" A COMPARISON OF TOPICAL AND PERIBULBAR ANAESTHESIA IN PHACOEMULSIFICATION WITH INTRAOCULAR LENS IMPLANTATION TO EVALUATE PATIENT AND SURGEON SATISFACTION: A RANDOMISED CLINICAL TRIAL"

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LIST OF ABBREVIATIONS USED

PCIOL	-	POSTERIOR CHAMBER INTRAOCULAR LENS
TA	-	TOPICAL ANESTHESIA
PA	-	PERIBULBAR ANESTHESIA
BSS	-	BALANCED SALT SOLUTION
PCR	–	POSTERIOR CAPSULAR RENT
PABA	-	PARAMINOBENZOIC ACID
CNS	-	CENTRAL NERVOUS SYSTEM
mL	-	MILLILITERS
OVD	-	OPHTHALMIC VISCOSURGICAL DEVICES
BCVA	-	BEST CORRECTED VISUAL ACUITY
ECCE	-	EXTRACAPSULAR CATARACT EXTRACTION
CCC	-	CONTINOUS CURVILINEAR CAPSULORHEXIS

ABSTRACT

Introduction:

Cataract is a major cause of visual disability worldwide. Cataract surgery has undergone significant changes beginning with the abandonment of intracapsular surgery, and continuing with the advent of intraocular lenses. Phacoemulsification is widely practiced as modern day cataract surgery with fast visual recovery. Local anesthesia has also evolved in the course to reduce orbital complications and systemic side effects. It is also important to consider patient and surgeon comfort without compromising safety and outcome of the surgery. This study was done to compare the efficacy of peribulbar with topical anaesthesia in phacoemulsification by quantitative assessment of both patient and surgeon satisfaction.

Materials and Methods:

This prospective randomized study comprised 160 patients who underwent phacoemulsification with intraocular lens implantation. Patients were randomised into two groups, 80 in each group.Group A received peribulbar anesthesia of lignocaine 2% with adrenaline. Another group B received topical anaesthesis of proparacaine hydrochloride 0.5%. Evaluation of patient's satisfaction is done using verbal pain score to measure pain intensity at the end of the surgery and 4 hours after the surgery. Evaluation of surgeon satisfaction was done at the end of the procedure based on patient's co-operation and ease of surgery. Intraoperative and postoperative complications were also recorded.

Results:

The mean age of study group was 63.37 years. Out of 160 patients,98 (61.25%) were male and 62(38.75%) were female. Lid akinesia and globe akinesia was seen in 95% and 96.25% of patients in group A ($p<0.001$).Complications during

administration of anaesthesia in group A were chemosis (18.75%), subconjunctival haemorrhage (15%) and giddiness (7.5%) was statistically significant (p<0.001) in comparison with group B. Intraoperative complications as endothelial touch 3.75% in group A and 2.5% in group B (p=0.4)and PC rent without vitreous loss 2.5% in group A and 3.75% in group B (p>0.2). Intraoperative pain in group A and group B ocurred during iridal contact (3.75%; 2.5%), intraocular lens implantation (2.5%;2.5%) , pain during irrigation and aspiration (3.75%:2.5%) with p value 0.4,>0.2and 0.4 respectively. Pain assessment immediately after surgery was 16.25% (group A) and 8.75% (group B) had tolerable pain (p>0.0415). Pain assessment after 4 hours of surgery was 81.25% and 95% had grade I(tolerable pain) in both groups A and B respectively(p>0.2).6.25% in group A and 1.25%in group B had grade 2 pain (p=0.11).Surgeon experienced grade 1 difficulty in 2.5% in group A and 2.5% in group B(p=0.5) rest all cases were grade 0.Surgeon graded patient's co-operation as excellent(grade 0) in group A (97.50%) and group B (93.75%).There was no significant difference in patient reported pain scores, surgeon's assessment of patient cooperation and intraoperative complications among two groups.

CONCLUSION

In this study, topical anesthesia provided good patient satisfaction and it was comparable to satisfaction achieved using peribulbar anesthesia. The speed and ease of administering topical anesthesia with lower incidence of complications associated with it, makes topical anesthesia suitable and safe choice for phacoemulsification surgery.

Key words- peribulbar, topical, phacoemulsification, ophthalmic anesthesia.

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INTRODUCTION

The history of cataract surgery spans 20 centuries. For long period of time, couching was the primary method for dislodging the cataract away from the pupil. It was replaced by cataract extraction surgery both by intracapsular and extracapsular technique. The practice of ophthalmology revolutionised with introduction of intraocular lens and phacoemulsification surgery. Viscoelastic agents, also playing an integral role, developed synchronously with modern phacoemulsification

In recent years, cataract surgery has become faster, safer and less traumatic. The advancement has led to faster visual rehabilitation, improved comfort and ease both among patients and surgeons. Parallel to its increasing frequency, minimally invasive techniques have been developed for routine cataract surgery, including small corneal or limbal incisions, phacoemulsification of the lens nucleus, and implantation of foldable intraocular lens(IOLs)[1-3].

Good anaesthesia is essential for the performance of safe intraocular surgery. It can be attained through local or general administration. Anaesthesia has moved a full circle from the ancient days of no-anaesthesia couching, to Koller’s topical cocaine, to general anaesthesia, to Knapp’s local anaesthesia and now again to topical and no-anaesthesia phacoemulsification. Anaesthesia for cataract surgery today aims at creating a comfortable environment for the patient and the surgeon during surgery. However, innovations in anaesthesia have also played important role in improving outcomes and visual recovery [4].

An ideal ophthalmic anaesthesia is the one which provides transient loss of sensation, transient muscle paralysis, rapid onset of action, hypotony and no local and systemic side effects. A wide variety of anaesthesia options are available for cataract surgery today. These include retrobulbar, peribulbar , subconjunctival, subtenon’s and

topical anaesthesia. Advances in cataract surgery including the use of smaller and self sealing incisions have shortened the duration of surgery resulting in the use of shorter acting anesthetics[5]. The advent of many ocular anesthetic techniques in past two decades, indicates the need for the development of an ideal anesthetic and technique for ocular surgery. Every existing technique has its own advantages and disadvantages.

Retrobulbar anaesthesia was the anaesthesia of choice for extra-capsular cataract extraction as well as for phacoemulsification for decades[6]. In the year 1884 cocaine hydrochloride was discovered as a topical anaesthetic agent for performing eye surgery. Various local anaesthetic techniques have evolved since then including both akinetic (needle-/cannula-based technique) and non-akinetic (topical anaesthesia) techniques.

Retrobulbar anaesthesia can be hazardous as the anaesthetic solution is blindly infiltrated into the orbit through a sharp needle. Globe perforation, retrobulbar haemorrhage, optic nerve damage, extraocular muscle dysfunction and injection of the anaesthetic solution into the subarachnoid space all have been reported[7].

Peribulbar anaesthesia has been used for many decades now in cataract surgery and various modifications have been devised over the last two decades to reduce the risks of injury of intraorbital structures during the surgery[4].The peribulbar anaesthesia is relatively safe but serious complications have also been reported like subconjunctival haemorrhage, ecchymosis, chemosis, globe perforation and injury to muscle.

In recent years, topical anaesthesia for cataract surgery has gained popularity as safe and atraumatic technique[8,9]. The benefits of topical anaesthesia over peribulbar

anaesthesia are: no risks of the needle techniques, the analgesia is immediate, no rise in intraocular pressure, no need for globe compression and no preoperative sedation[4].

It allows for rapid visual rehabilitation, causes less anxiety and provides sufficient anaesthesia while reducing the risk of serious complications such as globe perforation and retrobulbar haemorrhage associated with retrobulbar anaesthesia.[10,11]. Also the optic nerve and motor neurons are not affected, and the ocular motility is maintained [12].

The lack of akinesia is another drawback of the topical anaesthesia. Complete lack of akinesia can pose significant difficulty when dealing with uncooperative patients or the delay in surgical time due to intraoperative complications. Some surgeons find it difficult to work without akinesia. However, other studies state that lack of akinesia does not cause intraoperative difficulties to experienced surgeons[13] as globe can be stabilized with the phacoemulsification probe and also by the second instrument through the other port.

Topical anaesthesia provides for high patient comfort during cataract surgery, increased experience with the technique has shown that certain steps of the cataract procedure are associated with patient discomfort. These include iris manipulation, globe expansion as the phacoemulsification handpiece or irrigation–aspiration handpiece is inserted into the eye, and intraocular lens insertion.

Patient satisfaction is one of the important healthcare outcome measures[4]. Pain assessment is one of the important parameter to assess the patient’s satisfaction. Perceived pain directly affects the patient’s cooperation and has been reported to vary with age, sex, and whether the surgery is being performed for the first time [14,15].

However, conflicting results have been presented regarding pain, anxiety, patient discomfort and patient satisfaction postoperatively with topical anaesthesia[16].

This study evaluated the level of patient satisfaction and surgeon's satisfaction in individuals who underwent phacoemulsification with foldable IOL implantation under topical or peribulbar anaesthesia and also compared intraoperative complications among two techniques.

OBJECTIVES

1. Primary Objective –

i) To evaluate level of patient satisfaction by comparing the intraoperative and postoperative pain score during phacoemulsification with implantation of foldable lenses under topical and peribulbar anaesthesia.

ii) To evaluate level of surgeon satisfaction by comparing the level of difficulty and patient's co-operation during phacoemulsification with implantation of foldable lenses under topical and peribulbar anaesthesia.

2. **Secondary Objective** –

To compare intraoperative complications during phacoemulsification with implantation of foldable lenses under topical and peribulbar anaesthesia.

REVIEW OF LITERATURE

History of cataract surgery

Cataract surgery is one of the oldest surgery which in practice since ancient times. In ancient times, cataract was not recognized as opacification of the crystalline lens, rather it was thought to be a suffusion forming between the pupil and the lens. The term 'cataract' was introduced by Constantinus Africanus, a monk and an Arabic oculist. He translated Arabic 'suffusion' into Latin 'cataracta', meaning 'something poured underneath something', the waterfall [17]. Later, after many years, when complete eye dissection was performed the real cause of the disease was found in the opacity of the lens.

Couching

It was one of the primitive technique of cataract surgery in ancient Babylon documented from the 5th century BC, performed in those times when it was perfectly opaque, rigid, tough and the zonulas were extremely fragile [18]. The patient was hit on his eyeballs with a blunt object, strongly enough to determine the subluxation of the opaque crystalline in the vitreous cavity.

It was also described in India by Sushruta as early 800 BC. A needle was passed through the sclera or cornea to push the white lens downward or backwards into the vitreous cavity. Patients were able to see forms and figures afterwards. In the middle ages, couchers travelled from town to town and using a common sewing needle would couch cataracts in the village square. Complication rates were high with this technique, and it was considered a success if the patient was able to see again.

Extracapsular cataract extraction

Cataract surgery then advanced to extracapsular cataract extraction (ECCE): the extraction rather than simple displacement of the cataract. Jacques Daviel (1696–1762) and Albrecht von Graefe (1828–1870) laid the blue print for planned extracapsular extraction. The procedure was performed most safely after the cortex had liquefied, therefore surgery was delayed until the cataract was 'ripe'. This technique did not gain wide acceptance due to the significant risks of endophthalmitis, incomplete cortex removal, chronic inflammation, capsular opacification and pupil block glaucoma.

In 1748 a British surgeon, Laques David, performed an extracapsular cataract extraction (ECCE). This method involved removal of the cortex, nucleus, and the anterior capsule of the lens, but preservation of the posterior capsule, which remained inside the eye.[19] During this period, suturing was not practiced, so the incision was left unstitched. Patients were advised to remain in bed after surgery, and to keep the eye bandaged for several days. Minimal straining would cause dehiscence of the surgical wound, prolapse of the internal structure of the eye and infection.[19] Since the procedure was so delicate, it did not gain popularity.

Intracapsular cataract extraction

In 1753 Dr. Samuel Sharp performed intracapsular cataract extraction surgery by applying pressure to the eyeball with his thumb. Colonel Henry Smith popularised this technique, practicing it on many patients in India from 1900 to 1926.

Due to the problems of extracapsular extraction, the technique evolved to the removal of the entire lens from the eye with intact capsule. Lysis of the zonular fibres was a problem, initially mechanical zonulolysis was performed, later use of the cryoprobe, and subsequently chemical disillusion with the enzyme alpha-

chymotrypsin, improved the safety of intracapsular extraction to make it a very successful procedure. Patients achieved a good vision following this procedure. However, some patients were rendered blind due to complications, such as infection, haemorrhage, retinal detachment or cystoid macular oedema. Furthermore, these patients required aphakic spectacles, with their inherent problems.

In 1867 Dr. Williams was the first surgeon to use sutures in cataract surgery. Eye surgeons around the world followed his example of using sutures to close the surgical wound. Since then this became standard practice.

Modern extracapsular cataract extraction

Harold Ridley further modernised this technique in 1949 by implanting an intraocular lens after extracting the cataractous lens. Ridley was inspired during the second world war when he realised that fragments of canopy (a material that covered British fighters flight) which had fallen into a pilot's eye did not produce an adverse reaction. The canopy was made of a plastic material known as polymethyl methacrylate(PMMA)[19]. Ridley had an intraocular lens made of this material. In 1949, he became the first person to implant such a device.

Since then, the intraocular lens has undergone several modifications. The initial lens was placed in the anterior chamber, between the iris and the cornea and supported by the iris. Since many complications were noted, surgeons began placing the lens in the posterior chamber. Fewer complications were seen with posterior chamber lenses; which are used even today. Most of cataract surgeries performed involve intraocular lens implantation.

By preserving the posterior lens capsule, the risk of vitreous loss, and therefore many of the potentially blinding complications were cut down. With the

growing use of the operating microscope, this technique evolved alongside better ways of removing residual cortical material. This technique continued to be the procedure of choice during the 1980s and early 1990s.

SISCS - Small Incision Sutureless Cataract Surgery

Despite all the advances in cataract surgery, the greatest challenge was the large amount of cataract blindness in developing countries. Small incision or sutureless extracapsular cataract extraction has emerged as the procedure of choice for the developing world. A high-volume, low-cost, low-technology procedure that avoids the problems related to sutures and has a low complication rate is the paradigm.

This method involves making a self-sealing sclerocorneal tunnel incision, about 6-8 mm in length, in the superior side of sclera and performing paracentesis 3mm from the tunnel. After capsulorhexis on the lens and hydrodissection, the nucleus is flipped within the anterior chamber and removed with a vectis. The cortex is then aspirated with a simcoe cannula and a single-piece rigid polymethyl methacrylate (PMMA) posterior chamber intraocular lens (PCIOL) implant is then implanted into the capsular bag.

Phacoemulsification cataract surgery

The principles of modern cataract surgery are based on phacoemulsification cataract extraction through small incisions. Since the time of the inspiration of Charles Kelman[20] in the dentist's chair (while having his teeth ultrasonically cleaned), many advancement have been made in phacoemulsification technology to benefit patients with cataract. Though the central concept of using the ultrasonic energy to

emulsify lens matter remains the same, the newer fluidics and mechanics has made the surgery much safer and efficient.

When introduced in 1960s, the science of phacoemulsification was in infancy, but with application of advanced bioengineering technique it has now became a state of art technique used as the first option for cataract extraction in many parts of the world. Initially Dr. Kelman[20] devised a method to prolapse the nucleus into the anterior chamber for emulsification. This technique required a large anterior capsulotomy that he performed with a large cystotome in a “Christmas tree” or triangular fashion. The cystotome was then used to impale the nucleus and bring it forward to the anterior chamber in a tire iron maneuver under air. Once accomplished, the nucleus was emulsified in the chamber in a one-handed manner. Advent of Continous curvilinear capsulorrhexis (CCC), viscoelastics and IOLs added significantly along with various chopping maneuvers and state of art fluidics and power delivery systems.

BASIC FUNCTIONS OF PHACO MACHINE

Every phaco machine has three basic functions:

1)Irrigation

2) Aspiration

3) Ultrasonic fragmentation.

Correspondingly three handpieces are used in phacoemulsification; the irrigation handpiece, the irrigation-aspiration handpiece and phaco or ultrasonic handpiece.

Irrigation-Aspiration Handpiece

The irrigation-aspiration handpiece has a silicone sleeve that fits snugly around the aspirating tip. Irrigation is delivered through the openings of the sleeve. The tip differs from the phaco tip in being smooth and rounded with a single aspiration port on the side of the tip and not at the end. Its size is be turned to orient the irrigation port in any direction.The irrigation ports in the silicone sleeve should be kept perpendicular to the metallic aspiration port as this helps direct the infusion fluid along the iris plane.

Ultrasonic Handpiece

Ultrasonic handpiece consists of the acoustic vibrator that produces the ultrasonic energy which is then transferred to the tip.

Irrigation Handpiece

The irrigation handpiece is used when only irrigation is required. It is connected to an irrigation cystotome for anterior capsulotomy or to an irrigating loop for hydrodissection. During its use the foot-pedal is on position 1. More commonly it is used in bimanual microincision phaco. In this technique the phaco needle and irrigation ports are separated.

The Transducers

The acoustic vibrator is either a magnetorestrictive or Piezo-electric device that converts electrical energy into mechanical energy under the influence of an electrical signal. The acoustic vibrator oscillates longitudinally at a frequency between 30-60 kHz. This imparts a linear motion to the ultrasonic tip.

Piezoelectric Handpiece

The piezoelectric handpiece uses electric energy to stimulate piezoelectric crystal which in turn is translated into linear movement. The piezoelectric transducer

requires a direct electrical contact to be made with the crystal. It is lighter, can be air-cooled and has a more efficient power delivery. But it is fragile and can break on being dropped.

Power Settings

Too little power pushes nucleus and causes zonular stress while too much can pierce nucleus and may cause rent in posterior capsule. The ultrasound power is usually preset to 50 to 70 percent. If the lens is soft, it is decreased to about 30 to 40 percent and if it is hard, the power is increased to 80 or 90 percent. Power is reduced if the nucleus chatters and the linear ultrasound mode is changed to pulse mode, which tends to hold the nucleus better against the tip. Ultrasound is inaudible; the buzzing results from harmonic overtones of the handpiece and phaco tip.

Pumps

Three types of pumps are present:

Diaphragmatic pump

Venturi pump

Peristaltic pump

Venturi Pump

Compressed gas creates a negative suction force that is the vacuum inside a closed chamber which is directly transmitted to the handpiece. The advantages of venturi pump is that surgical procedure is fast and vacuum works more efficiently and thus holding capacity of the machine for the tissue is better. The disadvantages being that it is a fast machine the safety zone is less, causing catching of iris and iris chaffing and catching of anterior and posterior capsule is common.

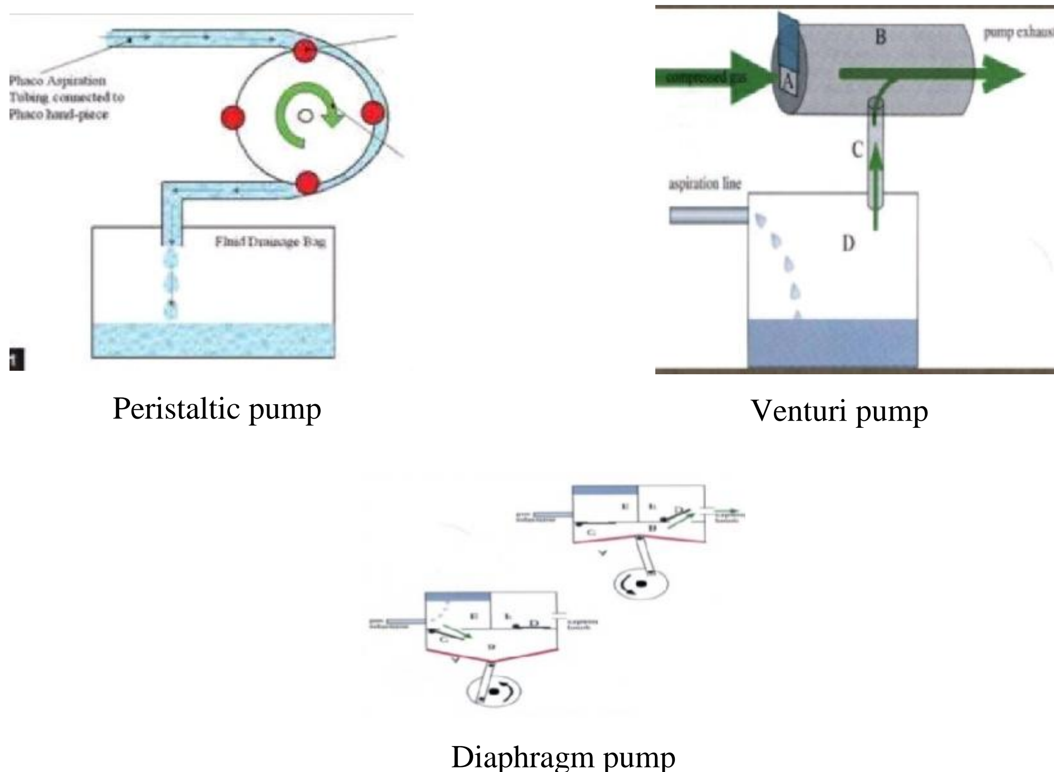
Diaphragmatic Pump

A diaphragm pump has a flexible membrane to generate vacuum. With this pump vacuum reaches to preset level without occlusion. This mechanism is easy to remove small pieces but safety margin is less.

Peristaltic Pump

It is one of the most widely used pump in the practice. Vacuum and aspiration flow rate work independently, but finally assisting each other. In peristaltic pump the rotation of the rollers by the pump pinches the soft silicon tubing, which creates a negative pressure by squeezing the fluid out of the tube. In this system the vacuum will be built up only when the tip is occluded. The advantages are that it is safe, complicated cases can be handled safely and in a skillful way. Chances of catching of iris, capsule is less. The disadvantages is that it is relatively slow.

Fig No. 1 Various pump mechanism in phaco



Peristaltic pump

Venturi pump

Diaphragm pump

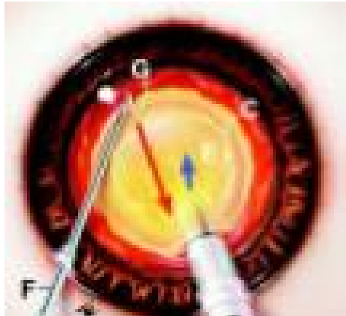
Phaco Chop technique

Since Kunihiro Nagahara first introduced the concept of phaco chop in 1993[21], many different chopping variations have been described. For simplification,chopping methods be conceptually divided into two general categories: horizontal and vertical[22]. Both share the same benefit of fragmenting the nucleus manually but accomplish this objective in different ways. The classic Nagahara technique exemplifies horizontal chopping because the instrument tips move toward each other in the horizontal plane during the chop. In vertical chopping,the two instrument tips move toward each other in the vertical plane in order to create the fracture.

The “stop and chop” method is a hybrid of divide-and-conquer and horizontal chopping. Koch and Katzen[23], modified the technique to provide space for tissue separation, nucleus manipulation and aid ease of removal. A deep, central groove is first sculpted in order to crack the nucleus in half, then stopping the divide-and-conquer method, and the heminuclei is chopped[23].

In this study this technique was used in all the cases. The advantage of “stop and chop” is that it avoids the difficult first chop. Chopping is done across the radius, rather than the full diameter of the nucleus. Then phaco tip positioned within the trough, heminucleus is cleaved. The presence of the trough facilitates removal of the first fragment because it is not tightly wedged inside the capsular bag. While chopping the heminuclei does reduce total ultrasound energy, the majority of sculpting during divide-and-conquer is used to create the first groove.

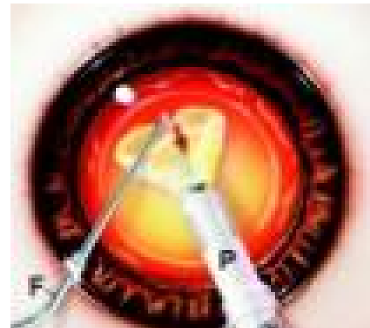
Fig No. 2 STOP AND CHOP



Initial trench

Rotation & separation of nuclear fragment

Chopping of each half



Phacoemulsification of nuclear pieces

ANAESTHESIA FOR CATARACT SURGERY

Anaesthesia for Cataract Surgery has undergone tremendous changes and advancements in last century. In 1846 general anaesthesia techniques were developed which were not found suitable and satisfactory for ophthalmic surgery. In 1884 Karl Koller discovered surface anaesthesia techniques using topical cocaine for cataract surgeries which found favor with the ophthalmologists[24]. However due to significant complications and side effects of cocaine this technique was abandoned.

Also in 1884 Herman Knapp[25] described retrobulbar injection as local anaesthetic technique for ocular surgery. He used 4 percent cocaine solution injected into the orbital tissue close to posterior part of the globe to achieve adequate anaesthesia but in the subsequent injections patients experienced pain.

In 1914 Van Lint introduced orbicularis akinesia by local injection to supplement subconjunctival and topical anaesthesia. However, this technique found favour only after 1930 when procaine a safer injectable agent made it feasible. With the development of hyaluronidase as an additive to the local anaesthetic solution Atkinson in 1948 reported that large volumes could be injected with less orbital pressure and improved safety injections into the cone (retrobulbar) were recommended and gained rapid favour becoming anaesthetic route of choice among ophthalmologists.

In Mid 1970s, Kelman introduced an alternative technique of local Anaesthesia for ocular surgery known as peribulbar injection. However, till 1985 this new technique was not published in ophthalmic literature. In 1985 Davis and Mandel[26] reported local anaesthetic injection outside the cone into the posterior peribulbar space. Further modifications of both retrobulbar and periocular injection

techniques were made by Bloomberg, Weiss and Deichaman, Hamilton and colleagues, whitsett, Murdoch Shriver and coworkers. These modifications consisted of more anterior deposition of anaesthetic solution with shorter needles and smaller dosages with modified site of injection[27].

With the introduction of small incision cataract surgery, Phacoemulsification and other micro-surgical procedures in ophthalmology, use of shorter needles with smaller dosages became more common. Fukasaku and Furata et al[28] reintroduced subconjunctival anaesthetic techniques. Fichman in 1992 first reported the use of topical tetracaine anaesthesia for phacoemulsification and intraocular lens implantation starting an era of topical anaesthesia in ocular surgery[29].

With the advent of many ocular anaesthetic techniques in past two decades there is a need for the development of an ideal anaesthetic and technique for ocular surgery. Every existing technique has its own advantages and disadvantages. General Anaesthesia for cataract surgery is virtually out of favor with ophthalmologists. Retrobulbar anaesthesia, periocular (peribulbar, subconjunctival, subtenon or peribulbar, orbital and epidural and topical anaesthesia or a combination of peribulbar and topical are being used in present day ocular surgery. Facial blocks namely Atkinson's method, Nadbath's method, Van lint's method and O'brien method used for paralysis of orbicularis oculi to attain lid akinesia are obsolete now.

Now with the advent of under 1.0 mm incision technique, foldable and rollable intraocular lenses, no anaesthesia cataract surgery is becoming popular and also cryoanalgesia technique modifying the former.

Evolution of anaesthetic techniques for cataract surgery

Technique	Year	Author
General anaesthesia	1846	Morton
Topical cocaine	1884	Köller
Injectable cocaine	1884	Knapp
Retrobulbar (4% cocaine)	1884	Knapp
Orbicularis akinesia	1914	Van Lint, O'Brien,Atkinson
Hyaluronidase	1948	Atkinson
Posterior peribulbar	1985	Davis y Mandel
Limbal	1990	Furata and coworkers
Sub-tenon anaesthesia	1990	Hansen
Anterior peribulbar	1991	Bloomberg
Subconjunctival	1991	Petersen
Topical anaesthesia	1992	Fichman
Pinpoint anaesthesia	1994	Fukasaku
Topical plus intracameral	1995	Gills
No anaesthesia	1998	Agarwal
Cryoanalgesia	1999	Gutiérrez-Carmona
Xylocaine jelly	1999	Koch, Assia
Hypothesis, no anaesthesia	2001	Pandey and Agarwal
Viscoanaesthesia	2002	Werner, Pandey, Apple

Local Anaesthesia in phacoemulsification have superseded general Anaesthesia due to their indisputable advantages,such as the potential for ambulatory surgery, rapid recovery and lack of complications. However local anaesthetic surgery using the retrobulbar or peribulbar technique is not without possible complications, such as perforation of the eyeball accompanied by retinal detachment and severe intraocular hemorrhage, retrobulbar hematoma, diplopia, direct optic nerve trauma caused by the retrobulbar needle, increased intraocular pressure, postoperative ptosis, or systemic complications such as accidental administration of anaesthetic to the bloodstream or nervous system.

Moreover, in the last decade, topical anaesthesia in phacoemulsification has gained more interest on the part of surgeons as it eliminates the risks involved in

using general and local anaesthesias. No anaesthesia surgery is also becoming popular among ophthalmologists worldwide.

A Brief anatomy of orbit and surgical space

The orbits are two pyramidal-shaped bony cavities situated on either side of the nose or midline of face. The apex is represented by the optic foramen and the base by the orbital margins of the frontal and maxillary bones. The average volume of orbit is approximately 30 cc. Approximately one-fifth of it is occupied by the eyeball. Other contents of the orbit include: part of optic nerve, extraocular muscles, lacrimal gland, lacrimal sac, ophthalmic artery and its branches, third, fourth and sixth cranial nerves and ophthalmic and maxillary divisions of the fifth cranial nerve, sympathetic nerve, orbital fat and fascia.

The surfaces of each orbit (roof, floor, medial and lateral wall) are composed of seven bones: ethmoid, frontal, lacrimal, maxillary, palatine, sphenoid and zygomatic bones. The thinnest of these bones is the lamina papyracea over the ethmoid sinuses along the medial wall.

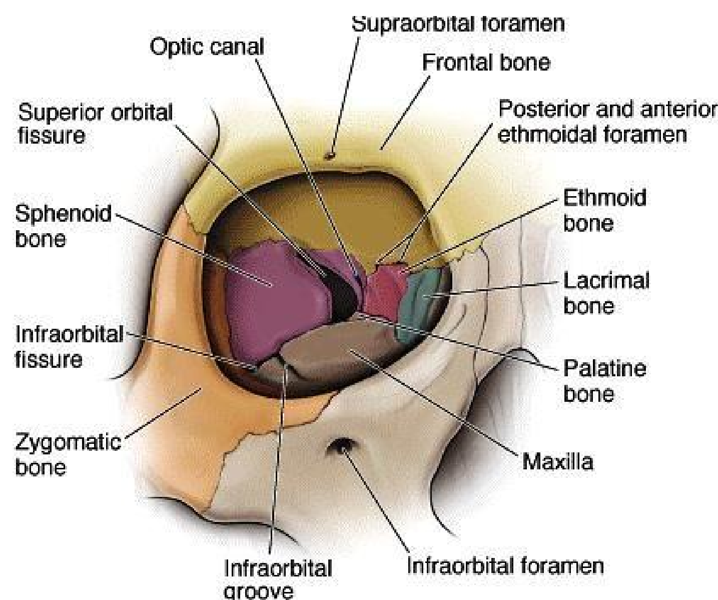


Fig No. 3 Walls of the orbit

SURGICAL SPACES IN THE ORBIT

These are of importance as most orbital pathologies tend to remain in the space in which they are formed. Each orbit is divisible into four surgical spaces

1. ***The subperiosteal space.*** This is a potential space between the bone and the periosteum. It is limited anteriorly by strong adhesions of periosteum to the orbital rim

2. ***The peripheral space***.It is the anterior space. It is bounded peripherally by the periorbita(periosteum) and internally by the four recti with thin intermuscular septa. For peribulbar anaesthesia, injection is made in this space. Contents of this space are peripheral orbital fat, superior oblique, inferior oblique, and levator palpebrae superioris muscles, lacrimal nerve, frontal nerve, trochlear nerve, anterior ethmoidal and posterior ethmoidal nerves, superior and inferior ophthalmic veins, lacrimal gland and half of lacrimal sac

3. ***The central space.*** It is also called muscular cone or retrobulbar space or posterior space. It is bounded anteriorly by the Tenon's capsule lining back of the eyeball and peripherally by the four recti muscles and their intermuscular septa in the anterior part. In the posterior part, it becomes continuous with the peripheral space. Contents of the central space include optic nerve and its meninges, superior and inferior divisions of oculomotor nerve, abducent nerve, nasociliary nerve, ciliary ganglion,ophthalmic artery, superior ophthalmic vein and central orbital fat. Retrobulbar injections are made in this space.

4. Tenon's space. It is a potential space around the eyeball between the sclera and Tenon's capsule. Pus collected in this space is drained by incision of Tenon's capsule through the conjunctiva it is also a site for drug instillation.

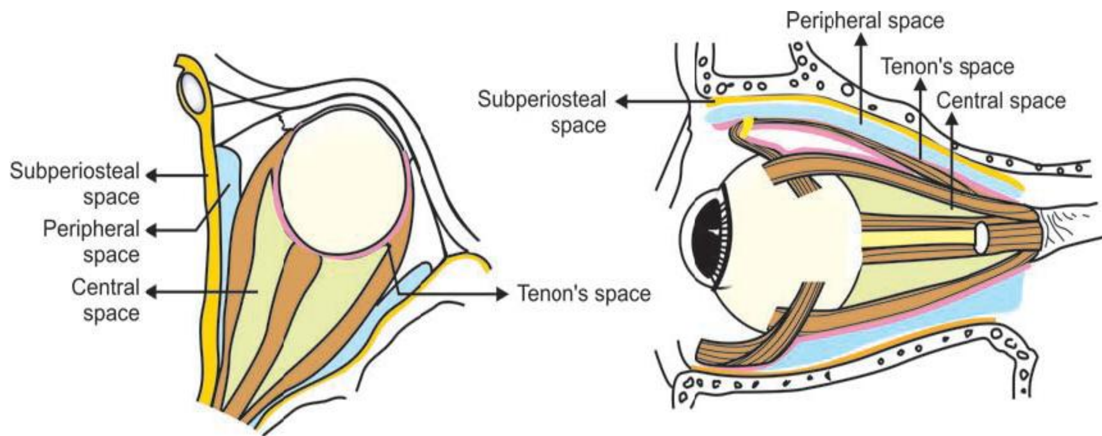


Fig No. 4- Surgical spaces of orbit

Ciliary ganglion

The ciliary ganglion, a parasympathetic ganglion, lies approximately 1 cm from the posterior boundary of the orbit between the lateral surface of the optic nerve and the ophthalmic artery. Parasympathetic fibers originating in the oculomotor nerve and postganglionic fibers supply the ciliary body and pupillary sphincter muscles. The nasociliary nerve, a branch of the ophthalmic nerve, supplies sensory innervation of the cornea, iris, and ciliary body by way of the short ciliary nerves

Retrobulbar block-It is given to block the ciliary ganglion, ciliary nerves, and cranial nerves II, III and VI. Cranial nerve IV is not affected since it lies outside the muscle cone. local anaesthetic is delivered within the muscle cone itself in retrobulbar block

Peribulbar block -The injection is given outside the muscle cone and spreads by way of diffusion to block the orbital nerves, including the IV nerve.

TECHNIQUES OF ADMINISTRATION OF LOCAL ANAESTHESIA

Several methods of local anaesthesia for cataract extraction are currently available. These include retrobulbar, peribulbar, subconjunctival, sub-Tenon's and the application of topical anaesthetic drops. Local ocular anaesthesia is the mainstay of cataract surgery. Local anaesthesia minimizes the risk of wound rupture and complication frequently associated with coughing during extubation and postoperative nausea and vomiting (in general Anaesthesia).

Generally, the use of 1:1 mixture of 2 percent xylocaine and 0.50 percent bupivacaine along with adrenaline and hyaluronidase in facial, retrobulbar and peribulbar blocks achieve rapid anaesthesia, akinesia and postoperative analgesia for several hours. On the other hand, sub-tenon or parabulbar anaesthesia performed with a blunt cannula which avoids the complications arising from the use of needles. Intraoperative analgesia and akinesia are similar to the peribulbar technique. Care taken to avoid intravascular injections of anaesthetic agents because refractory cardiopulmonary arrest may result from an inadvertent intravenous or intraarterial injections.

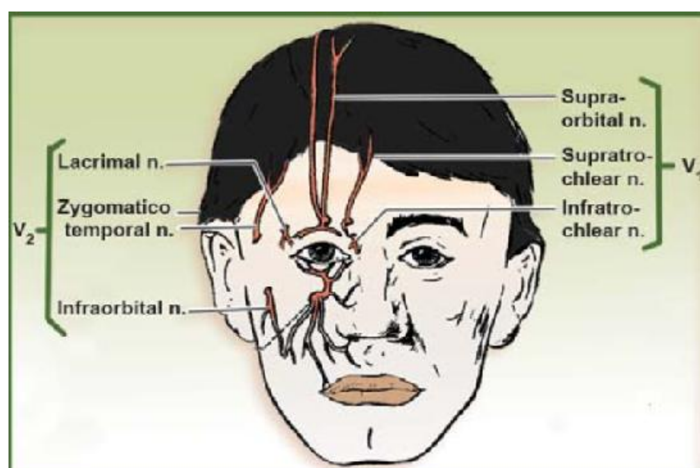


Fig No. 5- Distribution of sensory nerves. Branches derived from ophthalmic nerve (V1) and maxillary nerve (V2) a division of the trigeminal nerve.

Peribulbar (Periocular) Technique

Since the exit of retrobulbar akinesia, peribulbar akinesia is considered a safe and effective technique of local anaesthesia. It is method of choice with eye surgeons for giving local anaesthesia to cataract. As the name indicates, peribulbar anaesthesia is a technique in which a local anaesthetic is injected into peribulbar space and is not aimed at blocking a nerve.

Technique

Periocular anaesthesia is administered at two sites: lower temporal quadrant and superonasal quadrant. The required local anaesthetics are lidocaine 1 percent and bupivacaine 0.75 percent with hyaluronidase

In the first stage, injection of 0.5 cc of 2 percent lidocaine with a 26-gauge needle is done under the skin at about 1 cm away from the lateral canthus in the lower lid, along the orbital rim. The same needle is passed deeper to inject 0.5 cc of lidocaine into the orbicularis muscle and 1.0 cc into the muscle sheath. A second injection is done in the similar fashion in the upper eye lid just below the supraorbital notch. Pressure is applied at both sited for a minute using gauze pieces.

In the second stage, combination of 6.0 ml of 2 percent lidocaine and 0.25 cc of hyaluronidase is filled into a 10-ml disposable syringe fitted with a, 1-1/4-inch 26 gauge, hypodermic needle. The needle is first introduced deep into the orbit through the anesthetized site in the lower eye lid. One ml is injected just beneath the orbicularis muscle and then the needle is advanced up to the equator of the globe to inject 2 to 3 ml of the solution. The same procedure is followed in the upper nasal

quadrant through the preanesthetized site to inject 1 ml and another 1 ml may be injected around superior orbital fissure, by deeper penetration.

At the end of the procedure, fullness of the lids is noted due to the volume of the injected. Firm pressure with the flat of the hand is applied over the globe and is maintained for a minute. Then, before surgery, any pressure device as per the surgeon's choice like Honan's balloon, super pinky ball, balance weight or simple pad-bandage is applied for 20 to 30 minutes, to achieve the desire response of hypotony.

In case of persistent inferior or lateral movement injection lower temporal quadrant and in case of persistent movements upwards of nasally, the upper quadrant could be infiltrated in the same fashion. Hyaluronidase is essential as it helps in the spread of the drug. Otherwise, there are chances of the eye being proptosed due to high orbital pressure induced by the large quantity of the fluid injected.

Needle positions for peribulbar and retrobulbar akinesia

Single injection of 5 to 6 ml of anaesthetic mixture injected from any site posterior to equator of the globe also achieves same results. For convenience, however, it may be done through lower lid the junction of lateral and middle one third, along the floor of the orbit.

Adequacy of akinesia is determined by the absence of ocular movements in all directions. This technique is certainly better than retro-ocular technique and has least complications.

Advantages

The advantages reported are:

1. The injection is done outside the muscle cone and so, the inherent complications of passing the needle into the muscle cone is completely eliminated.
2. It does not enter the retrobulbar space and thereby avoids retrobulbar haemorrhage, injury to optic nerve and entry of anaesthetic agents into subarachnoid space and other complications like respiratory arrest.
3. Since the needle is constantly kept parallel to the bony orbit, it avoids injury to globe and entry of anaesthetic agents into the eye ball.
4. It causes less pain on injection.
5. The procedure is easier and can be performed without causing damage to vital structures.
6. It does not reduce vision on table.
7. No facial block is required.

Drawbacks

The possible drawbacks of this procedure are:

1. Chemosis of conjunctiva.
2. Delayed onset of anaesthetic effect and
3. Potential risk of orbital haemorrhage. Though it occurs rarely, the magnitude of the problem is comparable to retrobulbar haemorrhage and necessitates postponement of surgery.

Mechanism

This procedure may best be described as 'Infiltration Anaesthesia' where nerve endings in all tissues in injection get anesthetized. Peribulbar anaesthesia is a safe and reliable technique for achieving akinesia and anaesthesia of the globe. The operated eye must be bandaged at the end of surgery to avoid diplopia, as the effect of the anaesthetic may last a few hours.[30]

Parabulbar (Flush) or Sub-Tenon Akinesia

Stevens[31] described sub-Tenon's anaesthesia for cataract extraction in 1992. A small incision is made in the conjunctiva below the lower limbus in the temporal quadrant, exposing the sclera. The anaesthetic solution (2 mL) taken in a syringe is injected using a special blunt tipped curved needle (configuring the globe curvature) into the peribulbar space beyond the equator. Because of its easy administration under direct visibility of the needle insertion, it became more popular than the previous methods of giving anaesthesia for cataract surgery.

This is a very valuable alternative technique to the retrobulbar and peribulbar methods. In this technique, we attempt to place the anaesthetic in the intraconal space, near the ciliary ganglion. This method consists of a limbal sub tenon administration of retrobulbar anaesthesia using a blunt irrigating cannula. This technique can be used for anterior and posterior segment surgery.

Technique

Blunt cannula with the anaesthetic or mixture chosen. The patient needs to look up and in the direction of the eye to be operated on so that the inferior nasal quadrant is seen. Topical anaesthesia is applied and then conjunctival and Tenon incision is made with Wescott scissors creating a deep tunnel. The blunt cannula is

introduced through the tunnel, injecting the anaesthetic. Honan's balloon or Super Pinky decompressor is used for 10 minutes at 30 mmHg.

Complications

Retrobulbar haemorrhage: This can be produced mucous-Tenon dissection is performed, or when the cannula through the tunnel is introduced or when this technique is done by using a continuous infusion with catheter.

Conjunctival edema: This is produced when the anaesthetic in the subconjunctival space is injected and not in the sub-Tenon space, diminishing the possibility of achieving complete denervation of the eyeball.

Topical Anaesthesia

Fichman[32] reintroduced topical anaesthesia for cataract surgery in 1992. Topical anaesthesia is used to block the afferent nerves of the corneal and the conjunctiva (long and short ciliary nerves, nasociliary nerves). This technique eliminates the possible complications of injectable anaesthesia. Advantages of topical anaesthesia include no risk of ocular perforation, extraocular muscle injury, or central nervous system depression. Vision returns almost immediately, and patients are able to leave the operating room without being patched because no eyelid block is used. However, it does not eliminate pain sensitivity of the iris, the zonule, and the ciliary body.

Gills[33] introduced intracameral technique of anaesthesia with, wherein 0.25 mL of preservative free 1% lidocaine anaesthetic solution is injected into the anterior chamber on the surface of iris. Topical and intracameral techniques are not absolutely safe as epithelial and endothelial toxicities are reported with them[34].

Since the advent of retrobulbar and peribulbar techniques in the early part of this century, both procedures are mainstay of local anaesthesia for intraocular surgery till

today. They do carry the risk of perforation of globe, optic nerve and the inadvertent injection of anaesthetic at wrong places.

To overcome all these practical difficulties, use of topical anaesthesia in intraocular surgery has been widely suggested. Topical anaesthesia meaning topical application of 4 percent xylocaine or 0.5 to 0.75 percent proparacaine one drop 3 to 4 times at regular intervals in the eye has become increasingly popular and accepted.

Topical anaesthesia prevents these complications but has been reported to cause corneal epithelial, corneal endothelial, or retinal toxicity. The toxicity is mostly the result of the preservatives in the anaesthetic solutions[35].Some agents (eg, proparacaine) can lead to allergic and idiosyncratic reactions such as periocular swelling, erythema, and contact dermatitis[35].

Advantages of Topical Anaesthesia

1. In Phacoemulsification surgery, with topical anaesthesia visual recovery is immediate.
2. It prevents the well-known complications of retrobulbar and peribulbar injections.
3. It lessens the time of operating room use thereby lowering costs.
4. There is no immediate postoperative ptosis as seen in retrobulbar or peribulbar and Van Lint, O'Brien infiltrations lasts for 6 to 8 hours due to temporary akinesia of the lids.
5. With topical anaesthesia photon laser intraocular surgery can be OPD procedure.
6. Faster visual recovery and ability for patients to remain on anticoagulation therapy.
7. The patients are anxious to peribulbar and retrobulbar injections prior to surgery. With topical anaesthesia this problem is over and patient compliance will be better during intraoperative period.
8. There is no need for a qualified anaesthesiologist in the operating theatre during the

operation, although many ophthalmologists prefer an anaesthesiologist by their side for local anaesthesia (retrobulbar and peribulbar anaesthesia).

Disadvantages of Topical Anaesthesia

1. The eye can move which makes the operation more difficult. If the eye movement occurs when capsulorhexis is being done, an undesirable capsular tear may take place leading to failure of this important step of the operation.

2. Topical anaesthesia is not indicated in all patients specially in anxious stressed patients, people with hearing difficulties, children and very young patients.

3. The illiterate patient's compliance remains very poor and they do not respond adequately to the command during surgery with topical anaesthesia.

4. The presence of very opaque cataract is a contraindication to the use of topical anaesthesia. This is because surgeon depends on the patient ability to visually concentrate on the operating microscope light to avoid eye movement during the operation. Patients, who are not able to fix the eyes, may lead to complications.

6. Some patients may feel pain during surgery with topical anaesthesia.

Intracameral Anaesthesia

This an adjunct method with topical anaesthesia designed by Gills[33] in 1995. This results in the blocking of the sensitivity in the long ciliary nerve branches, so that the zonular stretching and the scraping of the iris during phacoemulsification do not produce discomfort in the patient.

This technique consists of injecting 0.1 ml of 1 percent preservative-free lidocaine in the anterior chamber, avoiding the risk of intraocular toxicity and achieving a good analgesia of the iris. Topical and intracameral anaesthesia can be

used in patients treated with anticoagulants. The use of intraoperative lidocaine is safe and effective in controlling intraoperative discomfort.

No Anaesthesia Cataract Surgery

Amar Agarwal[36] introduced the technique of “no anaesthesia” for cataract extraction in 1998. In this technique, no topical or intracameral drugs are used. Although without any side effects, the stress for the surgeon is increased. Concerning the anatomic factors, the cornea is supplied by the medial and lateral long ciliary nerves, which are branches of the trigeminal nerve. It is sensitive to touch, pain, and temperature[37]. However, there are marked topographical variations in corneal sensitivity. In addition to diurnal fluctuations, corneal sensitivity varies by age, sex, and race[38,39]. The central part of the cornea is the most sensitive, with an overall reduction from the centre to the periphery. The superior cornea is the least sensitive, probably because of difference in the density of the innervational network. The density of this network is highest in the centre of the cornea, encompassing an area 5.0 mm in diameter. The density decreases toward the limbus. There are more free nerve endings in the horizontal meridian than in the vertical one[40].

Due to increased stress on surgeon, the “no anaesthesia” technique has not gained popularity.

Cryoanalgesia

Gutierrez–Carmona[41] modified “no anaesthesia” technique and introduced cryoanalgesia for cataract surgery. In this technique, all solutions to be used during surgery are cooled to 4°C except povidone drops. Before surgery, an eye mask of cold gel is placed over the eye for 10 min. During the surgery, the eye is irrigated with cold balanced salt solution. The advantage of performing phaco with irrigation at low

temperature is that it partially avoids the heat generated by the phaco tip, eliminating pain. Further, using cold fluids reduces postop inflammation, the risk of endophthalmitis and the endothelial trauma caused by the heat of the phaco tip. Although showed to be a safe technique for clear cornea phacoemulsification with acceptable level of pain, it is not suitable for all cataracts and all patients.

Xylocaine Jelly

This method of topical anaesthesia with 2 percent lidocaine hydrochloride gel allows cataract surgeons to eliminate the risks associated with needle injection. The gel helps to keep the cornea moistened and increases contact time with the ocular surface, insuring sustained diffusion and prolonged anaesthetic effect. On the other hand, the gel is minimally absorbed by the ocular mucous, reducing the risk of secondary systemic effects.

Viscoanaesthesia

This a new type of topical intracameral anaesthesia by means of a viscoelastic cohesive material which contains an anaesthetic component. The topical component used preoperatively, consists of a mixture of 0.3 percent sodium hyaluronate and 2 percent lidocaine hydrochloride, while the intracameral component used preoperatively consists of 1.5 percent sodium hyaluronate and 1 percent lidocaine hydrochloride. The first step of the viscoanaesthesia procedure involves the preoperative application of the topical component. Once the topical mixture is applied, the patient’s eyes are kept closed for approximately 1 minute to allow for optimum diffusion of the mixture. The intracameral component is then used as a normal viscoelastic, mainly before capsulorhexis and before IOL implantation. It

provides a longer anaesthetic effect when compared with the application of only an aqueous topical anaesthetic.

LOCAL ANAESTHETICS IN COMMON USE

Classification of local anaesthetics

Divided into two biochemical categories:

1. Aminoesters (tetracaine and proparacaine)
2. Aminoamides (lidocaine and bupivacaine)

Mechanism of action

Local anaesthetics solution are acidic preparations which deliver the medication to the tissue in an ionized (lipophobic) form. In order for local anaesthetics to exert their mechanism of action they must be absorbed into intracellular space in an unionized form. Factors such as anaesthetics pKa and local tissue pH can influence the rate at which the local anaesthetics is incorporated into the intracellular space. The acidic intracellular pH converts the anaesthetics compound back to its ionized form, which is responsible for intracellular blockage of voltage gated sodium channels causing decreased influx of sodium ions[42].

Metabolism

Aminoesters are metabolised by plasma esterases, and aminoamides are metabolised by cytochrome P-450 hepatic enzymes. The R isomer of bupivacaine has a slower dissociation from sodium channels which can induce a more profound frequency dependent block which can induce a more profound frequency dependent block which can lead to cardiac arrhythmias. For this reason the S-isomer of bupivacaine seems to be a better option for local Anaesthesia due to its lower

incidence of cardiac toxicity[43]. It is important to remember that bupivacaine should be injected slowly and administered in conjunction with epinephrine in order to counteract the potential systemic toxicity of bupivacaine.

Esters

Procaine

Procaine is para-aminobenzoic acid ester of diethylaminoethanol. It is available as 1% ampoules. It has rapid onset of action (2-5 minutes) with average duration of action of one hour. Concentration of 0.5-2 % are used with max. dose of 14mg/kg body weight. Detoxification occurs by hydrolysis of para-amino-benzoic acid and diethylaminoethanol through the enzyme pseudo-cholinesterase in the plasma.

Chloroprocaine

It is a 2 chloro-4 aminobenzoate ester of b-diethyl aminoethanol. It is an analog of procaine. It is used for infiltration anaesthesia in concentration of 0.5-2 %.Onset of anaesthesia is very rapid (2-5 min) and average duration of action lasts for 1 and ½ hours. It is twice as potent as procaine. Metabolism is largely through hydrolysis by pseudo-cholinesterase in the plasma.

Tetracaine (Amethocaine)

Tetracaine is a para-butylaminobenzoic acid ester of dimethyl amino ethanol. Tetracaine is used for infiltration as well as topical anaesthesia. It is available in concentration of 0.25- 2% solution. It is potent and toxic local anaesthetic. Hence given with caution.

Amides

Lidocaine

It is one of the most common local injectable anaesthetic agent used in ophthalmic surgery. It is 2- diethyl amino-2'-6'- acetoxylidide. Lidocaine 2% is used for infiltration anaesthesia. It is available in concentration of 0.5- 4% as lidocaine hydrochloride. For infiltration anaesthesia generally 1% and 2% solutions are used. It has rapid onset of action (0.5-2 min) and average duration lasts for 1 and 1/2 to 2 hours.

It is metabolized in the liver to xylidine and diethyl amino acetic acid or is directly excreted into the urine and bile.It is generally given with mixture of adrenaline and hyaluronidase to prolong the anaesthetic effect and diffusion to the ocular tissue. Hyaluronidase is an enzyme capable of depolymerizing hyaluronic acid found in interstitial spaces and when it gets depolymerized, fluid passes more easily between the tissues.

Preferably 1:100000 solution of adrenaline concentration is used and it causes sufficient vasospasm to reduce significantly the rate of removal of local anaesthetic agent. Safe dose of lidocaine hydrochloride is 7 mg per kg body weight with vasoconstrictors and 3 mg body weight without vasoconstrictors.

Prilocaine

It is a propylamino- 2 methyl propionanilide. Its pharmacological properties are similar to lidocaine and it's onset of action takes 5-15 minutes and duration of action lasts for 1 to 3 hours. It is used for infiltration and regional nerve block anaesthesia. It is available in concentration of 0/5- 3 %.

Mepivacaine

It is a N- methyl pipecolic acid 2,6 dimethyl anilide. It has pharmacological properties similar to lidocaine. It is shown to have mild vasoconstrictor effect which reduces its absorption. The effect of mepivacaine on the peripheral circulation is a potentiation of the action of noradrenaline on nerve endings. The onset of action starts within 3-5 min and duration of action is from2-2 and 1/2:hours. It is used for infiltration and nerve block anaesthesia. It is available as1-2 % injectable solution.

Adjuvant Agents

Epinephrine, hyaluronidase, and sodium bicarbonate are adjuvant drugs that are commonly used to enhance the effect of regional anaesthesia.

Epinephrine

Epinephrine causes vasoconstriction at the site of injection, thereby delaying the absorption of regional anaesthetic agents. The duration of action is prolonged for all except the longest-acting agents, and the effectiveness of the block is improved. The addition of 0.1 ml of 1:1000 epinephrine to 20 ml of regional anaesthetic solution is standard, producing a concentration of 0|.1g/ml

Hyaluronidase

Hyaluronidase promotes the spread of the anaesthetic solution through tissue. The enzyme causes a reversible hydrolysis of extracellular hyaluronic acid,breaking down collagen bonds and allowing the anaesthetic to spread across fine connective tissue barriers. Hyaluronidase is typically added to the regional anaesthetic injectant in a concentration of 7.5 units/ml.

Complications of local Anaesthesia

Can be divided into two categories:

1. Complication associated with agent

2. Complication associated with anaesthetic technique.

Complication associated with agent

Allergic reactions are serious potential side effect associated with the administration of local aminoesters anaesthetic compounds. These allergic reactions are induced by hypersensitivity reaction to paraminobenzoic acid (PABA). PABA is an intermediate metabolite produced by the hydrolysis of aminoester compounds.

Previous patient sensitisation to PABA can occur with the use of cosmetic products containing methyl and propyl paraben, and explains some patients can develop allergic reactions to local anaesthetics even without previous exposure to the agent. The only aminoester that is not metabolised into PABA is proparacaine and therefore may be used with caution in patients with a history of documented allergic reaction to PABA containing products. Aminoamides are not derivatives of PABA and therefore have a much less allergenic potential.

Systemic toxicity of local anaesthetics

The main systemic toxicities associated with the use of local anaesthetics include: cardiac (arrhythmias, myocardial depression, cardiac arrest) and central nervous system (irritability, lethergy, seizures and generalised CNS depression leading to respiratory arrest) toxicity.

Complication associated with anaesthetic technique.

1.Conjunctival chemosis and subconjunctival hemorrhage

Conjunctival chemosis is most commonly associated to large peribulbar blocks. The excess conjunctival fluid can be controlled with use of compression devices such as honan ballon.Subconjunctival hemorrhage can also occur during or after injection of local anaesthetics. In rare instances, a prominent elevated subconjunctival hemorrhage can lead to postoperative corneal dellen.

2.Retrobulbar hemorrhage

It is a rare but sight threatening complication of both peribulbar and retrobulbar blocks. The estimated incidence of this complication is estimated to range between 0.44 to 0.77 in some series.[44,45]

The clinical manifestations of retrobulbar hemorrhage include: proptosis, subconjunctival hemorrhage, tightness of periocular lid skin, increased intraorbital and intraocular pressure which leads to central retinal artery occlusion and optic nerve ischemia causing severely reduced visual acuity.

The occurrence of this complication can be reduced with use of short needles(< 3mm), proper eye positioning and thorough preoperative history which can elicit the use of aspiri and other anticoagulants.The management of this complication includes a combined cantholysis-canthoplasty in presence of elevated IOP or spontaneous pulsation of the central retinal artery.

3.Globe penetration or globe perforation

It can occur in 0.014% of cases[46]. Risk factors include presence of pathologic myopia (axial length >26mm) and posterior staphyloma. Additional risk factors

include poor patient cooperation, difficult access and injection of anaesthetic while patient is looking up and in.

Penetration or perforation of globe can be recognised by presence of sudden loss of vision, hypotony, decreased red reflex and pain[47]. Injury to optic nerve may also occur due to direct trauma with needle or due to haemorrhage within the nerve sheath[48].

Retrobulbar Anaesthesia is contraindicated in ruptured globe cases due to higher chance of causing a perforation or penetration of the globe. In addition the elevated orbital pressure induced by anaesthetic can lead to extrusion of intraocular contents.

4.Amaurosis

It can occur after a retrobulbar block due to optic nerve block.this condition is characterised by transient loss of vision which is usually recognised at the end of surgery. The patient should be reassured about the transitory nature of this complication.

5.Impairment of ocular blood flow

Regional ophthalmic Anaesthesia has been associated with ischemic complications leading to optic nerve atrophy, central retinal artery occlusion and ischemic optic neuropathy[48]. Pulsatile ocular blood flow, pulse amplitude and pulse volume have been shown to decrease after injection of retrobulbar anaesthetics[49].

6.Brainstem Anaesthesia

It occurs when the injected anaesthetic gain access into the subarachnoid space due to direct injection or spread of local anaesthetic into the central nervous system[50]. The incidence of life threatening brainstem anaesthesia has been reported to occur in 1 out of 700 retrobulbar blocks[51].

Systemic manifestations of brainstem anaesthesia include apprehension, unconsciousness and apnea which occurs within 20 minutes of injection and resolves within one hour with appropriate management i.e., positive pressure ventilation to prevent hypoxia, bradycardia and cardiac arrest[52].

7.Oculocardiac reflex

Retrobulbar anaesthesia blocks the afferent pathway of the ocuolocardiac reflex which is a trigeminal vagal response. Local distension of tissues due to local anaesthetic or haemorrhage may precipitate the development of bradycardia, hypotension and cardiac arrhythmias. This complication is commonly seen after retrobulbar injection.

The use of systemic atropine or glycopyrrolate is commonly used to prevent the development of this condition in patients with baseline bradycardia[53].

METHODOLOGY

This randomized controlled clinical trial was conducted to compare and evaluate the patient and surgeon satisfaction between topical and peribulbar anesthesia on subjects attending the Ophthalmology OPD with cataract satisfying inclusion criteria at KLES Dr. Prabhakar Kore Hospital and MRC, Belagavi from January 2016 to December 2016. The patients eligible for the study were randomly assigned to two groups

STUDY DESIGN

One year randomised controlled clinical trial non blinded.

METHOD OF COLLECTION OF DATA

Source of data

Patients undergoing phacoemulsification at KLE'S Dr. Prabhakar Kore Hospital and Medical research centre, Belagavi

Duration: January 2016 – December 2016

Sample size

Total of one hundred and sixty cases were included in the study with eighty patients in each group.

Sampling Procedure

It was calculated according to the formula

$$n = \frac{2(Z\ \ +Z\ \ )^2pq}{(p_1-p_2)^2}$$

Where n= sample size

=0.05

=0.2

Power=80%

P_1=Patient discomfort (with peribulbar anaesthesia)=30%

P_2= Patient discomfort(with topical anaesthesia)=10%

P_1-P_2=effect size=20%

$$P = \frac{p_1+p_2}{2}$$

$$q = 1-p$$

Group A : with peribulbar anaesthesia: n=65

Group B : with topical anaesthesia: n=65

According to the calculation, one hundred and thirty cases were to be taken as minimum sample size. However, a total of one hundred and sixty cases satisfying inclusion criteria underwent phacoemulsification from January 2016 to December 2016.Hence, all cases were taken up for the study.

Selection Criteria:

<u>Inclusion criteria</u>

Patients with Pre senile/ Senile immature cataract of either gender.

1.Uncomplicated cataract.

2.Cataract of grade I to grade III nuclear sclerosis.

3.Patient willing to give consent.

Exclusion criteria

1. Secondary,congenital and complicated cataracts
2. Previous history of posterior segment ocular surgery and ocular trauma
3. Uncooperative patients, with dementia and deafness
4. Poor pupillary dilatation (<5mm)
5. Ocular movement disorders like nystagmus, mentally challenged.
6. Patients with allergy to lidocaine.

METHODOLOGY:

This study was conducted in the department of ophthalmology at KLE's Dr. Prabhakar Kore Hospital and medical research centre, Belagavi between January 2016 to December 2016. All patients with cataract undergoing phacoemulsification with foldable IOL implantation were selected by the inclusion criteria and enrolled into study after taking an informed and written consent.A total of 160 cases were taken for the study with 80 cases in each group. The study was approved by the ethical and research committee of Jawaharlal Nehru Medical College, Belagavi. All patients received a thorough explanation of the study design and aims and provided written informed consent.

The patients were day care cases and in-patients of the hospital. Demographic data of patients were noted in a predesigned proforma. Detailed history of symptoms were noted. History was followed by ocular examination that included :

- Visual Acuity with Snellen's chart,
- Ocular examination proper (Adnexa, conjunctiva, cornea, Anterior chamber, iris, pupil and lens).

- Detailed slit lamp bio microscopy to grade the cataract as:-
    - Cortical Cataract
    - Nuclear Sclerosis

        Nuclear sclerosis grading was done as(Oxford system)

        Grade I

        Grade II

        Grade III

        Grade IV

        Grade V
    - Posterior Subcapsular Cataract
- Ophthalmoscopy

Investigation done:

1. Measurement of intra-ocular pressure.
2. Tests for lacrimal patency.
3. Blood pressure.
4. Random blood sugar.
5. keratometry
6. A-scan
7. B-scan whenever necessary.

PROCEDURE:

Pre-operative preparation:

All patients received Tab. Levofloxacin 500 mg once a day and topical combination of moxifloxacin(0.5%)+ketorolac(0.5%) one drop four times per day, starting one day prior to surgery. Lignocaine sensitivity was done to all patients.

Tropicamide 0.8% and phenylephrine 5% eye drops were instilled for mydriasis every 15 minutes starting two hours prior to surgery. The patients were randomly assigned to two groups using the sealed envelope method in the preanaesthesia room. A person not concerned with the study supervised the randomization of envelope.

Group A-Phacoemulsification under peribulbar anaesthesia

Group B- Phacoemulsification under topical anaesthesia

All the patients underwent Phacoemulsification surgery with no additional oral sedation or analgesia. All the patients with uncomplicated senile/presenile cataracts with either gender were included in the study .

Peribulbar group (Group A):

For the Peribulbar anaesthesia group, injection of mixed solution of 2% lidocaine with 1:200000 adrenaline and 1500 IU (to achieve 50 IU/ml)of hyaluronidase was used.

Technique:

Using modified Weiss technique, 26 G disposable needle was inserted at the junction of middle and outer third of the lower orbital margin (just above infraorbital notch) and directed towards the floor of the orbit.3-5 ml of anesthetic solution was injected at the site.

Another injection of 2-3 ml was given in superonasal quadrant of the orbit,below the supraorbital notch. After the injection, the eyes were given digital

pressure for about 5 min. Before surgery, surgeon assessed the lid akinesia and globe akinesia. Eye movement was assessed in four direction of gaze- inferior,superior,medial and lateral.

Topical group (Group B):

For the Topical anaesthesia group,one drop of proparacaine hydrochloride 0.5% was instilled six times with an interval of 5 min before the start of the surgery and was asked to minimize the eye movements. Patient received last topical anesthetic dose after draping the patient.

SURGICAL PROCEDURE-

Cataract surgery was performed by one surgeon . Surgeon had performed approximately 10000 phacoemulsification surgery and about 20 surgeries using topical anaesthesia prior to the start of the study. The surgical procedure was same between the two study groups.

Under all aseptic precautions, the eye was painted with povidine iodine solution and draped. A self retaining wire speculum was used. Patients were asked to fixate on the microscope light during surgery. It consisted of a superior perilimbal 2.8 mm clear corneal incision, two paracentesis at 10 o'clock and 2 o'clock position using 15° angled side port, injection of a viscoelastic substance into the anterior chamber, continuous curvilinear capsulorhexis to open the anterior lens capsule, hydrodissection, hydrodelineation, endocapsular phacoemulsification of the lens nucleus using stop and chop technique, bimanual aspiration of the remaining cortical lens material and in-the-bag implantation of a 6.5-mm foldable posterior chamber

IOL. The wound integrity was tested for leakage of fluid by gentle compression of the globe. No sutures were required in any case.

Intracameral moxifloxacin 0.5% of 0.4ml diluted with BSS was administered as the last step of the surgery. During the postoperative recovery period, each patient received a combination of a topical corticosteroid and antibiotic eyedrops.

Any intraoperative complications were documented. Immediately after surgery, patients were asked to grade the pain felt during the operation, including the pain felt after delivery of topical or peribulbar anaesthesia. For that purpose, a modified visual analog was used , where grade 0 indicates no pain and grade 4 as extreme pain. The patient were described the score and verbal pain score[52] was obtained.

The surgeon also completed an assessment questionnaire immediately after each surgery. Lid squeezing, inadvertent eye movement, intraoperative miosis, iris prolapse, and surgical complications were noted if present. Patient cooperation was rated as poor, good, or excellent and given a respective value of 0, 1, or 2 respectively.

Additionally, the patients were asked whether the cataract surgery was more or less painful than having the needle used for intravenous infusions inserted into the back of the hand. The surgeon was also requested to grade any difficulties encountered during surgery immediately after the operation, using a 4-point scale, where 0 no difficulty and 3 extremely difficult. Visual acuity was measured postoperatively by Snellen's chart.

Evaluation:

The following parameters were assessed:

1.Lid akinesia and Globe akinesia

2.Anaesthesia related complications:

a.Pain during administration

b.Chemosis

c.Subconjunctival haemorrhage

d.Retrobulbar haemorrhage

e.Optic nerve injury

f.Globe perforation

g.Burning sensation

f.Giddiness

3.Analgesia

Pain assessment immediately after surgery and 4 hours postoperatively (by verbal pain score)

Grade 0 (no pain)

Grade 1(mild/tolerated pain)

Grade 2 (moderate/interference needed i.e.,more anesthetic or oral analgesic)

Grade 3 (severe/not tolerated with oral analgesic)

Grade 4(unbearable/needs to stop the procedure)

4.Intraoperative pain occurred at what stage

a.Scleral contact

b.Corneal cut

c.Iridal contact

d.Intraocular lens insertion

5.Patient's co-operation in terms of following surgeon's instructions

Grade 1(excellent)

Grade 2 (good)

Grade 3 (poor)

6.Difficulty encountered by surgeon during surgery

Grade 0 (not difficult)

Grade 1(mildly difficult)

Grade 2 (moderately difficult)

Grade 3 (extremely difficult)

7.Intraoperative Complications

a.Descemet stripping

b.Endothelial touch

c.Anterior chamber collapse

d.Capsular tear

e.Zonular tear

f.Posterior capsular rent

g.Vitreous loss

- Post-operative vision was noted on the following day of the surgery in the operated eye.

STATISTICAL ANALYSIS

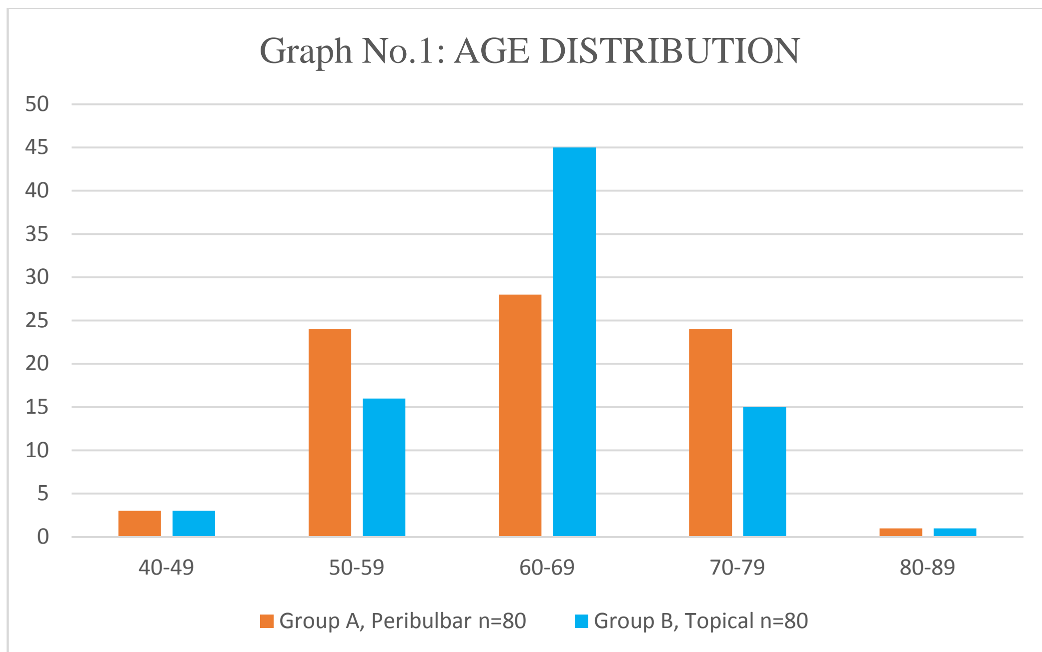
The chi-square test was used for intergroup comparisons of nominal data and the Student's t-test was used to compare numerical parameters. A p value of less than 0.05 was considered statistically significant. A SPSS software (ver. 23) was used for statistical analysis .

RESULTS

This study "A comparison of topical and peribulbar anaesthesia in phacoemulsification with intraocular lens implantation to evaluate patient and surgeon satisfaction: a randomised clinical trial" was conducted on 160 patients who underwent phacoemulsification at Department of Ophthalmology, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi during study period January 2016 to December 2016. The patients were divided into two groups that is Group A (Patients who underwent Phacoemulsification under peribulbar anesthesia) and Gtoup B (Patients who underwent Phacoemulsification under topical anesthesia).The data obtained from the study is tabulated as below:

Table no.1 AGE DISTRIBUTION

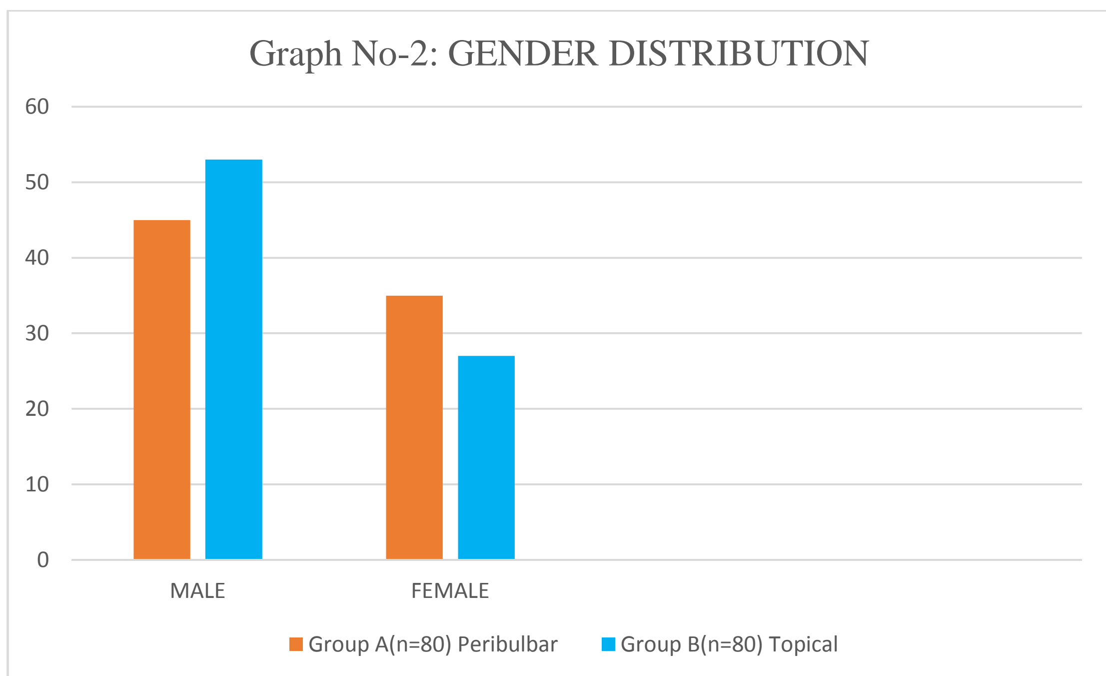
AGE(in years)	Group A (n=80) (Peribulbar)	Group B(n=80) (Topical)
40-49	3	3
50-59	24	16
60-69	28	45
70-79	24	15
80-89	1	1
TOTAL	80	80



In the present study 63% of patients belonged to 60-69 years of age group, 25 % belonged to 50-59 years of age group, 37% belonged to 70-79 years of age group, 75% belonged to 40-49 years, 25% belonged to 80-89 years of age group , Mean age is 63.37 years.

Table no. 2 GENDER DISTRIBUTION

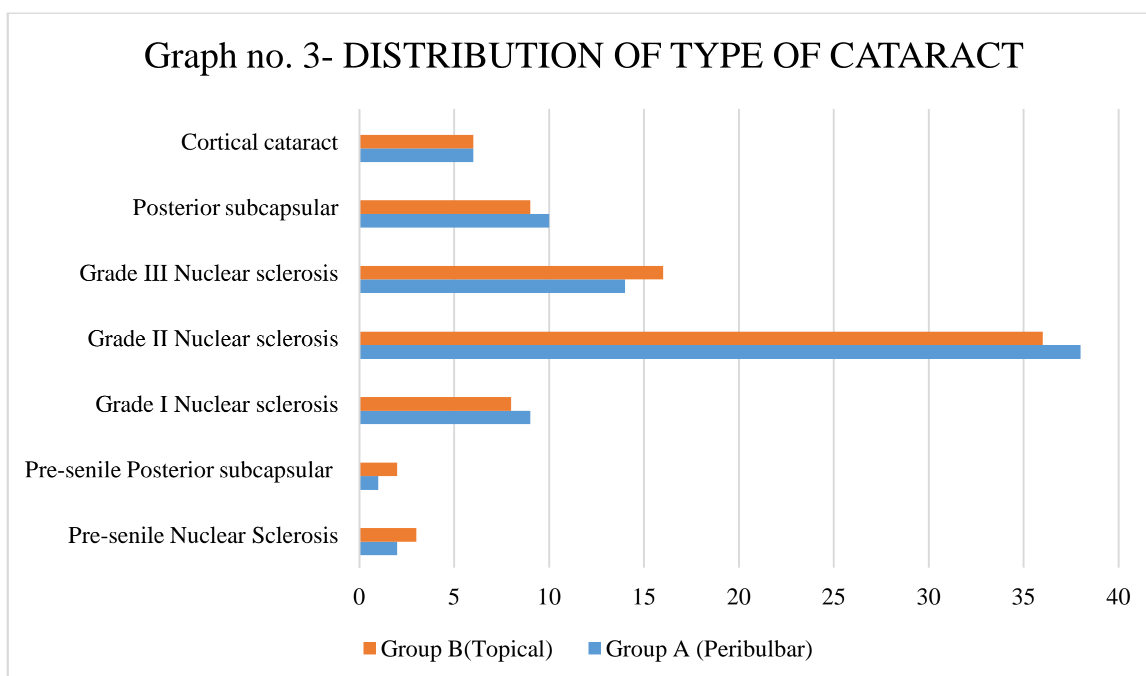
GENDER	Group A (n=80) (Peribulbar)	Group B (n=80) (Topical)
Male	45	53
Female	35	27
Total	80	80



Out of 160 patients, 98 (61.25%) were male and 62 (38.75%) were female. In group A 45 were male and 35 were female; In group B 53 were male and 27 were female. In the both groups males are more in number than female patients.

Table No.3 –DISTRIBUTION OF TYPE OF CATARACT

Type of cataract	Group A (n=80) (Peribulbar)	Group B (n=80) (Topical)	TOTAL	PERCENTAGE
Presenile immature cataract				
Nuclear Sclerosis	2	3	5	3.12
Posterior subcapsular	1	2	3	1.87
Senile immature cataract				
Grade I NS	9	8	17	10.62
Grade II NS	38	36	74	46.25
Grade III NS	14	16	30	18.74
Posterior subcapsular	10	9	19	11.87
Cortical cataract	6	6	12	9.37
TOTAL	80	80	160	100

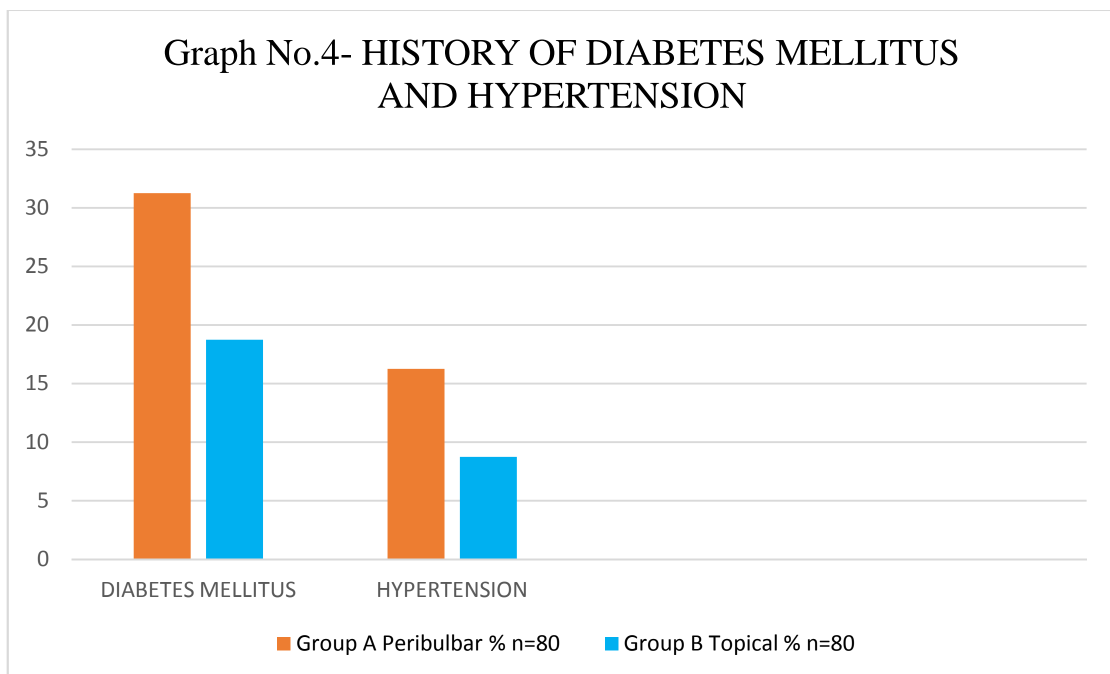


Out of 160patients, 5 patients had pre-senile immature cataract and rest 175 patients had senile immature cataract. In presenile immature patients 3.12% had Nuclear Sclerosis, 1.87 % had Posterior subcapsular cataract.

In senile immature cataract group, 10.62 % had grade I Nuclear Sclerosis ; 46.25% had grade II Nuclear Sclerosis; 18.74% had grade III Nuclear Sclerosis. 11.87% had only posterior subcapsular cataract and 9.37% had only cortical cataract.

Table no. 4. HISTORY OF DIABETES MELLITUS AND HYPERTENSION

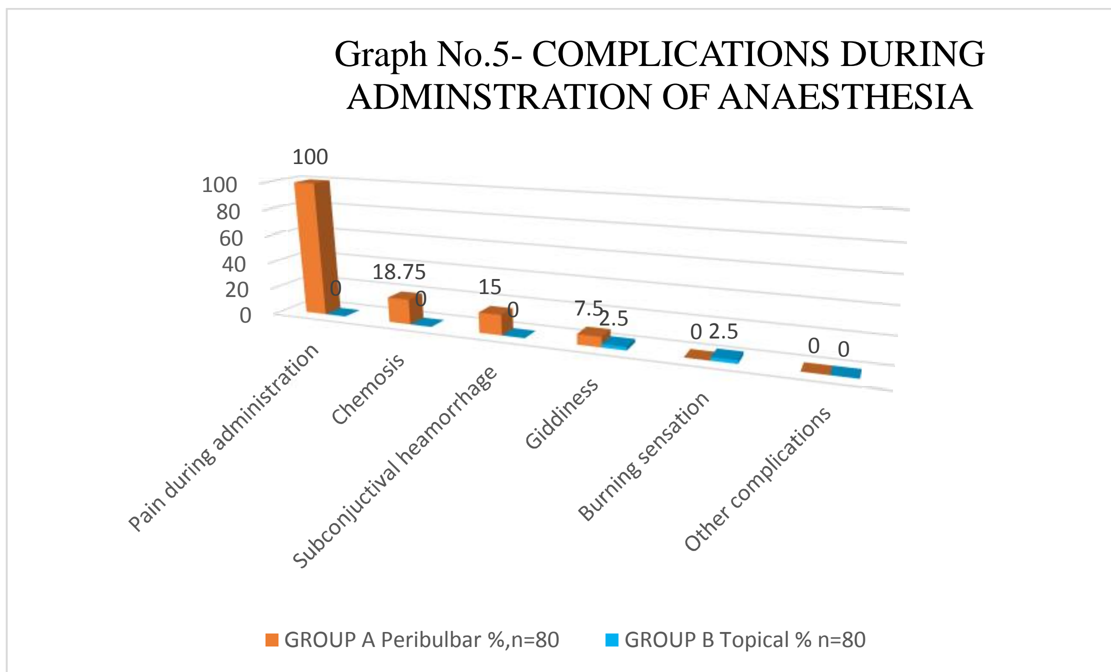
	Group A (n=80) (Peribulbar)		Group B (n=80) (Topical)	
	No.	%	No.	%
Diabetes mellitus	25	31.25	15	18.75
Hypertension	13	16.25	7	8.75
Total	38	47.50	22	27.50



Out of 160 patients, 25(31.25%) patients in group A and 15 (18.75%) patients in group B had diabetes mellitus.13 (16.25%) patients in group A and 7(8.75%) patients in group B had hypertension.In this study there was no co-relation of pain with Hypertension and Diabetes mellitus.

Table no. 5 COMPLICATIONS DURING ADMINISTRATION OF ANAESTHESIA

COMPLICATION	Group A (n=80) (Peribulbar)		Group B (n=80) (Topical)	
	No.	%	No.	%
Pain during administration	80	100	-	-
Chemosis	15	18.75	-	-
Subconjunctival haemorrhage	12	15	-	-
Giddiness	6	7.5	2	25
Burning sensation	-	-	2	2.5
Other complication	-	-	-	-
	26	32.5	4	5



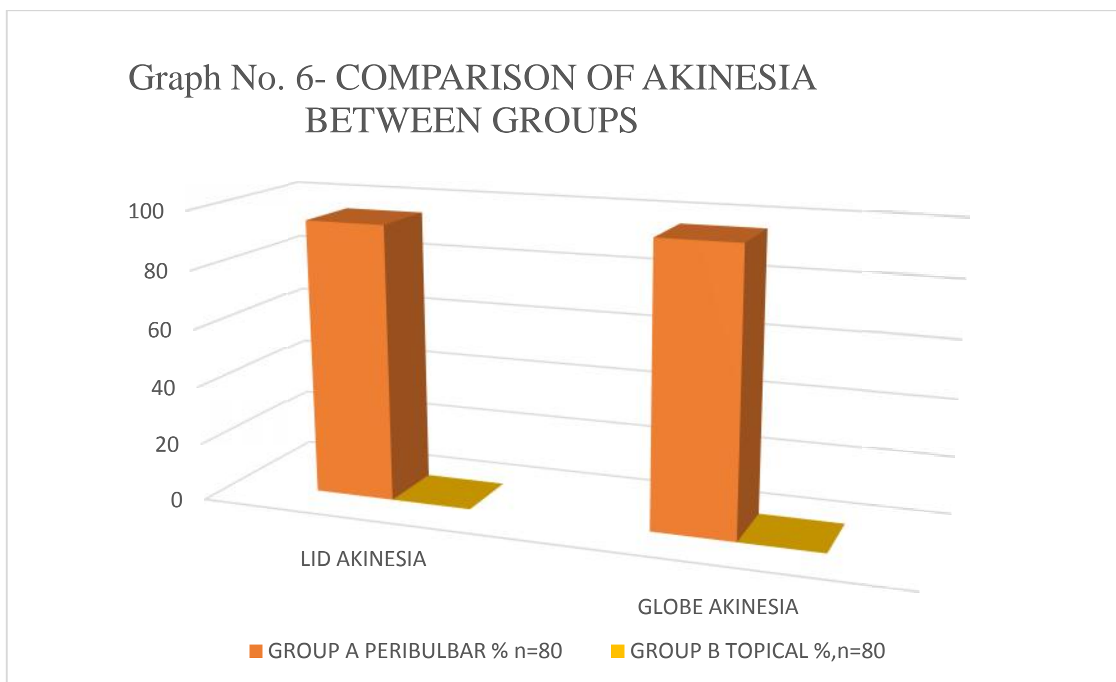
Out of 80 patients in group A , 80(100%) had pain during administration of anaesthesia which is statistically significant (p=0) where as none of the patient in group B had pain during admintration of anaesthesia.

In group A out of 80 , 15 (18.75%) had chemosis which was statistically significant (p= <0.001) ;12 (15%) had sub conjunctival heaemorrhage which was statistically significant (p <0 .001) ;6 (7.5 %) had giddiness which was statistically significant(p =<0.001).

In group B out of 80 , 2 (2.5%) had burning sensation and 2(2.5%)had giddiness which was statistically not significant (p= 2) .No other complications like optic nerve injury, retobulbar haemorrhage, and globe perforation were reported in both groups.

Table no. 6 COMPARISON OF AKINESIA

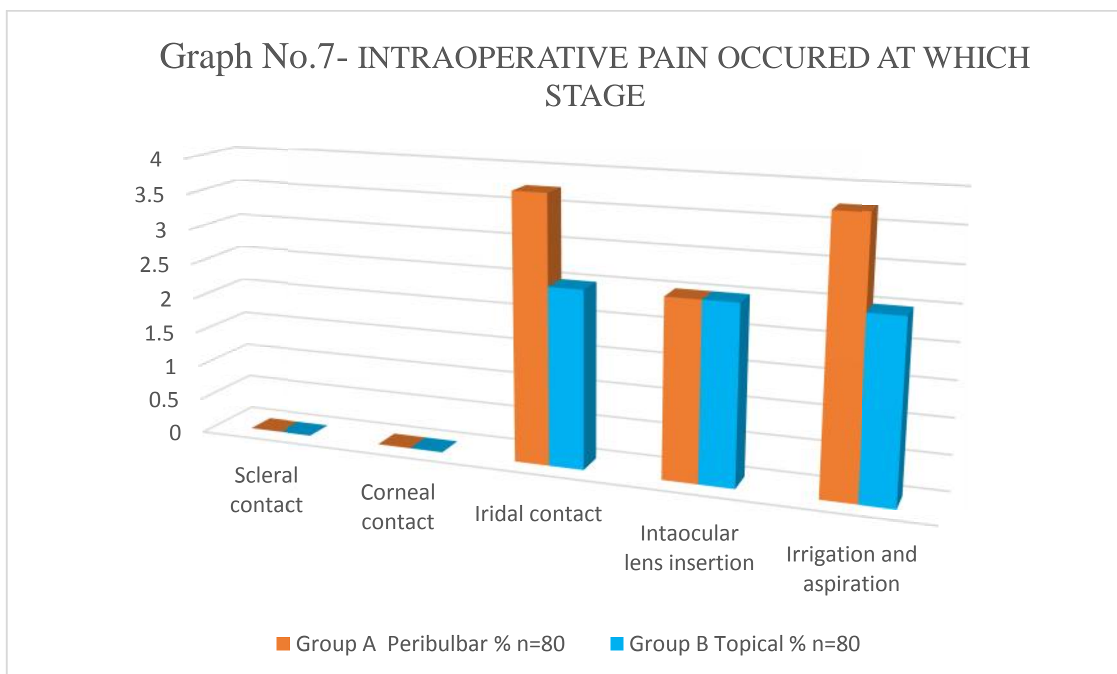
	Group A (n=80) (Peribulbar)		Group B(n=80) (Topical)	
	No.	%	No.	%
Lid akinesia	76	95	0	0
Globe akinesia	77	96.25	0	0



Among 160 patients, 76 (95%) had lid akinesia in group A and none in group B which was statistically significant (<0.001). Globe akinesia was present in 77 (96.25%) of patients in group A and none in group B which was statistically significant (<0.001).

Table no. 7 INTROPERATIVE PAIN OCCURRED AT WHAT STAGE

Pain occurred at stage	Group A (n=80) (Peribulbar)		Group B (n=80) (Topical)	
	No.	%	No.	%
Scleral contact	0	0	0	0
Corneal contact	0	0	0	0
Iridal contact	3	3.75	2	2.5
Intraocular lens insertion	2	2.5	2	2.5
Irrigation and aspiration	3	3.75	2	2.5
	8	10	6	7.5

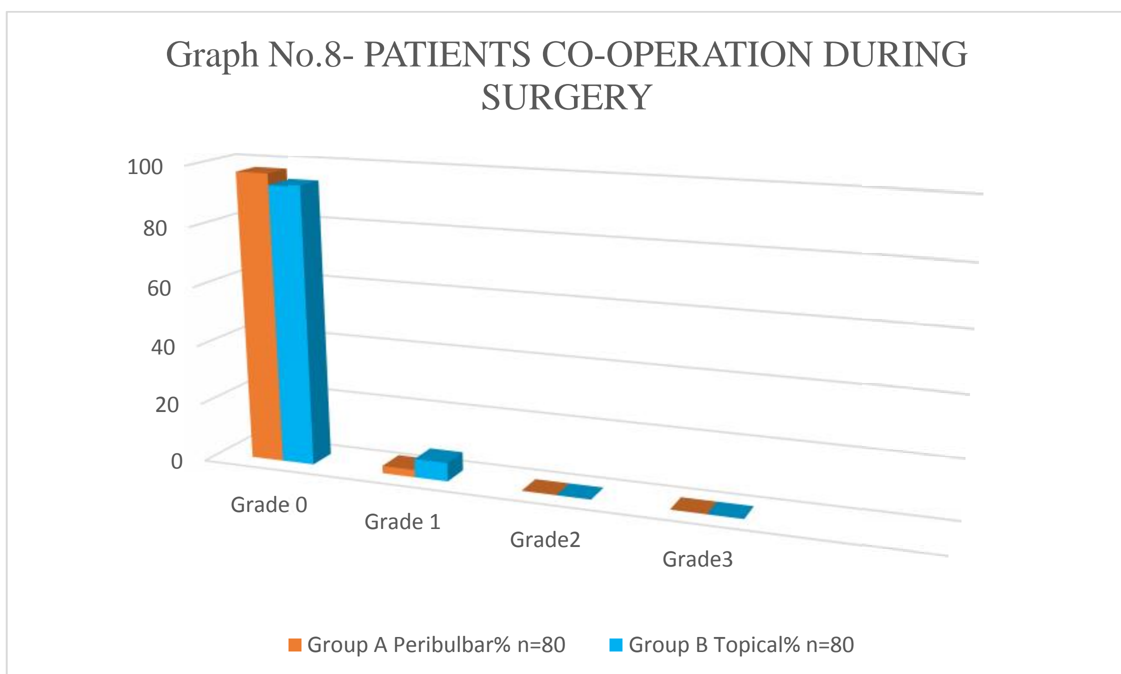


In group A out of 80, 3 (3.75%) had pain due to iridal contact which is statistically significant (P= <0.01), 2 (2.5%) had pain during intraocular lens insertion (p =>0.20) which is statiscally not significant and 3 (3.75%) had pain during irrigation aspiration which is statistically significant(p=<0.01)

In group B out of 80 ,2 (2.5%) had pain due to iridal contact which is statistically not significant(p= >0.20) pain during intraocular lens insertion and during irrigation and aspiration were 2(2.5%) which is statistically not significant(p=>0.20) scleral contact and corneal contact did not cause any pain in both the group.

Table no.8 PATIENT's COOPERATION DURING SURGERY

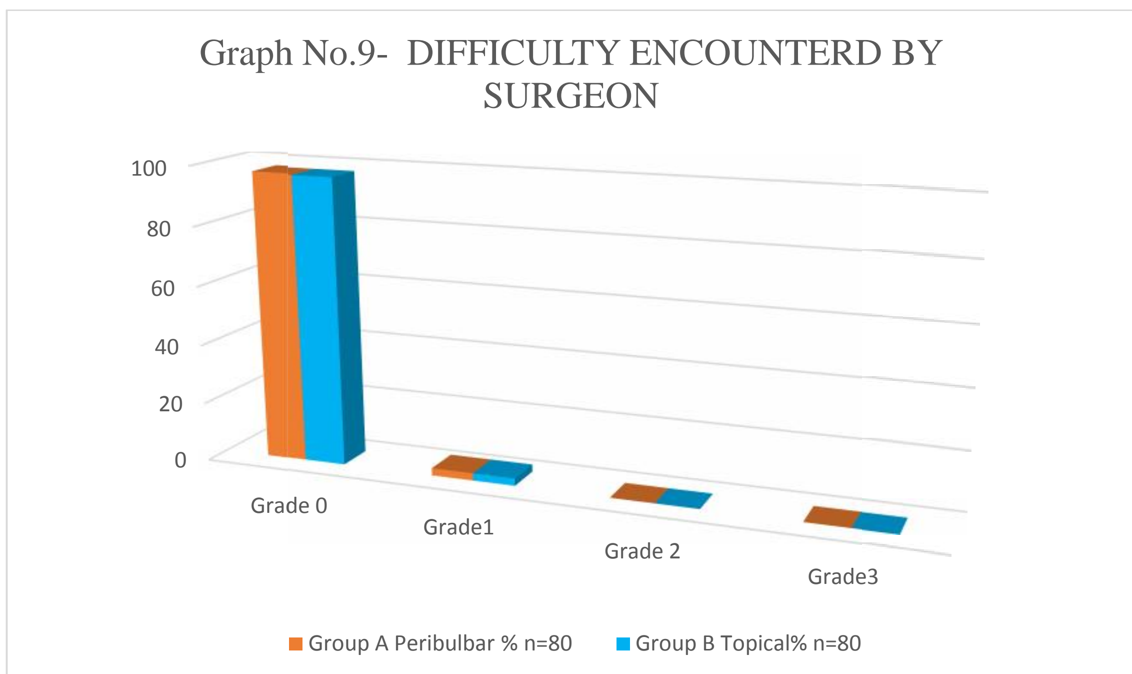
Grade of Co-operation	Group A (n=80) (Peribulbar)		Group B(n=80) (Topical)	
	No.	%	No.	%
Grade 0	78	97.50	75	93.75
Grade 1	2	2.50	5	6.25
Grade 2	0	0	0	0
Grade 3	0	0	0	0
TOTAL	80	100	80	100



Out of 160, 78 (97.50%) patients had excellent co-operation in group A and 75 (93.75%) patients in group B. Good co-operation was seen in 2(2.50%) patients in group A and 5(6.25%) patients in group B. There was statistical significance between two groups (p value is< 0.01).

Table no. 9 DIFFICULTY ENCOUNTERED BY SURGEON

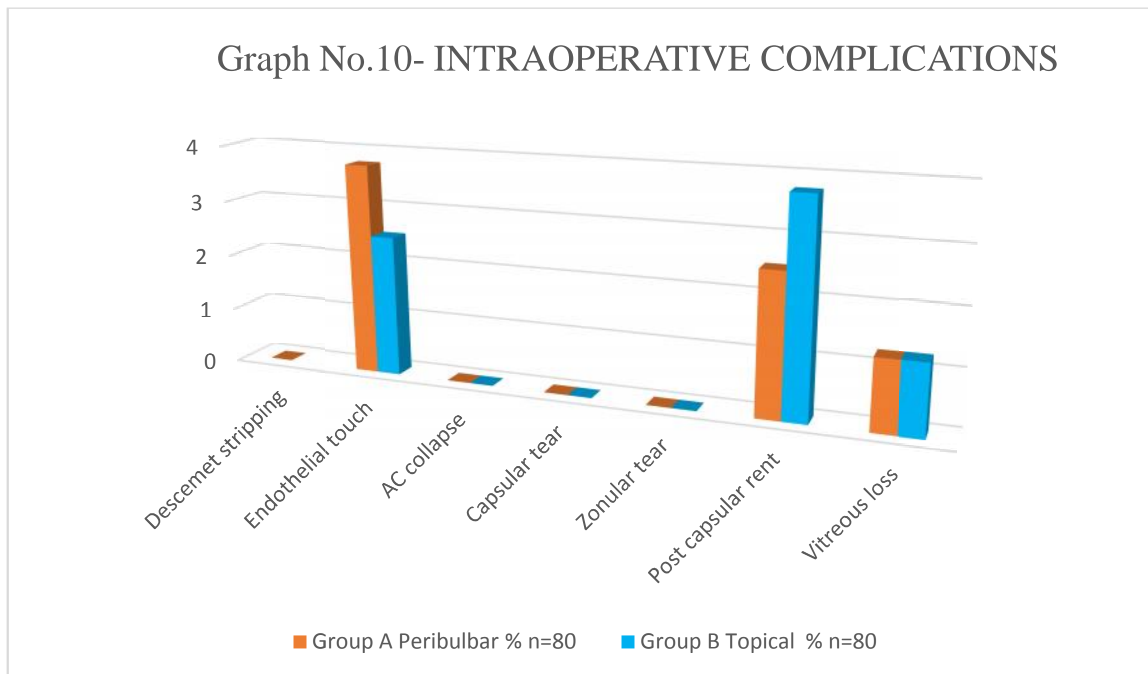
Level of difficulty	Group A (n=80) (Peribulbar)		Group B(n=80) (Topical)	
	No.	%	No.	%
Grade 0	78	97.50	78	97.50
Grade 1	2	2.50	2	2.50
Grade 2	0	0	0	0
Grade 3	0	0	0	0
TOTAL	80	100	80	100



Out of 160 patients ,surgeon had no difficulty during surgery in 78 (97.50%) patients in group A and 78 (97.50%) patients in group B .Surgeon had Grade 1 difficulty in 2 (2.50%) patients in both the groups which were statistically insignificant (p= .50).

Table no. 10 INTRAOPERATIVE COMPLICATIONS

COMPLICATION	Group A (n=80) (Peribulbar)		Group B(n=80) (Topical)	
	No.	%	No.	%
Descemet stripping	0	0	0	0
Endothelial touch	3	3.75	2	2.5
Anterior chamber collapse	0	0	0	0
Capsular tear	0	0	0	0
Zonular tear	0	0	0	0
Posterior capsular rent	2	2.50	3	3.75
Vitreous loss	1	1.25	1	1.25



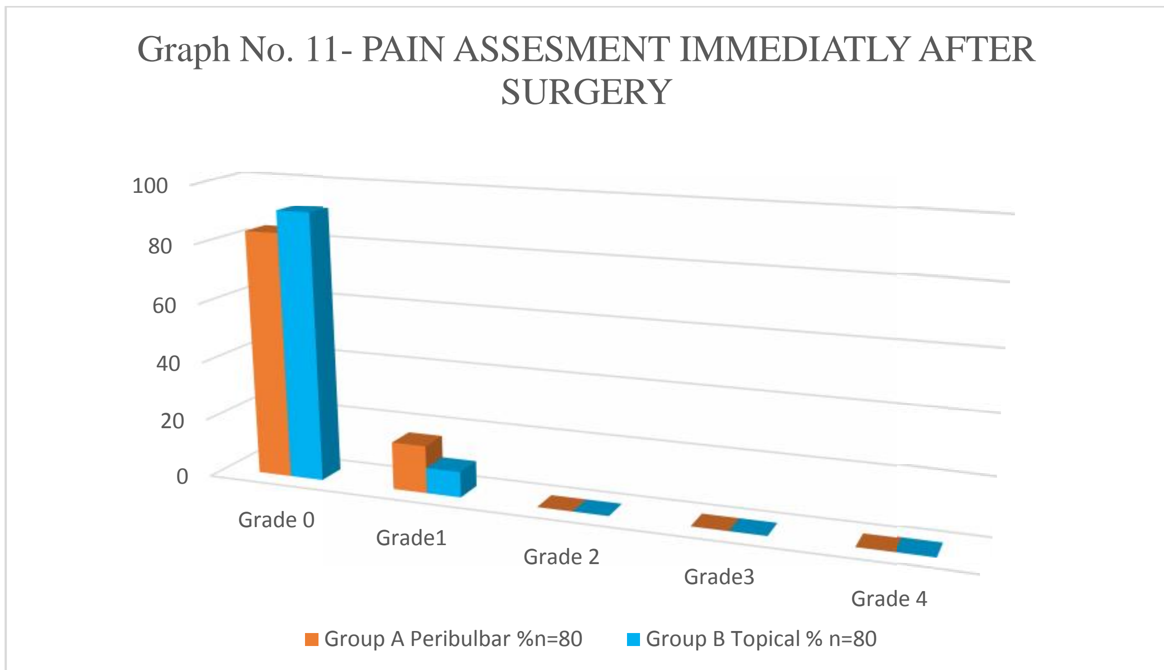
In group A out of 80 , 3 (3.75%) had endothelial touch which is statistically significant (p =<0.01) and 2 (2.5%) had posterior capsule rent which was statistically not significant (p=>0.20).

In group B out of 80 , 2 (2.5%) had endothelial touch which is statistically not significant (P=>0.20) and 3 (3.75%) had posterior capsule rent which was statistically significant (p=<0.10).

There was one case of vitreous loss in both the groups which not statistically significant. There was no case of descemet stripping , AC collapse, capsular tear and zonular tear in both the groups.

Table no.11 PAIN ASSESSMENT IMMEDIATELY AFTER SURGERY

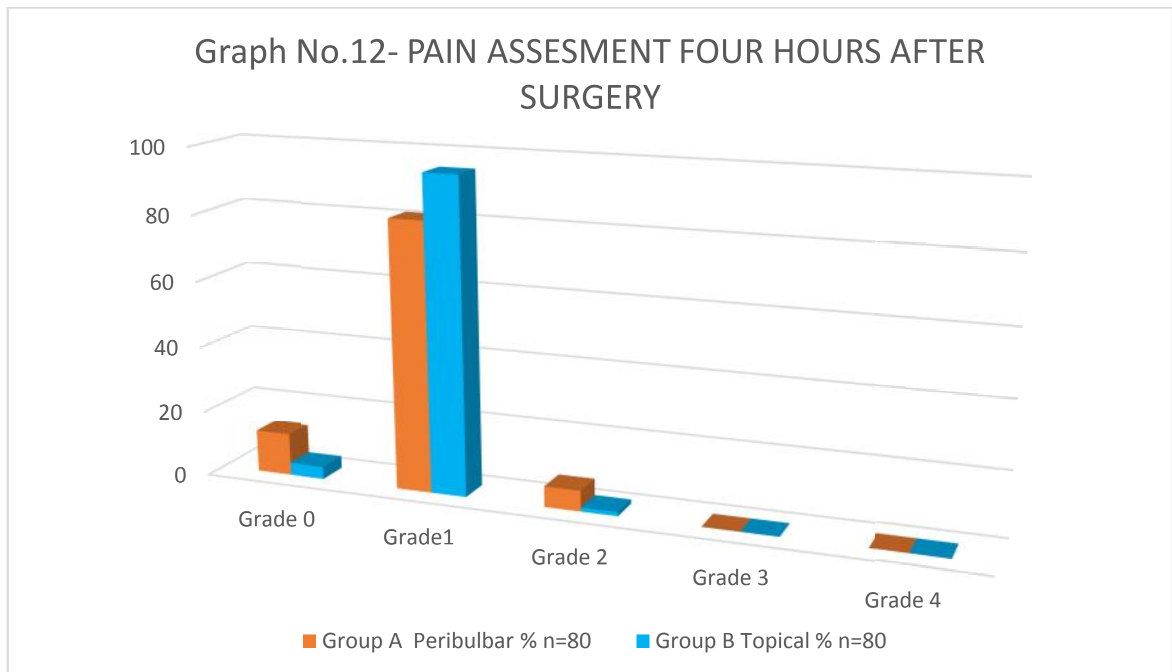
Pain assessment	Group A (n=80) (Peribulbar)		Group B(n=80) (Topical)	
	No.	%	No.	%
Grade 0	67	83.75	73	91.25
Grade 1	13	16.25	7	8.75
Grade 2	0	0	0	0
Grade 3	0	0	0	0
Grade 4	0	0	0	0
Total	80	100	80	100



Out of 160, No pain(Grade 0)was seen in 67 (83.75%) patients in group A and 73 (91.25%) patients in group B. Tolerable pain (Grade 1)was seen in 13 (16.25%) patients of group Aand 7 (8.75%) patients of group B which was statistically significant (P=0.0415). None of the patient in both group had pain which needed interference or in intolerable nature.

Table no. 12 PAIN ASSESSMENT AFTER FOUR HOURS OF SURGERY

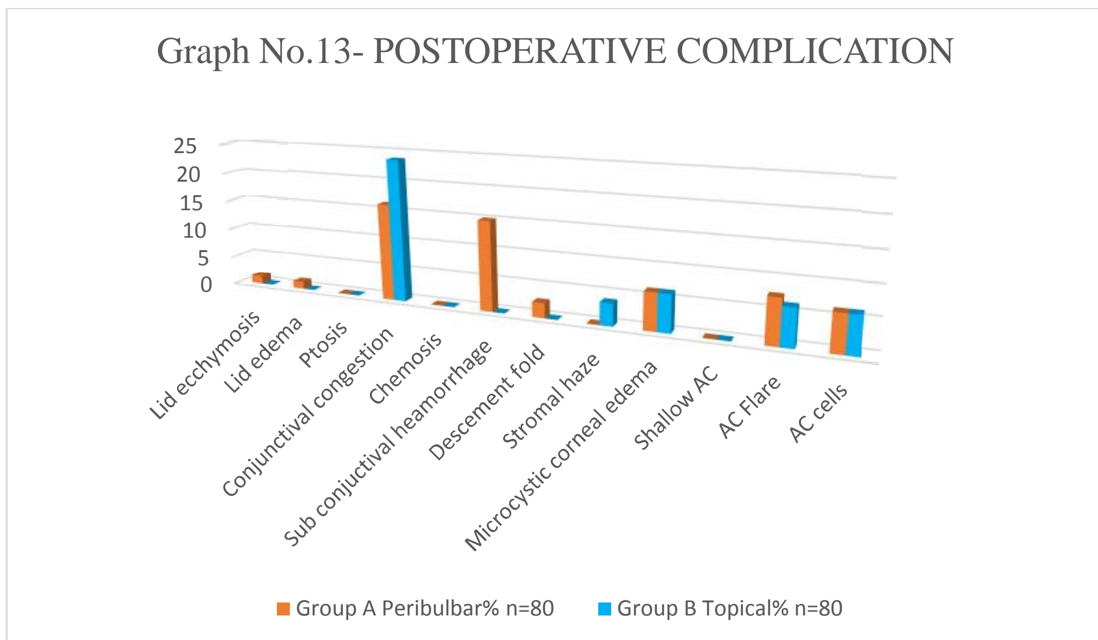
Pain assessment	Group A (n=80) (Peribulbar)		Group B (n=80) (Topical)	
	No.	%	No.	%
Grade 0	10	12.5	3	3.75
Grade 1	65	81.25	76	95
Grade 2	5	6.25	1	1.25
Grade 3	0	0	0	0
Grade 4	0	0	0	0
TOTAL	80	100	80	100



Out of 160, patients with no pain (Grade 0) were 10(12.5%) in group A and 3 (3.75%) in group B.Tolerable pain (Grade 1) was seen in 65 (81.25%) patients in group A and 76 (95%) patients of group B. Patients where intereference was needed for pain (Grade 3) were 5 (6.25%) patients of group A and 1 patient of group B which was statisticallynot significant (P=0.11).

TableNo.13 POSTOPERATIVE COMPLICATION

	Group A (n=80) (Peribulbar)		Group B (n=80) (Topical)	
Complications	No.		No.	%
Lid ecchymosis	1	1.25	0	0
Lid edema	1	1.25	0	0
Ptosis	0	0	0	0
Conjunctival congestion	13	16.25	19	23.75
Chemosis	0	0	0	0
Subconjuctival haemorrhage	12	15	0	0
Descement fold	2	2.50	0	0
Stromal haze	0	0	3	3.75
Microcystic corneal edema	5	6.25	5	6.25
Shallow AC	0	0	0	0
AC flare	6	7.50	5	6.25
AC cells	5	6.25	5	6.25
Total	45	56.25	37	46.25



Out of 80 patients in each group, postoperative complications were seen in 45 (56.25%) patients of group A and 37(46.25%) patients in group B.

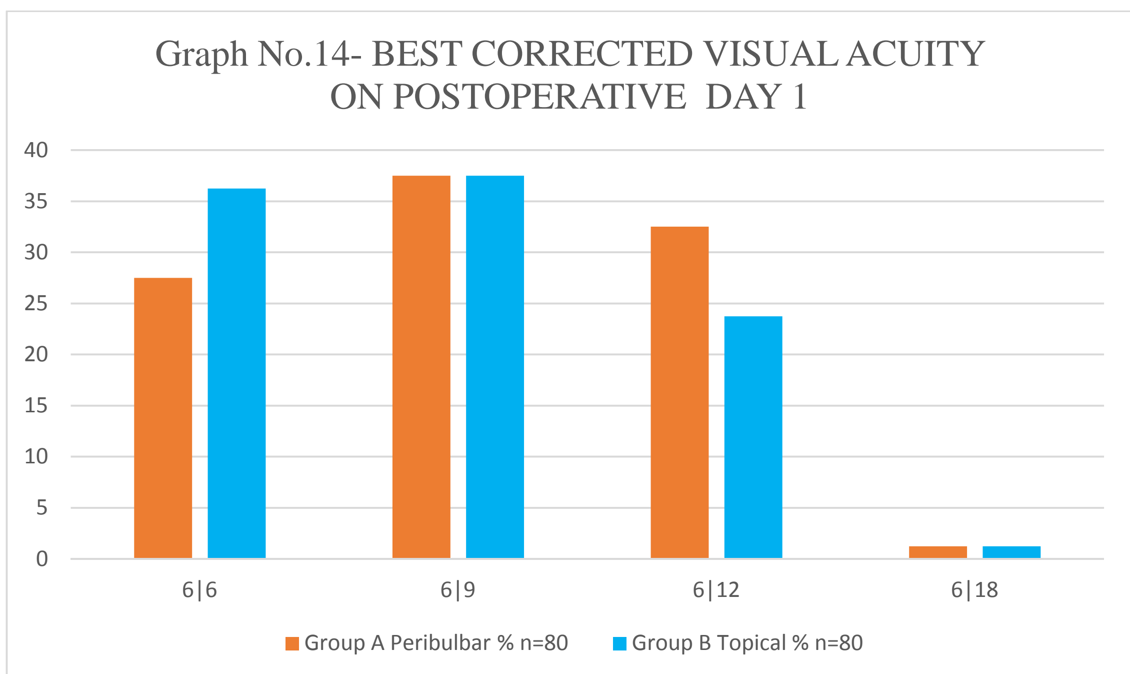
In group A 13(1.625%) patients and in group B 19 (2.375%) patients had conjunctival congestion.In both the group 5(6.25%) patients had microcystic corneal edema as post operative complication.In group A 1(1.25)% patient each had lid ecchymosis and lid edema and in group B there was no such incidence.

In group A,AC flare are seen in 6(7.50%) patients while 5(6.25%) patients had AC flare seen in group B.In Both group had 5 (6.25%) patients which had complications as AC cells.In group A none had stromal haze while in group B 3 (3.75%) patients had stromal haze.

In group A, 2 (2.50%) had descemet fold while in group B none of the patients had descemet fold. There was no statistical significance of postoperative complication between two groups with p value of 0 .42.

Table no. 14 BCVA ON POST-PERATIVE DAY 1

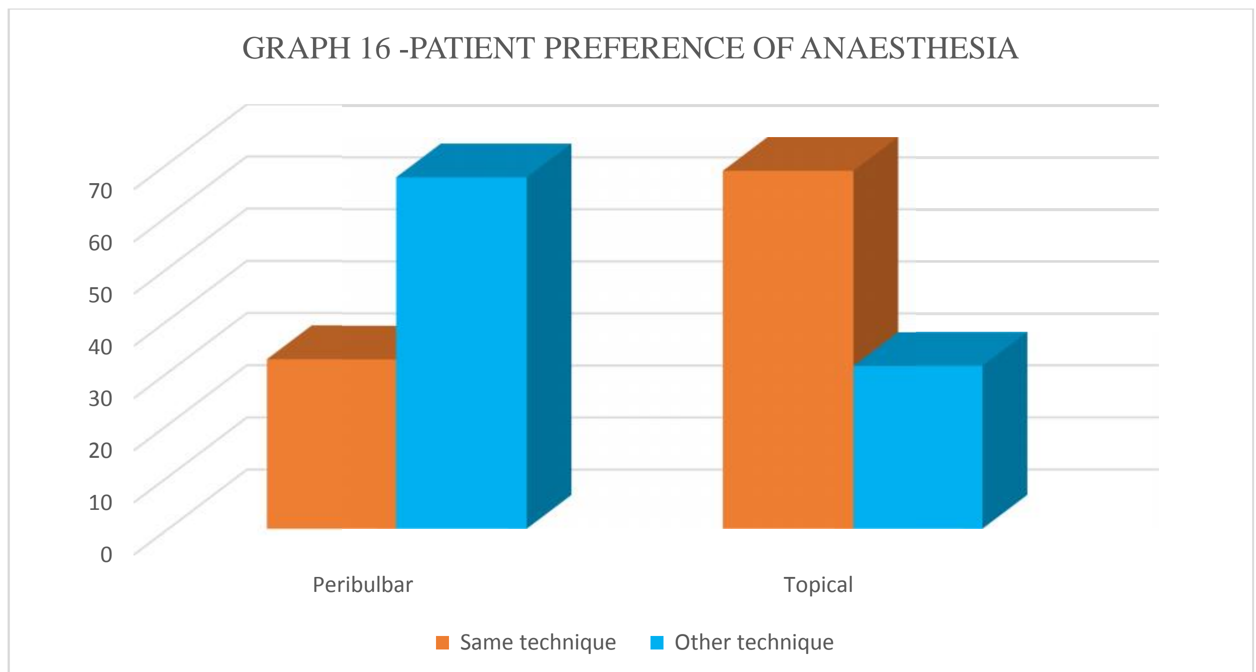
	Group A (n=80) (Peribulbar)		Group B (n=80) (Topical)	
	No.	%	No.	%
6/6	22	27.50	29	36.25
6/9	30	37.50	30	37.50
6/12	26	32.50	19	23.75
6/18	1	1.25	1	1.25
6/24	1	1.25	1	1.25
TOTAL	80	100	80	100



Out of 160 patients, on first postoperative day visiual acuity was 6/6 in 22(27.50%) patients in group A and 29 (36.25%) patients in group B with p value of< 0.05.In both groups 30 (37.50%) patients had visual acuity 6/9 .In group A 26 (32.50%) patients and in group B 19 (23.75%) patients had visual acuity of 6/12. In both groups 1(1.25%) patient had visual acuity 6/18 and 6/24.

Table no.15 PATIENT PREFERENCE OF ANAESTHESIA

	Group A (n=80) (Peribulbar)		Group B (n=80) (Topical)	
	No.	%	No.	%
Same technique	26	32.50	55	68.75
Other technique	54	67.50	25	31.25
TOTAL	80	100	80	100



Out of 160 patients, in group A 26(32.50%) patients preferred peribulbar anaesthesia and found it satisfactory where as 54(67.5%) patients in group B preferred other technique over peribulbar anaesthesia.

In group B 55(68.75%) patients preferred topical anaesthesia and found it satisfactory but 25 (31.25%) patients preferred other technique over topical anaesthesia.

DISCUSSION

This study included 160 patients who underwent Phacoemulsification with implantation of foldable IOLs. They were assigned to two groups (group A and group B) using the sealed envelope method in the preanaesthesia room. Patients in group A underwent phacoemulsification under peribulbar anaesthesia and patients in group B underwent phacoemulsification under topical anaesthesia, both groups had 80 patients each.

In our study, in both groups most of the patients belonged to age group of 60-69 years (45.63%) with mean age of 63.37 years. In both the groups equal distribution of patients was found in all age groups. A study by Rizvi et al with total of 186 patients had mean age range of 56-65 years[54]. Gombos et al[55] reported that young patients were more sensitive to pain during cataract surgery.

In our study out of 160 patients, 98 were male and 62 were female. In group A 45 were male and 35 were female; In group B 53 were male and 27 were female. In both the study groups male patients were predominant in number than female patients. A review conducted by Channing et al showed that women experience greater clinical pain[56]. Tan et al[57] also found that female patients experienced more pain during cataract surgery. However, in our study no association was seen between intraoperative or postoperative pain level with respect to patient’s age or gender.

In our study,5 patients had pre-senile immature cataract and rest 175 patients had senile immature cataract. In presenile immature patients 3.12% had Nuclear sclerosis, 1.87 % had Posterior subcapsular cataract. In senile immature cataract group, 75.61% had only nuclear sclerosis, 11.87% had only posterior subcapsular cataract and rest 9.37% had cortical cataract. A study conducted by Apil et al reported

that pain score varied among types of cataracts and was highest in mature cataracts and least in posterior subcapsular cataract[58]. In our study pain score did not vary with type of cataract.

In our study, the mean of axial length in group A was 22.31mm and in group B was 22.64mm. In a study conducted by Kang et al patients with greater axial length had increased subjective pain during surgery[59] but our study did not show any relation of pain score and axial length.

In our study, out of 160 patients 31.25% patients in group A and 18.75% patients in group B had diabetes mellitus. In group A 16.25% patients and 8.75% patients had hypertension in group B. There are no much studies in the literature investigating the relationship between systemic diseases and pain sensation during cataract surgery. Zeynep et al[60] reported that diabetic patients reported feeling less pain during and after cataract surgery. This may be attributable to diabetic neuropathy. However, in our study we did not see any corelation of Diabetes mellitus and Hypertension with intraoperative or postoperative pain score.

Pain during peribulbar anesthetic has been documented to be higher compared to topical anesthetic and was the main reason for negative feedback from patients in previous studies[61,62]. Our study confirmed this observation where all the patients in A group had experienced pain which was statistically significant (<0.001) in comparison with B group.

Coelho et al[63], reported that in patients receiving peribulbar anaesthesia reported more pain during anaesthetic solution infiltration and during the procedure in comparison with topical anaesthesia. A studyby Pandey et al, showed that feeling of pain, pressure and discomfort during administration of topical anaesthesia were all significantly lower compared to peribulbar anaesthesia[64].

In our study proparacaine was used topically with no additional intracameral anaesthesia. Aytekin Apil et al[65], conducted study which evaluated the efficacy of 0.5% propacaine hydrochloride as topical anaesthesia during phacoemulsification and reported that it is not a completely painless procedure and pain intensity varies with cataract type and stage of surgery but this study vary with this finding. Other local anesthetics like bupivacaine due to its lipid solubility, has greater potential to cause corneal endothelial damage.

In a prospective randomized double-masked clinical trial, Gillow et al[66] evaluated the efficacy of supplementary intracameral lidocaine in routine phacoemulsification under topical anaesthesia. Patients were randomly allocated to receive topical anaesthesia plus 0.5 mL intracameral BSS or topical anaesthesia plus 0.5 mL preservative-free lidocaine1%. Intraoperative and postoperative discomfort and the discomfort caused by the microscope light were assessed. Although there was a small reduction in discomfort from the microscope light when intracameral lidocaine was used, there was no significant relationship between the use of intracameral lidocaine and the intraoperative or postoperative pain scores. The authors concluded that the routine use of intracameral lidocaine as a supplement to topical anaesthesia has no clinically useful role.

In our study among 160 patients, 95% had lid akinesia in group A and in group B none attained lid akinesia which was statistically significant (<0.001). Globe akinesia was present in 96.25% of patients in group A and none in group B which was statistically significant (<0.001). Ali Melkkila et al[67] reported that using peribulbar technique complete akinesia was achieved in 72% (with inferotemporal+superomedial) and 75.3% (with inferotemporal+ inferomedial).

Lower rates of poor akinesia were found for a superomedial retrobulbar injection (8%) and superomedial peribulbar injection (10%).

In our study hyaluronidase was used an adjunct in peribulbar anaesthesia group. A study by Abelson et al reported that the proportion with complete akinesia of the extraocular muscles was significantly higher with hyaluronidase. It also reported that complete akinesia was seen in 70% of those in whom hyaluronidase was used versus 40% in those not receiving it. No patients receiving hyaluronidase had poor akinesia, as opposed to 15% in the control arm[68].

Topical anaesthesia does not provide akinesia which is the major disadvantage of it. A patient saccade or sudden movement at a critical moment may increase the chance of an intraoperative complication. The risk of such an occurrence can be greatly reduced by communicating with the patient to fixate carefully and not move during delicate manipulations, such as the capsulorrhexis. Careful patient selection will minimize such adverse outcomes. Patient performance during tonometry and A-scan can be a useful predictor of the potential for tolerating surgery with topical anaesthesia[69].

Complications noted while administering anaesthesia were, in group A 18.75% had chemosis ,15% had sub conjunctival haemorrhage ,7.5 % had giddiness which was statistically significant(p =<0.001) .In group B out of 80 , 2.5% had burning sensation and 2.5% had giddiness which was statistically not significant (p= 2) No cases of optic nerve injury,retobulbar haemorrhage, and globe perforation had occurred.

Chemosis and subconjunctival haemorrhage were the complications in A group compared to B group in this study which was consistent with other studies[70,71] .Riad and Akbar[72] discovered that globe perforations occurred in 8 of the 23 needle-related

complications (0.023%). The risk of needle injury to the globe is not limited to block technique alone because patient moving the eye during performance of the block is a real risk factor and the basis for litigation[73].

Pain occurring intraoperatively was assessed and was noted that in group A , 3.75% had pain due to iridal contact ,2.5% had pain during intraocular lens insertion (p =>0.20) ,3.75% had pain during irrigation aspiration which is statistically not significant(p=0.4) .In group B out of 80 ,2.5% had pain due to iridal contact (p= >0.20) pain during intraocular lens insertion and during irrigation and aspiration were 2.5% which is statistically not significant(p=>0.20) .Scleral contact and corneal contact did not cause any pain in both the group.

The intraoperative complications in A group and B group were not significant in our study. However, in a study by Virtamer et al, it was greater among patients undergoing phacoemulsification with topical anesthetic compared to peribulbar anesthetic[74]. Most of the pain during cataract surgery under topical anaesthesia was due to expansion of the anterior chamber by irrigation such as too much hydration during hydrodissection or after infusion before aspiration[75].In our study, we reported greater pain during iridal contact and during irrigation and aspiration. Stupp *et al*. noted that the rate intraoperative complications were minimal in both groups, however, older age of the patient posed a higher risk of complications in the topical group[76].

Intraoperative complications noted in this study were, in group A out of 80 , 3.75% had endothelial touch(p = 0.4) and 2.5% had posterior capsule rent which was statistically not significant (p=>0.20). In group B out of 80 , 2.5% had endothelial touch (p=>0.20) and 3.75% had posterior capsule rent which was statistically not

significant (p=>0.20).There was no case of descemet stripping , AC collapse, capsular tear and zonular tear in both the group.

Kuldeep Dole et al[77], topical versus peribulbar anaesthesia, reported that patient who underwent surgery with topical anaesthetic experienced lower complications but reported more pain compared to patients who underwent peribulbar anaesthesia. K Said et al[78],conducted study to compare levels of patient discomfort and complications during phacoemulsification under topical and peribulbar anaesthesia, they concluded that surgery related complications and patient discomfort were similar for two methods of anaesthesia which is consistent with our study.

Pain assessment done immediately after surgery, no pain was seen in 83.75% patients in group A and 91.25% patients in group B. Group A 16.25% patients had tolerable pain and 8.75% patients in group B had tolerable pain which is statistically not significant (P=>0.0415).None of the patients in both groups had pain which needed interference or in intolerable nature.

The pain scores reported by the patients immediately after completion of surgery did not differ significantly between the two study groups. This suggests that topical anaesthesia was sufficiently analgesic to reduce pain for the majority of the patients involved in the study. Our study showed that a patient who experienced more pain during surgery also has more postoperative pain which was also reported by Kang et al[59].

In our study, surgeon had no difficulty during surgery in 78 (97.50%) patients in A group and 78 (97.50%) patients in B group. Surgeon had grade I difficulty in 2 (2.50%) patients in both the groups due to ocular movement which were statistically insignificant (p= .50). During bimanual phacoemulsification, the cross action

achieved by placing the side-port instrument at 90 degrees to the phacoemulsification tip will effectively make the movement of eye under the control of surgeon.

Most of the studies reported that eye movements do not unduly interfere with cataract surgery[79-81]. In peribulbar anaesthesia if poor akinesia is achieved, involuntary movement of the eye pose more difficulty during the surgery. In topical anaesthesia, the full range of eye movements under voluntary control may be advantageous to the surgeon during superior cortical clean up and for better access to IOL implantation by instructing the patient to look up or look down. However, Roman et al[82] found increased surgical difficulty with topical anaesthesia and a distinct learning curve was reported.

In our study out of 160 , 78 (97.50%) patients had excellent co-operation in group A and 75 (93.75%) patients in group B. Good co-operation was seen in 2(2.50%) patients in group A and 5(6.25%) patients in group B. The “patient cooperation” describes the patient’s ability to follow directions from the surgeon. Patient cooperation is critical to successful topical cataract surgery.

In our study out of 160 patients, on first postoperative day visiual acuity was 6/6 in 27.50% patients in group A and 36.25% patients in group B.In both groups 37.50% patients had visual acuity 6/9 on postoperative first day. In group A 32.50% patients and in group B 23.75% patients had visual acuity of 6/12. BCVA was good in both groups with showing no statistical significance between two groups which was consistent with other study by wenzel et al[83].

In our study out of 160 patients, in group A 32.50% patients preferred same method of anaesthesia. and 68.75% patients in group B preferred same method of anaesthesia. In group A 67.50% patients preferred other method of anaesthesia and 31.25% patients in group B preferred other method of anaesthesia. A study by

Maclean H et al reported 10 patients in the topical group who had undergone cataract surgery in the fellow eye was removed using peribulbar anaesthesia,out of which 9 patients stated a preference for the topical method, while A patient thought there was no difference between the two methods[84].

Z Syed et al[85]reported that patient's undergoing peribulbar block gives better patient comfort and satisfaction than topical anaesthesia. Patients undergoing surgery under topical anaesthesia experience a variety of visual sensations such as light perception, different colours and shapes[86] which none of the patients reported in this study.

Considering trend followed world wide, Adekoya et al[87] reported that currently the most common technique of local anaesthesia for an ophthalmic procedure in Nigeria was peribulbar anaesthesia, followed by retrobulbar anaesthesia. Twelve months prior to the study, 25.9% of the ophthalmologists had experienced at least one complication from retrobulbar anaesthesia and 16.1% from peribulbar anaesthesia. Retrobulbar hemorrhage was the most common complication reported.

In an 8 year analysis, Thevi and Godinho[88] found that topical anaesthesia showed an upward trend while subtenon anaesthesia showed a downward trend. Topical anaesthesia was the common practice pattern for cataract surgery among United States Veteran Health Administration[89] and Canadian ophthalmologists[90]. In a 2000 survey,49% (range 37% to 62%) of members of the American Society of Cataract and Refractive Surgery in the United States stated a preference for topical anaesthesia[91].

Jacobi et al[16] recently reported that patients with potentially complicated cataract surgery, including uveitis, pseudo-exfoliation syndrome, posterior synechiae,

phacodonosis, or previous ocular surgery, also preferred topical anaesthesia over peribulbar/retrobulbar anaesthesia[92].

The use of topical agents in specific patient populations can be highly advantageous. For instance, patients on anticoagulants, such as coumadin and aspirin, can safely continue use of their medication during surgery. In addition, the use of topical agents in monocular patients provides immediate postoperative functional vision, lessening patient anxiety.

Clear corneal phacoemulsification has the advantage of avoiding touching superficial sensitive ocular tissue other than the peripheral cornea during the surgery. Preserved ocular motility can be used to improve the operating conditions by optimizing the red reflex and wound access[65].

CONCLUSION

Both topical and peribulbar anaesthesia are safe and effective as anesthesia for cataract surgery. In this study, topical anaesthesia provided good patient satisfaction and it was comparable to satisfaction achieved using peribulbaranesthesia. The speed and ease of administering topical anaesthesia with lower incidence of complications associated with it, makes topical anaesthesia suitable and safe choice for phacoemulsification surgery. However, topical anaesthesia does not produce akinesia which can be overcome by good selection of patients.

Patients reported a high level of satisfactionwith the degree of pain control, rapid returnof visual function, and avoidance of peribulbar needles. Not only is topical anesthesia highly effective, it also permits cataract surgery to be performed in a moretime-efficient and cost-effective manner. Its developmentand acceptance represents a significant advancementin modern-day cataract surgery.

Topical anesthesia completely eliminates life-threatening complications and is suitable in hands of skilled surgeon for motivated and cooperative patient to perform clear corneal phacoemulsification.

SUMMARY

This study **“**A comparison of topical and peribulbar anaesthesia in phacoemulsification with intraocular lens implantation to evaluate patient and surgeon satisfaction: a randomised clinical trial” was conducted on 160 patients who underwent phacoemulsification at Department of Ophthalmology, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi during study period January 2016 to December 2016. The patients were divided into two groups that is Group A (Patients who underwent Phacoemulsification under peribulbar anesthesia) and Gtoup B (Patients who underwent Phacoemulsification under topical anesthesia).The results of this study are summarized as follows:

- In our study out of 160 patients, in both groups most of the patients belonged to age group of 60-69 years (45.63%) with mean age of 63.37 years., 98 (61.25%) were male and 62 (38.75%) were female.
- In our study 175 patients had senile immature cataract and rest 5 patients had pre-senile immature cataract. In senile immature patients 75.61% had nuclear sclerosis, 11.87 % had posterior subcapsular cataract and 9.37% had cortical cataract. While in pre-senile immature patients 3.12% had NS, 1.87% had only PSC.
- In our study, diabetes mellitus in group A and group B was 31.25% and 18.75% respectively. Hypertension in group A and group B was 16.25% and 8.75% respectively.
- In peribulbar group, 18.75% had chemosis ; 6.25% had sub conjunctival haemorrhage; 7.5 % had giddiness which was statistically significant(p =<0.001) .In topical group,2.5% had burning sensation;2.5% had giddiness which was

statistically not significant (p= 2) .No cases of optic nerve injury,retobulbar haemorrhage, and globe perforation was reported in both the groups.

- 95% of patients had lid akinesia, 96.25% of patients had globe akinesia in peribulbar group and in topical group none of the patient attained lid akinesia and globe akinesia which was statistically significant (<0.001).
- Intraoperative pain occurring at what stage was noted. In peribulbar group, 3.75% of patients had pain due to iridal contact, 2.5% had pain during intraocular lens insertion and 3.75% had pain during irrigation aspiration .In topical group,2.5% of had pain due to iridal contact and 2.5% of patients pain during intraocular lens insertion and during irrigation and aspiration which was statistically not significant.
- In the study, surgeon had no difficulty during surgery in 78 (97.50%) patients in peribulbar group one and 78 97.50% patients in group two. Surgeon had some difficulty in 2 (2.50%) patients in both the groups which were statistically insignificant (p= .50). The same results were obtained in regard to patient's co-operation during surgery.
- Intraoperative complications in peribulbar group, 3.75% of patients had endothelial touch and 2.5% of patients had posterior capsule rent.In topical group, 2.5% of patients had endothelial touch which and 3.75% of patients had posterior capsule rent which was statistically not significant. There was no case of descemet stripping, AC collapse, capsular tear and zonular tear in both the groups.
- Immediately after surgery, 83.75% patients in peribulbar group and 91.25% patients in topical group had no pain (Grade 1). 16.25% patients and 8.75% patients in topical group had tolerable pain(Grade 2) which was statistically not

significant (P=>0.0415).None of the patient in both group had pain which needed interference or in intolerable nature

- Four hours after surgery,81.25% patients in peribulbar group and 95% patients in topical group had tolerable pain(Grade 2).12.5% patients in peribulbar group and 3.75% patients in topical group had no pain (Grade 1).6.25% patients in peribulbar group and 1.25% patients in topical group which needed interference for pain (Grade 3)which were statistically not significant (P=0.11))
- BCVA was good in both groups with showing no statistical significance between two groups.
- Out of 160 patients, in group A 32.50% patients preferred peribulbar anaesthesia and found it satisfactory where as 67.5% patients in group B preferred other technique over peribulbar anaesthesia.In group B 68.75% patients preferred topical anaesthesia and found it satisfactory but 31.25% patients preferred other technique over topical anaesthesia.
- Considering all the results, both groups did not differ in pain assessment, patient's co-operation and difficulty encountered by surgeon and BCVA. Complications during administration of anaesthesia and postoperative complications were significantly more in peribulbar group than topical group. However, akinesia could only be achieved in peribulbar group.

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ANNEXURE – I : PROFORMA

DATA COLLECTION PROFORMA

I.D. No.

NAME (in capital letters)

FIRST NAME MIDDLE NAME LAST NAME

AGE (in years)

SEX (M=Male; F=Female)

O.P. No.

I.P. No.

ADDRESS

TELEPHONE No.

DATE OF ADMISSION

DATE OF SURGERY

DATE OF DISCHARGE

PROVISIONAL DIAGNOSIS : ______________________________

____

CATARACT GRADING: _ - - - - - - - - - _

INCLUSION CRITERIA: (1=Met; 2=Not met) ☐

INFORMED CONSENT: (1=Taken; 2=Not taken) ☐

CHIEF COMPLAINTS: (1= Yes; 2= No)	RE	LE
DIMINUTION OF VISION	☐	☐

HISTORY OF PRESENT ILLNESS: (1= Yes ; 2= No)	RE	LE
HISTORY OF DIMINUTION OF VISION:	☐	☐
GRADUAL IN ONSET:	☐	☐
PAINLESS:	☐	☐
PROGRESSIVE IN NATURE:	☐	☐
HISTORY OF REDNESS:	☐	☐
HISTORY OF WATERING:	☐	☐
HISTORY OF DISCHARGE:	☐	☐
HISTORY OF OCULAR IRRITATION:	☐	☐
HISTORY OF PHOTOPHOBIA:	☐	☐
HISTORY OF DIPLOPIA:	☐	☐
HISTORY OF COLOURED HALOS:	☐	☐
HISTORY OF USING GLASSES: (IF 1 , DURATION:)	☐	☐

OTHER ____

COMPLAINTS: ____

____

PAST HISTORY (1= YES ; 2=No)

	RE	LE
UNDERWENT ANY INTRA-OCULAR SURGERY IF 1, THEN SPECIFY:		
HISTORY OF OCULAR TRAUMA		
OTHER PAST HISTORY(If present):		

MEDICAL HISTORY: (1= Yes ; 2= No)

DIABETES MELLITUS	
HYPERTENSION	
ASTHMA	
BLEEDING DISORDERS	

OTHERS : ____

____

FAMILY HISTORY : (1=Significant; 2=Insignificant) ☐

IF 1 , SPECIFY: ____

____

PERSONAL HISTORY: (1= Significant ; 2= Insignificant) ☐

IF 1 , SPECIFY: ____

____

GENERAL PHYSICAL EXAMINATION:

VITALS:

PULSE: (per min)

BLOOD PRESSURE:(mm Hg)

TEMPERATURE: (1=Febrile; 2= Afebrile)

RESPIRATORY RATE (per min)

(1 =Yes ; 2= No)

PALLOR		CLUBBING	
ICTERUS		LYMPHADENOPATHY	
CYANOSIS		OEDEMA	

SYSTEMIC EXAMINATION: (1= Normal ; 2= Abnormal)

C V S

IF 2, SPECIFY ____________________

R S

IF 2, SPECIFY ____________________

C N S

IF 2, SPECIFY ____________________

P / A

IF 2, SPECIFY ____________________

OCULAR EXAMINATION:

HEAD POSTURE (1=Erect; 2=Tilted)

FACIAL SYMMETRY (1=Symmetrical; 2= Asymmetrical)

VISUAL AXES (1=Parallel ; 2= Deviated)

EXTRA-OCULAR MOVEMENTS (1=Normal; 2= Restricted)

UNIOCULAR RE [ ] LE [ ]

IF 2, SPECIFY : RE: ______________________________

LE: ______________________________

BINOCULAR [ ]

IF 2, SPECIFY : ______________________________

____

VISION:

	RE	LE
UNAIDED		
PINHOLE		
SPECTACLES		

NEAR VISION:

	RE	LE
UNAIDED		
SPECTACLES		

ANTERIOR SEGMENT EXAMINATION:

	RE	LE
ADNEXA (1= Normal; 2=Abnormal) If 2, then specify		
CONJUNCTIVA (1= Normal; 2=Abnormal) If 2, then specify		
CORNEA (1= Clear; 2=E dematous; 3=Other) If 3, then specify		
SCLERA (1= Normal; 2=Abnormal) If 2, then specify		
ANTERIOR CHAMBER (1=Normal depth;2=Shallow;3=Deep)		
IRIS (1=Normal; 2=Atrophic patches;3=Other) If 3, then specify		
PUPIL SIZE (1=Normal; 2=Constricted; 3= Dilated) REACTION Direct Indirect (1= Present; 2=Absent; 3=Sluggish)		
LENS (CATARACT) (1=Cortical; 2=Nuclear; 3=Posterior subcapsular; 4= Pseudophakia; 5=Aphakia; 6=Clear)		

FUNDUS

	RE	LE
GLOW (1=Good; 2=Faint; 3=Absent)		
MEDIA (1=Clear; 2=Hazy)		
DISC SIZE (1=Normal; 2=Small; 3=Large) MARGINS (1=Normal;2=Abnormal) CDR (Mention: 0.2-1.0) NRR (1=Normal; 2=Thin)		
BLOOD VESSELS (1=Normal; 2=Abnormal)		
BACKGROUND (1=Normal; 2=Tessellated;3=Other)		
MACULA (1=Normal; 2=Abnormal)		

INVESTIGATIONS

BP(in mm Hg)

LACRIMAL SYRINGING: RE: ____________________
LE: ____________________

TONOMETRY :(By schiotz method)
IOP (mmHg) RE: ________________________
LE: ________________________

RANDOM BLOOD SUGAR(mg/dl): ☐☐☐

KERATOMETRY:
(By Bauch and Lomb)

(in Dioptres) K1: __________

K2: __________

A SCAN: (1= Right eye; 2=Left eye) ☐

Axial length (in mm) : __________

Average AC depth(in mm) : _________

PCIOL Power(in Diopters): __________

ANY OTHER INVESTIGATIONS:

DIAGNOSIS: ____

____

EYE TO BE OPERATED: (RE=1; LE=2)

ANESTHESIA:

TYPE OF ANESTHESIA GIVEN: PERIBULBAR ☐

TOPICAL ☐

ANESTHESIA RELATED COMPLICATIONS: (1= Yes; 2=No)

PAIN DURING ADMINISTRATION ☐

CHEMOSIS ☐

SUBCONJUNCTIVAL HAEMORRHAGE ☐

RETROBULBAR HAEMORRHAGE ☐

OPTIC NERVE INJURY ☐

GLOBE PERFORATION ☐

PAIN ASSESSMENT IMMEDIATELY AFTER SURGERY: (Tick accordingly)

GRADE 0 (NO PAIN) ☐

GRADE 1(TOLERATED PAIN) ☐

GRADE 2 (INTERFERENCE NEEDED) ☐

GRADE 3 (INTOLERABLE) ☐

INTRAOPERATIVE PAIN OCCURRED AT WHAT STAGE IN SURGERY: (Tick accordingly)

SCLERAL CONTACT ☐

CORNEAL CUT ☐

IRIDAL CONTACT ☐

INTRAOCULAR LENS INSERTION ☐

SUBCONJUNCTIVAL INJECTION ☐

PAIN ASSESSMENT AFTER 4 HOURS OF SURGEY: (Tick accordingly)

GRADE 0 (NO PAIN) ☐

GRADE 1(TOLERATED PAIN) ☐

GRADE 2 (INTERFERENCE NEEDED) ☐

GRADE 3 (INTOLERABLE) ☐

DIFFICULTY ENCOUNTERED BY SURGEON: (Tick accordingly)

GRADE 0(NOT DIFFICULT) ☐

GRADE 1 (MILDLY DIFFICULT) ☐

GRADE 2 (MODERATELY DIFFICULT) ☐

GRADE 3 (EXTREMELY DIFFICULT) ☐

INTRAOPERATIVE COMPLICATIONS: (Tick accordingly)

DESCEMENT STRIPPING ☐

ENDOTHELIAL TOUCH ☐

ANTERIOR CHAMBER COLLAPSE ☐

CAPSULAR TEAR ☐

ZONULAR TEAR ☐

POSTERIOR CAPSULAR RENT ☐

VITREOUS LOSS ☐

FOLLOW UP ON NEXT DAY OF SURGERY:
POST-OPERATIVE VISION IN OPERATED EYE (Tick accordingly)

>6/60 ☐

6/60-6/36 ☐

6/24-6/18 ☐

6/12-6/9 ☐

6/6 ☐

LIDS: (1=Yes; 2=No)

LID ECCHYMOSIS: ☐

LID EDEMA: ☐

PTOSIS: ☐

CONJUNCTIVA: (1=Yes; 2=No)

CONJUNCTIVAL CONGESTION: ☐

CHEMOSIS: ☐

SUBCONJUNCTIVAL HAEMORRHAGE: ☐

OTHERS: ____

SLIT LAMP EXAMINATION: (1=Yes; 2=No)

CORNEA:

DESCEMENTS FOLDS: ☐

STROMAL HAZE: ☐

MICROCYSTIC EDEMA: ☐

OTHERS: ________________________________

ANTERIOR CHAMBER:

FORMED: ☐

FLARE: ☐
(If 1, then specify Grade 0 to 4)

CELLS: ☐
(If 1, then specify Grade 0 to 4)

CONTENT: ☐
(1= None; 2= Cortical matter; 3=Blood; 4= Others)

IRIS: NORMAL COLOUR ☐

PUPIL :

NORMAL PATTERN ☐

ROUND ☐

REGULAR ☐

REACTIVE ☐

IOL: (Tick accordingly)

PCIOL ☐

ACIOL ☐

CONSENT FOR PARTICIPATION IN RESEARCH STUDY

I.D. NO. ______________

Mr/Mrs/Ms ____________________________You are invited to participate in our research study titled **"A COMPARISON OF TOPICAL AND PERIBULBAR ANAESTHESIA IN PHACOEMULSIFICATION WITH INTRAOCULAR LENS IMPLANTATION TO EVALUATE PATIENT AND SURGEON SATISFACTION: A RANDOMISED CLINICAL TRIAL"** conducted by Dr. _____________________Post graduate student in M.S. Ophthalmology, under the guidance of Dr _______________, Professor, Department of Ophthalmology, J N Medical College, Belagavi.

Respected Sir/ Madam we request you to enroll yourself in our study as you are eligible for participation. Your participation in research is voluntary. If you decide to participate you are free to withdraw at any time.

INTRODUCTION: Cataract surgery has become faster, safer and less traumatic. A wide variety of anaesthesia options are available for cataract surgery as as peribulbar anaesthesia and non-invasive topical anaesthesia. Patient satisfaction is one of the important healthcare outcome measures. This study will assess the outcome based on your response to one of the modality of anaesthetic technique which you would be undergoing.

Purpose of the Study: The purpose of research is to compare the levels of patient and surgeon satisfaction and intraoperative complications following peribulbar anesthesia versus topical anesthesia in phacoemulsification and intraocular lens implantation.

Procedure Involved: If you agree to enroll yourself in this study, you will be asked your present, past and family history. You will be clinically examined and relevant investigations will be done. You will receive anesthesia before the surgery either in the form of peribulbar injection near your eye or topical anesthetic drops instillation into your eye. Selection of the procedure will based on randomization chart, so you can be selected in either of the groups. You would be asked to grade the severity of your pain during the procedure and 2 hours after operation. Follow up will be done and documented the following morning after surgery.

Risks and Benefits: There are no major risks involved with the use of either anaesthetic procedure. However you can have some discomfort during the administration of anaesthetia, for which all necessary precautions would be taken. Your participation may benefit you and others by establishing certain facts about the study.

Alternatives: If you are not willing to participate you will be treated according to the existing protocol and it will not affect your relationship with tis hospital.

Costs for participating in this research: There will not be any extra cost incured by you. You will, however, have to pay for the investigations which are part of the existing management protocol for the condition. There is no commitment for any reimbursement or any other compensation.

Privacy and Confidentiality: Your privacy is guaranteed. However, your medical records can be directly accessed and reviewed by authorized individuals or by the ethics committee. Records, which could reveal your identity, will be kept confidential. Personal data will remain anonymous if data is being published or written as a dissertation.

Authorization to Publish Results: When the results of the research are published or discussed, in a conference, no information will be displayed that would disclose your identity.

Compensation: In the event of injury related to the study, treatment will be made available through KLES Dr. Prabhakar Kore Hospital and MRC, Belagavi.There is no compensation or payment for such medical treatment by law. The doctors and the staff will provide facilities and medical attention to you.

Questions:

If you have any questions about the research you may please contact:

1. Investigator, Dr ____________________ , Post Graduate student, Department of Ophthalmology, JNMC, Belagavi. Contact no. ———————
2. Guide, Dr. ______________ , Professor, Department of Ophthalmology, JNMC, Belagavi. Contact no. ______________

Consent for participation in research trial

I, Mr/Mrs/Ms ____________________________________ voluntarily agree for the participation as a subject of this study. By signing this consent form, I am not giving up any of my legal rights. I am signing the consent form after having read or been read for me in my own vernacular language, including the risks and the benefits and having all my questions answered.

Subject Name:____

Sinature or the Left Thumb Print of Subject:____________________

Witness Name:____

Signature of Witness:_______________________________________

Guide:____

Co-Investigator:____

Signature of Investigator:___________________________________

Date:

Place:

CONSENT FOR PARTICIPATION IN RESEARCH STUDY

I.D. NO. ______________

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Respected Sir/ Madam we request you to enroll yourself in our study as you are eligible for participation. Your participation in research is voluntary. If you decide to participate you are free to withdraw at any time.

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Authorization to Publish Results: When the results of the research are published or discussed, in a conference, no information will be displayed that would disclose your identity.

Compensation: In the event of injury related to the study, treatment will be made available through KLES Dr. Prabhakar Kore Hospital and MRC,Belagavi.There is no compensation or payment for such medical treatment by law. The doctors and the staff will provide facilities and medical attention to you.

Questions:

If you have any questions about the research you may please contact:

1. Investigator, Dr. Shweta Babugouda Patil, Post Graduate student, Department of Ophthalmology, JNMC, Belagavi. Contact no.9964878503
2. Guide, Dr. Umesh Harakuni, Professor, Department of Ophthalmology, JNMC, Belagavi. Contact no. 09845167027

Consent for participation in research trial

I, Mr/Mrs/Ms ________________________________ voluntarily agree for the participation as a subject of this study. By signing this consent form, I am not giving up any of my legal rights. I am signing the consent form after having read or been read for me in my own vernacular language, including the risks and the benefits and having all my questions answered.

Subject Name:____

Sinature or the Left Thumb Print of Subject:____________________

Witness Name:____

Signature of Witness:___________________________________

Guide:____

Co-Investigator:_______________________________________

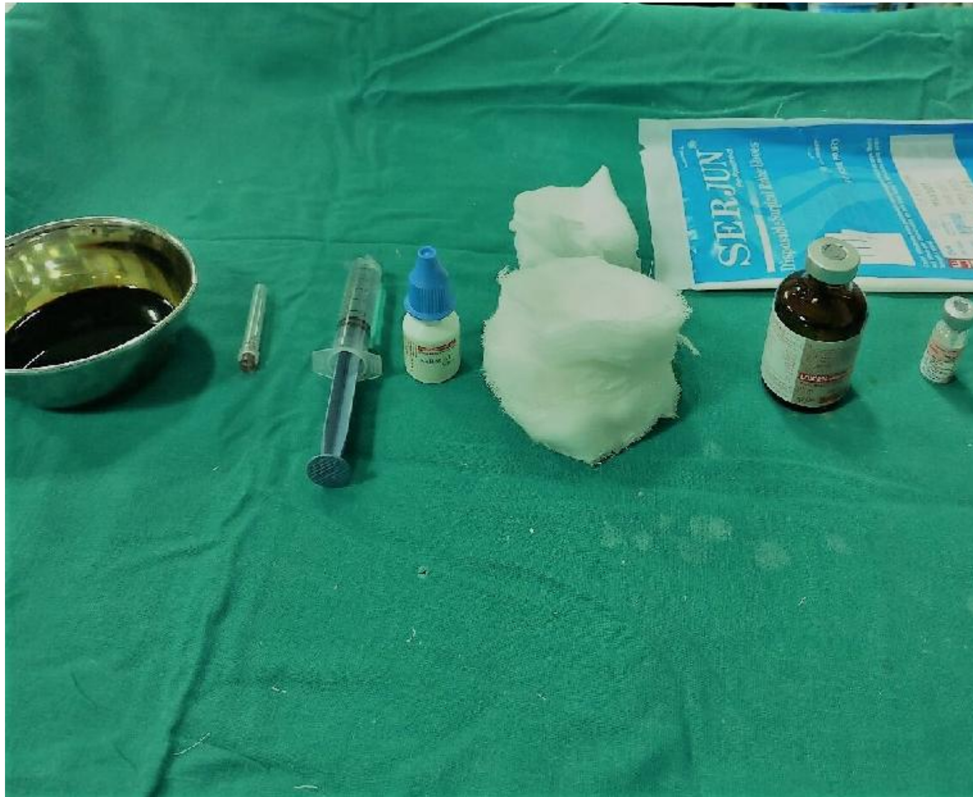
Signature of Investigator:_________________________________

Date:

Place:

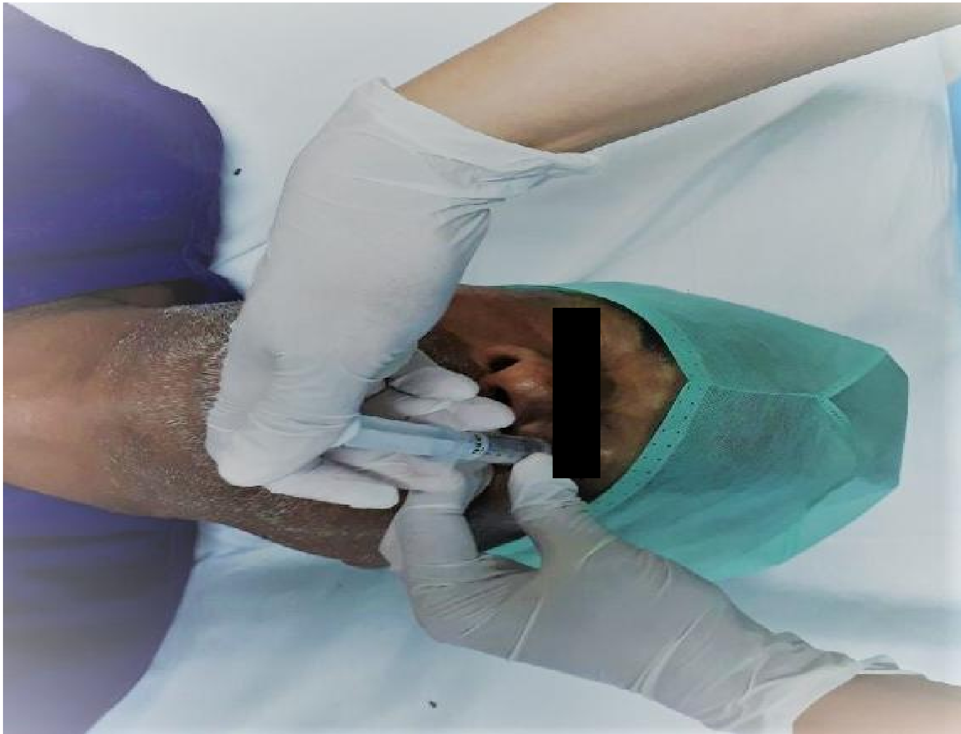
PHOTOGRAPHS

PIC: 1 Drugs and instruments required for peribulbar and topical anaesthesia

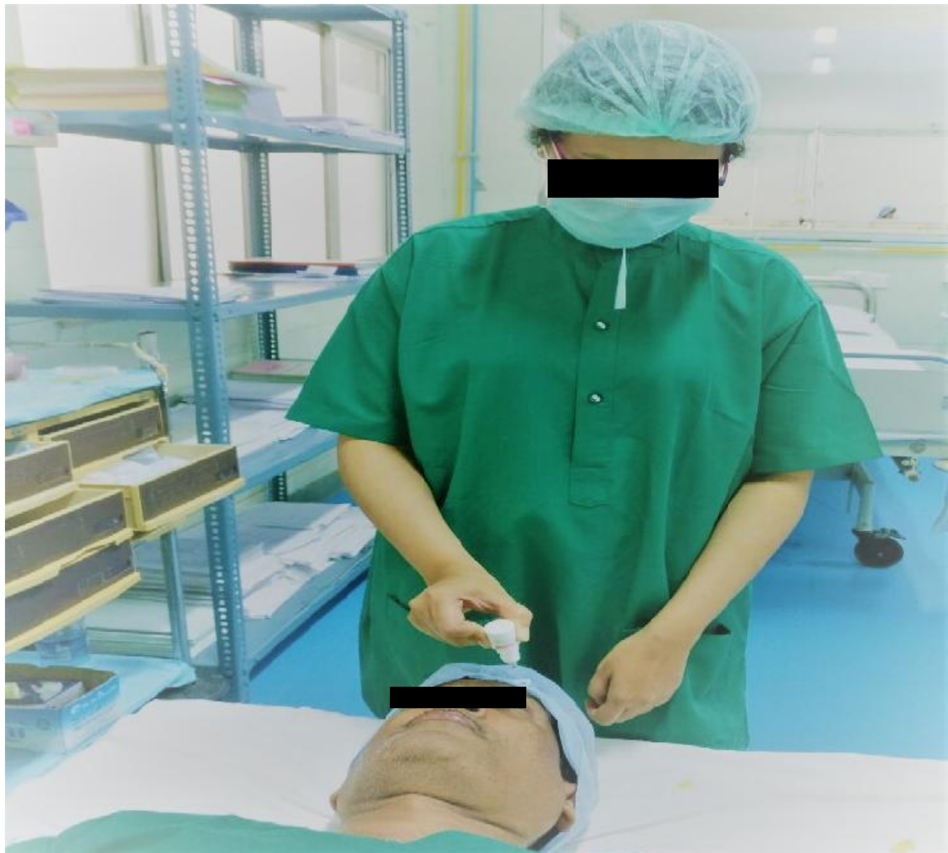


Pic:2 Adminstration of peribulbar anesthesia superonasal site'

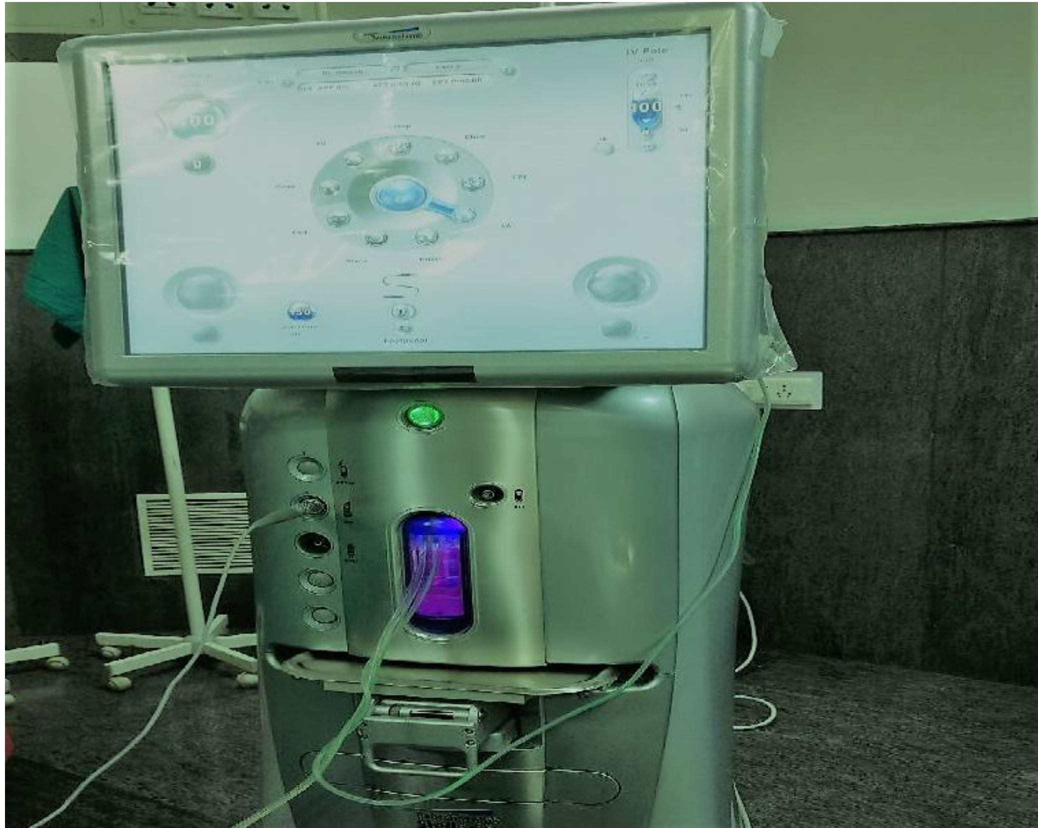
Pic:3 Adminstration of peribulbar anaesthesia infer temporal site



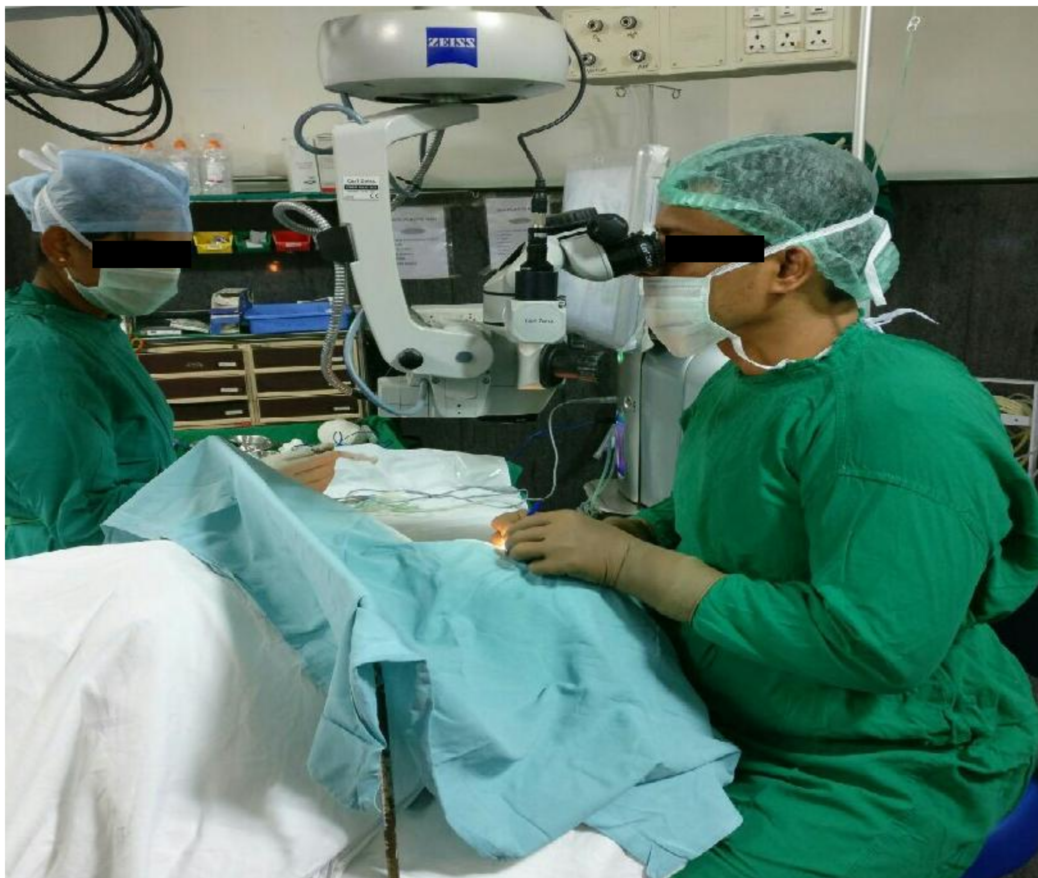
Pic: 4 Adminstration of topical anaesthesia



Pic:5 PHACO machine BAUSCH & LOMB



Pic :6 Surgeon operating on a patient



Annexure – IV: Key to Master Chart

- Diagnosis

I- Presenile immature cataract

I(1)- Grade I nuclear sclerosis

I(2)- Grade II nuclear sclerosis

I(3)- Grade III nuclear sclerosis

I(0) Posterior subcapsular cataract

II- Senile immature cataract

II(1)- Grade I nuclear sclerosis

II(2)- Grade II nuclear sclerosis

II(3)- Grade III nuclear sclerosis

III-Posterior subcapsular cataract

IV-Cortical cataract

- Preoperative complications

1- Chemosis

2- Subconjunctival haemorrhage

3- Retrobulbar haemorrhage

4-Optic nerve injury

5- Globe perforation

6- Giddiness

7-Burning sensation

- Intraoperative complications

1- Descemet stripping

2- Endothelial touch

3- Anterior chamber collapse

4- Capsular tear

5- Zonular tear

6- Posterior capsular rent

7- Vitreous loss

- Pain assessment immediately after surgery and 4 hours after surgery

0- no pain

1-tolerated pain

2- interfernce needed

3-intolerable

Intraoperative pain occurred at what stage in surgery

1- Scleral contact

2- Corneal contact

3- Iridal contact

4- Intraocular lens insertion

5-Irigation and aspiration

- Difficulty encountered by surgeon

0- not difficult

1- mildly difficult

2-moderately difficult

3- extremely difficult

- Patient's Cooperation During Surgery

0- Excellent cooperation

1-Good cooperation

2-Poor cooperation

3-Very poor cooperation

d- Conjunctival congestion

e- Chemosis

f- Subconjunctival haemorrhage

g-Descemet fold

h- Stromal haze

i- Microcystic edema

j- Shallow anterior chamber

k- AC flare

l- AC cells

- Patient's preference of anaesthesia

S- Same technique

O- Other technique

ERIBULBAR																							
SI No.	NAME	AGE	SEX	I.P NO.	EYE	DIAGNOSIS	PREOPERATIVE VISUAL ACUITY	AXIAL LENGTH	PAIN DURING ADMINISTRATION OF ANESTHESIA	LID AKINESIA	GLOBE AKINESIA	PRE OPERATIVE COMPLICATIONS	INTRAOPERATIVE COMPLICATIONS	INTRAOPERATIVE PAIN OCCURRED AT STAGE	PAIN ASSESSMENT IMMEDIATELY AFTER SURGERY	PAIN ASSESSMENT AFTER 4 HOURS OF SURGERY	PATIENT's COOPERATION DURING SURGERY	DIFFICULTY ENCOUNTERED BY SURGEON	POST OPERATIVE COMPLICATIONS	VISION NEXT POST OPERATIVE DAY	H/O DAIBETES MELLITUS	H/O HYPERTENSION	PATIENT'S PREFERENCE OF ANAE
1	SVJ	63	F	711242	RE	II (2)	6/60	22.1	1	+	+	-	-	-	0	1	0	0		6/9			O
2	ASK	60	M	711885	LE	III	6/24	21.34	1	+	+	6	-	-	0	1	0	0		6/9			O
3	MMR	65	F	713200	RE	II(2)	6/36	22.56	1	+	+	-	-	-	0	1	0	0	d,l	6/12			O
4	NAK	56	M	713319	LE	II (I)	6/60	23.45	1	+	-	-	-	-	0	1	1	0		6/9			O
5	SRB	56	M	713164	LE	II (2)	4/60	23.12	1	+	+	1	6	-	0	1	0	0		6/6			O
6	PPC	75	F	714949	LE	II (3)	3/60	22.55	1	+	+	-	-	-	0	0	0	0	a,b	6/12	+	+	S
7	BBS	52	M	714556	RE	II (2)	6/24	21.76	1	+	+	-	-	-	0	1	0	0		6/6			O
8	ABH	59	M	715186	RE	III	6/24	2.56	1	+	+	1	-	-	0	1	0	0		6/9			O
9	PSB	67	F	716243	RE	II (2)	6/36	22.13	1	+	+	-	-	-	0	1	0	0		6/9			S
10	CSG	55	F	715889	LE	II (1)	6/18	21.76	1	+	+	-	2	-	0	1	0	0		6/6			O
11	SGH	55	M	715889	LE	II (1)	6/12	21.87	1	+	+	2	-	5	1	1	0	0	f	6/9			O
12	SSP	71	F	718287	RE	II (3)	3/60	22.43	1	+	+	-	-	-	0	1	0	0		6/6	+		S
13	PRP	69	F	718296	LE	II (2)	6/24	23.76	1	+	+	1	-	-	0	0	0	0		6/9			O
14	VMH	77	M	718590	RE	II (3)	3/60	23.87	1	+	+	-	-	-	0	1	0	0	d,i	6/12		+	O
15	HMM	55	F	719382	LE	IV	6/36	24.12	1	+	+	-	-	3	0	2	0	0		6/9			O
16	YRS	71	M	719480	RE	III	6/60	22.54	1	+	+	-	-	-	0	1	0	0		6/6			O
17	SAH	57	M	719499	RE	II (2)	2/60	22.12	1	+	+	2	-	-	0	1	0	0	f	6/6	+		O
18	CGH	46	F	719327	LE	II(2)	6/12	23.32	1	-	+	-	-	-	0	1	0	0		6/9	+	+	O
19	SPM	50	M	713242	RE	III	6/24	22.82	1	+	+	1	-	-	0	1	0	0		6/9			O
20	PDS	50	M	719327	RE	II (1)	6/18	21.81	1	+	+	-	-	-	0	1	0	0	d	6/12			O
21	SKB	63	F	722268	RE	II (3)	4/60	22.56	1	+	+	2	7	-	1	1	0	1	g,l,f	6/12	+		S
22	VDN	75	M	722401	RE	II (2)	6/36	22.68	1	+	+	-	-	-	0	1	0	0		6/9			S
23	AAH	73	M	722200	RE	II (2)	3/60	23.32	1	+	+	1	-	-	0	1	0	0		6/6	+		S
24	SSB	74	F	724219	LE	II (3)	3/60	22.65	1	+	+	2	-	-	0	0	0	0	f	6/6			O
25	LAH	71	F	724228	LE	II (3)	3/60	22.92	1	+	+	2	-	-	0	1	0	0	k,f	6/9		+	S
26	BDH	50	M	724771	LE	II (3)	2/60	22.56	1	-	-	-	-	-	0	0	1	0		6/9			S
27	MSI	59	F	724948	RE	II (2)	6/60	21.83	1	+	+	1	-	-	0	1	0	0		6/12			O
28	JGP	75	M	725327	LE	II (2)	4/60	21.71	1	+	+	-	-	-	0	1	0	0	i	6/12			O
29	BSP	70	M	726148	LE	II (2)	6/60	22.9	1	+	+	6	2	-	0	1	0	0		6/9	+		S
30	JCK	60	F	726611	RE	II (2)	6/36	23.01	1	+	+	1	-	-	0	1	0	0	l	6/12	+	+	O
31	RTN	60	M	786435	LE	II (2)	6/24	22.34	1	+	+	-	-	5	1	1	0	0	d	6/12			O
32	MVB	61	F	728776	RE	II (2)	6/60	22.07	1	+	+	-	-	-	0	1	0	0		6/12			S
33	SCD	75	F	728777	RE	II (3)	3/60	23.31	1	+	+	1	-	-	0	0	0	1	g,l,l	6/24	+		O
34	MKJ	75	M	729936	LE	II (2)	4/60	23.84	1	+	+	-	-	-	1	1	0	0		6/9			O
35	SRK	56	M	729801	RE	II (3)	2/60	22.71	1	+	+	-	-	-	0	1	0	0		6/6			O
36	VHD	66	M	731679	LE	IV	6/36	24.03	1	+	+	2	-	-	0	1	0	0	k,f	6/9			S
37	PKN	64	M	732793	RE	II (2)	6/18	22.2	1	+	+	-	-	-	0	1	0	0		6/12			O
38	YGV	60	F	732800	RE	II (1)	6/12	21.77	1	+	+	1	-	3	1	2	0	0	d	6/12	+	+	O
39	YBP	65	F	732916	LE	II (2)	6/24	21.98	1	+	+	6	-	4	1	2	0	0		6/12			S
40	SRK	78	F	737034	RE	III	6/36	21.69	1	+	+	-	-	-	0	1	0	0		6/6			S
41	CMK	70	M	737026	LE	IV	3/60	22.61	1	+	+	-	-	-	0	1	0	0		6/9	+		O
42	RGP	58	F	741113	LE	II (2)	6/24	22.45	1	+	+	1	-	-	0	1	0	0		6/9			O
43	SRG	60	F	741136	RE	III	6/36	22.91	1	+	+	-	-	-	1	1	0	0	k	6/6	+		S
44	SBH	60	M	742411	LE	II (2)	6/60	23.32	1	-	+	2	-	-	0	1	0	0	f	6/12			O
45	ABP	65	M	744046	LE	II (3)	6/60	21.78	1	+	+	-	-	-	0	0	0	0	i	6/12		+	O

SI No.	NAME	AGE	SEX	I.P NO.	EYE	DIAGNOSIS	PREOPERATIVE VISUAL ACUITY	AXIAL LENGTH	PAIN DURING ADMINISTRATION OF ANESTHESIA	LID AKINESIA	GLOBE AKINESIA	PRE OPERATIVE COMPLICATIONS	INTRAOPERATIVE COMPLICATIONS	INTRAOPERATIVE PAIN OCCURRED AT STAGE	PAIN ASSESSMENT IMMEDIATELY AFTER SURGERY	PAIN ASSESSMENT AFTER 4 HOURS OF SURGERY	PATIENT's COOPERATION DURING SURGERY	DIFFICULTY ENCOUNTERED BY SURGEON	POST OPERATIVE COMPLICATIONS	VISION NEXT POST OPERATIVE DAY	H/O DAIBETES MELLITUS	H/O HYPERTENSION	PATIENT'S PREFERENCE OF ANAE
46	DST	80	M	746795	LE	III	6/60	22.75	1	+	+	-	-	-	0	1	0	0	d	6/9			S
47	RNJ	72	M	747847	LE	II (1)	6/36	22.68	1	+	+	1	-	-	0	1	0	0		6/12	+		O
48	DPP	57	F	747838	RE	II (1)	6/18	23.32	1	+	+	-	-	-	1	1	0	0		6/6			O
49	SVK	58	F	748247	RE	II (2)	6/24	22.82	1	+	+	-	-	-	0	1	0	0		6/12			O
50	PPP	58	M	749728	LE	IV	6/36	21.82	1	+	+	1	-	-	0	1	0	0	d	6/9	+		O
51	BGH	52	M	749754	LE	II (2)	6/24	21.49	1	+	+	-	-	-	0	1	0	0		6/9		+	O
52	ARU	70	F	749556	RE	II (2)	6/60	21.58	1	+	+	6	-	-	0	1	0	0		6/6			S
53	KNM	60	F	751743	LE	II (2)	6/18	21.71	1	+	+	-	-	-	0	0	0	0		6/9			S
54	LBK	65	F	753701	LE	II (2)	6/24	22.63	1	+	+	-	-	-	0	1	0	0		6/6			S
55	MSS	50	M	754145	RE	III	6/24	22.48	1	+	+	2	-	5	1	1	0	0	k,f	6/9			O
56	JMI	65	F	755773	LE	II (2)	6/36	22.52	1	+	+	-	-	-	0	1	0	0		6/6	+		O
57	NHP	65	M	756475	RE	II(1)	6/36	21.85	1	+	-	-	-	-	0	1	0	0	d	6/9			O
58	RGK	69	M	757124	LE	IV	4/60	23.22	1	+	+	2	-	-	0	1	0	0	d,f	6/9	+	+	O
59	MDV	44	F	758116	RE	I (2)	6/24	23.61	1	+	+	-	-	-	0	1	0	0		6/6	+		O
60	BKC	62	M	758115	LE	II (2)	6/60	22.69	1	-	+	1	-	-	0	1	0	0		6/12			O
61	HBK	45	F	758117	RE	I (2)	6/36	22.74	1	+	+	-	-	-	0	1	0	0		6/12	+		O
62	GDD	50	M	758131	LE	III	6/36	21.87	1	+	+	2	-	3	1	2	0	0	d,f	6/9			O
63	KSS	64	M	758112	RE	II (2)	6/24	24.01	1	-	+	-	-	-	0	0	0	0		6/12			O
64	VDD	70	M	758750	RE	III	4/60	23.54	1	+	+	1	-	-	0	1	0	0		6/12			S
65	SGB	59	F	760747	LE	II (3)	3/60	22.65	1	+	+	-	2	-	0	1	0	0	i,l	6/18	+	+	O
66	SHD	74	F	762252	RE	II (3)	2/60	21.84	1	+	+	-	-	-	0	1	0	0	d	6/12			S
67	PDM	44	F	763736	LE	I (0)	6/18	22.59	1	+	+	2	-	-	0	1	0	0	f	6/9	+		O
68	CCG	62	F	765274	RE	II (2)	6/36	22.45	1	+	+	2	-	-	1	1	0	0	k,f	6/6			O
69	SNB	64	F	768917	RE	II (2)	6/24	22.53	1	+	+	1	2	-	0	1	0	0		6/9	+	+	O
70	KRP	76	M	769858	LE	II (2)	6/60	21.72	1	+	+	-	-	-	0	1	0	0		6/6			S
71	SVP	74	M	771204	LE	II (3)	4/60	22.5	1	-	+	-	-	-	0	1	0	0		6/12			S
72	CBB	69	M	771412	RE	II (2)	6/60	21.63	1	+	+	1	-	-	0	0	0	0	d	6/12	+		S
73	LBP	70	M	771413	RE	II (2)	6/60	21.95	1	+	+	-	-	-	0	1	0	0		6/12			S
74	TGM	70	M	771418	RE	II (2)	6/60	23.32	1	+	+	1	6	-	0	1	0	0		6/6			S
75	RSL	74	M	777905	RE	II (2)	6/60	22.85	1	+	+	-	-	4	1	2	0	0	k	6/6	+		S
76	BAP	67	M	778731	RE	II (2)	6/36	22.79	1	+	+	6	-	-	1	1	0	0		6/9		+	O
77	NYD	50	M	764997	LE	III	4/60	23.34	1	+	+	-	-	-	0	1	0	0	d	6/12	+		O
78	SVP	58	M	765011	RE	II(1)	6/36	22.88	1	+	+	1	-	-	0	1	0	0		6/6			O
79	BAB	70	M	764999	LE	II (3)	4/60	21.74	1	+	+	-	-	-	0	1	0	0		6/9	+	+	O
80	NGV	58	F	766753	RE	II (2)	6/60	22.22	1	+	+	6	-	-	0	0	0	0		6/6			O
								22.31838															

TOPICAL																							
Sl No.	NAME	AGE	SEX	I.P NO.	EYE	DIAGNOSIS	PREOPERATIVE VISUAL ACUI	AXIAL LENGTH	PAIN DURING ADMINISTRATION OF ANESTHESIA	LID AKINESIA	GLOBE AKINESIA	PRE OPERATIVE COMPLICATIONS	INTRAOPERATIVE COMPLICATIONS	INTRAOPERATIVE PAIN OCCURRED AT STAGE	PAIN ASSESSMENT IMMEDIATELY AFTER SURGERY	PAIN ASSESSMENT AFTER 4 HOURS OF SURGERY	PATIENT's COOPERATION DURING SURGERY	DIFFICULTY ENCOUNTERED BY SURGEON	POST OPERATIVE COMPLICATIONS	VISION NEXT POST OPERATIVE DAY	H/O DAIBETES MELLITUS	H/O HYPERTENSION	PATIENT'S PREFERENCE OF A
1	MSK	68	M	716393	LE	II (2)	6/24	21.5	0	-	-	-	-	3	0	1	0	1	d	6/12	-	+	S
2	LSS	60	M	718294	RE	II (2)	6/36	22.24	0	-	-	-	-	-	0	1	0	0		6/6	-	-	S
3	SGH	55	M	724949	RE	II(1)	6/36	23.01	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
4	BPR	60	M	725366	RE	II (2)	4/60	22.45	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
5	SSH	65	F	725237	LE	II(2)	3/60	22.5	0	-	-	6	-	-	0	1	0	0	d,i	6/12	-	-	S
6	SKP	44	F	727463	LE	I (2)	6/60	23.22	0	-	-	-	-	-	0	1	0	0		6/6	-	-	S
7	ADV	63	M	727363	LE	II (3)	4/60	24.01	0	-	-	-	-	4	0	1	0	0		6/9	-	-	S
8	RKN	60	M	727376	LE	III	6/36	22.75	0	-	-	-	-	-	0	0	0	0	d	6/9	-	-	S
9	RNP	67	M	727644	RE	IV	6/24	23.44	0	-	-	-	-	-	0	0	0	0		6/12	+	+	S
10	HGH	58	M	728160	LE	II (2)	4/60	22.25	0	-	-	7	-	-	0	1	0	0	d	6/12	-	-	S
11	BGG	70	M	728693	LE	II (3)	3/60	21.98	0	-	-	-	-	-	0	1	0	0		6/6	-	-	S
12	CMK	70	M	728742	LE	II (3)	2/60	22.33	0	-	-	-	-	-	0	1	0	0		6/9	-	-	O
13	VMH	77	M	728993	RE	II(2)	6/36	23.32	0	-	-	-	2	3	1	2	0	0	d, I,h	6/24	+	-	O
14	AMH	59	M	730058	RE	II (2)	6/36	21.88	0	-	-	-	-	-	0	0	0	0		6/12	-	-	O
15	SNB	64	F	729922	LE	II (2)	6/60	23.43	0	-	-	-	-	-	0	1	0	0		6/9	-	-	O
16	MSB	69	M	729865	RE	II (2)	6/60	22.98	0	-	-	-	-	-	0	1	0	0	d	6/12	-	-	S
17	MSI	60	F	732792	LE	II (3)	4/60	22.12	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
18	BBH	54	F	732801	LE	II (1)	6/60	23.43	0	-	-	-	-	-	0	1	0	0		6/6	+	-	S
19	DST	64	M	732915	LE	II (2)	6/18	22.75	0	-	-	-	-	-	0	1	0	0		6/6	-	-	S
20	RNJ	61	F	732910	RE	II (2)	6/36	23.01	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
21	DPP	75	M	732919	RE	II (3)	3/60	23.33	0	-	-	-	-	-	0	1	0	0	d	6/12	-	-	O
22	SVK	66	M	732235	LE	III	6/60	24.01	0	-	-	-	-	-	0	1	0	0		6/6	+	-	O
23	PPP	65	M	734152	RE	IV	6/36	23.64	0	-	-	-	-	-	0	1	1	0		6/6	-	-	S
24	SDB	50	F	734213	LE	II (2)	6/24	23.87	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
25	GGH	70	M	734102	RE	II (2)	4/60	21.65	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
26	VKM	62	M	734212	RE	II (2)	6/60	22.95	0	-	-	6	7	-	0	1	0	0	d, i	6/12	+	-	O
27	SMS	66	F	735485	LE	II (1)	6/36	22.89	0	-	-	-	-	-	1	1	0	0	k	6/12	-	-	S
28	GBD	68	F	735261	RE	IV	6/36	21.94	0	-	-	-	-	-	0	1	0	0	d	6/9	-	-	S
29	ASJ	60	M	735488	RE	II (2)	6/60	22.45	0	-	-	-	-	-	0	1	0	0		6/6	-	-	O
30	KBS	67	F	735489	LE	II (2)	6/36	22.56	0	-	-	-	-	-	0	1	0	0		6/6	-	-	S
31	SRP	58	M	735493	LE	III	6/24	23.82	0	-	-	-	-	-	0	1	0	0		6/6	-	+	S
32	YGV	60	F	732412	LE	II(1)	6/36	24.22	0	-	-	-	-	-	1	1	0	0	k,l	6/9	+	-	S
33	ANG	67	F	736167	RE	II (3)	4/60	22.76	0	-	-	-	-	-	0	1	1	0	d	6/6	-	-	O
34	SKM	68	F	736538	LE	II (2)	3/60	22.71	0	-	-	-	-	-	0	1	0	1		6/9	-	-	O
35	SRP	62	F	738433	RE	II (2)	5/60	22.67	0	-	-	-	6	-	0	1	0	0		6/6	-	-	S
36	BCP	78	M	738769	LE	II (2)	4/60	23.32	0	-	-	-	-	-	0	1	0	0		6/6	-	-	O
37	VCH	76	M	739087	LE	II (3)	2/60	22.93	0	-	-	-	-	-	0	1	0	0		6/6	-	-	O
38	MSK	69	M	740041	RE	IV	4/60	21.65	0	-	-	-	-	-	1	1	0	0	d	6/9	-	-	O
39	BIT	60	M	740462	LE	II (2)	6/24	21.65	0	-	-	-	-	-	0	1	0	0		6/9	+	+	S
40	YPS	48	M	740467	RE	II (1)	6/12	22.45	0	-	-	-	-	-	0	1	0	0		6/6	-	-	S
41	HPH	66	M	742256	LE	III	3/60	22.67	0	-	-	-	-	4	0	1	0	0		6/12	+	-	S
42	JAD	73	M	742637	RE	III	4/60	22.92	0	-	-	-	-	-	0	1	1	0		6/9	-	-	O

Sl No.	NAME	AGE	SEX	I.P NO.	EYE	DIAGNOSIS	PREOPERATIVE VISUAL ACUI	AXIAL LENGTH	PAIN DURING ADMINISTRATION OF ANESTHESIA	LID AKINESIA	GLOBE AKINESIA	PRE OPERATIVE COMPLICATIONS	INTRAOPERATIVE COMPLICATIONS	INTRAOPERATIVE PAIN OCCURRED AT STAGE	PAIN ASSESSMENT IMMEDIATELY AFTER SURGERY	PAIN ASSESSMENT AFTER 4 HOURS OF SURGERY	PATIENT's COOPERATION DURING SURGERY	DIFFICULTY ENCOUNTERED BY SURGEON	POST OPERATIVE COMPLICATIONS	VISION NEXT POST OPERATIVE DAY	H/O DAIBETES MELLITUS	H/O HYPERTENSION	PATIENT'S PREFERENCE OF A
43	VBP	64	F	742638	RE	II(1)	6/36	23.56	0	-	-	-	-	-	0	1	0	0		6/6	-	-	O
44	DKP	63	M	742678	LE	II (3)	4/60	21.93	0	-	-	-	-	-	0	1	0	0		6/6	-	-	S
45	PJA	66	F	743284	RE	IV	6/60	22.56	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
46	BRS	62	M	744030	RE	III	6/36	23.65	0	-	-	-	-	-	0	1	0	0	d	6/12	+	-	S
47	LCC	70	F	744806	RE	II (2)	3/60	23.82	0	-	-	-	-	-	1	1	0	0		6/9	-	-	O
48	RGP	81	M	746323	RE	II (3)	2/60	22.98	0	-	-	-	-	-	0	1	0	0		6/6	-	-	O
49	LNN	58	M	747500	RE	III	6/36	22.86	0	-	-	-	-	5	0	1	0	0	k,l	6/9	-	-	S
50	KNM	60	F	748035	LE	II (2)	6/60	23.95	0	-	-	-	-	-	0	1	0	0	i	6/6	-	-	O
51	VBT	66	F	748066	LE	II (3)	3/60	22.45	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
52	PSS	41	M	749267	RE	I (2)	6/36	23.95	0	-	-	-	2	-	0	1	0	0	d	6/12	-	+	S
53	ABP	65	M	749508	RE	II(2)	6/36	23.54	0	-	-	-	6	-	0	1	0	0		6/12	-	-	S
54	PSM	60	F	751090	RE	II (2)	5/60	2.86	0	-	-	-	-	-	1	1	1	0	h	6/12	-	-	S
55	VTP	72	M	750876	RE	II (3)	3/60	21.98	0	-	-	-	-	-	0	1	0	0		6/9	+	-	O
56	MDG	74	M	752452	LE	II (3)	2/60	21.64	0	-	-	-	-	-	0	1	0	0		6/6	-	-	O
57	SRP	61	M	752455	LE	II (2)	6/60	24.12	0	-	-	-	-	-	0	1	0	0	d	6/9	+	-	S
58	YGV	56	M	752458	LE	II (2)	4/60	23.76	0	-	-	-	-	-	0	1	0	0	i	6/6	-	-	S
59	ANG	62	M	755233	RE	II (2)	6/60	23.53	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
60	SKM	78	M	755855	RE	II (3)	2/60	22.67	0	-	-	-	-	-	0	1	0	0		6/6	-	-	O
61	SRP	69	M	755858	RE	II (2)	6/60	23.01	0	-	-	-	-	-	0	1	0	0	d	6/12	-	-	S
62	BCP	58	M	756705	LE	II (2)	6/18	23.64	0	-	-	-	-	-	0	1	0	0	k,l	6/6	+	-	S
63	VCH	55	F	758113	RE	II (1)	6/18	21.34	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
64	MMK	55	M	758536	LE	II (1)	6/60	24.43	0	-	-	-	-	-	0	1	0	0		6/12	-	-	S
65	SPT	52	F	759154	LE	IV	6/36	23.54	0	-	-	-	-	-	1	1	0	0		6/6	-	-	S
66	HLB	70	M	759225	LE	II (3)	3/60	22.74	0	-	-	-	6	-	0	1	0	0	i, k,l	6/18	-	-	O
67	SRM	69	F	759333	RE	II (2)	6/36	24.23	0	-	-	-	-	-	0	1	0	0	d	6/12	+	-	S
68	AMI	60	F	759893	RE	II (2)	6/24	22.76	0	-	-	-	-	-	0	1	0	0		6/12	-	+	S
69	SPG	65	M	760461	RE	II (2)	6/60	22.09	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
70	SVP	59	M	760740	RE	II (2)	6/36	23.76	0	-	-	-	-	5	0	1	0	0		6/6	-	-	S
71	SYP	65	M	760750	RE	II (2)	6/60	23.01	0	-	-	-	-	-	0	1	0	0	d	6/6	+	-	S
72	NMP	60	M	760749	LE	II (2)	5/60	23.65	0	-	-	7	-	-	0	1	1	0		6/6	-	-	S
73	GSH	67	F	761053	RE	II (3)	3/60	23.52	0	-	-	-	-	-	0	1	0	0		6/6	-	-	S
74	DCC	44	F	761055	RE	I (2)	6/24	22.93	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
75	SHB	42	F	762253	RE	I (0)	6/12	22.45	0	-	-	-	-	-	0	1	0	0		6/9	-	-	S
76	BKP	43	M	762573	LE	I(0)	6/12	21.76	0	-	-	-	-	-	0	1	0	0	d	6/9	-	-	S
77	MMK	55	M	763486	RE	III	6/60	22.45	0	-	-	-	-	-	0	1	0	0		6/6	-	-	O
78	SIH	70	M	764858	RE	II (2)	2/60	21.87	0	-	-	-	-	-	0	1	0	0		6/9	-	-	O
79	NRY	76	M	765007	RE	II(3)	3/60	22.43	0	-	-	-	-	-	0	1	0	0		6/9	-	-	O
80	BSP	61	M	765006	RE	III	6/24	22.76	0	-	-	-	-	-	0	1	0	0	d, h	6/12	+	+	S
								22.648															

Diagnosis
I- Presenile immature cataract
I(1)- Grade I nuclear sclerosis
I(2)- Grade II nuclear sclerosis
I(3)- Grade III nuclear sclerosis
I(0) Posterior subcapsular cataract
II- Senile immature cataract
II(1)- Grade I nuclear sclerosis
II(2)- Grade II nuclear sclerosis
II(3)- Grade III nuclear sclerosis
III-Posterior subcapsular cataract
IV-Cortical cataract
Preoperative complications
1- Chemosis
2- Subconjunctival haemorrhage
3- Retrobulbar haemorrhage
4-Optic nerve injury
5- Globe perforation
6- Giddiness
7-Burning sensation
Intraoperative complications
1- Descemet stripping
2- Endothelial touch
3- Anterior chamber collapse
4- Capsular tear
5- Zonular tear
6- Posterior capsular rent
7- Vitreous loss

Pain assessment immediately after surgery and 4 hours after surgery
0- no pain
1-tolerated pain
2- interfernce needed
3-intolerable

Intraoperative pain occurred at what stage in surgery
1- Scleral contact
2- Corneal contact
3- Iridal contact
4- Intraocular lens insertion
5-Irigation and aspiration

Difficulty encountered by surgeon
0- not difficult
1- mildly difficult
2-moderately difficult

3- extremely difficult

PATIENT's COOPERATION DURING SURGERY
0- Excellent cooperation
1-Good cooperation
2-Poor cooperation
3-Very poor cooperation
d- Conjunctival congestion
e- Chemosis
f- Subconjunctival haemorrhage
g-Descemet fold
h- Stromal haze
i- Microcystic edema
j- Shallow anterior chamber
k- AC flare
l- AC cells

PATIENT'S PREFERENCE OF ANAESTHESIA
S- Same technique
O- Other technique