature and severity of the physical illness itself, the characteristic personality style and coping pattern. Also doctors' and nurses' responses to the patient modify his or her psychological reaction to illness and hospitalization [16].

The present work showed that anxiety for the whole studied sample was 15% (6 patients) which is considered low compared to what was previously reported by other studies. Marantetes and Masur noted that the incidence of preoperative anxiety has been reported to reach 80% among adult patients[17]. Moreover, Scott and his group demonstrated that emotional distress is more prevalent among patients with retinal disease than severely medically ill hospitalized and outpatients scheduled for audiological evalaution[10]. They concluded that vision loss represents an additional significant risk factor for emotional distress. Caumo and his group reported that preoperative anxiety correlate with high postoperative anxiety, increase postoperative pain and analgesic requirements[18]. Lampic et al, reported that patients who do not express high levels of anxiety may be either truly less anxious or anxious but not giving overt expression to their emotions[19]. Shafter et al, reported that male patients were reluctant to show their anxiety[20]. The regional block probably produced superior postoperative analgesia both in terms of quality and uniformity compared to general anaesthesia[20]. All of the above could explain the reduced incidence of anxiety reported by our patients.

A severe level of depression but not anxiety was reported by Augustin et al, who proved that it was strongly associated with visual impairment[22]. Also, Barcia and Psiquiatia highlighted the fact that in the blind the typical reaction is depression[23]. This maladjustment could be due to difficulties in social functioning, changes in social support and loneliness[23].

We expected to find more patients with depression. This low figure could be attributed to the nature of the culture to which the patients of this study belong. There are multiple factors, which might help the patient to cope with, and accept, such serious diseases with their sequelae. First, religious belief implicates the tendency to perceive and accept any stressful situations as a test of faith in and submission to God. On the other hand, facing such situations with feeling of anger and non-acceptance is sinful. Also, spiritual well-being gives patients more support and courage when facing stresses and difficulties[24]. Second, the social support derived from the adherent social network in which these patients live has been frequently found to have a positive effect[25]. Third, denial, a known defensive mechanism in the face of dangerous situations like serious diseases, influences the quality of life by improving the sense of well-being[26]. Lastly, depression may not be diagnosed because patients are often reluctant to report depressive symptoms to the treating team because they do not want to bother the nurses or physicians, or they fear being stigmatised by having mental illness especially in our Arabic societies [27,28].

In this study, about 57% of those patients who had preoperative psychological disturbances showed a reasonable degree of improvement postoperatively. This was consistent with the findings of Schumacher et al and Giovagnoli et al, who reported the same observation for patients with leukaemia and brain tumour[29,30]. They have explained this improvement by the increased acceptance and adaptability of the patients to the disease. On the other hand, contradicting results were shown by Anderson[31]. However, his patients had serious illness of a rapidly progressive nature.

This study has been done on a heterogeneous group of patients as regards their socio-demographic background. Many cultural, social and educational factors need to be evaluated in a more extensive view. However, the clinical impressions gave rise to many questions, which stimulate further studies of larger samples in this field. It is worth noting that evaluating the mental status of ophthalmic patients while planning their management will help to provide optimal treatment.

Conclusion

Local Saudi patients with RD undergoing retinal procedures infrequently suffered from perioperative anxiety and/or depression. This could be attributed to the religious belief**,** cultural bases**,** social support and denial as a defensive mechanism**.** Preoperative psychological disturbances were a good predictor of postoperative emotional upset. Severe visual impairment related positively to the perioperative psychological disturbances.

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Table (1) Socio-demographic data

Age (years)	61.7 (10.6)
Sex	
Male	29 (72.5%)
Female	11 (27.5%)
Residence	
Urban	36 (90%)
Rural	4 (10%)
Marital Status	
Married	33 (82.5%)
Unmarried	7 (17.5%)
Educational Level	
Illiterate	18 (45%)
Grade 11 or less	9 (22.5%)
High school	4 (10%)
Collage or higher degree	9 (22.5%)
Socioeconomic Status	
Very low – low	6 (15%)
Low – middle	22 (55%)
Middle - High	12 (30%)

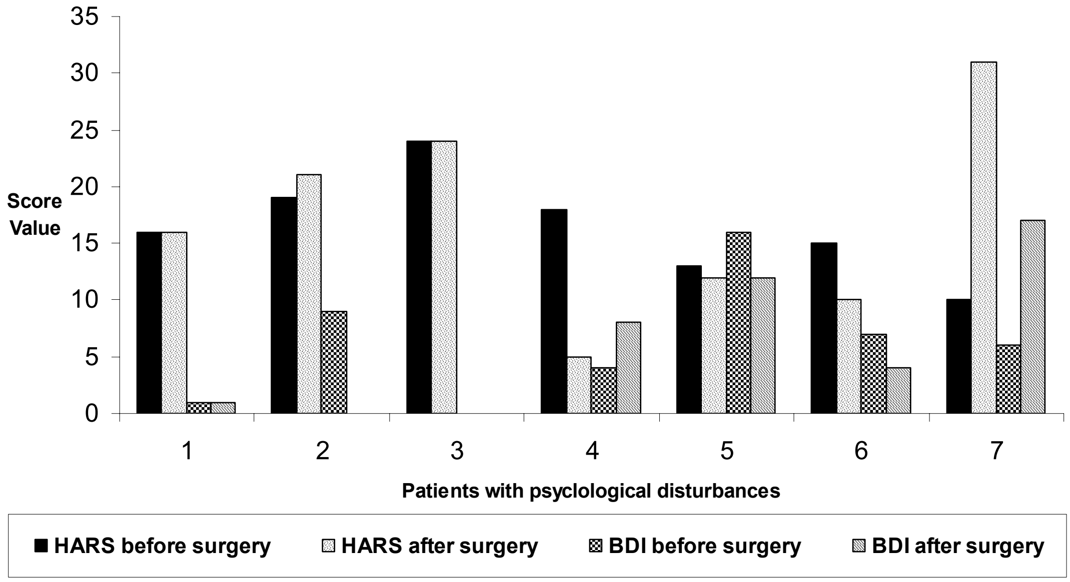
Data expressed as a mean value (SD) or number and percentages.

Table (2) Ophthalmic data

Diagnosis:	
Rhgmatogenous Retinal detachment	9 (22.5%)
Tractional Retinal detachment	31(77.5%)
Ocular involvement:	
One eye	17 (42.5%)
Two eyes	23 (57.5%)
Visual acuity:	
Mild	1 (2.5%)
Moderate	6 (15%)
Severe	33 (82.5%)
Duration of symptoms (years)	2.53 (0.8)
Previous procedure:	
Laser	25 (62.5%)
Surgery	10 (25%)
None	5 (12.5%)

Data expressed as a mean value (SD) or number and percentages.

Figure (1): Psychological Assessment



HARS: Hamilton Anxiety Rating Scale
BDI: Beck Depression Inventory scale

ANAESTHETIC CHALLENGES IN OPHTHALMIC TRAUMA

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Summary
Ophthalmic trauma is a very important health concern as it remains very prevalent and the leading cause of blindness in nearly the entire developing and developed world. Treatment of serious eye injuries with surgery requires anaesthesia tailored to the patient's presentation and type of injury. We report epidemiological data on eye injury and present a case of ocular trauma detailing the anaesthesia used for the patient's treatment. Finally, we discuss the rationale for drug selection and anaesthetic procedures in caring for patients with serious eye injuries.

Introduction
Globally, ocular trauma remains an important cause of monocular visual impairment and blindness. Serious ocular trauma, requiring hospital admission, and potentially surgery, occurs at the rate of 8 per 100,000 people in the developed world[1]. In the USA, the annual cost of caring for ocular trauma is in the $200 million range for intra-hospital care alone, most of which comes from the nearly 1 million work-related ocular injuries. Occupational eye injuries accounted for the majority of ocular trauma in the USA before modern workplace regulations and still account for a significant portion in the developing world. Sport-related injuries are a common cause of ocular trauma in most of the developed world, but assault continues to be a growing problem, with worse outcomes. These injuries require specialised care during anaesthesia given their potential presentation of an open globe and a "full stomach". With these two aspects in mind, anaesthesia must be carefully planned and performed utilizing the optimal selection of medications.

Background
Ophthalmic trauma can be broadly classified into closed globe injuries and open globe injuries with many subtypes in each category. A few examples include blunt injuries, lacerations, presence of foreign bodies, abrasions, and chemical burns, and each subtype can also be further divided into specific modes or sites of injury[2].
As mentioned earlier, severe eye injuries occur throughout the world, but many regions differ in prevalence of the injuries and demographics of the victims.
Including all types of eye injury with any degree of severity, there are close to 2.5 million injuries sustained annually in the United States making the cumulative lifetime prevalence of eye injury 1,400 per 100,000[3]. A number of individual studies have been completed measuring the annual incidence rate (per 100,000 people-years) of hospitalization due to eye injury. Some reported incidence values from around the

world are: 8.1 in Scotland[1], 13.2 in the U.S.A.[4], 12.6 in Singapore[5], and 4.9 in Italy[6]. These injuries account for a significant number of surgical operations and therefore involve considerable utilization of resources and correspondingly large economic costs. In one study, 77% of the injured eyes required at least 1 surgical procedure; many of these needed some type of vitreo-retinal surgical procedure[7].

Generally, severe eye injury was more common in men than in women[1,6-14]. Ocular trauma shows a bimodal distribution of incidents by age, in those between the ages of 20 and 40 and in those over the age of 70. Most injuries occurred to younger adults in the third or fourth decade of life[1,6-11,13-15]. In some studies, the workplace was the most common place for injury[10-11,15], while in others, the home has replaced the workplace as the most common place for injury, possibly due to increased workplace regulations for eye safety[1,7,13]. Other likely locations for injury are road accidents and school-related activities such as sports.

Severe eye injuries are a leading cause of blindness; however, decreases in visual acuity are another serious outcome of eye injury. In a Scottish study, the one-year cumulative incidence of blinding outcome from serious ocular trauma was 0.41 per 100,000 people years[1]. A number of studies conducted in India reported the age-sex-adjusted prevalence between 0.6% and 0.8%[8,10,12]. Rates of blindness as a result of trauma range from 6% to 18.2% in certain parts of the world[6-7,14] but may be as high as 54% in Ghana[9]. The rate of enucleation reported in some studies range from 12% to 20.9%[9,13,15], mostly depending on the distribution of injury types.

Anaesthesia in Ophthalmic Trauma
Anaesthesia in ophthalmic surgery must achieve akinesia, analgesia, attenuation of the oculocardiac reflex, control of intraocular pressure (IOP), minimal bleeding, and smooth emergence. However, this poses a number of challenges. Anaesthetic involvement in the care of ophthalmic trauma can increase IOP possibly causing extrusion of orbital contents. At the same time these risks must be balanced with the risk of pulmonary aspiration, which has its own morbidity and mortality, in the usual presentation of a "full stomach" in these patients. Thus, managing these patients in a safe and reasonable manner involves prudent drug selection, balancing the risks of pulmonary aspiration with aggravation of the ocular damage and simultaneously keeping patient safety in the forefront of this challenge. Since a significant part of ocular trauma occurs in children and in very elderly patients, these groups of patients present additional layers of anaesthetic challenge to overcome.

Case Presentation
An 18 year-old woman arrived at the hospital with an open globe injury caused by motorcycle helmet shards in a vehicular accident.

After examination in the Emergency Room, the patient required enucleation and placement of prosthesis. General anaesthesia was induced with lidocaine (1 mg/kg), fentanyl (2 µg/kg), propofol (2 mg/kg) and succinylcholine (2 mg/kg) to achieve a rapid sequence induction. Prior to the administration of succinylcholine, a defasciculating dose of vecuronium (0.1 mg/kg) was given. A size 7 endotracheal tube was placed uneventfully. Anaesthetic state was maintained with desflurane in a mixture of oxygen and nitrogen.

At the end of surgery, paralysis was reversed with neostigmine (0.07 mg/kg) and glycopyrrolate (7 µg/kg). An IV dose of lidocaine (1 mg/kg) was administered prior to extubation to attenuate the sympathetic response to extubation. After the patient regained spontaneous ventilation, the patient was kept in the lateral head down position to decrease risk of aspiration, and the endotracheal tube was removed (in this patient population, this method of extubation has been applied frequently, with no reports of extrusion).

Discussion
As exemplified in this case, there exist a number of added challenges to successful administration of anaesthesia in this patient population. These challenges arise in all stages of anaesthesia including pre-operative preparation, drug selection, intubation, maintenance of anaesthesia, and extubation. However, through proper planning and execution these problems can be overcome.

Pre-operatively, patients must first be assessed for their ability to cooperate. This is generally a problem in injuries involving the paediatric population. It is often problematic to place an IV cannula in children because stimulation and screaming of the child cause an increase in IOP, perhaps worsening the injury. Thus, paediatric patients must receive general anaesthesia via mask induction using sevoflurane in a mixture of nitrogen and oxygen. Once anaesthetic state is achieved, an IV can be placed, a neuromuscular blocking agent can be administered, the patient may be intubated, and anaesthesia and surgery can progress.

Given the usual presentation of a patient with a full stomach, it is often necessary to use medication to prevent pulmonary aspiration during various stages of the anaesthesia. Although a retrobulbar block would reduce the risk of aspiration, it is often contraindicated because it may increase IOP producing further damage to the injured eye. Instead, general anaesthesia is required along with pre-operative administration of metoclopramide* given intravenously at the time of admission and continued until surgery[16]. Although histamine-receptor antagonists, like ranitidine, may also be indicated, their use is limited in emergency surgery. Non-particulate antacids, like sodium citrate, have only a short term effect but can be useful just prior to induction[16]. These increase the pH of the stomach acid, reducing the probability of damage if aspiration should occur.

Patients with a full stomach also require a rapid induction agent to minimize the risk of pulmonary aspiration while avoiding an increase in IOP. Such agents include etomidate, ketamine, thiopental and propofol, but each agent has its own limitations[16]. Etomidate carries a risk of myoclonus which may cause retinal detachment and vitreous prolapse, while ketamine may cause blepharospasm or nystagmus. Intravenous anaesthetics like thiopental or propofol on the other hand, require a narcotic like fentanyl and a local anaesthetic, usually lidocaine, to attenuate the increase in IOP or blood pressure as a response to laryngoscopy and intubation.

The challenge of rapidly and safely controlling the airway in a trauma patient takes precedence over almost everything else. Succinylcholine is utilized for its fast onset of paralysis and optimal intubating conditions. Unfortunately however, succinylcholine is also known to raise IOP. For damaged and threatened ocular contents, this could be a recipe for disaster. However, if used after careful pretreatment with a priming dose of a nondepolarizing neuromuscular blocker (eg vecuronium) and an appropriate dose of an anaesthetic, succinylcholine will only cause a small increase in IOP. This small increase is believed to be insignificant when compared to the increase that may result from the Valsalva response to intubation.

To reduce the risk of aspiration, an assistant usually applies adequate pressure externally over the cricoid ring until verification of tube placement and inflation of the cuff of the endotracheal tube is complete.

Typically anaesthesia can be maintained by an inhaled anaesthetic like desflurane in a mixture of air and oxygen without difficulty.

Extubation and emergence also present times with increased risk of pulmonary aspiration and so must be done once the patient is wide awake and has intact airway reflexes[16]. At this point, the patient is kept in the lateral head down position and the tube is removed. If deep extubation is required, the risk of regurgitation can be reduced by intraoperative administration of antiemetics or nasogastric tube suctioning, but some risk will still remain.

Conclusion

Eye injuries are a devastating and troubling medical problem affecting many people in a wide variety of backgrounds. While cases of ocular trauma challenge surgeons and anaesthesiologists alike, most of the difficulties presented by these patients can be averted through proper patient preparation and drug selection. Thus, caring for these patients has proven widely successful, and good results are possible. For all these reasons, solving the challenges of caring for patients of ocular trauma can be very rewarding.

**Some authors advise there is a high risk of oculogyric crisis following the repeated administration of metoclopramide intravenously to teenagers and young adults, particularly females.*

Editor

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