



A clinical study to compare between 2% lidocaine with 1 in 200000 adrenaline and 2% lidocaine with 0.25% bupivacaine For sub-Tenon's block for cataract surgeries

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ABSTRACT:

Background: Regional anaesthesia is widely used for ophthalmic procedures. Sub Tenon's anaesthesia eliminates the risk of sharp needle injuries and provides better anaesthesia to iris and anterior segment without the drawbacks of topical anaesthesia.

Aim of study: To compare the efficacy of two different drug combinations using- 2% lidocaine with 1 in 200000 adrenaline and 2% lidocaine with 0.25% bupivacaine in sub-Tenon's anaesthesia in providing akinesia, analgesia and complications in small incision cataract surgery.

Methodology: This prospective study was performed on 60 patients, posted for small incision cataract surgery. 30 patients (group A) received 5 ml (milliliter) of 2% lidocaine with 1 in 200000 adrenaline and 30 patients (group B) received 5 ml of 2% lidocaine with 0.25% bupivacaine. Anaesthesia, analgesia, akinesia was graded on subjective scale and recorded. Effect of anaesthesia on intraocular pressure was also studied. P value calculated using unpaired student t test.

Results: Group A patients had a faster onset of akinesia compared to group B [p value= 0.003]. Group B patients had better post operative analgesia than group A patients [p value= 0.005]. Although there is significant difference between the two groups, a larger portion of patients in both the groups had eye movements, which are characteristics of sub-Tenon's block. Minor complications like chemosis, sub conjunctival haemorrhage were noticed.

Conclusion: Lidocaine with adrenaline provides faster onset of akinesia. However, the akinesia is incomplete in the sub-Tenon's block. Regarding post operative analgesia lidocaine with bupivacaine provided better pain relief compared to lidocaine with adrenaline group.

Keywords:- Sub-Tenon's anaesthesia, cataract surgery, analgesia, akinesia.

I. INTRODUCTION

Regional anaesthesia is widely used for ophthalmic surgical procedures.^[1] Cataract surgery constitutes by the far the most common eye operation done under local anaesthesia.^[2] Akinetic block using a needle, such as retrobulbar, peribulbar and the combined retrobulbar and peribulbar are the commonest techniques practiced around the world.^[3]

Sub-Tenon's local anaesthesia has become an accepted technique for anterior segment surgery. It is safe, quick and effective method of local anaesthesia.^[1-6] Advances in cataract surgical techniques, especially small incision phacoemulsification, has lessened the universal demand for akinetic anaesthesia using regional block.^[7]

Damage to globe resulting from the use of sharp needles for peribulbar and retrobulbar anaesthesia is well recognized and although relatively uncommon, can be catastrophic when it does occur. Sub-Tenon's anaesthesia block was reintroduced as a simple, safe, effective and versatile alternative to a sharp needle block for orbital anaesthesia.^[8]

Sub-Tenon's approach to retrobulbar anaesthesia has been described for cataract surgeries, pan-retinal photocoagulation, trabeculectomy and strabismus surgery.^[2] Sub-Tenon's anaesthesia eliminated the risk of sharp needle techniques and is thought to completely avoid vascular and optic nerve injury and provides better anaesthesia to iris and anterior segment without the drawback of topical anaesthesia.^[6] Various volumes and local anaesthetic combinations are used in Sub-Tenon's anaesthesia. Drug combinations used are, 2% lidocaine with 1:200000 epinephrine, 2% lidocaine, 1% ropivacaine, 2% lidocaine with 0.5% bupivacaine and 0.5% levobupivacaine with 2% lidocaine and so on.^[2-6], however, there is no comparative data available on their relative effectiveness.^[3]

Hence, an attempt is made to compare the efficacy of two different local anaesthetic combinations in sub-Tenon's anaesthesia for cataract surgery.

II. METHODS

On a arbitrarily chosen 60 patients, a prospective randomized double blinded study was performed over a period of 10 months in our institute. Ethical committee clearance was obtained for our study. All patients aged between 30-70 years with no co morbid conditions undergoing manual small incision cataract surgery were eligible for the study. A total of 60 cases were taken arbitrarily for the study with 30 cases in group A- receiving 5ml of 2% lidocaine with 1:200000 adrenaline and 30 cases in group B- receiving 5ml of 2% lidocaine with 0.25% bupivacaine. All patients were in-patients of the hospital. Informed consent was obtained from all the patients for the anaesthetic procedure and surgery. Detailed pre anaesthetic evaluation was done. Physician fitness prior to surgery was sought. Patients of : 1) age<30 or >70 years, 2) sensitivity to local anaesthetics, 3) history of convulsion, coronary artery disease, uncontrolled hypertension, 4) inability to get informed consent were excluded from the study.

The parameters and grading were studied as follows:

Chemosis: Grade 0= absent; Grade 1= involving one quadrant; Grade 2= involving two quadrant; Grade 3= involving three or four quadrant. **Sub conjunctival haemorrhage:** Grade 0= absent; Grade 1= involving one quadrant; Grade 2= involving two quadrant; Grade 3= involving three or four quadrant. **Intraocular pressure:** was recorded with schiottz tonometer at 1 min and 15th min after administration of block; **Analgesia:** pain during procedure and 4 hours post operatively- Grade 0 = no pain; Grade 1 = slight discomfort; Grade 2 = slight pain; Grade 3 = moderate pain; Grade 4= intense pain. **Akinesia:** was recorded at 5,15 and 25 minutes after a administration of block- Grade 0= no block; Grade 1= moderate movement; Grade 2= slight movement; Grade 3= no movement. Complications in both the groups were noted and compared

Pre operative evaluation and preparation was done to all patients. Topical antibiotic drops six times/day prior to the surgery and povidone iodine 5% eye drops were instilled twice at a gap of five minutes, fifteen minutes before administration of block. Preparation of the drug was as follows: 5 ml Lidocaine 2% with 1:200000 adrenaline was mixed with hyaluronidase resulting in 15 IU/ml of mixture in group A. 5 ml lidocaine 2% with 0.25% bupivacaine (2.5 ml 4% lidocaine + 2.5 ml 0.5% bupivacaine) to which hyaluronidase was added resulting in 15 IU/ml of mixture in group B.

The eye to be operated was painted with povidone iodine and draped. Patient's conjunctiva was anaesthetized by instilling 4% lidocaine eye drops 2-3 times. A lid spectrum was inserted. The patient was asked to look downwards and inwards. A button hole was made in the conjunctiva along with Tenon's capsule 4mm from limbus in the supratemporal quadrant. The scissor was then passed through the nick and a path created in the sub-Tenon's space. A visitec sub-Tenon's blunt metal cannula 19G×25 mm was inserted with the sub-Tenon's space and 5ml of prepared mixture was delivered and cataract surgery was done. The above procedures were performed by an experienced ophthalmologist to whom the study drug was given. During the surgery the above said parameters were observed by an anaesthesiologist who was not involved in the study in order to avoid the study bias.

Statistical analysis:

A pilot study was done to fix a sample size taking prevalence of analgesia in each group. On an average it was found to be 67% (p). We calculated the sample size by : $\text{Alpha size/type I error}$
Taking power of 80% with relative precision of 20% of p, we found $n= 49.1333$, taking 5% of error, it was found to be $3: 49.1333+3= 52.1333$. Hence, a minimum required sample size was 52. In our study we took a sample size of 60 which is well above the required sample size.
At the end of the study, the data was compiled systematically and was subjected to statistical analysis using unpaired student 't' test and SPSS version 10.0 for windows. Value of $p<0.05$ was considered significant.

III. RESULTS

Totally 60 patients were selected for the present study of which 30 patients underwent manual small incision cataract surgery under sub-Tenon's anaesthesia using lidocaine 2% with 1:200000 adrenaline and 30 patient under sub-Tenon's anaesthesia using lidocaine 2% with 0.25% bupivacaine.

In our study, all patients were in the group of 40-69 years. The mean age was 63.10 in group A and 61.07 in group B (Table 1). The two groups are similar in age with no statistical significance (p value=0.21).

In group A out of 30 cases, 22(73.3%) were males and 8(26.7%) were females. In group B out of 30 cases, 20(66.6%) were males and 10(33.3%) were females. There was no statistical significance between the two groups (p value =0.108).

In group A out of 30 cases, 8(26.6%) patients had no chemosis, 10(33.3%) patients had chemosis in one quadrant, 11(36.6%) patients had chemosis in two quadrants, and 1(3.3%) patient had chemosis in three or four quadrant. In group B out of 30 cases, 6(20%) patients had no chemosis, 10(33.3%) patients had chemosis in one quadrant, 12(40%) patients had chemosis in two quadrants, and 2(6.6%) patients had chemosis in three or four quadrants. P value shows statistically insignificant.

In group A out of 30 cases, 16(53.3%) patients had no sub-conjunctival haemorrhage, 12(40%) patients had sub-conjunctival haemorrhage in one quadrant, 2(6.7%) patients had sub-conjunctival haemorrhage in two quadrants, and 0 (0%) patients had sub-conjunctival haemorrhage in three or four quadrant. In group B out of 30 cases, 15(50%) patients had no sub-conjunctival haemorrhage, 12(40%) patients had sub-conjunctival haemorrhage in one quadrant, 3(10%) patients had sub-conjunctival haemorrhage in two quadrants, and 0 (0%) patient had sub-conjunctival haemorrhage in three or four quadrant. (Graph 1)

Pre operatively in group A the mean IOP was 15.92mmHg and in group B, it was 16.23mmHg. No statistically significant difference was found (p value> 0.05). Mean IOP at 1min post block, in group A was 17.87mmHg and in group B was 18.8mmHg. No statistically significant difference was found between the two groups (p value >0.05). Mean IOP at 15min post block, in group A was 16.97mmHg and in group B was 17.74mmHg. No statistically significant difference was found in the IOP at 15 minutes between the two groups (p value 0.150). (Graph 2)

In group A, out of 30 cases, 21(70%) had *no* pain, 6(20%) had slight discomfort, 3(10%) had slight pain, and no patients experienced moderate or severe pain during administration of anaesthesia. In group B, out of 30 cases, 19(63.3%) had *no* pain, 7(21%) had slight discomfort, 4(13.3%) had slight pain, and no patients experienced moderate or severe pain during administration of anaesthesia. *p* value >0.05, suggestive of insignificance statistically. (Graph 3)

Analgesia at 4 hours postoperatively: In group A, out of 30 cases, 8(26.6%) had *no* pain, 11(36.6%) had slight discomfort, 8(26.6%) had mild pain and 3(10%) experienced moderate pain. In group B, out of 30 cases, 19(63.3%) had *no* pain, 6(20%) had slight discomfort, 5(16.7%) had mild pain and none experienced moderate pain (Graph 4). Unpaired student't' test gave a *p* value <0.05-suggestive of significant statistical significances.

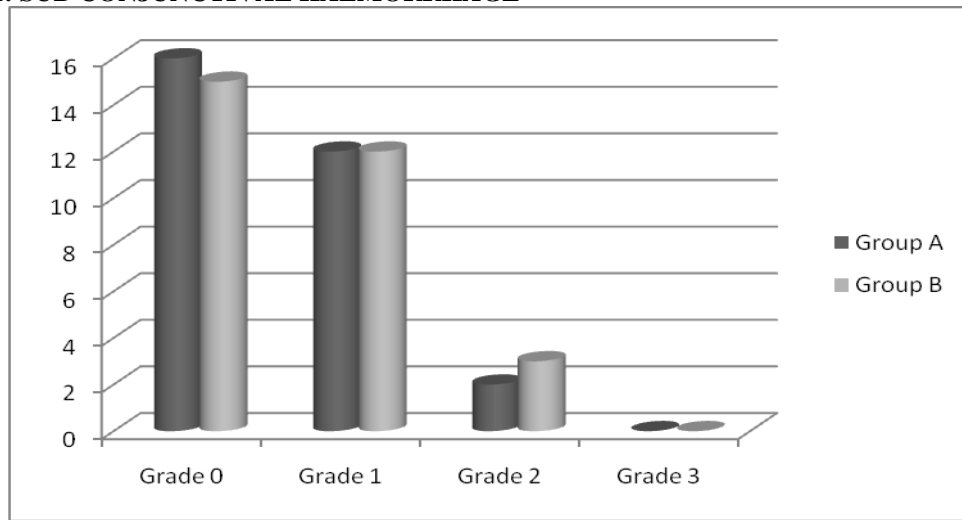
After 5 mins after administration of block- in group A, out of 30 cases, 6(20%) had slight movement, 19(63.3%) had moderate movement and 5(16.7%) had complete movement remaining. In group B, out of 30 cases, 9(30%) had slight movement, 7(23.3%) had moderate movement and 14(46.7%) had complete movement remaining. *p* value is not <0.05 suggest no statistical significances. Akinesia at 15 mins after administrations of block- In group A shows grade 3= 8(26.6%), grade 2=20(66.6%), grade 1=2(6.7%), grade 0= nil. However, in group B shows grade 3= 3(10%), grade 2= 8(26.6%), grade 1= 17(56.7%) and grade 0= 2(6.7%). *p* value is <0.05 suggesting significant statistical significances. Akinesia at 25 mins after administration of block- in group A, out of 30 cases, 8(26.7%) had no movement, 11(36.7%) had slight movement, 9(30%) had moderate movement and 2(6.7%) had complete movement remaining. In group B, out of 30 cases, 5(16.7%) had no movement, 13(43.3%) had slight movement, 9(30%) had moderate movement and 3(10%) had complete movement remaining. *p* value is not <0.05 suggest no statistical significances.(Graph 5).

TABLE 1: DEMOGRAPHY

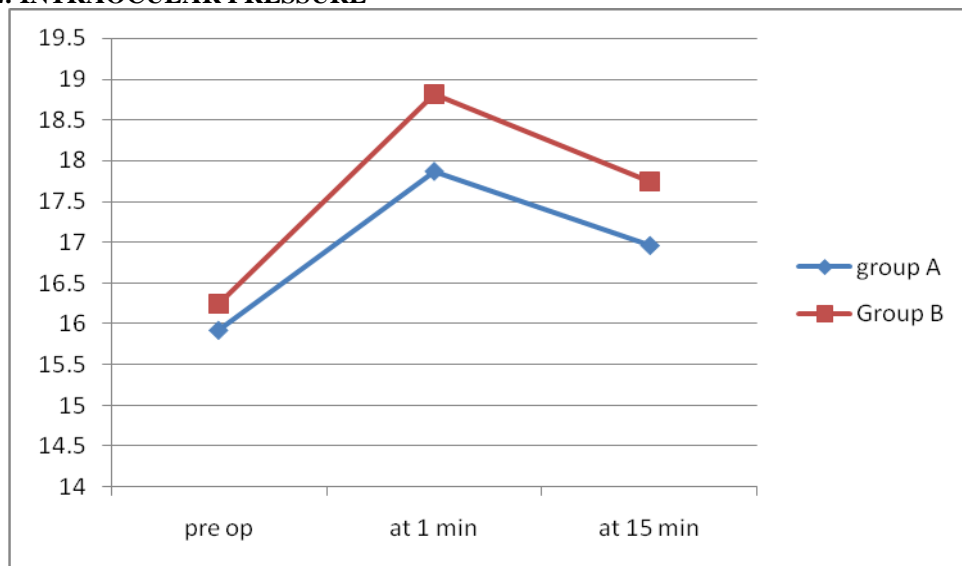
Age in years	Group A	Group B
40-50	1	3
51-60	8	9
61-70	21	18
Total	30	30
Mean ±SD	63.10±5.82	61.07±6.79

P value = 0.218

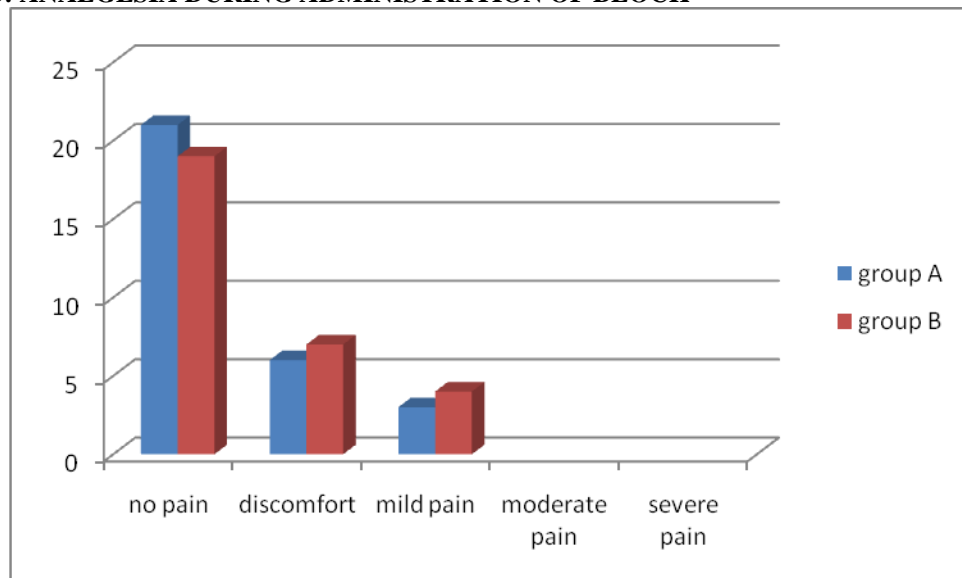
GRAPH 1: SUB CONJUNCTIVAL HAEMORRHAGE



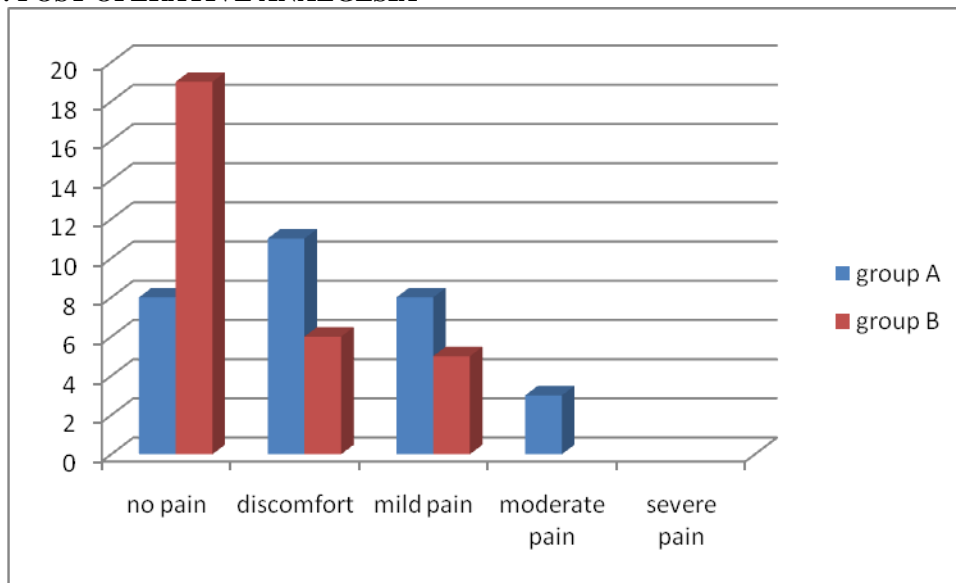
GRAPH 2: INTRAOCULAR PRESSURE



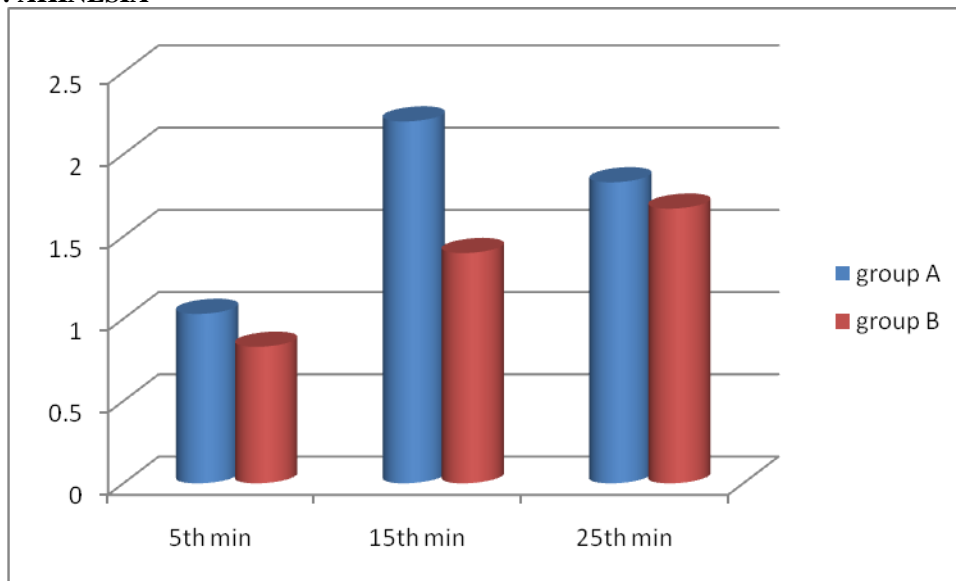
GRAPH 3: ANALGESIA DURING ADMINISTRATION OF BLOCK



GRAPH 4: POST OPERATIVE ANALGESIA



GRAPH 5: AKINESIA



IV. DISCUSSION

Anesthesiologist frequently perform sub-Tenon's block for a variety of ophthalmological procedures. It is a relatively pain free block to perform and is effective in producing sensory block sufficient for surgery without the use of sedation. Total akinesia may not be obtained. The relatively few complications reported in the 11 years since the technique was first described suggests that it is safe.^[9]

Roman SJ et al reported in their study that 39% of the patients had chemosis involving more than 1 quadrant in sub-Tenon's anaesthesia.^[10] Guise PA noted that conjunctival chemosis in 5.6% of patients receiving sub-Tenon's block but only in 0.06% of patients it was considered to interfere significantly with surgery.^[11] In our study, group A had 69.9% patients had chemosis involving one to two quadrants. In group B, 73.3% patients had chemosis involving one to two quadrants. Both the groups have similar incidence of chemosis as the needle (Visitec sub-Tenon's metal cannula 19g×25 mm described by Steven) used was the same in both the groups. The chemosis is more due to anterior placement of the cannulae which can be avoided by proper placement of the needle in the posterior sub-Tenon's space.^[10] Chemosis is swelling of conjunctiva and this occurs due to anterior spread of the local anaesthetic agent after injection. Mild to severe chemosis occurs after sub-Tenon's block and the incidence varies between 25 to 100%, depending on the length of the subTenon's cannulae used. Chemosis is unavoidable, but is more likely to occur if dissection of Tenon's

capsule is not adequate or a large volume of local anaesthetic is injected. This is usually limited to the site of injection but may spread to other quadrants of the globe.

Roman SJ et al in their study found that 56% of the patients receiving sub-Tenon's block had sub conjunctival haemorrhage using 1.5 ml of 2% lidocaine.^[10] Guise PA found that 7% of patients receiving sub-Tenon's block had sub conjunctival haemorrhage using 4 ml of 2% lidocaine+ 0.5% bupivacaine with hyaluronidase.^[11] Stevens JD reported an incidence of 32% of sub conjunctival haemorrhage extending to more than one quadrant using 50:50 mixture of lidocaine 2% and bupivacaine 0.5%.^[12] In our study (Graph 1), an incidence was almost similar of 46.7% of sub conjunctival haemorrhage was noted in the group A and 50% in group B. our results are comparable with the other studies. Sub conjunctival haemorrhage occurs in sub-Tenon's block while the dissection of the conjunctiva, when the fine vessels get cut. Redness or subconjunctival haemorrhage can be minimized by careful dissection which minimizes damage to fine vessels. Epinephrine containing local anaesthetic or application of vasoconstrictor using a soaked cotton bud may reduce the incidence of subconjunctival haemorrhage, but this remains unproven. Ophthalmologists can reduce the incidence of subconjunctival haemorrhage by applying diathermy using an operating microscope, but no such benefit was obtained when anaesthesia personnel used disposable diathermy.^[13]

In the present study, we found no statistically significant difference in the mean IOP in either of the group at 1 min and 15 min after administration of anaesthesia (Graph 2), as the volume of anaesthetic injected was same and contained hyaluronidase in both the groups which reduces the intra ocular pressure.^[14]

Roman SJ et al reported in their study that during administration of block 55% reported no pain and 44% only discomfort using 1.5 ml of 2% lidocaine.^[10] Guise PA found that 68% of patients found the administration of sub-Tenon's anaesthesia to be pain less and only 7% of patients experienced more than mild discomfort using 4 ml of 2% lidocaine+0.5% bupivacaine with hyaluronidase.^[11] In our study, in group A, 70% of patients had no pain, 20% had discomfort, and 10% mild pain. In group B, 63.3% had no pain, 23.3% had discomfort and 13.3% had mild pain, during administration (Graph 3).

Graph 4 compares the post operative analgesia between the groups. In group A, out of 30 patients 26.6% had no pain, 36.6% had discomfort, 26.6% had mild pain and 10% had moderate pain 4 hours post operatively. In group B, out of 30 cases, 63.3% had no pain, 20% had discomfort and 16.7% had mild pain 4 hours post operatively. In the present study, patients who received lidocaine with bupivacaine (group B) had better post operative analgesia than group A patients receiving lidocaine with adrenaline. pKa of bupivacaine is 8.1 and with relatively high conduction blocking potency as compared to 7.8 of lidocaine explains to this sequence.^[16] which were comparable with other studies like Steven JD and Parkar et al.^[12,15]

Roman SJ et al in their study found that, akinesia was always limited with the sub-Tenon's block and no patients reached complete akinesia at the end of procedure.^[10] Guise PA showed significantly better akinesia after 9 minutes with hyaluronidase group compared with control group in sub-Tenon's anaesthesia.^[17] In our study (Graph 5), we found that complete akinesia was found to be 26.6% of cases at 15th min in group A, whereas in group B it was 10%. Although there was significant difference between the two groups, a larger portion of both the groups had eye movements which are characteristic of sub-Tenon's block. Difference in the time of assessment and in the volume or mixture of anaesthetic solution administered can explain the various reports of akinesia depending on publications.^[10] Hence, our study concludes with the other studies. In our study, apart from chemosis and sub conjunctival hemorrhage there were no other complications noticed.

V. CONCLUSION

Sub-Tenon's eliminates the risk of sharp needle technique, provides reliable anaesthesia, can be supplemented for prolonged anaesthesia and post operative pain relief. Lidocaine with adrenaline provides the faster onset of akinesia, lidocaine with bupivacaine provides a better and prolongs analgesia. Chemosis and sub conjunctival haemorrhage were the complications noticed in either of the groups.

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