"A RANDOMISED, CONTROLLED, TRIAL OF SUB-TENON'S VERSUS PERIBULBAR ANAESTHESIA IN MANUAL SMALL INCISION CATARACT SURGERY"

By

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KLE University, Belgaum, Karnataka

In Partial Fulfillment
of the requirements for the degree of

MASTER OF SURGERY (M.S.)

IN

OPHTHALMOLOGY

Under the Guidance of

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DEPARTMENT OF OPHTHALMOLOGY
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BELGAUM, KARNATAKA

MAY - 2010

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DECLARATION BY THE CANDIDATE

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Dr. GEETHA S. BANDI

LIST OF ABBREVIATIONS

BSS	-	Balanced salt solution
cc	-	Cubic centimeter
CNS	-	Central nervous system
cm	-	Centimeters
G	-	Gauze
IU	-	International units
ml	-	Milli litre
mm	-	Millimeter
VAS	-	Visual analogue scale
Min	-	Minutes
SCH	-	Sub-conjunctival haemorrhage
S.D.	-	Standard Deviation

ABSTRACT

Background and Objectives

Peribulbar anaesthesia provides excellent analgesia, akinesia and is used world wide for performing cataract surgery. However, it is rarely associated with devastating complications. Sub-Tenon's anaesthesia is safe method of delivering anaesthesia as it avoids the introduction of sharp needles into the orbit. The objectives of the present study were to evaluate the comparative efficacy and safety of sub-Tenon's anaesthesia and peribulbar anaesthesia, during manual small incision cataract surgery.

Methods

The present randomized controlled trial was conducted among 100 patients undergoing manual small incision cataract surgery at KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum from January 2008 to December 2008. The patients were randomly allocated to peribulbar group (50 patients) and Sub -Tenon's group (50 patients). The efficacy was measured by akinesia of extraocular muscles, akinesia of lid, pain assessed during injection, intraoperative and after surgery, effects on intraocular pressure and complications of peribulbar and sub-Tenon's block.

Results

Both the techniques achieved complete akinesia at the end of 15 minutes following the administration of anaesthesia. Both the techniques were free from sight or life threatening complications. In Sub-Tenon's anaesthesia the onset of akinesia was faster and statistically significant number of patients achieved complete akinesia

in the first five minutes (p=0.048). It provided remarkable analgesia from the time of administration till four hours postoperative period. Only minor complications like chemosis and sub-conjuctival haemorrhage occurred. The incidence of chemosis was more in peribulbar anaesthesia and sub-conjunctival haemorrhage was more in sub-Tenon's anaesthesia.

Conclusion

Sub-Tenon's anaesthesia is a preferred alternative to peribulbar anaesthesia during manual small incision cataract surgery.

Key words

Peribulbar Anaesthesia; SICS; Sub-Tenon's Anaesthesia.

CONTENTS

LIST OF TABLES

LIST OF GRAPHS

LIST OF PHOTOGRAPHS

INTRODUCTION

Anaesthesia is an important prerequisite of any surgery. It is also equally important in ophthalmic surgery.

General anaesthesia requires a longer recovery time and causes more post-operative discomfort. It is preferred for patients who cannot co-operate fully with the surgeon for reasons like young age, mental retardation, senility and deafness.

With the advent of safer local anaesthetics, and the desire to mobilize the patient in early post-operative period, local anaesthesia has become more popular in ophthalmic surgery.

Regional anaesthesia is suitable for a wide variety of ocular surgeries. Cataract surgery is the most common eye operation done under local anaesthesia. Akinetic block using a needle, such as intraconal (retrobulbar), extraconal (peribulbar) and combined intraconal / extraconal are the commonest techniques practiced around the world.

Advances in cataract surgical techniques, especially small incision phacoemulsification, have lessened the universal demand for akinetic anaesthesia using regional block. Other methods using sub-Tenon's, sub-conjunctival and solely topical corneoconjunctival anaesthesia have been introduced. However, solid regional block anaesthesia including muscle akinesia is still the preferred choice of anaesthesia for many cataract surgeons.

Damage to the globe resulting from the use of sharp needles for peribulbar and retrobulbar anaesthesia is well recognized. Topical and sub-Tenon's local anaesthetic techniques have rapidly gained popularity for cataract and other ophthalmic surgical procedures both in India and abroad, largely because of their perceived margins of safety.

Peribulbar anaesthesia provides excellent anaesthesia, akinesia, and analgesia but, being a blind procedure of introduction of sharp needles into the orbit, is associated with rare but significant complications like globe perforation, orbital haemorrhage, central retinal artery occlusion, diplopia and brainstem anaesthesia.

Direct sub-Tenon's delivery of anaesthetic solution using a blunt cannula offers an alternative method of anaesthesia. It is safe, simple and a quick technique which eliminates the risks associated with introduction of sharp needle into the orbit. It is thought to completely avoid vascular and optic nerve injury and provides better anaesthesia and reliable akinesia with minimal risk of perforation of the globe.

So this study was done to evaluate the efficiency and safety of the peribulbar and sub-Tenon's anaesthesia techniques.

OBJECTIVES

The aim of the present study was to evaluate the comparative efficacy and safety of sub-Tenon's anaesthesia and peribulbar anaesthesia, during manual small incision cataract surgery in providing;

- Akinesia of extraocular muscles.
- Akinesia of lid.
- Pain assessed during injection, intraoperative and after surgery.
- Effects on intraocular pressure.
- Complications of peribulbar and sub-Tenon's block.

REVIEW OF LITERATURE

In 1884, Herman Knapp used cocaine for retrobulbar anaesthesia and performed an enucleation; ever since retrobulbar anaesthesia had been the technique of choice for cataract surgery. It had many complications and which led ophthalmologists to search for a safer technique.[1]

Kelman was the first to introduce Peribulbar technique in the mid seventies (1973). The technique was further modified followed by Tenant (1984), Thomson (1985), Bloomberg (1986), Weiss (1987) and Robert Hustead (1989). Several other methods have evolved to have better anaesthesia, analgesia and akinesia of the eye viz parabulbar; subconjunctival, retroperibulbar and others.[1,2,3,4]

Techniques of **subconjunctival anaesthetic injection** were reintroduced by Furata et al and Fukasawa with the advent of small incision cataract surgery.[1]

Sub-Tenon's block was first described by Turnbull in 1884 and later by Swan in 1956.[5] More recently, Mein and colleagues, Hansen and colleagues and Stevens have popularized this block.[6] The technique is also known as pinpoint anaesthesia, parabulbar block and episcleral block.[6] Since 1990, the sub-Tenon's injection technique has been extensively used.[4]

Peribulbar anaesthesia

Peribulbar block is an alternative technique born to probably replace retrobulbar anaesthesia which has many complications and the ophthalmologists prefering a safer technique. Here, the local anaesthetic injection acts by local

infiltration and diffusion without needle actually entering the muscle cone itself and hence avoiding damage to the structures within it.

Kelman was the first to introduce the technique in mid seventies. This was followed by many modifications by Tenant (1984), Thorton (1985), Bloomberg (1986), Weiss (1987) and Robert Hustead (1989).[1,4,7]

Weiss technique

It is one of the most commonly used technique. This technique involves two 5ml injections of a long acting anaesthetic mixture atleast 20 minutes before surgery; superior and inferior injections are given with a ¾ inch, 23 gauge needle. The superior injection is given superonasally beneath the superior orbital notch with the needle directed towards the roof of the orbit and remaining parallel to the nasal wall of the oribit. The inferior injection is given at the junction of outer one third and inner two thirds of the lower orbital rim with the patient looking in primary position. The needle is directed away from the eye and towards the floor of the orbit. Pressure is applied to 10-20 minutes intermittently.[7]

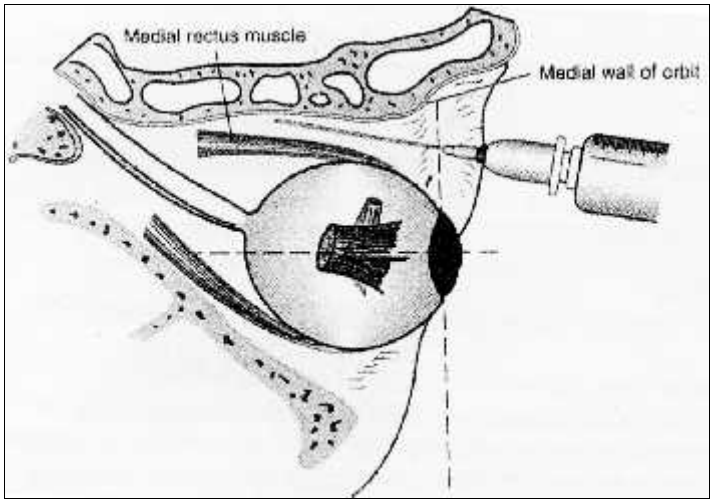


Figure 1: The needle is inserted into the medial peribulbar compartment.[8]

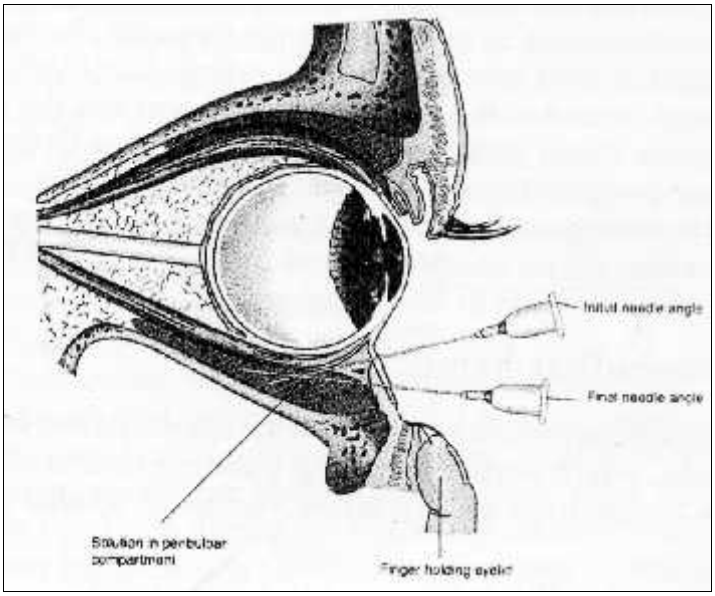


Figure 2: Needle is placed in the extraconal compartment through the inferotemporal area.[8]

Robert Hustead technique of peribulbar anaesthesia

This technique has two parts; an initial superficial injection and a deep peribulbar injection. Hustead introduced an almost painless injection technique for superficial injection.

Nine millilitres of BSS taken from the sterile 15ml of BSS vial is mixed with ice of 1% lidocaine without epinephrine in a 10ml syringe. This and the peribulbar injection to be given later are warmed to body temperature in a heating pad.

The superficial injection of mixture of 9:1 BSS./lidocaine is given at the junction of lateral 1/3rd and medial 2/3rd of the lower lid just above the orbital rim using a 1/2 inch 27 guage needle. A total of 2ml is given. First, a small skin wheal is raised and then 0.5ml is deposited in the orbicularis. The needle is than directed almost straight posteriorly to the full length of the ½ inch needle avoiding the globe, and an additional 1ml of this mixture is deposited in the anterior orbit. Because the pH

of this mixture is more physiologic than 1% lidocaine alone, it does not cause burning or stinging.

After about 1 minute of holding pressure over the injection site to diminish, the incidence of ecchymosis, the deep injection is given using a blunt 23 guage or 25 guage needle, a ¾ inch or 1 inch needle is also satisfactory. A mixture of 6.5ml of bupivacaine 0.75%, 3.75ml of lidocaine 1% without epinephrine and 0.1 to 0.25ml hyaluronidase is prepared in a 10ml syringe; the mixture is warmed to body temperature A total of 6-8ml is given. As the needle does not penetrate muscle cone, pain is diminished and also because of buffering with sodium bicarbonate and previous superficial injection.

The peribulbar injection is introduced to the same location as the skin injection. 1ml is deposited in the orbicularis. It is advanced just anterior to the equator of the globe, staying further away from globe, the patient is instructed to look straight ahead, and 2-3 ml are deposited and the needle is slowly advanced past the globe, just past the equator additional 4-7ml are administered slowly stopping when superior lid fold disappears. Immediately super pinky or digital pressure is applied intermittently.

Some minor movements may be present which may disappear later. Significant number of cases may require second injection (two quadrant).[7]

Modifications of technique of peribulbar anesthesia

Instead of giving the entire bolus in a single injection the anaesthetic is deposited in graded doses of 2-3 ml each time to avoid raising the intraocular pressure in a patient of glaucoma. Following the initial injection, either the ocular compression device is placed with only mild pressure or digital pressure is administered in an

attempt to prevent intraocular pressure from rising to levels that could damage the optic nerve.

For the occasional radial keratotomy patients, who require more than topical anaesthesia, the main desire is to temporarily increase the intraocular pressure to allow deeper incisions with diamond knife. The block is directed more laterally than for cataract surgery. 7-10 minutes are utilized and no compression is placed on the eye.

Variations of peribulbar technique

Many variations of the peribulbar technique have been described and they work well.

1. **Charles Kelman** utilizes a 1 5/8 inches 25 gauge needle through the superior fornix, depositing 4 to 5ml of anaesthetic superiorly. He bends the needle at the hub to a 70 degree angle. The injection is delivered transconjunctivally through the superior fornix all the way back until one can feel the tip of the needle hit the bony roof of the orbit. The needle is always held parallel to the plane of operating room floor.

2. **Jaswant Pannu** uses 5/8 inch needle with a mixture of bupivacaine 0.75%, lidocaine 4% and hyaluronidase. Approximately 8-10ml is given in the inferotemporal quadrant. The needle is directed away from the globe, muscle cone and optic foramen. He no longer uses the superotemporal quadrant but supplements through conjunctiva directly around the muscle when needed.

3. **Spencer Thornton** gives injection in the superotemporal area just lateral to the temporal edge of the superior rectus muscle. He initially directs the needle 45 degrees upward towards the orbital roof until it is gently touched at the level of the equator of the globe and then redirects it posteriorly to behind the globe outside of the muscle cone 5-6ml of 50:50 mixture of bupivacaine 0.75% and lidocaine 2% with hyaluronidase in given. Bevel of the needle should be directed towards the globe.

4. **Leroy Bloomberg** employs a 1 inch 25 guage needle injecting along the orbital floor both inferotemperally and inferonasally. He administers 10cc of etidocaine hydrochloride 1% with epinephrine and hyaluronidase and applies pressure with Honnan balloon for 20 min.

5. **Bary Galman and Howard Friedberg** use a 7/8 inch needle with an infero temporal approach followed by digital massage for 4-5 mins. 6-7ml of a 50:50 mixture of bupivacaine 0.75% and mepivacaine 2% with hyaluronidase is used. He notes a reinjection rate of less than 5 % and has noticed 100% akinesia does not occur but a small amount of residual eye movement which has not caused any problems.

6. **Jack Weiss** uses 25 guage 5/8 inch needle at the inferotemporal location. Five cc of 50:50 mixtures of 0.75% bupivacaine and 2% lidocaine with hyaluronidase is given. Honnan device is applied for 10 minutes.

Complications of peribulbar anaesthesia may be classified as[2,8,9,10]

Sight threatening complications

1. Globe perforation and penetration
2. Retrobulbar haemorrhage
3. Central retinal artery occlusion
4. Combined central retinal artery and central retinal vein obstruction
5. Trauma to optic nerve
6. Ophthalmic artery obstruction
7. Optic nerve damage.

Life threatening complications

1. Brain stem anaesthesia
2. Intravascular injection of local anaesthetic
3. Subarachanoid injection of local anaesthetic
4. Cardiac or cardiopulmonary arrest
5. Respiratory arrest or depression
6. CNS depression.

Others

1. Oculocardiac reflex
2. Disorientation, restlessness and tremors.
3. Unconsciousness
4. Hypertension and tachycardia

5. Grandmal epilepsy
6. Pain on injection
7. Contralateral amaurosis
8. Contralateral cavernous sinus syndrome
9. Retinal hemorrhages
10. Infection
11. Inferior rectus muscle palsy
12. Subcutaneous haemorrhage and lid abrasions
13. Sub- conjunctival haemorrhage
14. Allergic blepharoconjunctivitis
15. Allergic reactions
16. Novocainoma
17. Toxic reaction
18. Myotoxicity[2,8,10,11]

Advantages of Peribulbar anaesthesia

1. Reasonable akinesia.
2. Reliable anaesthesia.
3. Injection away from the key structures of the apex.
4. Minimum anterior haemorrhage
5. No rotation of the globe.
6. Less pain.

7. No need for additional seventh nerve block.
8. Less intraoperative positive pressure.
9. No intraoperative and post operative amarousis.

Disadvantages of peribulbar block:

1. Peribulbar blocks have all the disadvantages of retrobulbar blocks but they occur less frequently.
2. The quality of akinesia and anesthesia may not be as good as with retrobulbar block.
3. Often more than one injection is required. Slight movements are encountered requiring a need for second injection (2-30%) and third injection (5 %).
4. The block takes much longer to work; it can take upto 30 minutes.
5. Honan balloon may be uncomfortable for the patient . Chemosis occurs in 80% of cases, which makes operating conditions difficult.
6. In 5.8%of both retrobulbar and peribulbar blocks, ptosis can remain for upto 90 days.
7. One perforation for every 140 peribulbar blocks in eyes >26mm axial length.
8. Skill is required.
9. Although needle remains tangential to the globe key structures may be damaged.
10. Requires larger volumes of anaesthetic (6-10 ml).
11. Takes longer time to achieve full lid and globe anaesthesia.[2,8]

SUB- TENON'S BLOCK

Synonyms: (Parabulbar block, pin point anaesthesia, episcleral block)

The sub-Tenon's anaesthesia block was reintroduced as a simple, safe, effective and versatile alternative to sharp needle block for orbital anesthesia.[6] It avoids the sight and life threatening complications of needle block techniques.[5]

Greenbaum designed a specific flexible cannula also known as anterior sub-Tenon's cannula to deliver anesthesia.[12] Stevens described using a curved metal cannula.[4]

Recently, mid sub-Tenon's cannula and ultra short metal cannula has been described. The placement of polyethylene catheter into sub-Tenon's space has been described for surgery of long duration.

Basic principle: The Sub-Tenon's block involves obtaining surface anaesthesia, gaining access to the sub-Tenon's space, insertion of a cannula and subsequent administration of local anesthetic agent into sub-Tenon's space.

Standard technique: Local anaesthetic eye drops (proxymetacaine 0.5% or tetracaine 1%) are instilled onto the conjunctiva to obtain surface anaesthesia. The eye is cleaned with specially formulated 5% aqueous povidone iodine solution. An eyelid speculum or an assistants hand is used to keep the eyelids apart. The patient is asked to look upwards and outwards, to expose the inferonasal quadrant. Access to the space by inferonasal quadrant is the commonest approach described because the placement of cannula in this quadrant allows good fluid distribution superiorly while avoiding the area of surgery and reducing the risk of damage to vortex veins.[5]

Under sterile condition, the conjunctiva and Tenon's capsule are gripped with a non toothed forceps 3-5 mm away from the limbus. A small incision is made through these layers with scissors (Westcott scissors) to expose the white sclera.[5]

A blunt, curved sub-Tenon's cannula (19-G, 25mm long curved, with a flat profile and a blunt end hole) mounted onto a 5 ml syringe with local anaesthetic is inserted through the hole along the curvature of the sclera. The direction of the cannula is equidistant between the horizontal and vertical meridian of the globe. If resistance is encountered, a gentle pressure is applied and hydrodissection usually helps in advancing the canula. The resistance felt during insertion of cannula is due to intermuscular septum passing circumferentially between the extraocular muscles. Once this is negotiated, the canula easily passes into the posterior subtenon's space. If the hydrodisection does not help or resistance encountered is too great, it is advisable to reposition or reintroduce the cannula.

The local anaesthetic agent of choice is injected slowly and the patient is asked to return the eye to the primary gaze position. After removal of the cannula, gentle pressure is applied over the globe to favour the spread of the local anaesthetic agent.[5]

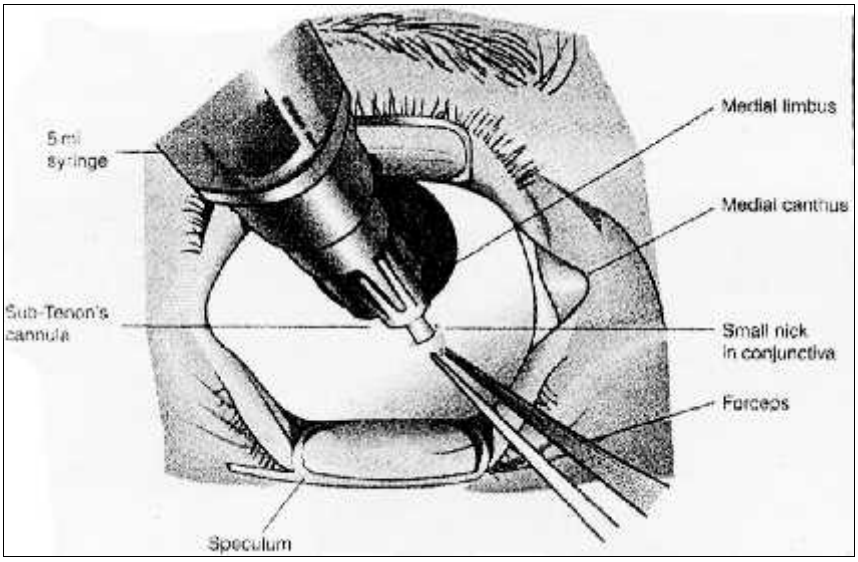


Fig 3 : Sub-Tenon cannula is inserted into the sub-Tenon's space in the inferonasal quadrant.[8]

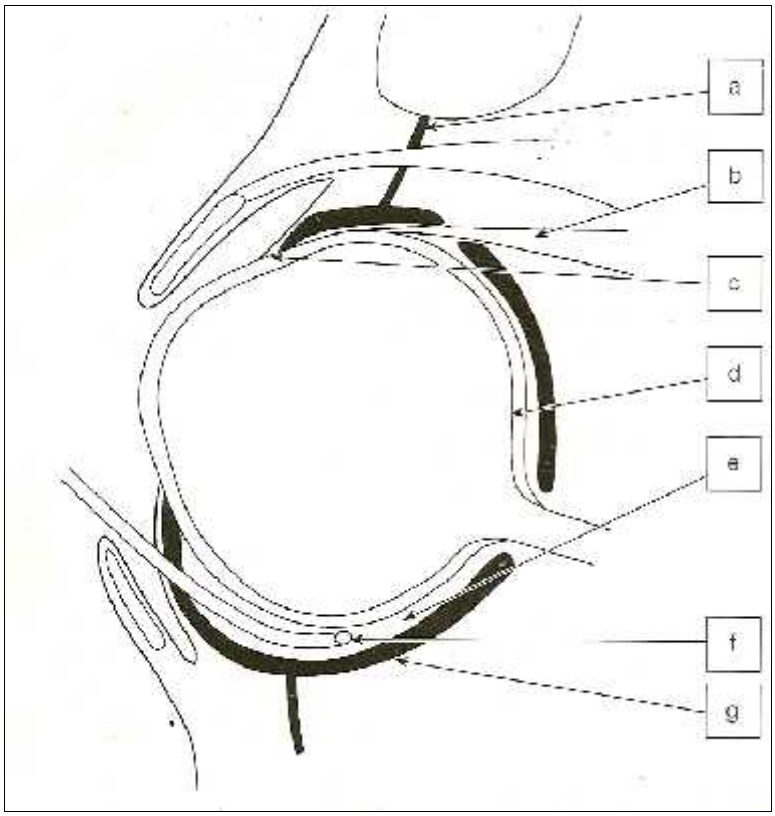


Figure 4: Schematic diagram of Sub-Tenon's space, with the cannula (f) positioned to administer local anaesthetic solution posterior to the globe, into the base of the retro orbital cone. a. Orbital septum, b. Superior rectus perforating Tenon's Capsule; c. Conjunctiva; d. Sclera; e. Sub-Tenon's Space; f. Cannula; g. Tenon's capsule [13]

Variations

1. Variations of access to sub-Tenon's space:

Access to all the quadrants have been reported and are essentialy similar in principle. They are:

a. Superotemporal quadrant – Fukasaku and Marron

b. Superonasal and inferotemporal – Roman and collegues

c. Medial canthal side – Ripart and collegues

d. Four quadrant method – Mein and Woodcock.

2. Variations in the sub–Tenon's cannulas used:

The sub–Tenon's cannulas used to administer the block may be-

a. Specifically designed cannulae

b. Nonspecific sub- Tenon's cannulae.

a) Specifically designed cannulae : may be

- Made up of : Metal or plastic
- The metal cannulae vary in gauge, length, curvature and position of end – hole.
- Plastic cannulae advocated by Greenbaum is 15G-1.2cm long 'D' shaped and flat bottomed.

b) Non – specific sub-Tenon's cannulae : include

- Metal Southampton cannula.
- Metal ophthalmic irrigation cannula.
- Plastic intravenous cannula.
- Placement of a polyethylene catheter into sub–Tenon's space has been described for surgery for long duration.

Based on the length, the cannulae may be-

1. Anterior sub–Tenon's cannula – 1.2cm made of plastic advocated by Greenbaum.
2. Mid sub-Tenon's cannula – 4 cm made of plastic.
3. Ultra short metal cannula – 16 G, 6mm with

Additionally access to the sub-Tenon's space through the medial canthal approach has been described using needles without dissection.

3. Variations based on the amount and local anesthetic agent used:

The choice of local anaesthetic agent depends on the duration of anaesthesia, availability and anaesthetist preference. Two percent lidocaine is the most commonly used agent and is considered as gold standard**.**

Agents such as mixtures of lidocaine and bupivacaine, mepivacaine, articaine, etidocaine and prilocaine have all been used in sub-Tenon's block. However, there is no comparative date available on their relative effectiveness.

4. Variation based as volume of local anesthetic agent used.

There is a wide variation in the volume of local anesthestic used in sub – tenon's and this is a subject of debate. The volumes very from 1 to 11 ml but 3 to 5 ml are generally used. Smaller volumes usually provide globe anesthesia but larger volumes are required if akinesia is desired.[5,6]

Overview on the amount and type of local anaesthetic agent used by various authors in administering sub-Tenon's block[14,15,16,17,18,19]

Author	Anaesthestic mixture used	Amount of anaesthetic agent
Stan J Roman et al	2% lignocaine	1.5 ml
Guise P.A.	1. 2% Lignocaine 0.5% Bupivacaine + 150 IU hyaluronidase 2. 1% Ropivacaine + 150 IU Hyaluronidase 3. 2% lignocaine + 150 IU Hyaluronidase	4 ml
Stevens JD	50:50 mixture of 2% lignocaine and 0.5% Bupivacaine	3-3.5 ml
Parkar et al	2% lignocaine with 1: 10,000 adrenaline	1 ml
Barak Azmon et al	1:1 mixture of 2% lignocaine with 0.5% bupivacaine	2ml
Rowley SA et al	2% lignocaine + adrenaline 1: 2,00,000 + 30 IU/ml of hyaluronidase	3ml

For cataract surgery, 3ml is the optimal dosage of anaesthetic solution in sub-Tenon's anaesthesia.[20]

Techniques:

Stan J Roman et al used a method where after applying topical anaesthesia to conjunctiva, a buttonhole was made through conjunctiva and Tenon's capsule 10 mm posterior to the limbus. A 15 mm flexible cannula was passed through the buttonhole and slid 5.7mm along sclera where 1.5ml of 2% lignocaine was administered.[19]

Guise described a method wherein the fused conjunctiva and anterior Tenon's capsule was picked up at an inferonasal point 7-10mm from the limbus, midway between the insertions of medial and inferior rectus muscles and the sub-Tenon's space was accessed using blunt Westcott's scissors to create a thin channel to the posterior sub-Tenon's space. A blunt tipped sub-Tenon cannula was then inserted into the posterior sub-Tenon's space and approximately 4ml of local anaesthetic was introduced. An intraocular pressure lowering device was applied for 5 minutes after performing the block.[16]

Stevens JD described a simple technique which involves transconjunctival infiltration of local anaesthetic directly into the sub-Tenon's space, in the inferior nasal quadrant, using a blunt 19G Southampton cannula.[14]

Parkar et al used a technique wherein after applying topical anaesthesia and making a small nick in the conjunctiva and Tenon's capsule in the inferonasal quadrant, 4 mm from the limbus, a curved sub-Tenon's cannula was then inserted onto bare sclera and glided along the contour of the globe. 1ml of 2% lignocaine with 1: 10,000 adrenaline was injected slowly in the posterior sub-Tenon's space.[17]

Barak Azmon et al used a technique where a topical anaesthetic agent, benoxinate 4% was instilled. A 2 ml of 1:1 mixure of lignocaine and bupivacaine

0.5% was injected with a visitec cannula through an incision made 3 mm from the limbus in temporal quadrant. The cannula was inserted approximately 25 mm along the sclera to sub-Tenon's space and solution was injected into retrobulbar space.[18]

For cataract surgery 3ml is the optimal dose of anaesthetic solution in sub-Tenon's anaesthesia.[20]

Mechanism of anaesthesia in Sub-Tenon's block :

The passage of local anaesthetic during sub-Tenon's block has been studied using different imaging techniques. These studies confirm that when the anaesthetic agent is injected into the sub-Tenon's space, it opens the space to form a characteristic T-sign. As the local anaesthetic agent spreads through the sub – Tenon's space, it diffuses into intraconal and extraconal areas and results in anaesthesia and akinesia of the globe and eyelids. Intense analgesia is produced by blockade of the short ciliary nerves as they pass through the Tenon's space. Akinesia is caused by a blockade of the motor nerves present in the intraconal and extraconal compartments.[6]

Effects on the eye:

1. **Analgesia and anaesthesia**: Anaesthetic solution diffuses into the intraconal region blocking the long ciliary and short ciliary nerves as they enter the globe and the ciliary ganglion. Sub-Tenon's block provides reliable anesthesia, can be supplemented for prolonged anaesthesia and post operative pain relief. The deepness of analgesia has been reported by all the authors using this technique for cataract surgery and strabismus surgery[19]. Many published studies on the subject report good results when anaesthesia accompanies sub–Tenon's block.[19]

2. **Akinesia**: is obtained by blockade of ocular motor nerves in the orbit. Akinesia is variable while few studies have found that complete akinesia can be obtained.[5]

   Difference in the time of assessment and in the time of assessments and in the volume or mixture of the anaesthetic solution administered can explain the various reports of akinesia depending on publications.[19]

   Some surgeons find difficult to work without akinesia however the lack of akinesia does not cause intra operative difficulties. If necessary, unwanted movements can be controlled by forceps fixation[19]. Akinesia is volume dependent and if 4-5ml of local anaesthetic agent is injected, most patients develop akinesia. However, superior oblique muscle and lid movements may remains active in a small but significant of patients.[21]

3. **Intraocular pressure**: Barak Azmon et al found a greater rise in IOP with peribulbar anaesthesia than with sub–Tenon's anaesthesia. IOP rise can be due to mechanical compression of the eye and blood vessels by the large volume of solution injected in the small ortital space. The rise in intra ocular pressure after sub-Tenon's is small or even non – significant.[18,19]

4. **Amarousis**: Loss of visual acuity occurs in retrobulbar block, peribulbar block and in sub-Tenon's anaesthesia.[5]

Limitations of sub-Tenon's block

1. Sub-conjunctival haemorrhage and chemosis are common and occur relatively less as experience increases.

2. Residual muscle movement or incomplete akinesia does not cause intra operative difficulties and is generally acceptable to surgeons.

3. The block may be difficult to perform in patients who have had previous sub-Tenon's block in the same quadrant, previous retinal detachment and strabismus surgery, eye trauma and infection to the orbit.[5]

Complications of sub-Tenon's Block

Sub-Tenon's block has been advocated as an alternative method of local, orbital regional anaesthesia to avoid the sight and life threatening complications of sharp needle blocks.

Common complications of sub–Tenon's block are mainly minor, although rare major complications have also been reported.

Minor complications

1. Pain during injection

Incidence of pain during sub-Tenon's injection with posterior metal cannula is reported in upto 44% of patients. Pain experienced during ophthalmic blocks is multifactorial. Pain scores on a visual analogue scale (VAS) [22] have been reported as high as 5.

Smaller cannulae appear to offer marginal benefit. Other measures to reduce the pain include:

a) Preoperative explanation of the procedure.

b) Good surface anaesthesia.

c) Gentle technique.

d) Slow injection of warm local anaesthesia agent

e) Reassurance.

2. Chemosis

Signifies anterior injection of the anaesthetic agent. This usually occurs if a large volume of local anaesthetic is injected and if the Tenon's capsule is not dissected properly.

The incidence varies from 25 to 60% with a posterior cannula and 100% with shorter cannulae.

This usually resolves after digital pressure and no intra operative problems have been reported.

3. Minor conjunctival haemorrhage

The vessels inevitably severed on making the conjunctival dissection causes conjunctival haemorrhage. The incidence of haemorrhage varies from 20 to 100% and depends on the cannula used.

This can be minimized by

a) Care full dissection avoiding damage to fine vessels.

b) Application of cautery.

c) The use of topical epinephrine.

4. Loss of local anesthetic volume during injection

Overspill of local anesthetic during its administration is commonly observed. This is likely to appear if-

- The dissection of sub–Tenon's capsule is not complete.
- There is resistance to injection.
- Careful dissection and use of diathermy may minimize the loss.

5. Anaesthesia and akinesia

Anaesthesia is good following sub–Tenon's block. However, akinesia is variable and may not be complete. Akinesia is volume dependent and if 4-5 ml local anesthetic agent is injected a large proportion of patients develop akinesia.[5,6,8]

Significant complications: include

1. **Short lived muscle paresis:** trauma to inferior and medial rectus muscles leading to restrictive functions resulting in diplopia have been reported following damage to muscles by metal cannulae.[5]

2. **Orbital and retrobulbar hemorrhage :** Two cases of retrobulbar hemorrhage have been reported after sub-Tenon's block of which one patient

was on oral anticoagulants. The possible mechanism could be trauma to the orbital vessels by the metal posterior sub-Tenon's cannula.

3. **Scleral perforation:** Recently a case of scleral perforation during sub–Tenon's block has been reported in a patient who had previously undergone retinal surgery.

4. **Central spread of local anaesthetic:** A case of central spread of local anaesthetic agent leading to cardio respiratory collapse has been reported.

   Mechanism: is not clear, but

   a) Spread of injected local anaesthestic agent into the subarachanoid space through the optic nerve sheath.

   b) Back tracking of the local anaesthestic agent through one of orbital foramina are possible explanations.

5. **Optic neuropathy:** A case of traumatic optic neuropathy has been reported following sub-Tenon's block for cataract surgery. Use of shorter, blunt – tipped needles with anterior site of injection are thought to reduce or eliminate the risk of optic nerve injury.

6. Afferent pupillary and accomodation defects – have also been reported.

7. **Retinal artery occlusion –** possible causes include

   - Mechanical pressure from the bolus of the anesthetic solution.

   - Localised vasoconstriction from the anaesthetic mixture producing a decrease blood flow.

This complication can be avoided by:

- Not inserting the cannula too posteriorly
- Not injecting forcibly against resistance.
- Using minimum volume of anaesthetic possible.

8. **Hyphaema** – two cases of hyphaema have been reported.
9. **Orbital cellulitis.-** Mechanism for orbital swelling and inflammation following sub-Tenon's block could be :
    - infection
    - Reaction to povidone – iodine or sub-Tenon's anaesthetic
    - Trauma due to sub-Tenon's cannula.
10. **Foreign body** falling into sub-Tenon's space.
11. **Orbital swelling** from high concentrations of hyaluronidase.

The **exact mechanism of the above complications is not clear,** but they may be due to forceful or in appropriate placement of the metal, posterior sub-Tenon's cannula.[5,8,23,24,25]

Advantages of sub-Tenon's block:

1. Simple and safe technique.
2. Fast onset of action.
3. Offers excellent anaesthesia and reliable akinesia.
4. Less painful than retrobulbar and peribulbar block.

5. No serious complications are associated with this technique.
6. No rise in intraocular pressure, immediately after the administration of local anaesthetic solution.
7. Surgery can begin almost immediately.
8. It can be supplemented for prolonged anaesthesia and postoperative pain relief.
9. Low dose and low volume of anaesthetic agent are required, easily topped up.
10. Eliminates the risks of sharp needle techniques and minimal risk to globe.
11. Used for large number of ophthalmic surgical procedures apart from cataract.
12. Used safely in patients receiving anticoagulants and non-steroidal agents provided the blood levels are within normal limits.

Disadvantages of sub-Tenon's block:

1. Surgical procedure and skill required.
2. Chemosis.
3. Conjunctival haemorrhage.
4. Serious life and sight threatening complications reported but less frequently compared to needle blocks.
5. Risk of infection.
6. Difficult to perform in patients who had previous and repeated eye surgeries.

7. The local anesthetic agent must be injected into the capsule-double perforation of conjunctiva results is anaesthetic leaking out, which decreases the effectiveness of the block.

8. Although if it is an advantage that the globe can be moved under instruction, it is important that the eye is not moved at other times. Use of stabilizing sutures or forceps is advised. Dissection of the capsule must be carried out under sterile conditions.[2, 5,8]

METHODOLOGY

A randomised clinical trial was conducted to compare the efficacy and safety of Peribulbar anaesthesia and Sub-Tenon's anaesthesia among patients undergoing manual small incision cataract surgery at KLES Dr. Prabhakar Kore Hospital and MRC, Belgaum from January 2008 to December 2008.

Study design

Randomised clinical trial.

Study period

The present study was conducted during January 2008 to December 2008.

Method of collection of data

Source of Data

Patients undergoing cataract surgery at KLES, Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum.

Sample size

Hundred (100) patients undergoing cataract surgery.

Sampling procedure

The following formula was used to calculate the sample size.

$\alpha = 0.05$ $Z_\alpha = 1.96$

$\beta = 0.2$ $Z_\beta = 0.84$

Power – 80% $P_1 = 35\%$

Sample size will be $P_2 = 61\%$

$$n = \frac{2 (Z_\alpha + Z_\beta)^2 pq}{(P_1 - P_2)^2}$$ $$P = \frac{P_1+P_2}{2} = 30.5\%$$

$= 49 \cong 50$

Thus the study contains 50 patients in Peribulbar group and 50 patients in Sub -Tenon's group.

Selection criteria

Inclusion Criteria

- Patients undergoing manual small incision cataract surgery
- Patients between ages 40-80 years.

Exclusion Criteria

- Age below 40 years and above 80 years.
- Sensitivity to xylocaine / Hyaluronidase
- Inability to give informed consent, hearing defects and not complying with oral commands.
- Previous intraocular surgery, inflammation or injury.
- History of convulsions or epilepsy, pre-existing paresis of orbicularis oculi & extraocular muscles.

Method of collection of data

- Data was obtained from patients undergoing manual small incision cataract surgery at KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum between January 2008 to December 2008
- A total of 100 cases were randomly selected for the study with 50 cases in the peribulbar group and 50 cases in the sub-Tenon's group.
- Informed written consent was obtained from all the patients for the anaesthetic procedure and surgery.

- Detailed history was taken and ocular examination including visual acuity, anterior segment examination with slit lamp biomicroscopy, fundoscopy and tonometry were done.
- Systemic examination and physician fitness prior to surgery was sought.
- The patients were randomly allocated into two groups of 50 each.

Statistical analysis:

The collected data was analyzed using chi-square test and $p<0.05$ was considered significant.

Procedure

Pre operative preparation

All patients received oral ciprofloxacin 500mg and topical ciprofloxacin eye drops (0.3%), one drop six times per day, one day prior to surgery. Medications for patients with systemic illness were continued.

The pupil in the operated eye was dilated with Tropicacyl 0.8% + phenylephrine hydrochloride 5% eye drops instilled in the morning, one drop for four times every 15 minutes, one hour before surgery.

All the patients received preoperative preparation as per standard departmental protocol. The skin of the lid and surrounding area was painted with povidone iodine 5% aqueous solution followed by surgical spirit. Conjunctival sac was irrigated with povidone iodine 5%, 1 in 10 dilution solution (0.5%). A drop of povidone iodine 5% was instilled into the eye.

At this point of time, Patient was assigned to one of the two groups of study.

One group of patients received Peribulbar anaesthesia (PB group). The other group received Sub-Tenon's anaesthesia (ST group).

Preparation of anaesthetic mixture

Lignocaine 2% with adrenaline 1 in 2,00,000 (30ml) solution was used. Hyaluronidase 1500 IU was reconstituted with 3ml of distilled water or the anaesthetic solution. 1ml of the solution was added to 30ml vial of the anaesthetic solution resulting in 15 IU of Hyaluronidase/ml of the anaesthetic mixture.

Peribulbar Group

Peribulbar group of patients received two anaesthetic injection with 26G half inch disposable needle in the inferiotemporal and superonasal quadrant. The initial injection was given at the junction of medial 2/3 and lateral 1/3 of the inferior orbital margin with patient looking in primary position, needle directed parallel to orbital floor. After test aspiration, 5ml of anaesthetic solution was injected. The second injection was injected at superionasal quadrant near the supraorbital notch with needle directed along the orbital roof. After test aspiration 3 ml of anaesthetic solution was injected. Firm intermittent digital pressure was applied to the eye for 5 minutes. Akinesia and anaesthesia were recorded at every 5 minutes for 15 minutes. IOP was recorded before surgery. A repeat injection of 2 ml was given at inferiotemporal site for patients who did not develop adequate akinesia and analgesia even at the end of fifteen minutes. We have followed the modified weiss technique.

Sub-Tenon's Group

The patient was placed on the operating table. The eye to be operated was repainted with Povidone iodine and spirit and draped. Conjunctival sac was anaesthetized by instilling 4% lignocaine eye drops 2drops at 2 minute interval. A lid

speculum was inserted. The patient was asked to look upwards and outwards. A button hole was made in the conjunctiva along with tenon's capsule 5mm from the limbus in the inferionasal quadrant. A 23G curved blunt cannula was inserted in the sub-Tenon's space and was directed posteriorly along the contour of the globe till the hub of the cannula reached the conjunctival incision. 4 ml of anaesthetic solution was delivered into the posterior sub-Tenon's space. The parameters were studied at every 5 minutes. Repeat injection of 1 ml was given in the same site in patients who did not develope adequate akinesia and analgesia at the end of fifteen minutes. We have followed the modified technique of Parkar et al study.

Block Assessment

Effectiveness of the block was assessed every 5 min for onset of akinesia of extraocular muscles and orbicularis oculi. Akinesia was checked at 5min, 10min, 15min. the time taken for sufficient akinesia to occur was noted. The re-injection was considered at the end of 15min, if there was insufficient akinesia.

The parameters studied were as follows:-

1. Analgesia :

Pain during administration, intraoperative and post operative analgesia (4hrs after surgery) was assessed and graded by a subjective grading called visual analogue pain scale (VAS).

Grade 0	No pain
Grade 1	Slight sensations or discomfort
Grade 2	Slight pain
Grade 3	Moderate pain
Grade 4	Intense pain

2. Akinesia :

a) Akinesia of lids:

- Assessed as either being present or absent.
- This was done at the end of 5 minutes, 10 minutes, and 15 minutes.

b) Akinesia of globe:

- Assessed at 5 minutes, 10 minutes, 15 minutes after administration of block and compared. It was graded as per modified Nicoll et al criteria[27] as follows.

Grade 0	Complete/full movement present
Grade 1	Moderate movement
Grade 2	Slight movement
Grade 3	No movement

*3. **Measurement of intraocular pressure (IOP) :***

The intraocular pressure was recorded with autoclaved schiotz tonometer as pre anaesthetic IOP (before the administration of block) and pre-surgical (after the administration of the block but before surgery).

*4. **Complications of the block :***

Complications occurring in both the groups were noted and compared. The following complications were noted.

- Chemosis
- Lid ecchymosis
- Sub-conjunctival haemorrhage
- Pre septal or peribulbar haemorrhage
- Any other complications.

RESULTS

This was a comparative study conducted to evaluate the peribulbar and sub-Tenon's anaesthesia with regards to efficacy and safety.

The outcome measures included following aims of regional anesthesia for intraocular surgery in each group of anaesthesia.

- Anaesthesia of the globe and lid
- Akinesia of globe and lid
- Preoperative hypotony.

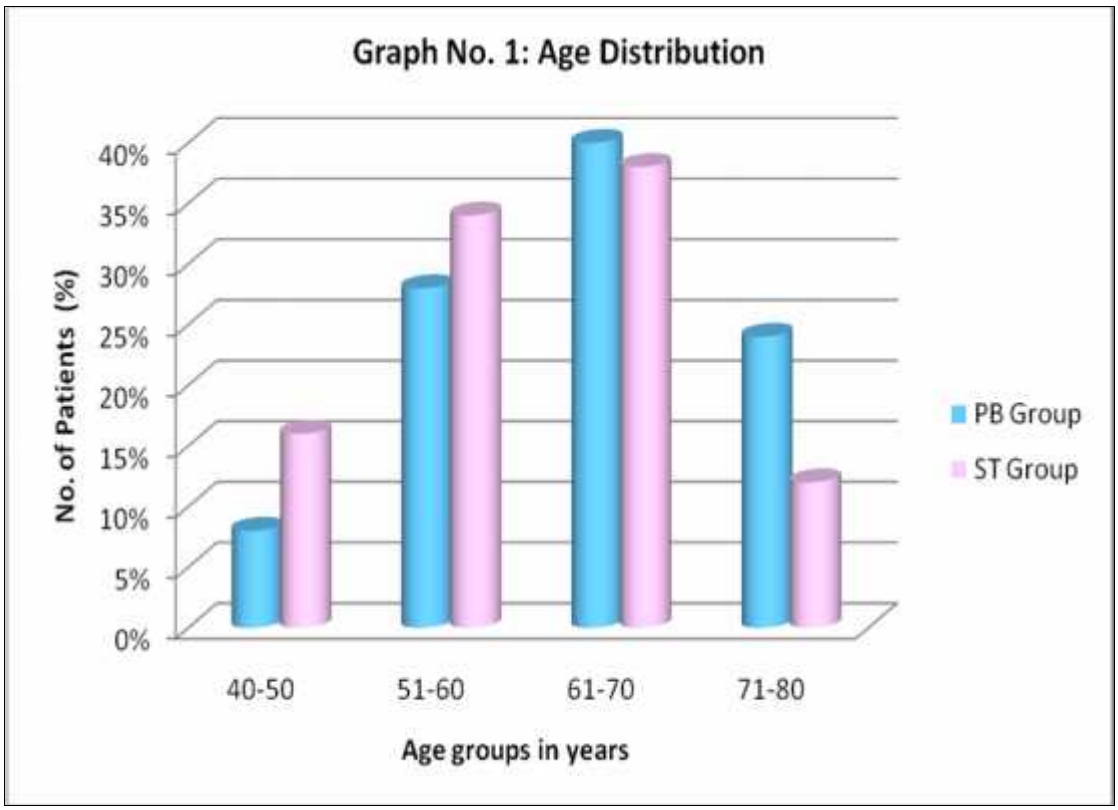
The study consisted of 100 patients who were allocated into two groups of 50 each.

- Peribulbar group in which patients received peribulbar anaesthesia (n=50).
- Sub-Tenon's group in which patients received sub-Tenon's anaesthesia (n=50).

The collected data was analyzed using chi-square test and $p<0.05$ was considered significant.

TABLE 1: AGE DISTRIBUTION

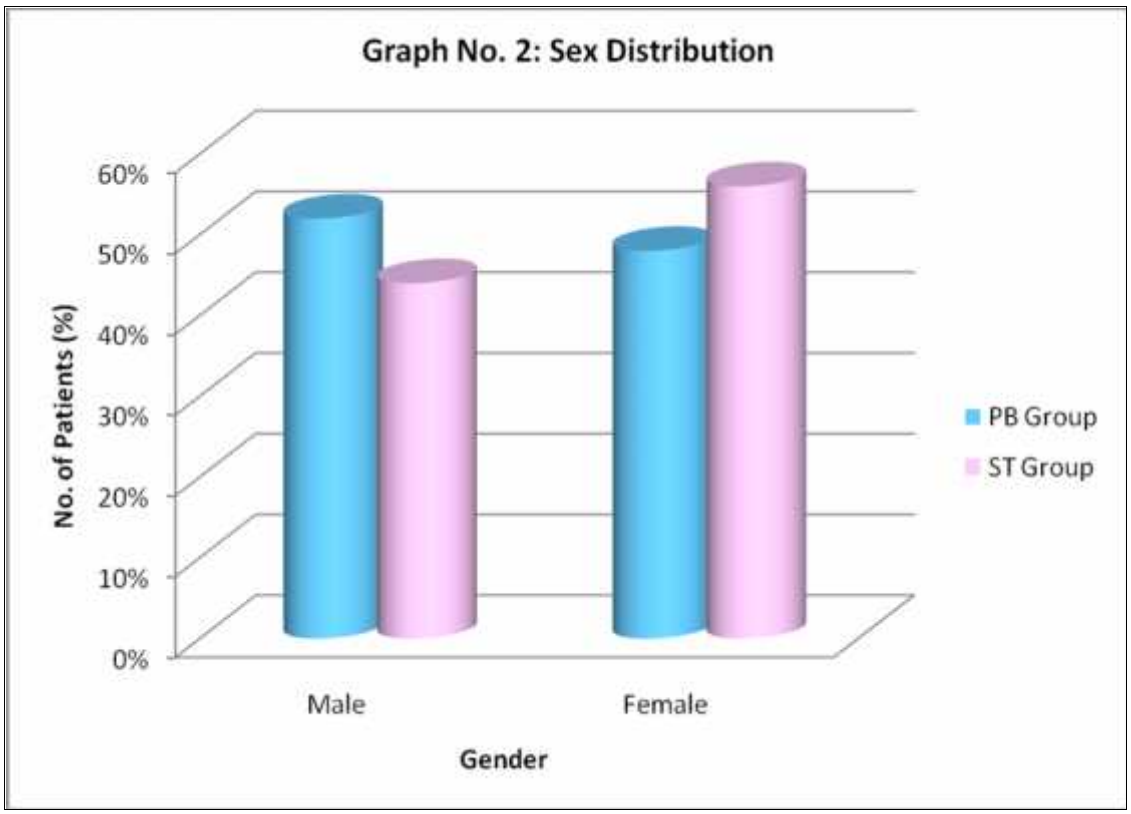
Age (Years)	PB Group (n=50)		ST Group (n=50)		TOTAL (n=100)	
	No.	%	No.	%	No.	%
40-50	4	8	8	16	12	12
51-60	14	28	17	34	31	31
60-70	20	40	19	38	39	39
71-80	12	24	6	12	18	18



The patients were in the age group of 40-80years. 31 (31%) patients were in the age group of 51-60 years. 39 (39%) patients were in the age group of 51-60 years. Thus the highest number of patients i.e. (n=70) 70% was found in the age group of 51-70 years.

TABLE 2: SEX DISTRIBUTION

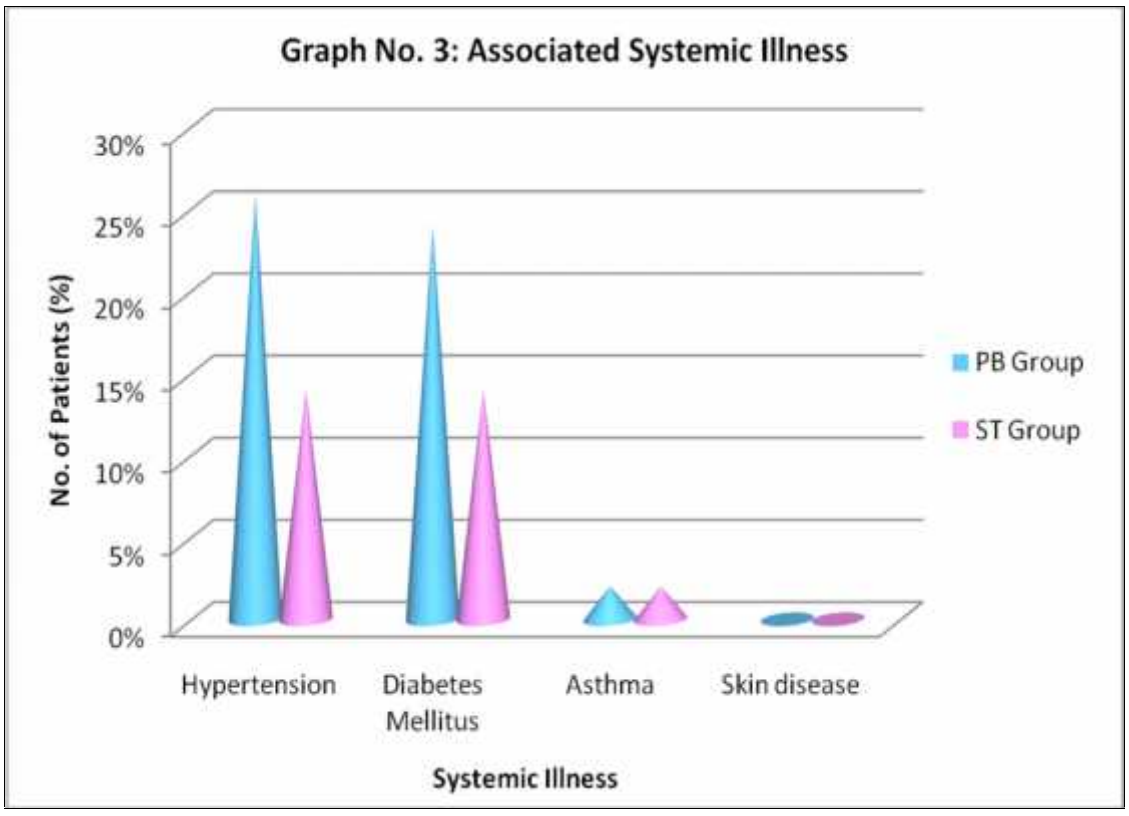
Sex	PB Group (n=50)		ST Group (n=50)		TOTAL (n=100)	
	No.	**%**	**No.**	**%**	**No.**	**%**
Male	26	52	22	44	48	48
Female	24	48	28	56	52	52
Total	**50**	**100**	**50**	**100**	**100**	**100**



In the present study, 26 (52%) patients in PB group were males and 24 (48%) were females. In ST group, 22 (44%) were males and 28 (56%) were females. Thus a total of 48 (48%) males and 52 (52%) females were included in the study.

TABLE 3: ASSOCIATED SYSTEMIC ILLNESS

Systemic illness	PB Group (n=50)		ST Group (n=50)		TOTAL (n=100)	
	No.	%	No.	%	No.	%
Hypertension	13	26	7	14	20	20
Diabetes Mellitus	12	24	7	14	19	19
Asthma	1	2	1	2	2	2
Skin disease	0	0	0	0	0	0



In our study 20(20%) patients were hypertensive. Diabetes mellitus was present in 19(19%) patients and 2 patients suffered from asthma.

All patients with these illnesses were well under control prior to surgery. Systemic illness affects the outcome of surgery and acts as predisposing factors for retrobulbar haemorrhage, sub-conjunctival haemorrhage and lid ecchymosis.

EFFICACY OF THE BLOCK

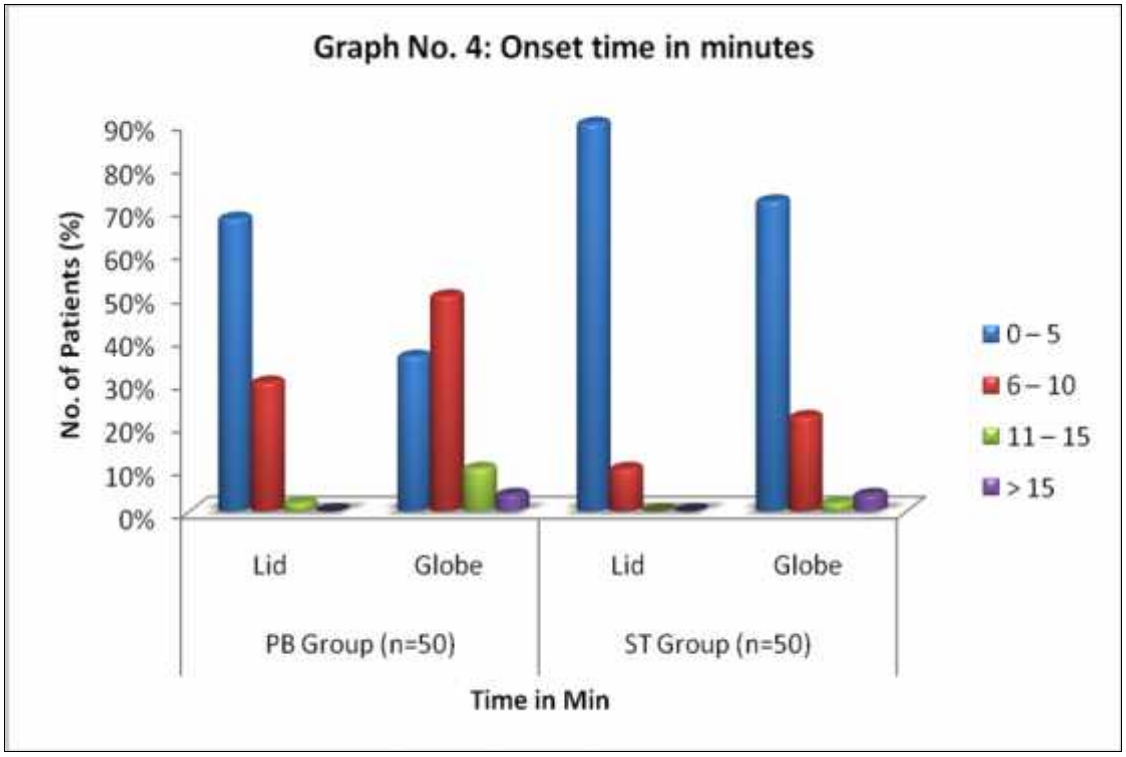
The effectiveness of the block can be estimated by tabulating the patients with adequate akinesia and analgesia, the need for supplemental injections and intra operative pain or discomfort.

ONSET OF ACTION:

Onset of action is taken as time duration from the completion of injection of local anaesthetic drug to the paralysis of any extraocular muscle.

TABLE 4: ONSET TIME IN MINUTES

Time (In minutes)	PB Group (n=50)				ST Group (n=50)			
	Akinesia				Akinesia			
	Lid		Globe		Lid		Globe	
	No.	%	No.	%	No.	%	No.	%
0-5	34	68	18	36	45	90	36	72
6-10	15	30	25	50	5	10	11	22
11-15	1	2	5	10	0	0	1	2
>15	0	0	2	4	0	0	2	4



In PB group, lid akinesia achieved within 5minutes in 34 (68%) cases, within 10 minutes in 15 (30%) cases and within 15 minutes in 1 (2%) case.

In ST group, lid akinesia was achieved within 5minutes in 45(90%) cases and within 10 minutes in the remaining 5(10%) cases. Chi-square test revealed (p=0.007) statistically significant difference between the two groups. The Sub-Tenon's group achieved faster lid akinesia as compared to Peribulbar group.

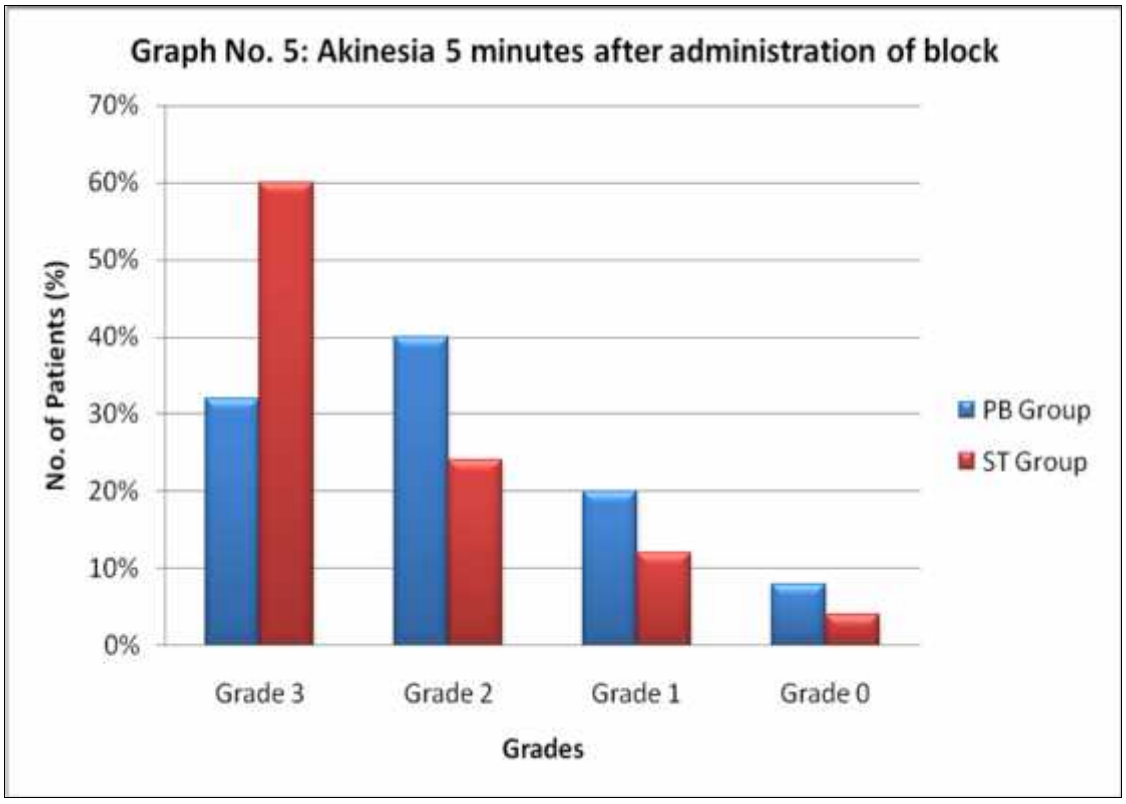
In PB group, globe akinesia had onset time of 5minutes in 18(36%) cases, of 10 minutes in 25 (50%) cases, of 15 minutes in 5(10%) cases and 2(4%) cases had onset time of more than 15 minutes.

In ST group, globe akinesia had onset time of 5 minutes in 36 (72%) cases, of 10 minutes 11 (22%) cases, of 15 minutes in 1 (2%) case and 2(4%) cases had onset time of more than 15 minutes. Chi-square test showed (p=0.001) statistically significant difference between the two groups. The onset time of akinesia of the Globe was significantly less in PB group as compared to ST group.

QUALITY OF AKINESIA

TABLE 5: AKINESIA 5 MINUTES AFTER ADMINISTRATION OF BLOCK

Grades	PB Group (n=50)		ST Group (n=50)	
	No.	%	No.	%
Grade 3	16	32	30	60
Grade 2	20	40	12	24
Grade 1	10	20	6	12
Grade 0	4	8	2	4
Total	**50**	**100**	**50**	**100**



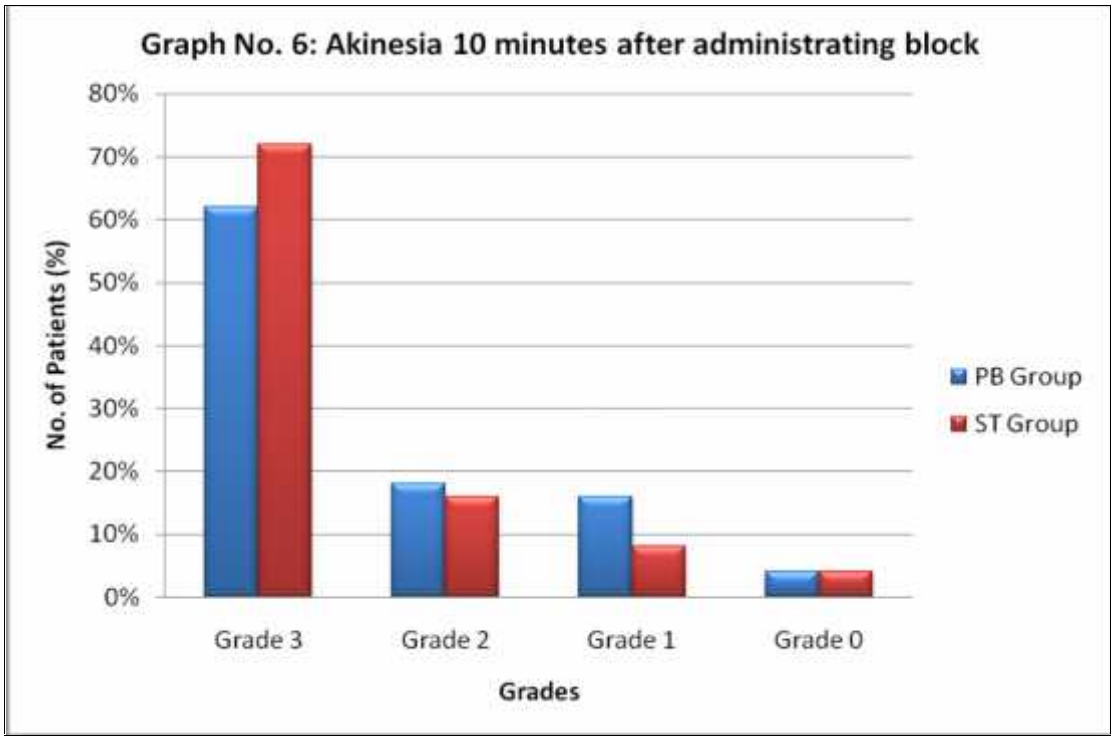
In PB group, out of 50 cases, 16 (32%) had no movement, 20 (40%) had slight movement, 10 (20%) had moderate movement and 4 (8%) had full movement present.

In ST group, out of 50 cases, 30 (60%) had no movement, 12 (24%) had slight movement, 6(12%) had moderate movement and 2(4%) had full/complete movement present.

Chi-square test revealed p=.048, which is statistically significant. The ST group achieved higher number of complete akinesia (Grade 3 –No movement) as compared to PB group.

TABLE 6: AKINESIA 10 MINUTES AFTER ADMINISTRATING BLOCK

Grades	**PB Group (n=50)**		**ST Group (n=50)**	
	No.	**%**	**No.**	**%**
Grade 3	31	62	36	72
Grade 2	9	18	8	16
Grade 1	8	16	4	8
Grade 0	2	4	2	4
Total	**50**	**100**	**50**	**100**

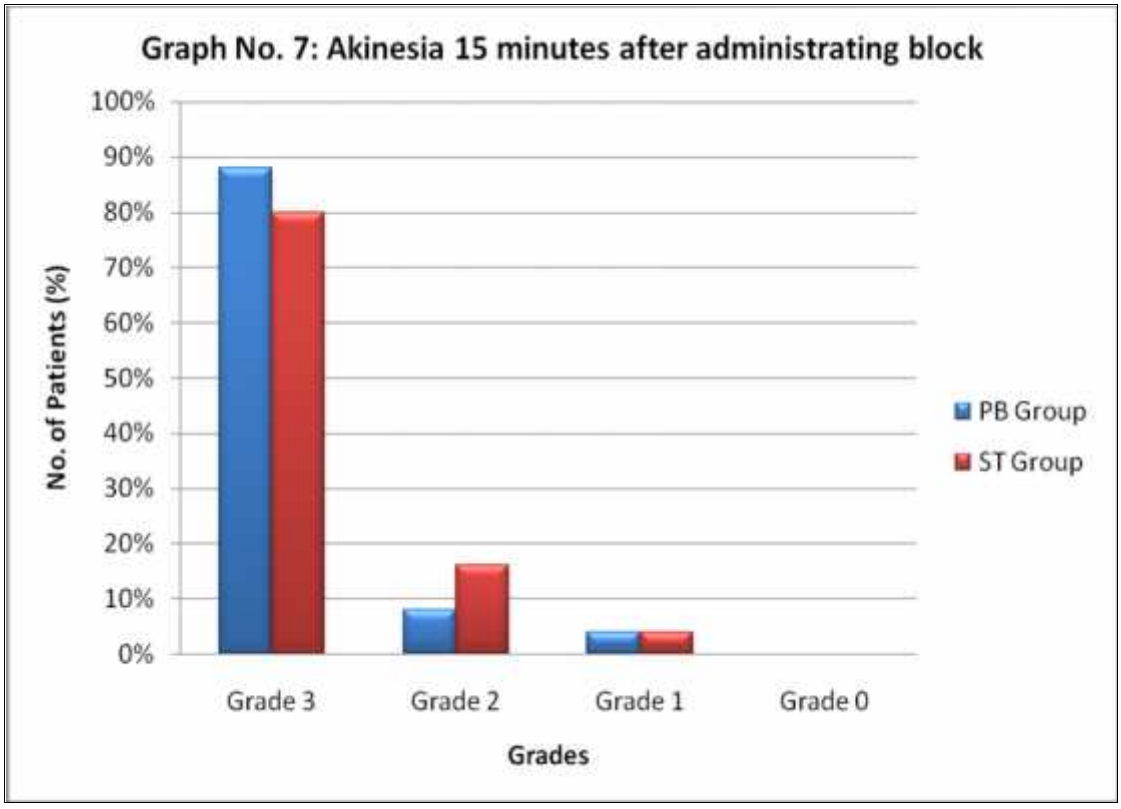


In PB group, 31 (62%) had no movement, 9 (18%) had slight movement, 8 (16%) had moderate movement and 2 (4%) had full movement present.

In ST group, 36(72%) had no movement, 8 (16%) had slight movement, 4 (8%) had moderate movement and 2(4%) had full movement present. Chi-square test revealed (p=0.623) no statistical significant difference between the two groups. The quality of akinesia following 10 minutes of anaesthesia was same in ST group as compared to PB group.

TABLE 7: AKINESIA 15 MINUTES AFTER ADMINISTRATING BLOCK

Grades	**PB Group (n=50)**		**ST Group (n=50)**	
	No.	**%**	**No.**	**%**
Grade 3	44	88	40	80
Grade 2	4	8	8	16
Grade 1	2	4	2	4
Grade 0	0	0	0	0
Total	**50**	**100**	**50**	**100**



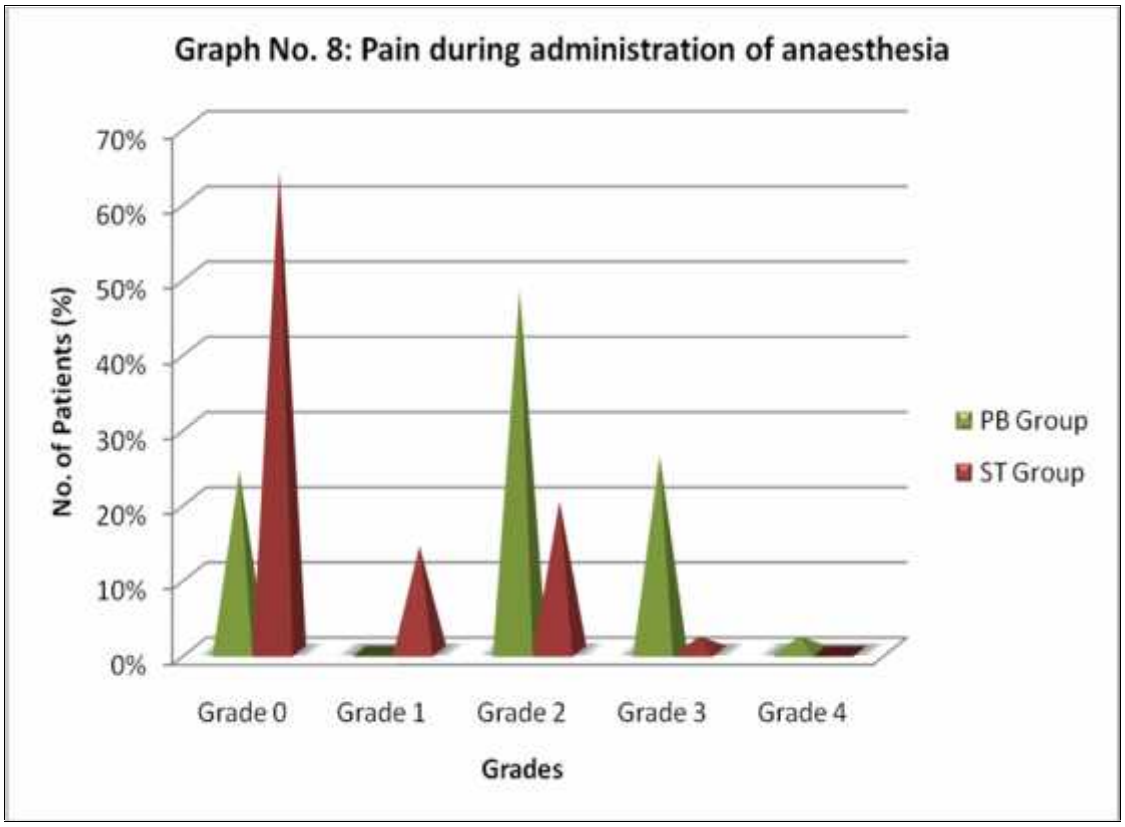
In PB group, 44 (88%) had no movement, 4 (8%) had slight movement, 2 (4%) had moderate movement. In ST group, 40 (80%) had no movement, 8 (16%) had slight movement and 2 (4%) had moderate movement. Chi-square test showed p=0.467, no statistical significant difference between the two groups. The quality of akinesia following 15 minutes of anesthesia was same in ST group as compared to PB group.

Repeat block was given in two cases in PB group at inferiotemporal site (2ml) and two cases in ST group at inferionasal quadrant (1ml) at the end of 15 minutes.

ANALGESIA

TABLE 8: PAIN DURING ADMINISTRATION OF ANAESTHESIA

Grades	PB Group (n=50)		ST Group (n=50)	
	No.	%	No.	%
Grade 0	12	24	32	64
Grade 1	0	0	7	14
Grade 2	24	48	10	20
Grade 3	13	26	1	2
Grade 4	1	2	0	0
Total	**50**	**100**	**50**	**100**



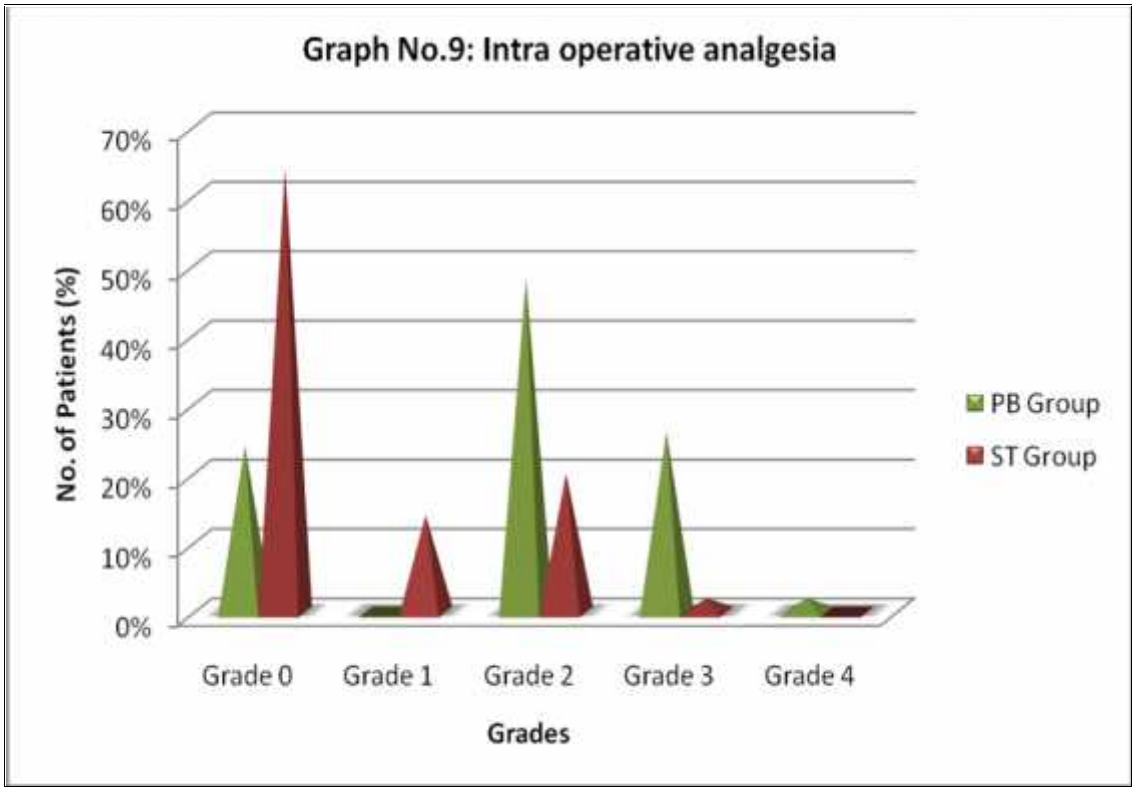
In PB group- out of 50 cases, 12 (24%) had no pain, 24 (48%) had slight pain, 13 (26%) had moderate pain and 1 (2%) had severe pain during administration of anaesthesia.

In ST group- out of 50 cases, 32 (64%) had no pain, 7(14%) had slight sensation or discomfort, 10 (20%) had slight pain and 1 (2%) had moderate pain.

Chi-square test revealed $p< 0.001$, indicating statistically significant difference between the two groups. The patients felt significantly less pain in ST group as compared to PB group during administration of anaesthesia.

TABLE 9: INTRA OPERATIVE ANALGESIA

Grades	**PB Group (n=50)**		**ST Group (n=50)**	
	No.	**%**	**No.**	**%**
Grade 0	45	90	43	86
Grade 1	5	10	5	10
Grade 2	-	-	2	4
Grade 3	-	-	-	-
Grade 4	-	-	-	-
Total	**50**	**100**	**50**	**100**



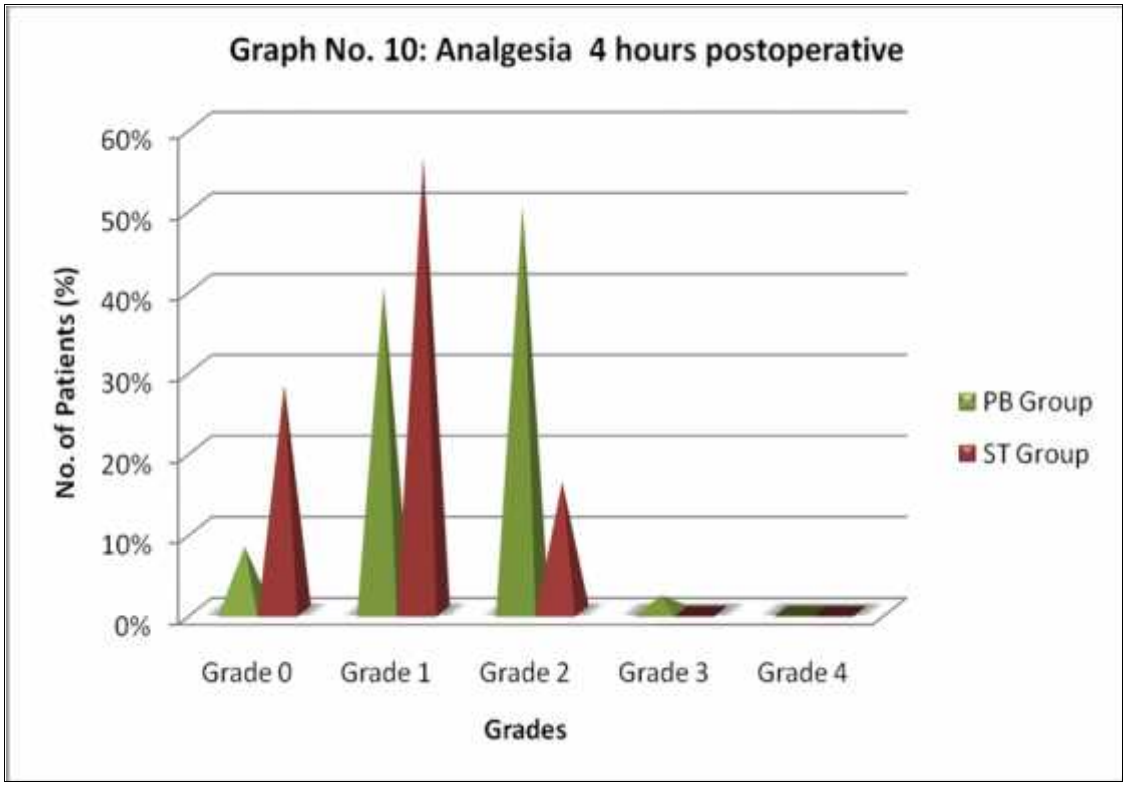
In PB group, 45 (90%) experienced no sensation or pain, 5 (10%) experienced slight sensation or discomfort during surgery.

In ST group, 43 (86%) experienced no pain or sensation, 5 (10%) experienced slight sensation or discomfort, 2(4%) experienced slight pain during the end of the surgery.

Chi-square test showed p=0.538, indicating no statistical significant difference between the two groups. The majority of the patients in both groups complained no pain or only slight discomfort during the surgery.

TABLE 10: ANALGESIA 4 HOURS POSTOPERATIVE

Grades	PB Group (n=50)		ST Group (n=50)	
	No.	%	No.	%
Grade 0	4	8	14	28
Grade 1	20	40	28	56
Grade 2	25	50	8	16
Grade 3	1	2	-	-
Grade 4	-	-	-	-
Total	**50**	**100**	**50**	**100**



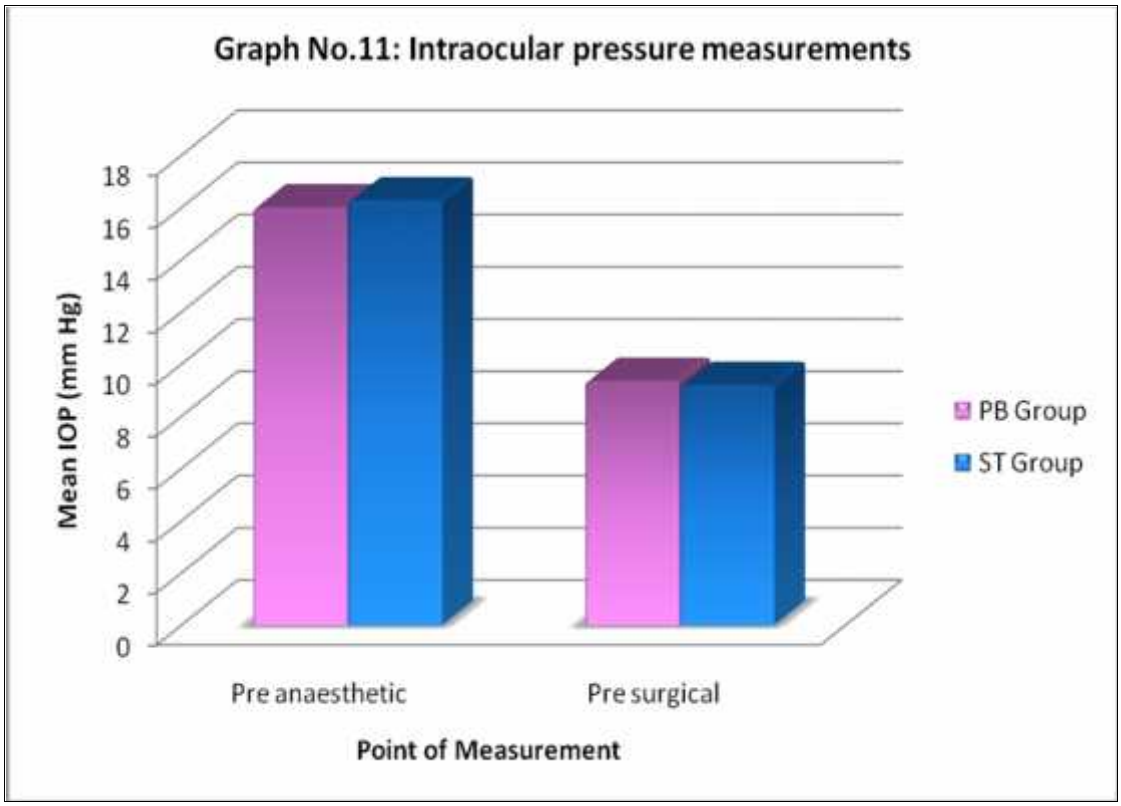
In PB group- out of 50 cases, 4 (8%) had no pain / sensation, 20(40%) had slight sensation or discomfort, 25(50%) had slight pain and 1(2%) had moderate pain 4 hours postoperatively.

In ST group- out of 50 cases, 14 (28%) had no pain / sensation, 28 (56%) had slight sensation or discomfort, 8 (16%) had slight pain 4 hours postoperatively.

Chi-square test showed p<.001, indicating statistically significant difference between the two groups. The patients in the ST group did not experience pain in the immediate postoperative period more often than the PB group.

TABLE 11: INTRAOCULAR PRESSURE MEASUREMENTS

Point of Measurement	Mean IOP (mm Hg)			
	PB Group (n=50)		ST Group (n=50)	
	Mean	S.D.	Mean	S.D.
Pre anaesthetic	16.00	2.07	16.27	2.11
Pre Surgical	9.35	1.98	9.20	2.21

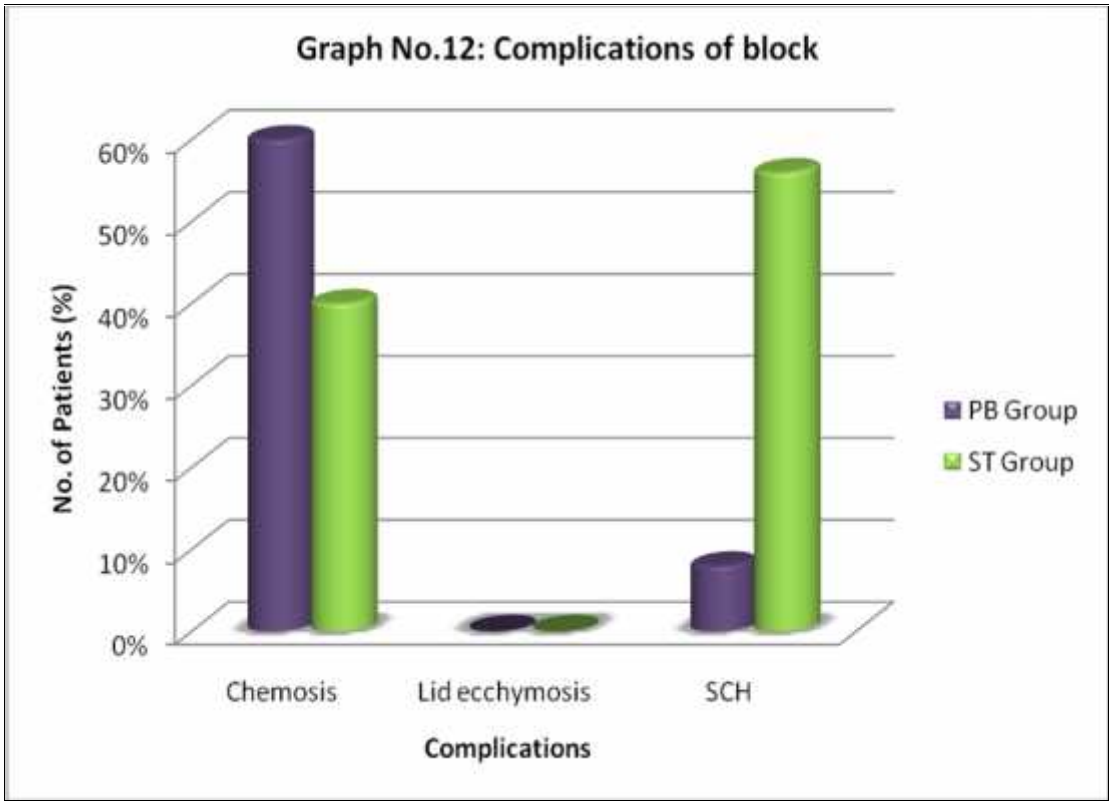


Mean Intraocular pressure before the administration of the anesthesia was 16.00+/-2.07 mm Hg in the PB group and 16.27+/-2.11mm Hg in ST group. Mean intraocular pressure just before the start of surgery was 9.35+/-1.98 mmHg in the PB group and 9.20+/-2.21 mmHg in the ST group.

Chi-square test showed no statistically significant difference in the mean pre anaesthetic IOP (p=0.520) and pre surgical IOP (p=0.605) between the PB group and ST group. The preoperative hypotony achieved by the either group was similar.

TABLE 12: COMPLICATIONS OF BLOCK

Complications	**PB Group (n=50)**		**ST Group (n=50)**	
	No.	**%**	**No.**	**%**
Chemosis	30	60	20	40
Lid Ecchymosis	-	-	-	-
Sub-conjunctival haemorrhage(SCH)	4	8	28	56
None	16	32	2	4
Total	**50**	**100**	**50**	**100**



In PB group-30 (60%) cases had chemosis and 20 (40%) cases had chemosis in ST group. Sub-conjunctival haemorrhage was seen in 4 (8%) cases of PB group and 28 (56%) cases in ST group. Chi-square test showed $p<.001$, indicating statistically significant difference between the two groups. The sub-conjunctival haemorrhage was more common in ST group than in PB group.

DISCUSSION

100 cases undergoing manual small incision cataract surgery were included in our study. They were randomly assigned into two groups comprising 50 patients each in the peribulbar block (PB group) and sub-Tenon's block (ST group).

Age Distribution:

Cataract is more common in the elderly patients, as a result of senile changes. In our study, the patients were in the ages between 40-80 years. Highest number of patients were in the age group of 51-70 years i.e.70% (n=70). As the surgical procedure selected for the study was cataract surgery and senility being the commonest cause of cataract, we had more number of patients in the age group of 51-70 years. In both the groups, the distribution of the age groups was almost similar due to random allocation of the patients.

Sex distribution:

In the present study, PB group had 26 (52%) males and 24 (48%) females. In ST group, 22(44%) were males and 28(56%) were females.

Our study showed a female preponderance of 52% (n=52) as compared to male patients 48% (n= 48). However the difference is not significant enough to affect the study.

Associated systemic illness:

Systemic illness like hypertension and diabetes mellitus affect the outcome of surgery and the anaesthetic procedure. Vascular diseases are the predisposing factors

for complications associated with regional anaesthesia, such as lid ecchymosis, sub-conjunctival or retrobulbar haemorrhage.

In our study, Sub-conjunctival haemorrhage attributable to hypertension was seen in 3 hypertensive patients indicating that systemic diseases could be a risk factor for the development of complications.

EFFICACY OF THE BLOCK

The effectiveness of the block was estimated by evaluating, the time of onset, the completeness of akinesia and anaesthesia, and number of patients requiring repeat injections. Preoperative intraocular pressure was recorded. In addition, patient's perception of pain at different points of time was noted. The complications during the block were recorded.

Onset of action:

Onset of action is taken as time duration from the completion of injection of local anaesthetic drug to the appearance of paralysis of any extraocular muscle.

Lid akinesia:

In PB group, lid akinesia was achieved within 5minutes in 34 (68%) cases and 45 (90%) cases in ST group. When compared between the two groups, chi-square test revealed a p-value = 0.007 indicating a significant difference between the two groups. The onset of lid akinesia was faster in ST group compared to PB group.

Globe akinesia:

In PB group, onset of action within 5 minutes was seen in 18 (36%) cases and 36(72%) cases in ST group. This was statistically significant. Sub-Tenon's anaesthesia group had the faster onset of action because the anaesthetic solution is placed in the sub-Tenon's space posteriorly has no barrier, than the thin Tenon's capsule and reaches the muscle cone immediately following the injection. In peribulbar anaesthesia the solution has to travel from extraconal space to intraconal space through the orbital fascia and the extraocular muscles, therefore the onset of action is delayed.

Adequate Akinesia:

In our study, complete (Grade 3, No movement) globe akinesia achieved within 5minutes in 16 (32%) cases in PB group and in 30 (60%) cases in ST group. which showed statistically significant difference between the two groups. The ST group achieved higher number of complete akinesia (p=0.048) as compared to PB group.

Our study compares well with the study done by **Kumar C.M.** which reported that akinesia and anaesthesia occurred within 5minutes with usage of 4 and 5ml of local anaesthetic in sub-Tenon's block.[28]

When the anaesthetic agent is injected into the sub-Tenon's space it diffuses posteriorly in large amounts into the intraconal space where it acts upon the motor nerves of the extraocular muscles as they enter into the muscles through their inner surface providing effective akinesia in a short time. In Peribulbar anaesthesia the solution placed in the extraconal space needs to overcome the barrier of orbital fascia,

therefore may take more time to reach the intraconal space. The solution may also spread diffusely in the extraconal space. Therefore the quantity that enters the intraconal space is less. These facts explain why sub-Tenon's technique achieves more consistent complete akinesia as compared to peribulbar technique.[14] The shorter onset of complete akinesia may have relevance in the management of high volume cataract surgery as in Eye camps.

At 10 minutes, 31 (62%) cases in PB group and 36 (72%) cases in ST group achieved adequate globe akinesia. At the end of 15 minutes, 44(88%) cases in PB group and 40 (80%) cases in ST group achieved complete globe akinesia. The quality of akinesia of anaesthesia was same in ST group as compared to PB group when compared at 10 minutes ($p = 0.623$) and 15 minutes ($p=0.467$) following injection.

A study done by **Kolkaritis et al**, has reported complete akinesia in 82% of cases in peribulbar and 80% in sub-Tenon's anaesthesia. Our findings are similar to their study.[29]

Diffusion of solution into the periorbital tissues leads to the akinesia of the eyelids. The development of akinesia is also related to direct spread into the Tenon's sheaths surrounding the insertion of the extra-ocular muscles.[13]

One of the studies done by **Stevens J D** has reported complete akinesia at 15 minutes after administration of anaesthetic in 52% of patients in sub-Tenon's anesthesia.[14]

Another study by **Roman S J et al** showed that akinesia was always limited with sub-Tenon's block and no patients reached complete akinesia at the end of surgical procedure and 37.6% had no akinesia at all.[19]

These studies seem to contradict the findings of our study with regard to the efficacy of Sub-Tenon's anaesthesia .However, the variation in the anatomical barriers, site of injection, its time relative to the surgery and the variations in the composition and volume of the anaesthetic solution may explain the various reports of akinesia depending on publications[-].[19]

Analgesia:

A) Pain during administration of anaesthesia:

In our study, The patients felt significantly less pain in ST group as compared to PB group during administration of anesthesia ($p<.001$).

One of the studies done by **Roman S J et al** reported that following the administration of sub-Tenon's anaesthesia, 55% had no pain or sensations and 44% had only sensations.[19]

Another study by **Parkar T et al** showed that in the peribulbar group, 35.2% had no pain, 53.4% had slight pain and 7.1% of patients had moderate pain during administration of the block; in the sub-Tenon's group, 77.5% experienced no pain, 20% had slight pain during administration of anaesthesia.[17]

Our results are comparable with other studies. Sub-Tenon's anaesthesia is more comfortable to the patient at the time of administration of block as the procedure involves the instillation of topical anaesthetic solution to anaesthetize the conjunctiva before making a nick into it at the pre injection site and blunt cannula is used to deliver the anaesthetic agent. In peribulbar anaesthesia a sharp needle is used to prick

the skin that is not anaesthetized to deliver the anaesthetic solution which is painful to patient.

B) Intra operative analgesia:

In our study, majority of the patients in both groups complained no pain or only slight discomfort during the surgery (p=0.538).

One of the studies done by **Parkar T et al** found no statistically significant difference in the intraoperative analgesia among sub-Tenon's group with 88.6% in peribulbar and 91.3% in sub-Tenon's group having no pain during surgery and the remaining patients having mild pain in both the groups. Only 2.3% of patients in peribulbar group experiencing severe pain.[17]

Another study by **Kolkaritis et al** found that sub-Tenon's block provides a similar degree of intra operative analgesia to retrobulbar and peribulbar blocks.[29]

Our results are similar to other studies. The deepness of anaesthesia and analgesia has been found by all authors using sub-Tenon's technique.[19]

C) Analgesia 4 hours postoperative:

The patients in the ST group did not experience pain in the immediate postoperative period more often than the PB group (p<.001).

In a study done by **Zafirakis et al** reported that 100% of sub-Tenon's group patients reported no pain 30 minutes postoperatively and 77% reported no pain 24 hours postoperatively.[30]

A study by **Kwok and colleagues** have demonstrated minimal use of post operative analgesics in the first 24 hours after sub–Tenon's block and all patients had adequate anaesthesia.[31]

In our study, sub-Tenon's block provided better postoperative analgesia than the peribulbar anaesthesia. This is comparable to other studies.

In sub-Tenon's anaesthesia the cannula follows the contour of the globe until posterior to the equator under Tenon's capsule and delivers the solution to the posterior sub-Tenson's space; then the solution diffuses through the thin posterior section of the tenson's capsule to the intraconal region blocking the long and short ciliary nerves as they enter the globe resulting in prolonged effectiveness of analgesia in this group.[19]

INTRAOCULAR PRESSURE:

In the present study, we found no statistically significant difference in the mean pre anaesthetic IOP (p=0.520) and pre surgical IOP (p=0.605) between the peribulbar and sub-Tenon's group.

In a study of 64 patients done by **Barak Azmon et al**, it was found that sub-Tenon's anaesthesia led to less IOP elevation than peribulbar anaesthesia at 1 minute.[18]

Pazit Pianka et al in their study of 40 patients compared effect of peribulbar and sub-Tenon's anaesthesia on IOP and found no significant change in IOP in 1 and 10 minutes.[32]

Our results are comparable with these other studies.

Pre surgical hypotony is an important prerequisite for safe intraocular surgery. Sub-Tenon's anaesthesia resulted in satisfactory hypotony even without digital compression, as the volume of anaesthetic agent used is less, in addition to direct blockade of the ciliary ganglion.[19]

In peribulbar anaesthesia IOP may increase immediately after the block due to the large volume of anaesthetic used, as well as other factors like the orbital volume and tightness in the orbital septum. Digital compression needs to be given intermittently to reduce the IOP.[33] Use of various devices like mercury bag, honan balloon, super pinky ball, nerf ball etc has been advocated for ocular compression to achieve pre surgical hypotony.

COMPLICATIONS OF BLOCK:

No serious sight threatening complications were observed during our study with either of the techniques.

Chemosis was the most common side effect observed. It was seen in 30 (60%) patients in PB group and 20 (40%) in ST group.

In a study done by **Parkar T et al**, in the peribulbar group 18% of patients had chemosis involving one quadrant and 15% of patients had chemosis in more than one quadrant. Whereas in the sub-Tenon's group, 29% of patients had chemosis involving one quadrant and 7.5% of patients had chemosis in more than one quadrant. They found no difference in chemosis between both techniques of anaesthesia.[17] Our study compares well with the study.

Chemosis in peribulbar block occurred due to anterior spread of the local anaesthetic agent and use of large volume of anaesthetic agent.[8] In Sub-Tenon's technique it is due to diffusion of solution anteriorly and improper dissection of the Tenon's capsule.[5,13]

Sub-conjunctival haemorrhage:

In our study Subconjuctival hemorrhage was seen more frequently in ST group than in PB group ($p<0.001$).

In a study done by **Stevens J D**, 56% of the patients receiving sub-Tenon's block had sub- conjunctival haemorrhage.[19]

Another study by **Parkar T et al** noted that 38% patients in the peribulbar and 58.7% of patients in the sub-Tenon's group had sub-conjunctival haemorrhage.[17] Our results are comparable with these studies. Sub-conjunctival haemorrhage in sub-Tenon's block is caused by inevitable severing of fine vessels during the conjunctival dissection.[14]

CONCLUSION

Sub-Tenon's anaesthesia is comparable to the Peribulbar anaesthesia in terms of efficacy and safety. Both the techniques achieved complete akinesia at the end of 15 minutes following the administration of anaesthesia. Both the techniques were free from sight or life threatening complications.

Sub-Tenon's anaesthesia appeared superior to Peribulbar anaesthesia on two counts. The onset of akinesia was faster in Sub-Tenon's technique. Statistically significant number of patients achieved complete akinesia in the first five minutes. This fact may have relevance in the settings of high volume cataract surgery. It provided remarkable analgesia from the time of administration till four hours postoperative period.

The technique itself has certain inherent positive advantages. It avoids the use of sharp needle into the vascular orbit. The volume required for complete akinesia is half the amount that is required for peribulbar technique, thus leading to less systemic side effects. Hence it may be more preferred technique in patients suffering from systemic vascular diseases. The anaesthesia can be prolonged, if required, by just reintroducing the cannula into the injection site.

Therefore Sub-Tenon's block is a preferred alternative to peribulbar anaesthesia during manual small incision cataract surgery.

SUMMARY

This study was done to evaluate the efficacy and safety of peribulbar and sub-Tenon's anaesthesia. 100 patients undergoing manual small incision cataract surgery were randomized into two groups (50 cases each).

- PB Group – peribulbar anaesthesia
- ST Group – sub-Tenon's anaesthesia

The age of the patients ranged from 40-80 years, the mean age was 63.3+/-9.15 years in our study. In both the groups, the distribution of the age groups was almost similar due to random allocation of the patients. Our study showed a female preponderance as compared to male patients. 41 patients had systemic illness like Diabetes Mellitus, Hypertension and Asthma.

Analgesia:

Sub-Tenon's block provided earlier onset and adequate analgesia and better anaesthesia when compared to the peribulbar block. Sub-Tenon's anaesthesia was significantly more comfortable to the patient during the administration of the block ($p<0.001$) and provided significantly better post operative analgesia as compared to the peribulbar anaesthesia. However, intraoperative analgesia obtained was similar in both the groups.

Akinesia:

The onset of akinesia was earlier in the sub-Tenon's group within 5 minutes of administration of the block both for lid ($p=0.007$) and globe akinesia ($p=0.001$) as

compared to the peribulbar group. Sub-Tenon's anaesthesia provided similar globe akinesia to that of peribulbar group but the effect was achieved early within 5 minutes (p=0.048). Subsequently both the groups achieved similar grade of akinesia at the end of ten and fifteen minutes.

Intraocular Pressure:

There was no statistically significant difference in pre anaesthetic mean IOP and pre surgical mean IOP in both the groups. Sub-Tenon's anaesthesia has similar effect on IOP reduction as that of peribulbar anaesthesia with the benefit of no need for ocular compression.

Complications of the Block:

No major, sight or life threatening complications were seen in both the groups. Only minor complications like chemosis and sub-conjunctival haemorrhage occurred. The incidence of chemosis was more in peribulbar anaesthesia and sub-conjunctival hemorrhage was more in sub-Tenon's anaesthesia. But these minor complications resolved spontaneously and did not interfere with the surgery.

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INFORMED CONSENT

I.D. No ☐ ☐ ☐

Mr/Mrs/Ms_____

you are invited to participate in our research study titled

"A RANDOMISED, CONTROLLED, TRIAL OF SUB-TENON'S VERSUS PERIBULBAR ANAESTHESIA IN MANUAL SMALL INCISION CATARACT SURGERY" conducted by Dr. Geetha S Bandi Post-Graduate in M.S. Ophthalmology under the guidance of Dr Mahesh I Magdum M.S. D.O.M.S Professor , Department of Ophthalmology, J N Medical College, Belgaum.

Respected sir/ madam, we request you to enroll yourself to participate in our study as, you are eligible for participating in this study. During the study you will be asked some questions in detail regarding your present complaint and you are supposed to answer to the best of your knowledge.

Your participation in research is voluntary, your decision whether or not to participate in the study will not affect your relationship with J N Medical college. If you decide to participate you are free to with draw at any time.

Purpose of the Study:

The purpose of research is to compare the efficacy and safety of sub-Tenon's versus peribulbar anaesthesia in manual small incision cataract surgery.

Procedure Involved:

If you agree to participate in this study, you will be asked to give detailed history of the disease you have and you will have to undergo necessary investigations that may be required. You will then be allotted to one of the two groups by randomization and then subjected to anaesthetic procedure depending on the group.

Whichever group is allotted to you, you will have to agree upon it. You would be asked to follow up on specified dates when your progress would be monitored, documented and if necessary photographed.

Risks and Benefits:

As such there are no major risks involved, however some discomfort may occur during the process of investigations and the risks involved with the anaesthetic procedure and with small incision cataract surgical procedure for which all precautions will be taken. As such minimal risk is involved in the operative procedure mentioned above. If you agree to enroll in the study you will be helpful in choosing better anaesthetic block in terms of reduction of pain and better anaesthesia. Your participation may benefit you and others suffering from same ailment in future, by helping us learn more about the disease process and better treatment modalities. No financial incentives are promised to you for being a part of study.

Alternatives :

Your decision whether or not to participate in this study will not affect the quality of treatment you receive and if you are not willing to participate, Further you may withdraw from the study at any time.

Costs for participating in this research:

There will not be any extra cost incurred by you. The participant will have to pay for the investigations which are the part of the existing management protocol for this ailment. There is not commitment for any reimbursement or any other compensation for the participant.

Privacy and Confidentiality:

The only people to know that you are a research subject are members of the research team. No information about you or information provided by you during the research will be disclosed to others without your written permission, except:

1. In emergency to protect your rights and welfare.
2. If required by law

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. Any information that is obtained in connection with this study and that can be identified with you will remain confidential.

Compensation:

In the event of injury related to the study, treatment will be made available through KLES Dr. Prabhakar Kore Hospital and M R C, Belgaum. 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) Chief investigator, Dr. GEETHA S BANDI P.G. Department of Ophthalmology, J N Medical College, Belgaum. Contact No: 9448361976.
2) Guide, Dr. Mahesh. I. Magdum, Professor, Department of Ophthalmology, J N Medical College, Belgaum. Ph: 9845507509.
3) Dr. V D Patil, Principal, J N Medical College Belgaum and Chairman of Institutional Ethics Committee. Ph: 0831-2471350.

Consent Statement

I.D. No: ☐ ☐ ☐

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

Subject Name: _____

Signature or the Left Thumb Print of Subject: _____

Witness Name: _____

Signature of Witness: _____

Investigators Name: _____

Signature of Investigator: _____

Date :_____

Place :_____

PHOTOGRAPHS

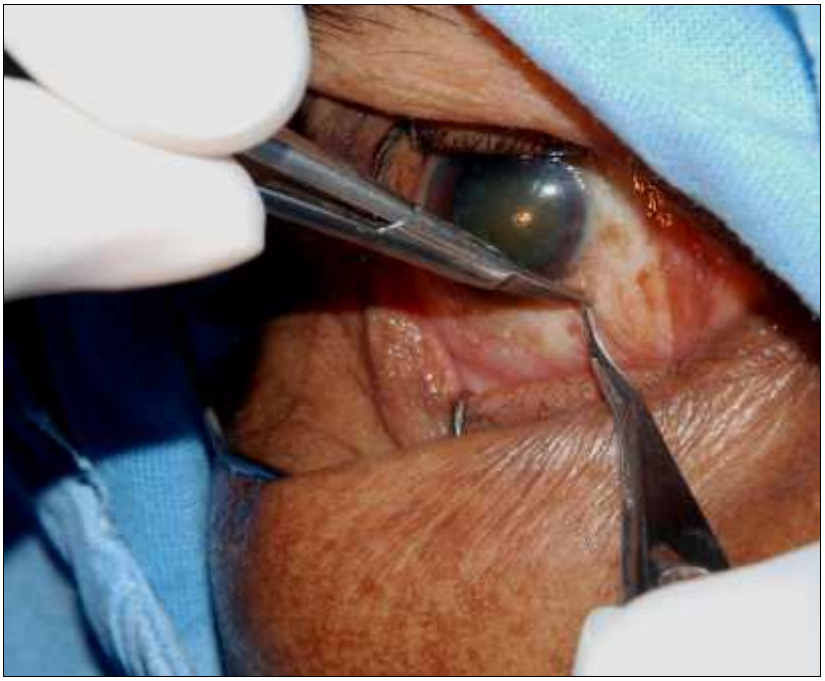
PHOTO 1: DRUGS AND INSTRUMENTS USED

Inferiotemporal quadrant

Superionasal quadrant

PHOTO 2: TECHNIQUE OF ADMINISTRATION OF PERIBULBAR BLOCK

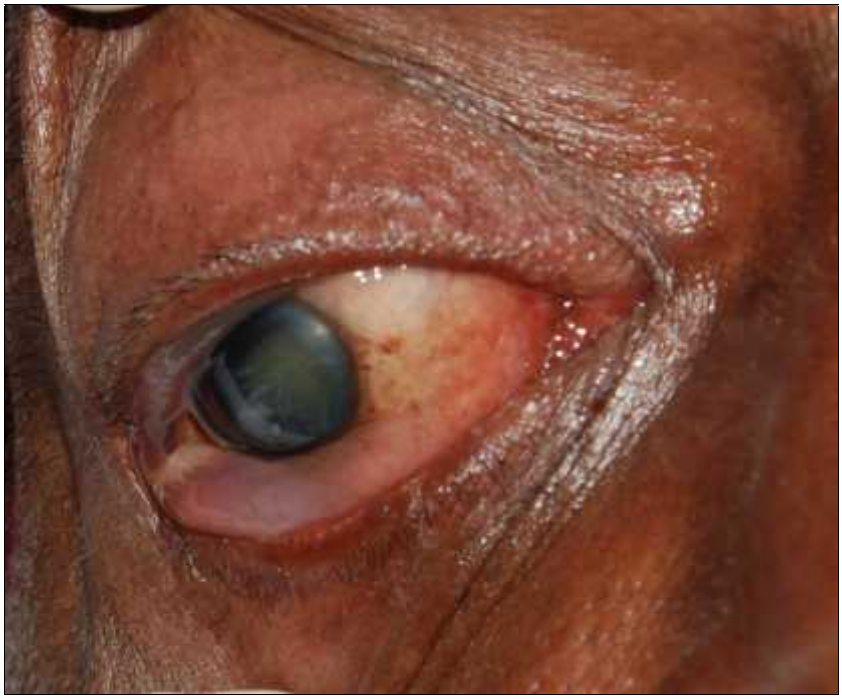
PHOTO 3: TECHNIQUE OF ADMINISTRATION OF SUB-TENON'S BLOCK



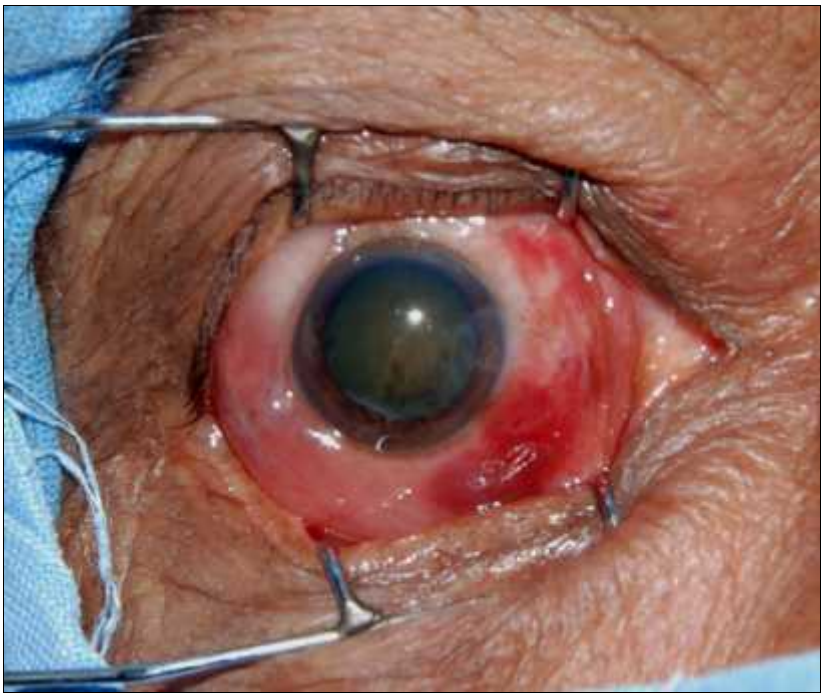
Dissection of conjunctiva and Tenon's capsule

Insertion of 23 G metal sub-Tenon's cannula

PHOTO 4: COMPLICATIONS

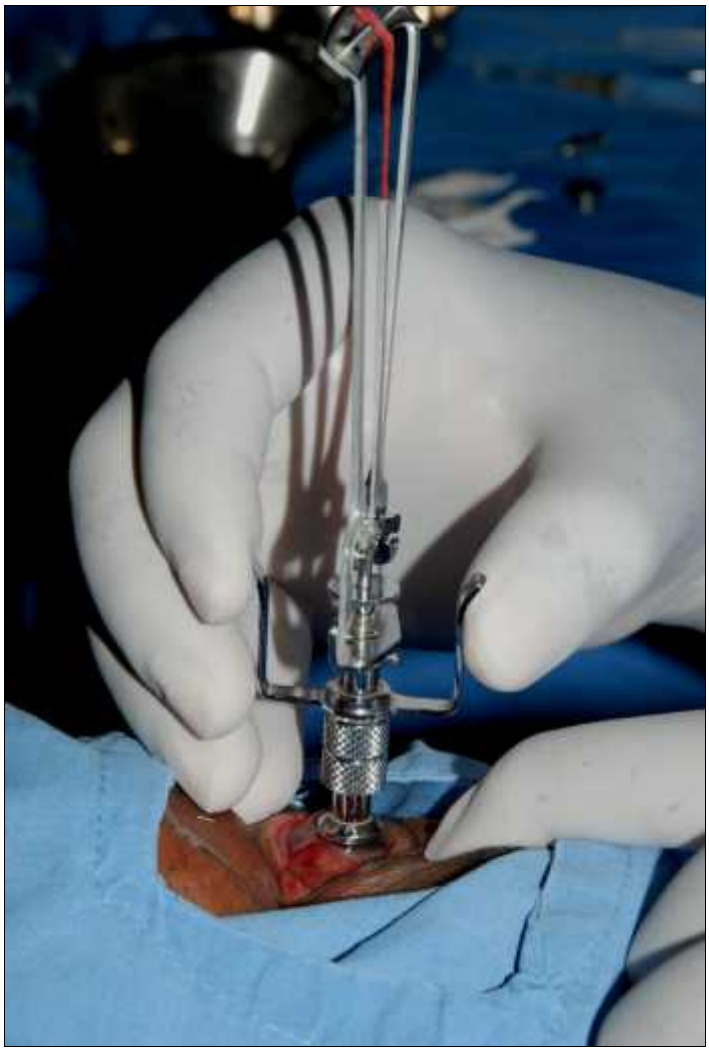


Chemosis



Chemosis and sub-conjunctival haemorrhage

PHOTO 5: MEASUREMENT OF INTRAOCCULAR PRESSURE



PROFORMA

SUMMARY SHEET

IP No: ☐

Name: ☐ ☐ ☐

(First Name) (Middle Name) (Surname)

Age: ☐ Years

Sex: ☐ 1 – Male; 2 – Female

Address: _____

Occupation: ☐

Religion: ☐ 1- Hindu 2 – Muslim 3 – Christian 4 – Sikh 5 -Others (Specify)

Date of Admission: ☐☐ ☐☐ ☐☐☐☐

Date of Discharge**:** ☐☐ ☐☐ ☐☐☐☐

Diagnosis: _____

Proposed Surgery: _____

Is the patient eligible for Study? ☐ 1 – Yes 2 – No

Has informed consent been taken? ☐ 1 – Yes 2 – No

Final Result Information:

1. Ineligible
2. Eligible, Refusal ☐
3. Eligible, Participating

I.D. No: ☐ ☐ ☐

Doctor's Name: _____

Doctor's Signature: _____

Date: ☐☐ ☐☐ ☐☐☐☐

I.D. No:- ☐ ☐ ☐

Chief complaints :

Diminution of vision Duration_____months / years

☐ RE ☐ LE

History of present illness :

1. Diminution of vision ☐ Gradual ☐ Sudden
   ☐ Progressive ☐ Static
   ☐ Painless ☐ Painful
   ☐ (1-Distance; 2 Near; 3 Both)

2. History of Diplopia / polypia ☐ 1 - Yes 2 - No
3. History of Coloured halos ☐ 1 - Yes 2 - No
4. History of Black spots infront of the eyes ☐ 1 - Yes 2 - No
5. History of watering / Discharge ☐ 1 - Yes 2 - No
6. History of Redness ☐ 1 - Yes 2 - No
7. H/o wearing spectacles: ☐ (1- Distance; 2 Near; 3 Both)

   Duration _____months / years

8. Any other complaints (if present, specify):

Past history

Diabetes: ☐ Duration: _____months / years

Hypertension : ☐ Duration: _____months / Years

Asthma: ☐ Duration: _____months / Years

Any other medical disorders: _____

General physical examination

Pallor: ☐

Oedema : ☐

Lymphadenopathy : ☐

Vital signs :
Pulse rate (Per minute): ☐☐☐

Blood Pressure : (mm of Hg) ☐☐☐/☐☐☐

Temperature: ☐ ^{0} C

Cardiovascular system: ☐ 1-Normal; 2-Abnormal; If abnormal specify :_____

Respiratory system: ☐ 1-Normal; 2-Abnormal; If abnormal specify :_____

Nervous System: ☐ 1-Normal; 2-Abnormal; If abnormal specify :_____

Per abdomen : ☐ 1-Normal ; 2-Abnormal; If abnormal specify :_____

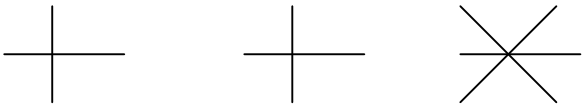
Ocular Examination :

Head Posture: ☐ (1- Errect ; 2 Tilted)

Facial Symmetry: ☐ (1-Symmetrical; 2-Asymmetrical)

Visual Axes: ☐ (1-Parallel; 2-Deviated)

Extra Ocular Movements: Right Eye Left Eye Binocular



Visual Acuity: Right Eye Left Eye

Distant:

Pinhole:

Near:

	(RIGHT EYE)	(LEFT EYE)
Adnexa		
Conjunctiva		
Cornea		
Sclera		
Anterior chamber		
Iris		
Pupil		
Lens		

FUNDUS: Right Eye ☐ Left Eye ☐

1. WNL
2. No glow due to cataractous lens
3. Findings (Specify) : _____

_____

Investigation :

1. Random Blood Sugar _____ mg%
2. Urine - Albumin ☐ (1-Present ; 2-Absent)
   - Sugar ☐ (1-Present; 2-Absent)
   - Microscopy ☐ (1-Pus cells; 2-No pus cells)

3. Lacrimal Sac patency: (1 – Patent; 2 – Blocked)

   Right Eye ☐ Left Eye ☐

4. Intra ocular Pressure: Right Eye ☐☐.☐ Left Eye ☐☐.☐ (mm of Hg)

5. Any other: _____

TYPE OF ANAESTHESIA GIVEN :

PB GROUP – Peribulbar anaesthesia ☐

ST GROUP – Sub-Tenon's anaesthesia ☐

ANAESTHESIA ASSESSMENT :

Analgesia : (Visual Analogue Pain Scale Grading)

(0- No pain; 1- Slight discomfort; 2-Mild pain ; 3- Moderate pain ; 4-Severe pain)

	RE	LE
1. Pain during administration of anaesthesia	☐	☐
2. Intra operative pain	☐	☐
3. Pain after 4 hours of surgery	☐	☐

Time taken for Akinesia (minutes):	RE	LE
1. Lid Akinesia	☐	☐
2. Globe Akinesia	☐	☐

RESIDUAL MOVEMENTS : (1-Present ; 2-Absent)

Upper Lid	☐	☐
Lower Lid	☐	☐

Extra Ocular Movements : (1-Present ; 2-Absent)

Adduction	☐	☐
Abduction	☐	☐
Elevation	☐	☐
Depression	☐	☐
Intorsion	☐	☐
Extorsion	☐	☐

EFFECT ON INTRA OCULAR PRESSURE (IOP) :

Pre anaesthetic IOP – _____ mm of Hg

Pre surgical IOP _ _____ mm of Hg

BLOCK GIVEN :

Site - _____

Volume - _____ ml

REPEAT BLOCK :

Site - _____

Volume _____ ml

COMPLICATION OF ANAESTHESIA :

Chemosis	☐	Systemic	
Lid ecchymosis	☐		
Sub-conjuctival haemorrhage	☐	Convulsions	☐
Retrobulbar Haemorrhage	☐	Loss of consciousness	☐
Globe perforation	☐	Respiratory Arrest	☐
Optic Nerve Injury	☐	Cardiac Arrest	☐

INTRA OPERATIVE PROBLEMS : _____

MASTER CHART – PB GROUP

						BLOCK ASSESSMENT											
						IOP mm Hg		Onset Time (Min)		Analgesia			Quality of Akinesia			Complications	
Sl. No.	IP No	Age (yrs)	Sex	Diagnosis	Systemic illness	Pre -A	Pre -S	Lid akinesia	Globe akinesia	PDA	Intra Op	Post op 4 hr	05 Min	10 Min	15 Min	Chemosis	SC H
1	257378	60	F	LE SMC	DM	18.9	12.2	12	10	3	0	2	1	2	3	-	+
2	258322	55	M	LESIMC	HTN	17.3	12.2	6	8	0	0	1	2	1	3	+	-
3	258955	75	M	LESIMC	-	15.9	15.9	5	7	3	0	0	2	3	3	+	-
4	258983	75	F	RE SMC	HTN	17.3	7.1	7	7	2	0	1	2	2	3	+	-
5	259041	70	F	LESIMC	-	14.6	11.2	5	5	2	0	2	3	3	3	+	-
6	260584	65	F	RE SMC	DM	14.6	9.4	4	5	2	0	1	3	3	3	+	-
7	260588	60	M	LE SMC	-	17.3	9.4	6	12	2	0	2	0	3	3	+	-
8	261093	62	F	LE SMC	HTN	14.6	5.9	5	7	0	0	1	2	3	3	+	-
9	261101	62	M	LESIMC	HTN	17.3	10.2	6	5	2	0	2	3	3	3	+	-
10	261385	62	F	RE SMC	-	17.3	10.2	5	5	2	0	0	2	3	3	-	-
11	261392	67	M	LE SMC	AST	20.6	12.2	8	12	2	1	2	0	1	2	+	-
12	261917	54	M	RE SMC	-	17.3	8.5	7	8	0	0	1	2	2	3	-	-
13	262253	60	F	LE SMC	-	14.6	9.4	5	5	3	0	2	3	3	3	+	-
14	262369	60	M	LE SMC	HTN	15.9	10.2	6	8	0	0	2	2	2	3	+	-
15	262784	70	F	RE SMC	-	12.2	5.9	6	8	2	0	1	2	2	3	+	-
16	263031	60	F	LE SMC	DM	17.3	8.5	4	5	2	0	2	3	3	3	+	-
17	263032	66	M	RE SMC	-	17.3	10.2	8	>15	3	0	2	0	0	1	-	-
18	283141	70	F	RESIMC	-	8.9	10.2	5	10	2	1	1	1	1	2	+	-
19	283975	48	F	LE SMC	HTN	14.6	8.5	5	9	0	0	2	1	2	3	+	-
20	284562	58	M	LE SMC	-	18.9	10.2	5	11	2	0	1	1	1	2	+	+
21	284660	76	M	LESIMC	DM	14.6	5.9	4	5	2	0	2	2	3	3	-	-
22	286314	69	M	LESIMC	-	17.3	8.5	5	5	2	0	1	3	3	3	-	-
23	286540	58	F	RE SMC	-	12.2	5.9	6	7	0	0	0	2	3	3	+	-
24	286561	76	F	RESIMC	HTN	17.3	10.2	4	5	2	0	2	3	3	3	+	-
25	287645	72	M	LESIMC	-	17.3	5.9	6	7	3	0	1	2	3	3	-	-
26	288604	75	M	LE SMC	DM	14.6	8.5	4	7	3	0	2	2	3	3	-	-
27	289077	63	M	RE SMC	-	13.4	9.4	6	7	2	0	2	2	3	3	+	-
28	290045	70	M	LE SMC	HTN	17.3	11.2	5	5	2	0	1	3	3	3	-	-
29	291298	40	M	RESIMC	-	17.3	10.2	3	4	3	0	2	3	3	3	-	-
30	291302	74	M	RESIMC	-	17.3	11.9	12	>15	3	1	3	0	0	1	+	-
31	291338	80	F	LESIMC	HTN	14.6	12.2	4	5	2	0	0	3	3	3	+	-
32	292447	70	F	LESIMC	DM	14.6	7.1	3	5	2	0	2	3	3	3	+	-
33	292633	60	M	LESIMC	DM	17.3	10.2	5	7	0	0	2	2	3	3	-	-
34	292638	45	F	LESIMC	-	14.6	12.2	5	10	3	0	1	1	1	2	+	+
35	292640	65	M	RESIMC	HTN	15.9	8.5	7	9	2	0	2	1	2	3	+	-
36	292650	68	F	RESIMC	-	15.9	10.2	5	10	0	1	1	1	2	3	-	-
37	293060	50	F	LESIMC	-	15.9	10.2	5	7	0	0	2	2	3	3	+	-
38	293276	68	M	LESIMC	DM	14.6	10.2	7	10	3	0	1	1	1	3	-	-
39	293451	68	M	LE SMC	-	12.2	8.5	2	4	2	0	2	3	3	3	-	-
40	293620	65	M	RESIMC	HTN	14.6	9.4	4	11	1	0	2	1	1	3	-	-
41	294641	52	F	LE SMC	-	14.6	7.1	3	5	2	0	1	3	3	3	+	-
42	294664	80	M	LESIMC	DM	13.4	7.1	3	5	0	0	2	2	3	3	-	-
43	294665	78	F	RE SMC	-	12.2	7.1	3	5	2	0	1	3	3	3	+	-
44	294802	75	F	RE SMC	DM	17.3	7.8	5	7	0	0	2	2	3	3	+	-
45	294905	65	M	LESIMC	HTN	14.6	8.5	5	8	2	0	1	2	3	3	+	+
46	295160	60	F	RESIMC	-	17.3	12.2	3	5	3	0	2	3	3	3	+	-
47	295755	80	F	LESIMC	DM	18.9	12.2	4	7	2	0	1	2	2	3	-	-
48	295800	60	M	RESIMC	HTN	17.3	10.2	3	5	3	0	2	3	3	3	-	-
49	295810	60	F	LESIMC	-	20.6	12.2	5	6	0	0	1	2	3	3	-	-
50	296339	70	M	LESIMC	DM	12.2	9.4	5	11	3	1	1	1	1	3	+	-

MASTER CHART – ST GROUP

						BLOCK ASSESSMENT											
						IOP mm Hg		Onset Time (Min)		Analgesia			Quality of Akinesia			Complications	
Sl. No.	IP No	Age (yrs)	Sex	Diagnosis	Systemic illness	Pre -A	Pre -S	Lid akinesia	Globe akinesia	PDA	Intra Op	Post op 4 hr	05 Min	10 Min	15 Min	Chemosis	SC H
1	258499	68	F	LE SMC	-	17.3	8.5	2	2	1	0	2	2	1	2	+	+
2	258837	58	F	RESIMC	-	14.6	10.2	5.5	7	1	0	0	1	2	2	-	+
3	259320	72	F	LESIMC	DM	17.3	9.4	2	4	0	0	1	3	3	3	-	-
4	259570	50	F	LE SMC	-	18.9	10.2	5	6	0	1	0	1	2	2	-	-
5	259616	45	M	RESIMC	-	17.3	11.2	1	2	0	0	1	3	3	3	+	-
6	261516	80	F	RESIMC	HTN	17.3	8.5	2	4	0	0	1	3	3	3	-	+
7	261519	60	F	RESIMC	-	14.6	8.5	2	5	2	1	0	2	2	2	-	+
8	261520	80	M	RE SMC	-	17.3	8.5	1.5	4	2	1	0	3	3	3	+	+
9	261523	75	M	LE SMC	HTN	12.2	7.1	1.5	5	2	1	0	2	3	3	+	+
10	261524	55	M	RE SMC	-	14.6	4.9	4	3	0	0	1	3	3	3	-	+
11	261525	59	F	LE SIMC	-	17.3	12.2	2	6	0	0	1	2	3	3	+	+
12	261527	60	F	LE SIMC	-	14.6	9.4	1.5	4	2	0	2	3	3	3	+	-
13	261896	55	M	RE SIMC	DM	14.6	8.5	2	4	0	0	0	3	3	3	-	-
14	261932	70	M	LE SMC	-	14.6	8.5	2	6	1	0	0	2	1	2	-	-
15	262203	61	F	LE SIMC	-	17.3	11.2	6	11	0	0	0	1	2	3	-	+
16	262226	70	F	LE SMC	AST	14.6	7.1	2.5	3	1	0	0	3	3	3	-	-
17	283488	61	M	RE SMC	-	14.6	7.1	10	>15	2	0	0	0	0	1	+	+
18	284006	60	M	LE SIMC	-	14.6	7.8	3	4	1	0	0	3	3	3	-	-
19	284302	65	M	RE SMC	DM	17.3	5.9	2	4	0	0	1	3	3	3	+	-
20	288991	70	M	RE SIMC	-	15.9	10.2	3	6	2	1	0	2	3	3	+	+
21	285673	60	M	RE SMC	-	14.6	8.5	2	3.5	1	0	0	3	3	3	-	+
22	286821	54	M	LE SIMC	-	17.3	8.5	2	3.5	2	0	0	3	3	3	+	-
23	287603	50	F	RE SIMC	-	17.3	7.1	3	6	0	0	2	2	3	3	-	-
24	287957	70	F	RE SMC	-	12.2	5.9	1	3	0	0	1	3	3	3	+	+
25	287968	56	M	RE SIMC	-	17.3	10.2	3	6	0	0	1	2	1	2	-	+
26	285091	70	M	LE SMC	DM	17.3	7.1	5.5	8	0	0	1	1	2	3	-	-
27	289020	68	F	RE SMC	-	12.2	7.1	2	3	2	0	0	3	3	3	+	-
28	293057	41	F	RE SMC	HTN	17.3	12.2	3	6	0	0	2	1	2	3	-	-
29	294791	58	M	LE SIMC	-	17.3	12.2	1	2	0	0	1	3	3	3	+	-
30	295752	73	F	RE SIMC	-	17.3	10.2	2.5	4	3	2	0	3	3	3	+	+
31	295754	50	F	LE SMC	-	17.3	12.2	2	5	0	0	0	2	1	2	+	+
32	296919	65	F	LE SMC	-	14.6	5.9	2	4	0	0	0	3	3	3	-	+
33	296926	65	F	LE SMC	DM	14.6	10.2	2	4	0	0	1	3	3	3	-	+
34	297862	58	M	LE SMC	-	20.6	12.2	1	2	0	0	2	3	3	3	-	+
35	297887	56	M	RE SMC	-	17.3	6.5	2	4	0	0	0	3	3	3	+	-
36	297888	48	M	RE SMC	-	17.3	7.1	1.5	3.5	0	0	1	2	2	3	+	-
37	297952	68	M	RE SIMC	HTN	17.3	10.2	1	2	0	0	0	3	3	3	-	+
38	297957	65	F	RE SMC	-	17.3	11.2	2	2	0	0	1	3	3	3	-	-
39	298196	60	F	LE SIMC	-	14.6	10.2	8	>15	0	2	0	0	0	1	-	+
40	298522	60	F	RE SMC	-	14.6	10.2	2	2	0	0	0	3	3	3	-	+
41	298524	50	F	RE SIMC	DM	17.3	11.2	2.5	4	2	0	0	2	3	3	-	+
42	298541	68	F	LE SIMC	-	17.3	10.2	2	4	0	0	2	3	3	3	-	+
43	298546	40	F	RE SIMC	-	14.6	5.9	4	6	0	0	0	2	3	3	+	+
44	298565	55	M	RE SMC	HTN	14.6	8.5	2.5	4	0	0	0	3	3	3	-	-
45	298820	68	F	LE SMC	-	17.3	8.5	1.5	2	2	0	0	3	3	3	+	+
46	299849	60	M	RE SIMC	-	14.6	12.2	1.5	3	0	0	1	3	3	3	-	+
47	300427	67	F	LE SMC	HTN	14.6	8.5	3	6	0	0	2	1	2	2	-	-
48	300430	75	M	RE SIMC	-	17.3	10.2	2	3	0	0	0	3	3	3	+	-
49	300452	65	F	RE SIMC	HTN	18.9	10.2	2.5	2	1	0	0	3	3	3	-	+
50	300849	65	F	LE SMC	DM	24.4	14.6	1	3	0	0	2	3	3	3	-	-

KEY TO MASTER CHART

Sl.No.	-	Serial number
IP.No.	-	In patient Number
M	-	Male
F	-	Female
SIMC	-	Senile Immature cataract
SMC	-	Senile mature cataract
DM	-	Diabetes mellitus
HTN	-	Hypertension
AST	-	Asthma
IOP	-	Intra ocular pressure
Pre-A	-	Pre anaesthetic
Pre-S	-	Pre surgical
Min	-	Minute
Hr	-	hour
Yrs	-	years
PDA	-	Pain during administration
Intra Op	-	Intra operative
Pre Op	-	Pre operative
Post Op	-	Post operative
SCH	-	Sub- conjunctival haemorrhage