



# 65<sup>TH</sup> ISACON KOLKATA

# ANESTHESIA UPDATE 2017

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**Sabyasachi Das**



**ANESTHESIA UPDATE**  
**2017**

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# ANESTHESIA UPDATE

# 2017

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## FOREWORD

It is my privilege and pleasure to write the foreword for the *Anesthesia Update 2017* compiled by the 65<sup>th</sup> ISACON Kolkata organizing team. The compilation includes chapters on different topics of anesthesiology including subspecialties and superspecialties, such as pain, palliative medicine, critical care medicine, neuroanesthesia, cardiac anesthesia, pediatric anesthesia, and so on. The theme of the Congress "Enigma to Reality" is clearly reflected in *Anesthesia Update 2017*.

*"Education is a progressive discovery of our own ignorance"*

— Will Durant

The most constant thing in this world is change. Medical education is growing at a very rapid rate and anesthesiology is no exception. Anesthesiologists have grown from being "sleep" doctors to physicians envied by others. The specialty today finally has an independent repute.

Keeping oneself updated in this ever evolving branch is no mean task. The flood of knowledge from widespread access to the internet has the propensity to confuse rather than enlighten us. Regular updates and CMEs are mainly targeted for the benefit of the delegates and postgraduate residents.

The team has tried to digress from the tradition of handing over monotonous lecture notes by bringing out a peer-reviewed update book. Eminent faculty in the field of anesthesiology and intensive care have contributed their valuable time and effort reflected in various chapters of the book. I am confident that this book will be highly appreciated by all the anesthesiologists and intensivists, including our budding postgraduate trainees and the book will find a place in their personal library.

I congratulate the whole team for tremendous endeavor and wish them success.

**Sagarmoy Basu**

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# PREFACE

*Awareness of ignorance is the beginning of wisdom*

— Socrates

Anesthesia has travelled beyond the realms of the operating room to the domain of critical care, pain, perioperative care, and care of the terminally ill.

*Anesthesia Update 2017* is a small endeavor by the 65<sup>th</sup> Annual Conference of Indian Society of Anaesthesiologists (ISACON) 2017 Kolkata organizing team, to open our minds to "reality" from the depths of "enigma". In keeping with the theme, the book is a comprehensive compilation of a variety of topics on the specialty and superspecialty that has increased exponentially in our fraternity. It is a small attempt to impart the knowledge and insights of the luminaries and our generation next from all over the country.

The contents of the book has been organized in a systematic manner and has emphasized on airway management, perioperative evaluation, risk stratification, perioperative fluid and blood product administration, and newer horizons in critical care, palliative, and pain medicine.

Our sincere thanks to all our patrons, the organizing committee, and the entire fraternity of the Indian Society of Anaesthesiologists for all their moral support and encouragement. The team would also like to acknowledge and appreciate the painstaking efforts of the faculty who have taken the time off to contribute and enrich the book; the book which would not have been possible without their help and cooperation.

Last but not the least, our sincere thanks to the publisher, Jaypee Brothers Medical Publishers (P) Ltd., for supporting us with timely publication of *Anesthesia Update 2017*.

Our efforts will be successful only if this book brings us to the doors of "reality" from "enigma," thus enhancing the prestige of our society.

With sincere gratitude, on behalf of the organizing team, ISACON 2017.

**Bibhukalyani Das**  
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## Anesthesia for Ophthalmic Surgery

Rasesh P Diwan

### INTRODUCTION

There is a changing trend in the ophthalmology surgical practice as they are mostly performed as day-case. Moreover, extensive and complex surgical procedures like vitreoretinal and oculoplastic surgeries are also carried out under regional anesthesia. Patients fear and anxiety, pain and fear of losing vision are commonly observed during these procedures. These are associated with more surgical complications and poor visual outcome.

Regional anesthesia held a sway over general anesthesia for the first part of this century. In the 1950s and 1960s, a swing back to general anesthesia occurred, as improved drugs, safe techniques of general anesthesia and monitoring systems with high precision became available. However in recent times the advanced surgical technology, predominant use of outpatient facilities and high volume patient turnover practice goes well with regional anesthesia. Moreover the risk of morbidity and mortality involved in general anesthesia in geriatric age group, with coronary artery disease, hypertension, chronic obstructive pulmonary disorder, diabetes mellitus, obesity, etc. has made a clear choice of regional anesthesia and general anesthesia is restricted to very limited group of patients with contra indications to regional techniques.

The history of the topic dates back to the introduction of cocaine as a topical ophthalmic anesthetic by Karl Koller in 1884. Later in

the same year, Knapp performed the first retrobulbar injection using 4% cocaine, and pioneered the field of regional anesthesia.

In last two decades, more anesthesiologists have taken an interest in learning and performing local anesthesia for eye surgery, the traditional domain of ophthalmologist. Anesthesiologists have specialized in this area; and have become proficient in performing and teaching others also. In performing ophthalmic regional anesthesia, practitioners must have the personality traits and communications skills that will enable them to gain their patients trust rapidly. Anxiety of potential vision loss is a special concern in ophthalmic anesthesia. The sympathetic stress response is a common cause for many medical emergencies in perioperative time. Adequate preoperative counseling and reassurance are a potent substitute to sedatives.

### MONITORED ANESTHESIA CARE

Monitored anesthesia care includes preoperative visit, assessment, intraoperative care, and postprocedure management.<sup>1</sup> Diagnosis and treatment of clinical problems that occur during the procedure, support of vital functions, administer sedatives, analgesics, hypnotics, anesthetic agents or other medications as necessary for patient safety, psychological support and provide physical comfort and other medical services as needed to complete the surgical procedure safely. Post-surgical responsibility includes assuring a return to full

consciousness, relief of pain, management of adverse physiological responses or side effects from medications administered during the procedure as well as diagnosis and treatment of coexisting medical problems.<sup>2</sup>

Sedation is an important adjunct of monitored anesthesia care. It is defined as depression of a patient's awareness to the environment and reduction of his or her responsiveness to external stimulation.<sup>3</sup> Clinical practice of sedation during ophthalmic anesthesia varies among procedures and clinicians.<sup>4</sup> The experience of pain and anxiety are subjective and they are difficult to predict. The clinician with his or her prudence decides the level of sedation depending upon psychological and physical status of the patient and the nature of the surgical procedure. Other factors such as type and stage of surgery, the patient, the surgeon and technique used for anesthesia are also considered.<sup>5</sup> Various methods have been tried to alleviate anxiety. Preoperative instruction and counselling<sup>6-7</sup> by an anaesthesia nurse or a counsellor explaining the whole ordeal to the patient has an important role to play and may improve the outcome. Mokashi et al. suggested that continuous intraoperative interaction with the patient is a useful strategy.<sup>8</sup> Many patients need the medications for sedation either during administration of block or surgical procedures. This has an added advantage of enhanced cooperation and satisfaction to patient as well as hemodynamic stability.<sup>8</sup>

Most of the ophthalmic procedures under regional anaesthesia are performed as day care procedures where the patients are discharged home. In this setting the ideal sedative should have quick onset and predictable short duration of action. It should have minimal side effects and should ensure readiness to be discharged for home. Drugs used for sedation include benzodiazepines, intravenous anesthetic agents, opioids, and  $\alpha$  adrenoreceptor agonists. Some drugs are good hypnotics and some are good analgesics. The combination of more than one drug is used for synergistic effect, and thus the dose of each drug is minimized and there are fewer side effects.

## REGIONAL ANESTHESIA

An understanding of anatomy and physiology of the eye along with the ophthalmologic

procedures and the knowledge of the systemic effects of ophthalmic drugs are essential in proceeding with regional anesthesia.

Intravenous line should be secured before beginning of the procedure. Pulse oximetry and ECG are mandatory for cardiopulmonary monitoring. Many patients may require 1–2 mg of injection midazolam or 25–50  $\mu$ g of fentanyl.

It is a good habit to keep an open ventilating system during surgery and place an oxygen catheter below the drape during surgery. That prevents the collection of carbon dioxide and humidity from exhaled air below the drape. This increases the comfort of the patient and eliminates claustrophobic feeling. Five-degree head up tilt to the operation table and a pillow below the knees of the patients also add to the comfort of the geriatric patient.

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## TECHNIQUES OF REGIONAL

### ANESTHESIA

Any technique selected for anesthesia is primarily aimed to achieve analgesia, bulbar and lidakinesia (immobility) and control of intraocular pressure. Following are the techniques in current use.

- Retrobulbar anesthesia
- Facial nerve block
- Peribulbar anesthesia
- Medial canthal extraconal block
- Sub-Tenon's anesthesia
- Topical anesthesia.

### Retrobulbar Anesthesia

Retrobulbar or intraconal injection of anesthetic agents provides anesthesia of the cornea, conjunctiva and uvea by blocking the ciliary nerves and akinesia of extra ocular muscles by blocking III, IV, and VI cranial nerves in the retrobulbar space, which is a closed potential space formed by extra ocular muscles of eye and connecting fibrous fascial septa. The injection site is immediately above the inferior orbital rim, 5 mm. medial to the lateral canthus of eye. Retrobulbar injection can be given either percutaneous or transconjunctival, after retracting the lower eyelid. Initial course of the needle is posterior, parallel to the floor of the orbit, up to the equator of the eyeball and then it is turned up and medially. It is recommended that patient looks straight in the primary gaze,

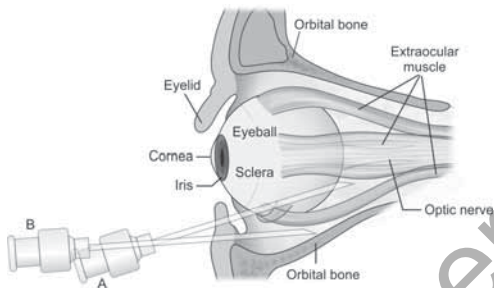


FIG. 1: A, Retrobulbar; B, Peribulbar

and not up and medially. Sharp cutting 24/25 gauge needle, not more than 31 mm (1.25 inch) in length is preferred for retrobulbar anesthesia. (Fig. 1). Use of sharp needles results in less pain on injection, less distortion of tissues and less tissue damage than blunt tipped Atkinson needles. An increase in the gauge of needle results in a reduced “feel” of the tissue planes. Recommended dose is about 1.5 to 2 mL of anesthetic solution. Gentle orbito-ocular compression is applied after injection, for better spread of the drug and reduction in intraocular pressure. A separate facial nerve block is necessary to prevent blepharospasm.

### Complications of Retrobulbar Anesthesia

**Ocular Complications:** Retrobulbar hemorrhage is the most common complication. It is characterized by increasing proptosis, chemosis, and subconjunctival blood. It leads to postponement of surgery and sometimes even an eye-threatening situation.

Perforation of globe can occur with retrobulbar needle and conditions that predispose to this complication include a highly myopic eye, a posterior staphyloma, a previous scleral buckling procedure and necessity to repeat the injection. It causes severe pain and restlessness to the patient and intraocular hypotony. It is confirmed by indirect ophthalmoscopy, which may reveal intraocular hemorrhage, retinal tear or detachment. Bevel of the needle should be kept towards sclera while introducing the needle to reduce the chance of perforation.

Optic nerve injury and damage to other orbital structures are possible complications. Optic atrophy and permanent loss of vision can occur. In addition, retinal vascular occlusion also has been observed.

Systemic complications associated with retrobulbar anesthesia are rare but potentially serious. The Oculocardiac reflex is commonly seen with traction on the extraocular muscles or from pressure on the eyeball. It causes bradycardia, arrhythmias, or cardiac arrest. Young patients are more susceptible than geriatric patients. Retrobulbar hemorrhage also can precipitate oculocardiac reflex. The patients should be closely monitored during procedure. There is no role of prophylactic anticholinergic drug.

Another rare but very serious complication is optic nerve sheath injection. There are numerous reports of episodes of presumed brain-stem anesthesia<sup>10,13</sup> following retrobulbar injection. The mechanism is generally felt to be penetration of the optic nerve sheath with injection into the subdural or subarachnoid space, resulting into instantaneous fatality. The anesthetic can also track posteriorly along the optic nerve into the space around optic chiasm, causing contralateral amaurosis, that is loss of vision in the opposite eye.<sup>14</sup>

The total amount of anesthetic dose given in retrobulbar injection is very negligible to cause the systemic toxicity, however intra-arterial injection, by means of retrograde flow from branch of ophthalmic artery to the

internal carotid artery, with subsequent access to midbrain structures will result in severe central nervous system toxicity, convulsions, and cardiopulmonary arrest.

The retrobulbar injection does not block the eyelid muscle as it is supplied by 7<sup>th</sup> nerve; this technique always needs additional facial nerve block by any of the techniques mentioned below.

Although the technique of retrobulbar anesthesia served ophthalmology for almost a century, the technique and its serious local and systemic complications have been reviewed in last two decades. Peribulbar anesthesia is a very safe an excellent alternative.

### Facial Nerve Block

It has been stated that akinesia of the eyelids is a necessary anesthetic condition for successful intraocular surgery. Forced closure or squeezing of eyelids may result in rise in intraocular pressure, and sometimes vitreous loss in conventional intra ocular surgery.

Facial nerve can be blocked at various places in its course. In Van Lint's technique, (Fig. 2) needle puncture is done 1 cm posterior to the lateral orbital rim, perpendicular to the skull and then needle is directed subcutaneously, but directly over the periosteum, in caudal and cephalad fashion.<sup>9</sup> The advantage with this technique is that the paresis is localized to the orbicularis oculi, and blockade of other facial muscles is avoided.

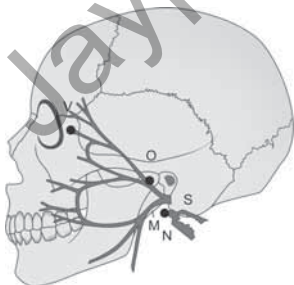


FIG. 2: Sites for facial nerve block

In O'Brien's technique (Fig. 2) the injection is given over the condyle of the mandible, just inferior to the posterior zygomatic process. The needle is inserted until the periosteum is contacted. Approximately 2 to 5 mL is injected as the needle is withdrawn. This is the most popular and widely practiced facial nerve block.<sup>9</sup>

In 1963 Nudbath & Rehman (Fig.2) described another method where the injection is performed over the main trunk of the facial nerve after it leaves the stylomastoid foramen. A complete hemi facial akinesia is obtained with this method.<sup>9</sup> Among the facial nerve blocks, this technique is associated with the highest risk of serious complications, due to other anatomical structures around. In present times the rationale of separate orbicularis oculi block has been reviewed.

### Peribulbar Anesthesia

Peribulbar or extraconal the name itself suggests that, it is around the eyeball, and not behind the eyeball like retrobulbar. In this technique the anesthetic solution is deposited in the fibro fatty tissues around the eyeball.<sup>11</sup> The drug has to travel from site of deposition to the target nerves, plexus, and muscles. For this reason hyaluronidase is an absolute mandatory adjuvant to the anesthetic solution and the recommended concentration is 10 to 20 IU per 1 mL.

The technique is very simple. A 23/24-gauge sharp disposable, 7/8 inch or 24 mm in length, needle is inserted, at the junction of middle and lateral fourth on lower lid, just above the inferior orbital rim. (Fig. 3) The bevel of the

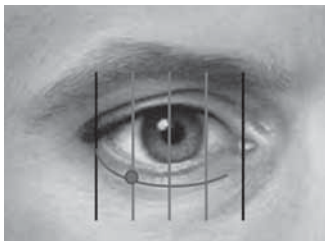


FIG. 3: Site for injection

needle is kept facing the sclera like retrobulbar technique. At the equator the needle is guided little up and medially. The aim is to deposit the anesthetic, as close as possible to the cone. About 5 to 7 mL of anesthetic solution is spread at different planes. Initially 2 to 4 mL at deeper plane, posterior to equator, and then needle is gradually withdrawn and about 2 to 3 mL is infiltrated in front of the equator. 1 ml solution is infiltrated sub orbitalis. The injection is given very slowly taking approximately 15 to 30 seconds. Gentle pressure is applied with the thumb on the lower lid, to prevent the drug escaping out off the orbit. Slow injection spreads better and there is less pain and less complications. The volume of drug necessary for proper anesthesia and akinesia depends upon the capacity of the orbit. There is great degree of variation in the architecture from one patient to another. Anesthetists must be aware of the length of the eyeball. The size of the orbit is judged clinically by assessing the diameters of the orbital inlet. Excess volume infiltration raises intraocular pressure, takes long time for intraocular pressure to come down, can even precipitate oculocardiac reflex. To reduce the pain of injection it is a good practice to inject 0.5 mL local anesthetic subcutaneously and then proceed with the peribulbar anesthesia.

A larger volume of local anesthetic is necessary because the deposition occurs at a distance from ciliary ganglion and greater latency is expected for attainment of full akinesia and anesthesia of the globe.

Complications are all minor, as compared to retrobulbar block, and they are chemosis and sub conjunctival hemorrhage. Ptosis is sometimes noticed, postoperatively which is because of the myotoxicity of local anesthetic. Globe perforation also been reported with peribulbar anesthesia in myopic patients with axial length >26 mm. However the literature again mentions that it is common with myopic eyes with posterior staphyloma<sup>9</sup>. Oculocardiac reflex can occur, if larger volume is injected, than the capacity of the orbit.<sup>15</sup> In comparison to retrobulbar anesthesia, the serious life and eye threatening complications like retrobulbar hemorrhage, optic nerve injury, brain stem anesthesia, etc. are less frequently observed with peribulbar technique.

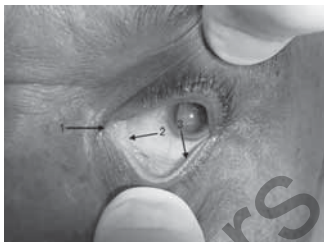


FIG. 4: Medial canthal block

Separate facial nerve block is not necessary in most of the cases with peribulbar anesthesia.

### Medial Canthal Extraconal Block

The medial canthal block is a type of extraconal block, performed with a short needle, less than one inch.<sup>15</sup> The needle is placed between the medial canthal fold and the caruncle (Fig. 4). This block is commonly used to supplement incomplete paribulbar or extraconal block.<sup>16</sup>

### Topical Anesthesia

Cataract surgeries have become minimally invasive and simple with the advancement of technology. In 1992, R. A. Fichman, presented that, phacoemulsification with posterior chamber IOL can be performed with use of topical anaesthesia.<sup>17</sup> The penetration of local anesthetic from topical instillation gives enough surface and uveal analgesia. This technology does not require reduction in intraocular pressure. With experience, surgical skill and confidence, the surgeons are operating with the mobile eye, without achieving akinesia.

The anesthesia is achieved by 4% Lignocaine, 1% tetracaine, 1% proparacaine, or 2% Lignocaine gel, instilled every 5 minutes, 2 or 3 times preoperatively. This can be supplemented any number of times during surgery also.

During phacoemulsification the distension of anterior chamber of the eye with irrigation fluid or injection of viscoelastic substance, may cause mild discomfort to the patient. Gills and coauthors suggested the routine use of 1% unpreserved lignocaine, injected directly in the anterior chamber, in addition to topical

anaesthesia.<sup>19</sup> It helps in diminishing the sensation associated with sudden changes in intraocular pressure.

The key to success is constant interaction with the patient. However the success rate of topical anesthesia depends upon the selection of the patient. Not all patients are suitable and not all eyes are suitable as well. Hyper anxious, deaf, patients with language barrier, dementia and neurologic movement disorders are not suitable for topical anesthesia. Complicated eyes with hyper mature cataracts, small pupil, combined with glaucoma surgery and eyes with postirritic synechia are challenges to the surgeon, may be relative contraindication to topical anesthetic technique.

The distinct advantage of topical anesthesia include, persistent vision to the patient and avoiding the complications of needle. Post operatively most of the patients are not given eye pad or shield. Cosmetically the eye looks much better than any other injection technique. There is early rehabilitation postoperatively, and great satisfaction to the patients. However many patients need intravenous sedation in the form of midazolam or fentanyl, as compared to other techniques of anesthesia.

### Sub-Tenon's Injection

Hideharu presented a new technique that provides rapid, thorough local anesthesia and eliminates the potential serious complications of other techniques of ocular anaesthesia.<sup>20</sup> His aim was to deliver 1cc of 2% lignocaine into the sub-Tenon's space near the ciliary nerve adjacent to optic nerve.

The sclera is tightly covered by Tenon's capsule. In this technique the sclera and Tenon's capsule are incised 8 to 12 mm posterior to the limbus in the superotemporal quadrant under the effect of topical anesthesia. A specially designed 24-gauge, curved, blunt tip cannula is introduced into the sub-Tenon's space and advanced posteriorly along the eye wall to its fullest extent. (Fig. 5) On injecting small amount of anesthetic, the result was rapid, and complete anesthesia. Here the drug is delivered right at the point, where the sensory nerves enter the eyeball, it also termed as pinpoint anesthesia.<sup>20</sup> However in this technique the extraocular muscle function is preserved.

Helen K. Li et al; even used this technique even for posterior segment ophthalmic surgery.<sup>21</sup> Any anesthetic can be preferred according personal practice. The usual dose is 4 mL of the anesthetic drug.

The advantage of this technique is it avoids serious complications of needle blocks and provides better anesthesia and reasonable akinesia than topical anesthesia technique. Sub-Tenon's block is gaining popularity at many cetes and preferred over other technique in difficult cataract and other extensive surgical procedures. Active congenital infection is the only absolute contraindication.

Ophthalmic surgery in adults is routinely performed under regional anesthesia. For the modern ophthalmic surgery, the trend is changed from inpatient general anesthesia to monitored ambulatory anesthesia care. It is mandatory to have comfortable, so that a satisfactory and desired surgical outcome is achieved without complication.<sup>22</sup>

## GENERAL ANESTHESIA FOR OPHTHALMIC SURGERIES

Although the majority of ophthalmic surgeries are performed under local anesthesia, general anesthesia may be necessary or advisable in certain circumstances.

The children, mentally challenged individual, psychologically unstable and extremely dementic and noncommunicable patients obviously need general anesthesia. Open-globe injuries and infected cases are relative indication for general anesthesia. Some extensive oculoplastic surgeries also require general anesthesia.

Most of the ophthalmic surgeries are performed either in elderly patients with multiple co-morbidities or children with other congenital anomalies or metabolic disorders. Meticulous preoperative evaluation is necessary in all patients for coexisting systemic diseases. It is vital to optimize the risk factors and understand the current drug therapy.

This chapter will address the points of concern for general anesthesia, related to ophthalmic surgeries.

Pediatric patients with congenital eye disorders requiring surgery, carry a special need. Many of them have congenital anomalies

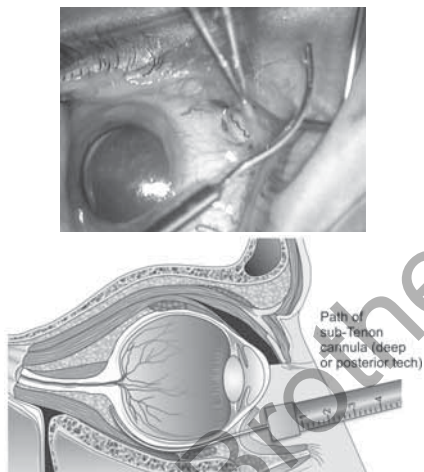


FIG. 5: Sub-Tenon's block

including heart diseases, metabolic disorders, craniofacial anomalies along with the concern with pediatric physiology and anatomical difference.

They need proper preoperative evaluation and optimization, plan of anesthesia and postoperative care.

Nitrous oxide should be avoided during vitreoretinal surgery when intravitreal gas is injected to create tamponade in posterior segment of eye and also when there is a history of gas injection in recent past.

There is always a consideration of ophthalmic drops and their systemic side effects.

It is mandatory for the anesthetists to understand the factors which increase or decrease intraocular pressure during surgery. It is very critical when anesthesia is required for open-globe injuries.

There is high incidence of Oculo-cardiac reflex in vitreoretinal procedures where buckling is carried out. Incidence is also commonly observed with squint surgeries.

There is higher incidence of post-operative nausea and vomiting in ophthalmic procedures particularly with squint surgeries.

Airway access is limited during surgeries. Supraglottic airway devices are getting popularity in ophthalmic surgeries. However it does not protect fully against aspiration and it is a question of personal preferred practice. Some do not prefer in infants and neonates.

Vigilant monitoring of vital functions is must, during ophthalmic anesthesia, as many times the surgeries are performed in dark room.

To summarize, the ophthalmic anesthesia involves a population of pediatric, geriatric, psychologically unstable and mentally challenged, and most patients with coexisting morbidities. In view of special needs during ophthalmic procedure, ophthalmic anesthesia has become an important sub-specialty of anesthesia

### STRESS POINTS

- All patients require preanesthetic evaluation and preparation in view of the systemic disorders

- Time spent in establishing a good rapport with the patient is more effective in allaying anxiety, than restoring pharmacological methods
- Monitored anesthesia care is the important role and demand for anesthesiologists
- Knowledge of ocular anatomy and physiology is vital for anesthesiologists involved with regional anesthesia
- Patient's comfort on table should be first priority during eye surgery
- There are important concerns during general anesthesia in ophthalmic surgeries.

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