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INSIDE THE ISSUE

From the Editor's Desk

Dear ALL,

Let me wish all our readers a happy and joyful new year 2012.

At the outset I thank everyone for attending the ophthalmic forum in the recently concluded ISACON 2011 at Mumbai, and making it a success with full house participation. The topics were received well with the audience. We hope to continue the same in the future, and special congratulations to Dr.V.V.Jaichandran who was the coordinator for the forum.

It is a pleasure for me to release the next edition of OFISACON newsletter in this new year, which has four topics of concern to all anaesthesiologists practicing ophthalmic anaesthesia. Dr Anjolie Chhabra from AIIMS has reviewed on the most controversial issue in ophthalmic anaesthesia - Do we need to discontinue antiplatelet and anticoagulant for eye surgery under regional blocks, Dr Puspha Susan from Giridhar Eye Institute Cochin reports an interesting case of anaphylactic shock during an FFA procedure, Dr Jaichandran V V, Sankara Nethralaya highlights important syndromes of anaesthetic implications for children with congenital cataract and squint and Dr Chandrasekhara PM, Retina Institute of Bangalore, mentions about the challenges faced by anaesthesiologists for paediatric eye surgery under general anaesthesia.

Enjoy reading.

Once again I remind our members that we welcome your articles and case discussions in the newsletter.

Thanking you

Dr. Kannan R

Editor, OFISA Newsletter.

Should anticoagulants and antiplatelet drugs be discontinued before ophthalmic surgeries under regional blocks?

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Many patients coming for ophthalmic surgeries are elderly with a high incidence of systemic diseases. Government of India “Vision 2020” survey revealed that 4.8 million cataract surgeries were performed in India in 2006 and the number is on the rise. (1) This elderly patient population has multiple comorbidities such as coronary artery disease, hypertension, diabetes for which they recieve multiple drugs including anticoagulants and antiplatelet agents. The decision whether to continue the anticoagulants and antiplatelet drugs in the perioperative period and risk ocular haemorrhage and sight threatening complications (as eye surgery is usually performed under regional nerve blocks), or stop these drugs and risk life threateningthrombo-embolic events continues to worry the ophthalmic anaesthesiologist.

This article aims to review the evidence available in literature regarding the incidence of ocular complications due to the regional anesthesia technique or surgery itself if the anticoagulants and antiplatelet drugsare continued in the peri-operative period for differenteye surgeries.

Cataract surgery:

Phacoemulsification is the one of the most commonly performed outpatient surgeries for adult cataract. Anaesthesia for cataract surgery can be provided by general anaesthesia, or various regional anaesthesia techniques like retrobulbar block, peribulbar block, subTenon’s block, intracameral injection (local anaesthetic injection into the anterior chamber) or topical anaesthesia. The incidence of complications and continuing anticoagulants as described in literature varies with the regional anaesthetic block used for cataract surgery.

The use of retrobulbar anaesthesia for cataract surgery is on the decline; less than 0.5% practitioners in UK prefer this block for performing cataract surgery (2) and the trend is the same in India.

In a meta analysis carried out to assess the safety profile and efficacy of retrobulbar and peribulbar blocks in patients undergoing cataract surgery, Alhassan et al(3) reviewed 6 trials consisting of 1438 patients.There was no difference in the incidence of pain scores, ocular akinesia, patient acceptability, systemic complications and serious eye complications between the two techniques. However, minor ocular complications varied between the two block groups. Conjuctival chemosis was commoner in peribulbar block whereas lid hematoma was more in patients who received retrobulbar block. Retrobulbar haemorrhage occurred in only one patient who received retrobulbar block. However, with the longer needle used (1.5 inches) and angulation towards the ophthalmic artery, the risk of serious eye threatening complications is more.

In peribulbar block a short needle (25 mm) is used and extraconal deposition of local anaesthetic performed away from the opthalmic artery and optic nerve, however, the risk of periorbital haematoma due to inadvertent injury of small blood vessels remains especially in patients on anticoagulants or antiplatelet drugs. Literature assessing the risk of haemorrhagic complications with these blocks and concomitant anticoagulants is limited.

Kallio et al (4) studied 1383 patients who underwent cataract surgery with peribulbar or retrobulbar block. Thirty five percent(35%) of these patients were on aspirin, 5.5% on warfarin and 19% on other non steroidal antiinflammatory drugs (NSAID’s). Fifty five patients (4%) had lid haemorrhages (mostly spot like), with no reports of retrobulbar haemorrhage.

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The authors concluded that aspirin,warfarin, paracetamol or other NSAIDs did notincrease the incidence of retrobulbar haemorrhage in patients receiving peribulbar or retrobulbar block.

As compared to other regional blocks that use sharp needles, subTenon's block involves dissection of the avascular subTenon's space with blunt tip scissors and depositing the drug posterior to the equator of the eye using a blunt needle or cannula. Kumar et alreviewed the frequency of haemorrhagic complications with subTenon's anaesthesia in patients undergoing elective phacoemulsification.(5) Seventy five patients were on aspirin, 65 on warfarin and 40 on clopidogrel. The anticoagulants were continued in the perioperative period. The authors observed an increased frequency of subconjuctival haemorrhage following subTenon's block in patients receiving clopidogrel (40%), warfarin (35%) or aspirin (21%) as compared to controls (19%) who were not on anticoagulants. No sight threatening complications were reported. The authors support the continuation of anticoagulants perioperatively in patients undergoing cataract surgery with subTenon's block.

The Cataract National Data setelectronicmulticentre audit (UK) carried out a retrospective observational review from 2001 to 2006. They examined the prevalence of aspirin, clopidogrel, dipyridamole and warfarin use in patients undergoing cataract surgery and studied the ensuing complications. (6) The incidence of hemorrhagic complication (subconjunctival haemorrhage) was increased in patients taking clopidogrel (4.4%, P<0.0001) or warfarin (3.7%, P<0.0001) versus non-users (1.7%).

However, the incidence ofhyphaema or majorsight-threatening haemorrhagic complicationssuch as choroidal/suprachoroidal haemorrhage were not significantly increased.The authors concluded that irrespective of the technique [sharp needle (retro/peribulbar block) or subTenon's block], clopidogrel and warfarin significantly increased the risk of minor haemorrhagic complications. In a UK national survey (7), subTenon's block was performed by the majority of the respondents (87.8%) in patients on anticoagulants. Complications included vascular and muscular injuries, a case of fainting, and several cases of dysrhythmias. No consensus was reached regarding the cut-off levels of INR for performing the subTenon's block, though most of them accepted an INR of 3.5 or less.

In high risk groups, such as those with prosthetic heart valve, drug eluting stents (within 1 year of insertion) and those with previous history of thrombotic strokes, stopping the antiplatelet drugs may cause potentially fatal thrombotic episodes.(8) The incidence of serious complications like retrobulbar haemorrhage, suprachoroidal haemorrhage is so low that recommen dationsadvising discontinuation of these drugs prior to cataract surgerycannot be made irrespective of the block used to perform the surgery.

However, ophthalmic anaesthesiologists should keep in mind the fact that certain medicines (amiodarone, diltizem, propranolol)and foods (mangoes, grapefruit juice, fenugreek) can inhibit the metabolism of warfarin and potentiate its effects resulting in an increased risk of haemorrhagic complications.

(9) This underlines the importance of preoperative assessment of INR in these patients.

Increasing number of cataract surgeries are nowadays being performed under topical anaesthesia because of its relative safety and ease of administration. Many surgeons in addition use intracameral local anaesthetic injection (local anaesthetic injected in the anterior chamber) to improve the quality of block. Gupta et al observed that manual small incision cataract surgery performed under topical anaesthesia and intracameral injection of 0.5 % lignocaine produced increased patient comfort, low pain scores and no effect on surgical outcome. (10) Similarly Ezra et al, in a meta analysis comprising 8 trials with 1281 patients, observed that intracameral 1% lidocaine was an effective and safe adjunct to topical anaesthesia for phacoemulsification cataract surgery. (11)

Wirbelauer et al studied the incidence of haemorrhagic complications in 128 patients on oral anticoagulants undergoing cataract surgery under topical anesthesia. Nine patients (7%) developed ocular haemorrhage, though no sight threatening complication or decrease in postoperative visual acuity was observed. The authors recommend continuing oral anticoagulants for ambulatory cataract surgery under topical anaesthesia.(12)

Topical 2% lignocaine jelly has been found to be a safe and effective modality of providing anaesthesia for phacoemulsification.

(13) The use of 2% lignocaine gel was associated with significantly higher intracameral lignocaine levels, significantly lower pain scores and better patient cooperation than4% lignocaine eye drops.(14) Therefore the use of this gel should be preferred in patients on anticoagulants undergoing cataract surgery.

The British Ophthalmic Anaesthesia Society recommends the following guidelines regarding continuation of anticoagulants for cataract surgery (15):

Grades of recommendations

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

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

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

* Recommended best practice based on the clinical experience of the guide line development group.

Good practice points:

In general patients with prosthetic heart valves and coronary stents should **not** have anticoagulant or antiplatelet agents discontinued for cataract surgery. [A]

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Continuing warfarin for routine cataract surgery **is recommended**. The international normalized ratio (INR) must be checked and the INR should be within the range that is determined by the condition for which the patient is being anticoagulated. [B]

Patients who self medicate or receive prescribed low dose aspirin may have a slightly increased risk of haemorrhage but the benefit to be derived from stopping aspirin is, at best, questionable. It is therefore recommended that low-dose aspirin should **not** be stopped prior to cataract surgery under LA. [B]

Patients on clopidogrel, dipyridamole or combinations of these with aspirin are usually on these drugs for sound medical reasons. Withdrawal of the drugs in these circumstances may lead to dangerous thromboembolic events. It is therefore recommended that these drugs should **not** be stopped. [B]

Evidence is lacking to allow a firm recommendation to be made with regard to technique. In particular, a recommendation for sub-Tenon‘s block over needleblock **cannot** be supported by weight of evidence at this time. [B]

The use of short (less than 25mm) needles may be inherently safer but there is as yet no published evidence to support this. If appropriate, topical-intracameral local anaesthetic or topical alone is a safer alternative than needle or subTenon‘s block by cannula with regards to haemorrhagic complications related to anaesthetic technique.

For operations on patients unsuitable for topical or topical-intracameralanaesthesia, the risk/benefit of a needle or cannula technique versus general anaesthetic must be considered individually for each patient*

If indicated, a fresh INR result should be obtained on the day of surgery, prior to anaesthetic /surgical intervention *

In general, whenever there are any specific concerns (e.g. complicated surgery, only eye surgery) there should be discussion between anaesthetist, surgeon and patient (and where appropriate, the patient‘s cardiologist) regarding the risks and benefits of continuing anticoagulants and antiplatelet drugs to agree an acceptable approach*

Patients on combination of anticoagulants or antiplatelet drugs:

Some concern may be raised on the use of combination antiplatelet drugs such as low dose aspirin combined with clopidrogel in patients with acute coronary syndromes. In a single case report Davies et al reported extensive intraoperative hyphaema and vitreous haemorrhage following peripheral iridectomy (after lens phacoemulsification) in a 76 year old patient on aspirin and clopidrogel.(16)The authors suggested stopping clopidrogel for a week and continuing aspirin inorder to decrease intraoperative bleeding in patients on combination therapy undergoing cataract surgery.

Barequet et al assessed the incidence of intraoperative and postoperative bleeding in

63 patients on coumadin derivatives (warfarin) who underwent phacoemulsification for uncomplicated cataract under topical anaesthesia in a nonrandomised prospective case series.(17)The patients had a mean INR of 2.03.

Nine of these patients(14.3%) were also receiving antiplatelet drugs. Only 4 patients (6.3%) with a mean INRof 2.13, developed minor postoperative bleeds which cleared within a week and did not affectvisual acuity. No significant intraoperative bleeding was reported.

In another review by Kobayashi, the incidence of intraoperative and postoperative haemorrhagic complications were observed in patients on warfarin, aspirin or both who underwent phacoemulsification under subTenon's anaesthesia.

(18)In 182 patients the above drugs were discontinued 1 week prior to surgery whereas in 173 patients the warfarin/aspirin were continued (maintenance group). The authors reported a slightly higher incidence of the subconjunctival haemorrhage (4%) in the maintenance group as compared to the discontinuation group (2.5%). However, no difference in intraoperative, postoperative haemorrhagic complications or visual outcome was observed.

In a recent review specifically for patients on combination therapy, Barequet et al studied the intraoperative and postoperative complications in 40 patients, with a mean age of 72 years who were on combination warfarin and aspirin or clopidrogel therapy and underwent phacoemulsification under topical anaesthesia.(19)

No intraoperative or postoperative (upto 1 week) haemorrhagic complications were observed in these patients nor wereany thromboembolic events reported.

The authorsopined that in patients at high risk of thromboembolic events, phacoemulsification for uncomplicated cataract could be safely performed under topical anaesthesia without stopping the combination therapy.

Glaucoma surgery:

Perioperative anticoagulation has to be carefully considered in glaucoma surgery as even minor haemorrhagic complications can result in high intraocular pressure and surgical failure.

Cobb et al (20) retrospectively studied the risk of haemorrhagic complications and surgical outcomes in patients on aspirin or warfarin undergoing trabeculectomy. Of 367 patients studied, 55were on aspirin and 5 were on warfarin. All surgeries were performed under peribulbar or subtnon's block. Patients on aspirin had an increased risk of hyphaema (twice the risk compared to controls), though it did not affect short term or long term IOP or the surgical success (defined as intraocular pressure (IOP)<21 mmHg and an IOP <16 mmHg at 2 years) following the trabeculectomy. Patients on warfarin(INR 1.5 to 4.5),however, had haemorrhagic complications (all 5 patients had hyphema) after trabeculectomy which led to failure of the surgery. In 2 patients the hyphaema had to be surgically drained. One of the patients on warfarin developed

periorbital hematoma following a peribulbar block.The authors concluded that aspirin is safe but warfarin must be used with caution inpatientsundergoing glaucoma surgery.

In a retrospective case control study, Law et al (21) observed a higher rate of haemorrhagic complications (10.1% vs 3.7%), in 347 patients on antiplatelet/ anticoagulation therapyas compared to 347 controlsundergoing trabeculectomy. Patients on anticoagulants had a higher rate of haemorrhagic complications than patients on antiplatelet agents (22.9% vs 8.0%,P = 0.003). The authors found that perioperative anticoagulants and raised IOP are potential risk factors for developing haemorrhagic complications in patients undergoing glaucoma surgery. Discontinuation of anticoagulant therapy prior to surgery or use of antiplatelet drugs alone was associated with lower risk of these complications.

Vitreoretinal surgery:

Narendran et al (22) examined the effects of anticoagulation on vitreoretinal surgeries. Five hundred and forty one consecutive patients were enrolled in the study, of whom 60 were taking aspirin and 7 were taking warfarin. Choroidal haemorrhage occurred in one of the patients on warfarin. Two patients on aspirin and two on warfarin had preoperative vitreous hemorrhage. Rebleed was observed in 1 patient who underwent vitrectomy for diabetic vitreous hemorrhage. The association of warfarin with bleeding was statistically significant. (P = 0.01, relative risk 6.185).

The authors concluded that aspirin had little effect on bleeding during vitreoretinal surgery though warfarin was associated with significant bleeding complications. Warfarin should be discontinued after discussing with the patients cardiologist/ physician provided the risk of thrombo-embolism is low.

Dayani et al evaluated the risk of haemorrhagic complications in 1,737 consecutive patients undergoing vitreoretinal surgery in whom in 54 patients warfarin was continued in the intraoperative period.(23) The patients were sub divided into 4 groups-group S or subtherapeutic with an INR value1.2-1.49, group B or borderlinewith an INR value1.5-1.99, group T or therapeutic(INR value 2-2.49), group HT or highly therapeutic (INR value>2.5). No patients experienced intraoperative anaesthesia related or hemorrhagic complication. Four procedures were complicated by postoperative haemorrhage – 2 patients (7.7%) were from the sub-therapeutic group and 2 (16.7%) from the highly therapeutic group.

The haemorrhages resolved with conservative treatment. The authors opined that patients can safely undergo vitreo-retinal surgery while maintaining therapeutic warfarin levels.

Fu et al reviewed the clinical course of 25 patients receiving warfarin and undergoing vitreoretinal surgeries (24). The INR ranged from 1.5 – 3.1. Only one patient who underwent scleral buckling and external drainage of sub-retinal fluid had an intraoperative subretinal haemorrhage. No intraoperative complications occurred in the other patients. The authors opined that it was safe for patients on warfarin to undergo vitreo retinal surgery without stopping the drug.

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Chauvaud et al (25) studied the incidence of haemorrhagic complications in 60 patients on anticoagulation therapy undergoing vitreoretinal surgery under subTenon's anaesthesia.

Twenty-two patients (36.7%) were treated with vitamin K antagonists and 38 (67.3%) with antiplatelet agents (clopridogel or aspirin).

Only one patient who underwent a major procedure for complicated retinal detachment had an intraoperative subretinal haemorrhage requiring retinectomy. The author suggested that no change in ongoing anticoagulant therapy is required for patients scheduled for vitreoretinal surgery.

Herbert et al in a case series of four patients on a combination aspirin - clopidrogel or dipyridamole reported intraoperative uncontrolled bleeding in 3 patients (2 intraocular, one extraocular) undergoing vitreo retinal surgry.

(26) They felt that the combination antilpatelet therapy could be responsible for the intraoperative haemorrhage as well as the presentation of bilateral vitreous haemmorhage observed in one patient.

Oh et al (27) carried out a retrospective observational study (during 3 intervals in 1994,2004 and 2008) to evaluate practices regarding the use of antiplatelet and anticoagulants in patients undergoing vitreoretinal surgeries. The incidence of bleeding was higher (20.0%) in the patients who did not suspend antiplatelets than in those who did (9.6%) (P = 0.05). Anticoagulant use was associated with intraocular hemorrhage on first postoperative day after vitrectomy. (P = 0.03)

The authors concluded that the use of anticoagulants was associated with a higher, though not serious, risk of intraocular haemorrhage compared to antiplatelet agents.

In another review Chandra et al retrospectively compared perioperative haemorrhagic complications in 60 patients onwarfarin undergoing pars plana vitrectomy with 60 controls.(28) Suprachoroidal haemorrhage occured in 2 patients in the control group while none in the warfarin group.Twelve patients with rhegmatogenous retinal detachment (RRD) presented with vitreous haemorrhage compared with 4 in the control group (p =0.04). The authors concluded that though there was norisk of intraoperative haemorrhagic complications with warfarin, patients with RRD were more likely to present with vitreous haemorrhage if they were on warfarin. In a online survey performed in UK, the authors also reported that 81% ophthalmologists preferred to stop warfarin prior to vitreo retinal surgery.

In a comprehensive article Tan et al have done an extensive literature review on haemorrhagic complications with antithrombotic therapy in patients undergoing vitreoretinal surgery and also studied the systemic effects resulting from the discontinuation of these drugs.(29) They concluded that at present evidence points towards continuing perioperative anti thrombotic drugs during vitreo retinal surgery. Even dual therapy should be continued as patients at high risk of thrombo-embolic events can develop life threatening complications if the drugs are discontinued.

If the therapy needs to be discontinued, risks of the same should be discussed with the patient's cardiologist. According to the authors, introduction ofsmaller (23 and 25G) vitrectomy probes, use of newer intraocular agents e.g. vascular endothelial growthfactor and topical anaesthesia wouldcontribute to decreasing the risk of haemorrhagic complications in vitreo retinal surgery.

Conclusion:

Phacoemulsification is the most commonly performed surgery for cataract in adults, and is nowadays commonly done under subTenon's, peribulbar or topical anesthesia. Though there is no recommendation at present favouring a particular technique over another for cataract surgery, topical anesthesia with the least risk of hemorrhagic complications should be preferred in patients on anticoagulants/ antiplatelet drugs. The continued use of antiplatelet and anticoagulants is associated with minor ocular complications, not eye threatening haemorrhage.

Anticoagulants and increased intraocular pressure are identified as potential risk factors for haemorrhagic complications in patients with glaucoma undergoing trabeculectomy surgery. Available literature on the risk of bleeding in patients undergoing glaucoma surgeries points towards a higher risk of haemorrhagic complications in patients on anticoagulants (warfarin) as compared to those on antiplatelet drugs (aspirin, clopidrogel).

In patients undergoing vitreoretinal surgery the consensus is to continue with the antiplatelet drugs and anticoagulants in the perioperative period.

Some authors however report higher incidence of local haemorrhagic complications with warfarin as compared to antiplatelet drugs.(22,27)

To conclude patients at high risk of thrombotic events while undergoing eye surgery should continue antiplatelet drugs and anticoagulants in the perioperative period considering the minor risk of ocular haemorrhagic complications as compared to the life threatening thrombosis associated with discontinuing these drugs. However, decisions must be made on a case to case basis by the cardiologist, ophthalmic surgeon and anaesthesiologist, depending on the surgery being performed and the risks associated with stopping these drugs in the perioperative period.

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Anaphylactic shock during Fundus Fluorescein Angiography (FFA) – Case report

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A 56 year old male was advised Fundus Fluorescein Angiography (FFA) after being diagnosed as Proliferative Diabetic Retinopathy (PDR) with macular ischemia in both eyes. He was a known diabetic and hypertensive on oral medications and apart from a surgery for cervical cord compression 2 years ago there was no history of any other medical illness or allergy. He had already undergone FFA, elsewhere two years ago where he was diagnosed to have PDR in both eyes. No adverse events were recorded during the procedure.

After the protocol serological and clinical systemic evaluation, patient was posted for FFA. Renal function tests were normal. Serum cholesterol and HbA1c levels were 242mg% and 7.2% respectively, all other serological tests were normal. Vital parameters were examined before the procedure and he had a Blood pressure of 140/90mm of Hg and pulse rate of 70/minute. After obtaining the consent from the patient and the relatives, the procedure commenced with intravenous administration (22G, IV cannula, CATHULA) of 3ml of 20% Flourescein over 10 seconds.

Until the 60 second fundus photographs, patient did not complain of any discomfort but after the 90th second of the injection, patient experienced nausea and giddiness and with in no time, he collapsed in the chair expressing his difficulty in breathing. Doctor who was performing the procedure recorded the vitals while the staff nurse announced code blue. 3 members of the team which included one Anesthesiologist reached the spot in 30 seconds.

Patient's pulse and blood pressure (BP) were not recordable and he stopped breathing. Cardio pulmonary resuscitation (CPR) was initiated. Injection Adrenaline 0.5ml s/c was given (IV line had slipped out in the initial struggle).100% oxygen was given by face mask and IV cannula was again started. Two more doses of injection Adrenaline (1mg IV) were given and intra venous Ringer lactate was administered rapidly. As it was a witnessed arrest, the first few chest compressions brought back the pulse and respiration. The BP came up to 90/60mm of Hg and pulse rate was 126/minute with an oxygen saturation of 98%.

Once the patient became stable, he was shifted to the nearby multi specialty hospital for further management. He was investigated for coronary events with ECG, ECHO, Trop T followed by a Tread mill test, the next day. The investigation ruled out the possibility of a myocardial infarction.

Anaphylaxis is diagnosed based on clinical criteria.9 When any one of the following three is true there is a high likelihood of anaphylaxis:9

1. Symptom onset within minutes to several hours with involvement of the skin or mucosal tissue plus either respiratory difficulty or a low blood pressure.
2. Any two or more of the following symptoms within minutes to several hours of allergen exposure: a. involvement of the skin or mucosa b. respiratory difficulties c. low blood pressure d. gastrointestinal symptoms
3. Low blood pressure within minutes to several hours after exposure to known allergen

In a vasovagal attack, stimulation of the vagus causes slowing of the heart rate, and if sufficient can cause fainting or even cardiac arrest. Usually when this happens, the ventricles start beating on their own despite continued vagal stimulation. Since he was pulseless and had stopped breathing, and reverted only after cardiac massage and adrenaline, we concluded that it was an anaphylactic shock

Though adverse events like myocardial infarction1 and utricaria are reported in the past, an anaphylactic shock during the second FFA procedure with the first one being uneventful is extremely rare. Authors report frequencies of urticaria between 0.5% and 1.2 %(2, 3, 4) and of respiratory distress between 0.02% and 0.1 %(3, 5, 6). Such reactions can be explained by different pathophysiologic mechanisms; however they are probably of the anaphylactoid type, characterized by independent IgE mechanisms that involve direct activation of mast cells, activation of complement system and alterations in arachidonic acid metabolism (7, 8).

This case is an example for the necessity of emergency resuscitation support system for all angiography procedures even if the previous ones were uneventful.

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Syndromes for anaesthetic implications in Paediatric cataract and Squint: Unraveling the Gordian's knot

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The majority of the surgeries performed in Paediatric Ophthalmology include cataract removal and strabismus (squint) correction. Cataract is one of the main causes of global blindness and low vision in children.1 Congenital cataracts are responsible for about 10% blindness among children worldwide. Cataract in children may be present at birth (congenital cataract) or may appear anytime during the first few years of life (developmental cataract). Globally 20,000-40,000 children are born each year with congenital cataract2 and the incidence of childhood cataract has been reported as 1-15/10,000 live births.3,4

Chilhood cataract is the most common treatable cause of childhood blindness. Cataracts in children can be isolated or can be associated with myriad systemic conditions, including chromosomal abnormalities; craniofacial, mandibulofacial, and skeletal syndromes, metabolic disorders; congenital infection; dermatologic, CNS, musculoskeletal or renal disease.5 The only treatment option available is surgical removal of the lens material.

The squint may be the first sign of a serious ocular or systemic disorder, and yet it is also one of the most common ocular conditions of childhood.6 It can be isolated defect or can be associated with other medical conditions like myopathies, myasthenia gravis, brain stem disorder, cranial nerve palsies, jaw deformity with weak neck and chest muscles (Mobius syndrome)6 etc. High incidence of strabismus have been reported in children suffering from cerebral palsy.7

Thus in Paediatric Ophthalmology anaesthetizing children for the above conditions is a challenging task for an anaesthetist. An investigation of the causes of the disease is necessary for a correct pre-operative assessment if either cataract or squint is associated with systemic disease and the anaesthesiological evaluation will be more specific in relation to the main disease. During preoperative evaluation of children presenting with congenital / developmental cataract or squint, an anaesthetist should perform a thorough examination of all these systems, order for appropriate investigations and liaise with specialists like cardiologists, neurologists, endocrinologists etc when appropriate. In tertiary eye care centre, specific investigations like echocardiography, CT/MRI brain etc and specialists' opinion can be obtained easily. But when these surgeries are performed in primary and secondary eye care centre its very difficult for an anaesthetist to get these opinion and investigations done. For safe anaesthetic practice, it is important for the anaesthetist to be aware of the conditions mentioned, syndromes and their anaesthetic implications. Thus the main aim of the article it to highlight some of the syndromes associated with the paediatric cataract and squint with anaesthetic implications.

In inherited cataract subtypes there are numerous syndromes with associated systemic involvement of anaesthetic implications, see Table 1 below and it is highly important for an anaesthetist to know these beforehand for better management.

Associated systemic disorders	**Metabolic disease** (examples)	Galactosemia Galactokinase deficiency G6PD deficiency Fabry disease Mannosidosis Refsum sd Wilson disease Hyperferritinemia
	Musculoskeletal disease (examples)	Chondrodysplasia punctata Myotonic dystrophy Albright hereditary osteodystrophy Stickler sd Robert sd Nance-Horans sd
	Central Nervous system disorders (examples)	Marinesco-Sjogren sd Sjogren sd Meckel sd Neurofibromatosis
	Central Nervous system disorders (examples)	Marinesco-Sjogren sd Sjogren sd Meckel sd Neurofibromatosis
	Connective tissue disorders (examples)	Marfan Sd Homocystinuria Ehlers-Danlos sd Weill-Marchesani sd
	Craniofacial malformations	Hallermann-Streiff sd Rubinstein-Taybi sd Smith-Lemli-Opitz sd Marshall cd Cerebro-oculo-fascial-skeletal sd
	Renal	Lowe sd, Alport sd
	Dermatological	Cockayne sd Rothmund-Thomson sd Block-Sulzberger sd Ichthyosis
	Chromosomal anomalies	Numerical anomalies	Trisomy 8, Patau sd Edwards sd, Down sd, Trisomy 22, Monosomy 21, Turner sd, Triploidy
		Structural anomalies	Deletion of 2q, 3q, 4p, 5p, 13 q, 18p, 18q Duplication of 2p, 3q, 5p, 9p, 10q, 15q

References: http://www.ncbi.nlm.nih.gov/sites/entrez?db=omim)
sd: syndrome

The table 2 below shows some of the syndromes associated with congenital cataract and squint with systemic involvement of anaesthetic implications:

Table 2

For cataract

Syndrome	Systemic involvement	Anaesthetic implications
Patau syndrome	Mental and motor dysfunction	Delay in recovery from anaesthesia
	Microcephaly, cleft palate	Difficult airway/intubation
	Septal defects (Ventricular Septal defect, VSD)	Sudden haemodynamic imbalance
	Kidney defects	Delay in recovery from Anaesthesia

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Syndrome	Systemic involvement	Anaesthetic implications
Edward's syndrome	Structural defects in heart – VSD, ASD, PDA	Sudden haemodynamic imbalance during Intubation/extubation can occur
	Microcephaly, cleft lip/palate Micrognathia, prominent occiput	Difficult airway/intubation
	Mental retardation, development Delay, arthrogryposis	Might cause delay in recovery from anaesthesia
Down syndrome	Microgenia, macroglossia, Short neck, atlanto-axial joint instability	Difficult airway/intubation
	Mental retardation, muscle Hypotonia, hypothyroidism Congenital heart disease VSD	Delay in recovery from anaesthesia
Turner syndrome	Coarctation of aorta, Aortic valve, partial anomalous Venous drainage, aortic valve Stenosis or regurgitation	Sudden haemodynamic instability bicuspid Sudden haemodynamic disturbances
	Short webbed neck, micrognathia Scoliosis	Difficult airway/intubation airway problems
	Restrictive Renal defects	Hypertension, delay in recovery

For squint		
Syndrome	**Systemic involvement**	**Anaesthetic implications**
Apert syndrome	High arched palate, mandibular Prognathism, crowding of teeth Midface hypoplasia	Difficult larnygoscopy / intubation Difficult in ventilation
	Cranialsynostosis, increased Intracranial pressure	Intracranial pressure could raise further during stress
Noonan syndrome	Pulmonary valvular stenosis, ASD/ VSD, Cardiomyopathy	Congestive cardiac failure
	Scoliosis, pectus excavatum	Restrictive airway problem
	Hypotonia	Delay in recovery
	Short webbed neck, micrognathia	Difficult intubation
	Bleeding diathesis	Abnormal / uncontrolled Bleeding at surgical site
Incontinentia Pigmenti	Cerebral atrophy, hypotonia, mental retardation, seizures, dilated ventricles	Might lead to delay in recovery

Hence with this article, in future, if a child is presenting with any of the above congenital abnormalities, then in their pre-anaesthetic evaluation, anaesthetist would have a high suspicion of the commonly prevalent diseases or syndromes in our population. This can be utilized by health care professionals in primary and secondary care centre for better management of syndromic patients

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Anaesthetic Challenges During Paediatric Ophthalmic Surgery.

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Introduction:

During paediatric eye surgery, success of each surgical step is dependent on anaesthesia which is the foundation for a successful surgical procedure. If anaesthesia is properly performed, the child will be comfortable and still, and the surgeon will be able to examine the eye comfortably for the first time and enables one to accomplish the goals of the procedure up to satisfaction. In that way, the child may perhaps escape from blindness that was looming large. Children undergoing paediatric surgical procedures pose many challenges to the Anaesthesiologist. These challenges mainly come from the differences or peculiarities in paediatric ophthalmic anaesthesia. They are : (1). Anatomical, (2). Physiological, (3). Psychological, (4). Associated involvement of Central and Autonomic nervous system, Cardio-respiratory system, Neuromuscular and endocrinal system; (5). Associated developmental anomalies and various syndromes that may pose certain specific problems like different motor and visual milestone, difficult airway management, abnormal response to muscle relaxants etc. (6), non-availability of appropriate paediatric ophthalmic pharmacological preparations or formulations. Where, medication dosage within narrow therapeutic ranges must be carefully observed, particularly in infants. (7). Possibility of repeated anaesthetic exposure during the course of the therapy. The anaesthesiologist who encounters these special children with different ophthalmic conditions should have a comprehensive knowledge of ocular pharmacology, physiology, and expected altered responses to anaesthesia.

Further, such a situation demands, technical expertise, and physician – parent sensitivity. The success of such an endeavour depends on a team approach where the participants are paediatric ophthalmic anaesthesiologist, surgeon, neonatologist, paediatrician as well as specialists in the field of paediatric cardiology, endocrinology and paediatric and neonatal intensive care. The anaesthesiologist would face these children as ambulatory in the radiology, MRI, CT, cardiac catheterisation laboratory, radiotherapy room, laser room, or even at the causality ward where the violation of preoperative feeding instructions are common. The inpatients comes from neonatal ICU, paediatric ward. These children with visual disability are extremely hypersensitive and hyperactive because of the associated insecurity and lack of confidence that would otherwise come with normal visual capabilities. It will be an exception to find the parents who are equally apprehensive, confused, more often the restless that makes them to wonder seeking the opinion from the various quarters while losing the precious time and financial resource.

In the process of paediatric ophthalmic anaesthesia, one must be cognizant of the fact that the alien environment of the operation theatre with separation from parents may provoke uncontrolled anxiety and agitation in the most co-operative child, thus compromising the surgical situation.. General anaesthesia in the paediatric population requires the ophthalmologist to have a mindful understanding of the anaesthesia procedures used.

Anaesthetic Challenges During Paediatric Ophthalmic Surgery.

The paediatric ophthalmic anaesthesiologist should document any untoward response during anaesthesia in the medical records and also mention the same in the discharge summary which would become a reference point when the child has to undergo subsequent ophthalmic procedure. Anaesthesia in the paediatric age group begins the moment the family enters the ophthalmologist's office. The setting should be pleasant to both parents and child and provide an atmosphere of comfort and confidence. The child should be allowed as much autonomy as possible during the examination and given choices whenever possible. The child must be treated as an active member of the care team, regardless of age, and reference to the child in the third person should be avoided. Patients should be encouraged to ask questions and be given the opportunity to speak with the anaesthesiologist. They can be reassured that the morbidity rate associated with elective ophthalmic procedure is extremely low.

Children must be evaluated by a paediatrician once a decision to perform surgery under general anaesthesia has been made. The examination should take place within 2 weeks of surgery because a child's health status may change suddenly. The evaluation is designed to identify the risk factors that may compromise the outcome, determine the presence of acute or chronic co-morbid conditions, and determine whether the child is healthy enough to undergo the planned procedure.

Attention to recent exposure to infectious disease is an essential component of the history. A child with a runny nose and no other systemic symptoms may suffer from allergic rhinitis. Although excessive secretions secondary to this condition may complicate general anaesthesia, it is not a contraindication to surgery. If antihistaminics are being used before surgery, they should be continued until the day of surgery. Surgery on a patient with a history of exposure to infectious agents such as chickenpox within the prior 3 weeks and strep throat within 3 to 5 days probably should be postponed. Other systemic symptoms such as high temperature, lethargy, anorexia, purulent rhinorrhea, or productive cough must suggest the presence of a more serous infection, and surgery should be postponed until symptoms are resolved.

In general, the infant or young child is best managed under general anaesthesia with surgery performed early in the day. Issues to be considered in children include history of ocular abnormalities, with possible systemic associations, such as seen in Down's, Goldenhar's, Marfan's, Lowe, Riley-Day, or Sturge-Weber syndrome, or myotonic dystrophy, Sockle cell anaemia, Homocystinuria as well as a history of asthma, sleep apnoea. Good practice includes establishing rapport with the child and its parents and to make the separation least traumatic. A heightened state of attentiveness and preparedness is appropriate in the operation theatre. When caring for congenital conditions such as cataracts or glaucoma, it must be borne in mind that infants born prematurely are at higher risk for postanaesthetic apnea.

This situation persists at least 4 to 6 and possibly up to 60 weeks of postconceptual age. One should be aware of the possibility of apnea during the post operative period after instillation of â blocker eye drops [Timolol] in these children with infantile and juvenile glaucoma. When possible, surgery should be delayed. If delay is deemed inadvisable, overnight admission to a facility like paediatric ICU with appropriate monitoring and support service is recommended.

I O P and Anaesthesia:

The intraocular pressure [IOP] is kept higher than that of tissue pressure to maintain the optical properties of the refracting surfaces of the eye. Any abnormal increase in the intraocular pressure damage the cornea, retina and other vital structures of the eye which may lead to the loss of vision unless appropriate measures are instituted on an emergency basis. Likewise any sudden accidental opening of the globe will result in rupture of vessels, haemorrhage, loss of vitreous, prolapse of the lens and iris. Hence it is mandatory to control and maintain an appropriate intraocular pressure during surgery and anaesthesia. During any surgical procedure on the eye, any intraocular pathology of the eye, alterations in the size of the pupil, ophthalmic medications, depth of anaesthesia, end tidal carbon dioxide level, tone of extra-ocular muscles, muscle relaxants, at the time of airway instrumentation (laryngoscopy and endotracheal intubation), hydration, retching , bucking and during nausea and vomiting would increase the intraocular pressure.

It is important to note that at the time of estimation of the intraocular pressure by a tonometer, the anaesthesiologist should not keep the child at a deep level of anaesthesia by administering a higher concentration of halothane.

Infantile or Juvenile Glaucoma: This is a congenital or developmental abnormality where there will be an obstruction to the outflow of aqueous humor. The list of surgical procedures that are conducted to establish an alternative route includes Trabeculectomy, Iridectomy, peripheral Iridoplasty, or laser Geniosynechiolysis, Filtering procedures, Cyclocrotherapy and Cyclo Photocoagulation etc. It is recommended to conduct the preoperative evaluation of these children about one to two weeks before the scheduled date of the proposed surgery. In addition. A full list of current ocular and systemic medication must be made available at the time of preoperative evaluation. Echothiophat iodide and demecarium bormide , occasionally used for control of IOP, may deplete plasma cholinesterase levels. This enzyme hydrolyses succunylcholine and ester-type local anaesthetics, and lack of psuedocholinesterase may lead to prolonged muscle relaxation and respiratory depression if these anaesthetics are used. It can take as long as 6 weeks for pseudocholinesterase levels to return to normal after discontinuing these drugs. In addition these children with a high intraocular pressure may be put on intravenous hypertonic solutions like Mannitol, Dextraon, Urea, Acetazolamide(Diamox).

One should exercise caution while administering the hypertonic solutions that may induce an acute plasma volume expansion in a child with a compromised cardio-respiratory reserve. Likewise. Diuresis after the administration of drugs like Diamox and Mannitol can result in hyponatremia, hypokalemia, metabolic acidosis that may in turn induce cardiac arrhythmias.

Laboratory work should include a complete blood count, serum electrolytes, and an ECG in children with CVS involvement. The effect of medications used in general anaesthesia on IOP is especially important in infants and children undergoing diagnostic or follow-up examination under anaesthesia, in which accurate determination of IOP is relevant and essential. Minute doses of combination of Intramuscular ketamine, fentanyl or pentozocin [fortwin], midazolam and glycopyrrolate taken in a tuberculinor insulin syringe is the anaesthetic of choice for general anaesthesia without intubation and without the fear of respiratory depression. It is prudent to avoid atropine in any form. The depolarising muscle relaxant succinylcholine raises IOP at least by 8 mm Hg and that lasts about four minutes. Mechanism : (1). this agent causes extraocular muscle tonic contraction in the depolarization phase of anaesthesia, (2). Relaxation of orbital smooth muscle, (3). Choroidal vascular dilatation, (4). Cycolplegic action and (5). Systemic hypertensive effect. Thus it should be avoided in childhood eye diseases and cases of suspected ocular trauma.

This increase in IOP effect may be blunted by deeper anaesthesia, or the preoperative use of acetazolamide, nifedipine, â-blockes, magnesium, or precurarisation or self taming or priming technique. Other than succnylcholine and possibly ketamine, nearly all the other general anaesthetic agents either lower IOP or have a minimal effect on it. All inhalation anaesthetics reduce IOP and most central nervous system depressants have a similar effect. This is theorized to be secondary to depression of brain centers, which maintain extraocular muscle tome. The intravenous anaesthetics, propofol, thiopental, and etomiodate reduce IOP. Narcotics. Benzodiazepins [Midzolam], Dexmeditomidine, Droperidol, Colnidine, Ganglion blockers and hyperventilation also lower IOP approximately 10 to 15%. In contrast to succinylcholine, the nondepolarising muscle relaxants reduce IOP. It is questionable as to whether Nitrous oxide has any effect at all on IOP. One should consider administration of peribulbar block at the end of the surgery so as to facilitate a smooth extubation and recovery from anaesthesia. This procedure will lessen the complications at the end of the surgery like excessive thrashing, bucking, restlessness that would in turn increase the intraocular pressure. Most of these children do not like their eyes bandaged and may create unforeseen problems unless they have been counselled before.

Besides direct drug effects, a number of other factors may influence IOP. Physiologic factors, including a marked elevation of heart rate or systemic arterial pressure, can cause an increased IOP.

Anaesthetic Challenges During Paediatric Ophthalmic Surgery.

Hypercarbia and hypoxia resulting from hypoventilation during anaesthesia may cause IOP elevation. Whereas the opposite situation leads to a lowering of IOP by diminishing choroidal blood flow through vasoconstriction of the precapillay arterioles.

Manoeuvres that increase central venous pressure, such as keeping the child in Trendelenburg position, coughing, straining, or vomiting, may raise episcleral venous pressure by as much as 35 mm. Hg. Any airway instrumentation like endotracheal intubation and to a certain extent following the insertion of laryngeal mask airway results in an increase in arterial blood pressure and heart rate. General anaesthesia is not without ocular complications because it has been implicated in delayed subarachnoid hemorrhage [SCH] when post intubation increase in episcleral venous pressure occurs. Elevated venous pressure resulting from bucking, retching, vomiting or a Valslava manoeuvre is also a particular threat.

Eye Injuries :

Penetrating ocular trauma in children presents perhaps the most challenging clinical situation in anaesthetic management. Usually the victims are of school going age, sharp objects like pencil is the common object that causes the penetrating type of trauma. Otherwise sports related injury is also common in school going age where blunt injury to the globe by a speeding ball is a common occurrence. Other types of injury in children may be occupation related injury or accidental penetrating injury during “Deepavali” or the festival of lights is a common occurrence.

The common occurrence is a “Aeroplane” a high speed flying rocket hitting the eye of a bystander with full force. Under such circumstances, two important issues are often in conflict: the stomach is full and aspiration of gastric contents is a real danger, and eye is open and in need of repair with threatened extrusion of intraocular contents. Surgery often cannot be delayed up to 6 to 8 hours that is needed for gastric emptying, but many manoeuvres used to prevent aspiration can significantly elevate the intraocular pressure with an increased risk of further trauma to the already injured globe. Regardless, the anaesthesiologist should be informed of the existence of an open globe, and the need for general anaesthesia. The classic teaching followed for ocular surgery; succinylcholine is with held in the setting of an open globe. This teaching has been seriously challenged on several fronts. First, elevation in intraocular pressure {IOP} is not clinically significant and does not cause extrusion of intraocular contents or change the eventual visual outcome. Secondly, with proper pre-treatment no elevation in IOP is observed following the administration of succunylcholine. Thus, it can be used with little or no risk to the globe. With careful selection of a safe protocol general anaesthesia in these children with traumatic injury could be smooth and uncomplicated.

Neuro-ophthalmic Reflexes :

OculoCardiac Reflex :.

Oculocardiac reflex can be seen in the setting of local or general anaesthesia, but it is more common in the latter setting owing to an alteration in vagal tone associated with anaesthesia.

This reflex, resulting from ocular manipulation, traction on extraocular muscles {especially medial rectus muscle} as well as on the orbital tissue, pressure on the globe or empty orbit {pressure on the stump of the optic nerve},a tight fitting speculum, is characterised by cardiac arrhythmias, including a range from bradycardia, asystole, and ventricular dysrhythmia as well as nausea and faintness. A similar picture can be seen after stretching of the muscles of the eyelid or cold irrigation of the eye. The afferent limb of the reflex is mediated through the trigeminal nerve. The efferent limb of the reflex is through the brain stem to the visceral motor nuclei of the vagus nerve and then to the heart. This reflex in the form of ominous refractive broad spectrum of ventricular dysrhythmia is particularly common in children and the reported incidence ranges from 10 to 82%. Strabismus patients not pretreated with atropine have a reported 90% incidence. Effective treatment of the reflex has been reported with the use of intravenous atropine or glycopyrrolate. ECG monitoring is recommended during retinal detachment surgery. When the bradycardia appears on the screen, cessation of the traction or surgical manipulation will restore a normal rhythm.

The use of atropine in premedication has no effect on the incidence of bradycardia because much higher doses are required to guard against it. The afferent limb of the reflex can be blocked by a retrobulbar block. Ventricular arrhythmia may require intravenous lidocaine. If the reflex is persistent or recurrent, a peribulbar infusion of 1 to 3 ml. Of 2% lidocaine or a retrobulbar injection may block the afferent limb of this reflex.

OculoRespiratory reflex :

Brady-apnea that is common in premature infants and has been already dealt with.

OculoGastric reflex:

Post operative nausea and vomiting is the most common reason for readmission or not able to discharge the child after ambulatory strabismus surgery or any other ophthalmic surgery. Postoperative nausea and vomiting complicates 40 to 85% of cases without attempt at prophylaxis. Some studies have shown that preoperative droperidol or metoclopramide given before the surgery dramatically reduces the incidence of emesis compared to controls. Propofol, is associated with less postoperative emesis and faster recovery in older children. Factors, that may contribute to postoperative nausea, such as pain, intra-operative muscle manipulation, increased intraocular pressure, narcotics, and post operative movement, should be kept to a minimum. The oculogastric reflex has been implicated by some researches as a possible cause.

It has been suggested that patients not be forced to consume fluids because of this may increase nausea. The repeated or continuous irrigation of the conjunctival sac during surgery allows the irrigation fluid to find its way to the stomach and may initiate nausea. It is a good practice to pass a suction catheter and clear the stomach as well as the nasopharynx before extubation. Along with various congenital abnormalities one should also anticipate and prepare for obstructed or difficult airway in these children.

Use of preformed angled endotracheal tube such as Rae's tube, is an ideal endotracheal tube during ophthalmic surgery .

Ophthalmic Drugs :

Unfortunately the paediatric formulation of routinely used ophthalmic drops are not available and one has to dilute the drug before instillation. These ophthalmic drops when instilled in the eye it will find its way into the nasal mucosa which is highly vascular ie it is as good as an intravenous administration. Hence it is recommended to use diluted drug, use not more than two drops and while instilling the drops, the medial canthus is compressed with a cotton bud to prevent it being entering the nasopharynx. The other recommended method is to turn the head laterally so as to drain away any excess drug which could be easily wiped out.. Topical miotic drugs or acetyl choline derivatives may induce branchospasm, salivation, bradycardia and hypotension. Likewise echothiophate iodide which is a long acting anticholinesterase drug used in children with glaucoma will prolong the action of suxamethonium indefinitely.

Mydriatic agent like cyclopentolate may induce CNS dysfunction in infants and children It is recommended to dilute the drug to 0.5 to 1% and restrict it to 2 drops in each eye. Epinephrine is other mydriatic agent that is extensively used in open angle glaucoma induce marked cardiovascular response like tachycardia, hypertension and dysrhythmias. It is recommended to use diluted solution of 2.5% and one drop per hour.

Day care procedures :

Examination under anaesthesia, probing and dilatation of the lachrymal duct, chalajion, laser indirect ophthalmoscopy, procedures etc are treated routinely under general anaesthesia as a out patient procedure. The premature infants with retinopathy of prematurity from the neonatal ICU scheduled for laser procedures are carried out under monitored anaesthesia care. All these day care procedures are scheduled in the morning hours of the day and the starvation period is kept to a minimum. Oral or parenteral atropinisation is advocated in these children to prevent the occurrence of bradycardia as a result of the pressure on the eye ball. The baby is allowed to suck on a gauze soaked in sugar solution during the procedure.

Summary :

Anaesthesia for the ophthalmic procedures in children demands attention to the preoperative associated conditions and counselling with the parents and the specialists involved is mandatory. Dexterous management during surgery and during the immediate post operative period call for attention to details and following a set protocol that is familiar to every one in the operation theatre that includes the paediatric ophthalmic surgeon. Ultimately, it is not an exaggeration to stress that the paediatriac anaesthesiologist should personify the care and compassion that is required while attending to these children with visual disability.