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Original Article

Comparison of Efficacy and Safety of Subtenon's Anaesthesia with and without Hyaluronidase in Bilateral Cataract Patients.

Sai Monisha Jammula[1], Manjula T R[2]*, Mohan Kumar H[3]

1. Postgraduate, Department of Ophthalmology, Sri Devaraj Urs Medical College, Sri Devaraj Urs Academy of Higher Education and Research, Tamaka, Kolar-563101.
2. Professor & HOD, Department of Ophthalmology, Sri Devaraj Urs Medical College, Sri Devaraj Urs Academy of Higher Education and Research, Tamaka, Kolar-563101.
3. Professor & HOD, Department of Ophthalmology, Sapthagiri Medical College, Bangalore, Karnataka.

Abstract

Background: The effect of subtenon's block with the usage of hyaluronidase in terms of analgesia and akinesia was studied in different sets of people and the results were not satisfactory in all of them .This study eliminates bias and mitigates the confounding factors such as age, sex, pain threshold of a person, anatomical variations when done on different individuals.

Objectives: To evaluate the efficacy of subtenon's anaesthesia with hyaluronidase in group A patients and without use of hyaluronidase in group B undergoing cataract surgery in terms of Globe and lid akinesia, analgesia, onset and duration of anaesthesia intra operatively and to document complications related to subtenon's anaesthesia.

Methods : 39 patients (78 eyes) who fulfil inclusion criteria were selected and subtenon's anaesthesia with hyaluronidase during the first eye cataract surgery followed by other eye subtenon's anaesthesia without hyaluronidase was adopted. the study is done at RLJH, Kolar in ophthalmology department which is a teritiary setting hospital. In both groups Analgesia was graded between 0-4grades and globe akinesia was graded between 0-3 grades and lid movements was graded between 0-2 grades. Study design used is non randomized study.

Results: Analgesia (p = 0.008), globe akinesia (p = 0.002)at 15 mins ,lid akinesia (p=0.027) at 10 mins were good in Group A and it was statistically significant. The rate of onset of akinesia, patient and surgeon satisfaction were better in case of GroupA . Complications were equal in both the groups showing no role of hyaluronidase in the complications and relating them to subtenon's.

Conclusions: Hyaluronidase has shown better onset of akinesia, good intraoperative analgesia , good globe and lid akinesia.

Keywords: Subtenon's block , Hyaluronidase, Akinesia, Analgesia.

Introduction

Subtenon's block; one of the technique of anaesthesia helps in an uneventful cataract surgery and better surgeons comfort and satisfaction. It is a procedure in which the anesthetic agent is injected into the virtual space in between the sclera and the tenon's capsule known as the subtenon's space and from there the anesthetic agent diffuses to the nerves and the myoneural junction resulting in akinesia and analgesia.[1]

Some complications like sub-conjunctival haemorrhage, chemosis, optic nerve injury are associated with subtenon's anaesthesia. Blunt cannula is used for this procedure which reduces globe perforation to larger extent when compared to peribulbar and retrobulbar block where a beveled needle is used and might lead to globe perforation. Hyaluronidase is an agent which aids in dispersion of anesthetic agent by modifying the

***Corresponding Author**
Dr. Manjula T R
Professor & HOD, Department of Ophthalmology,
Sri Devaraj Urs Medical College, Sri Devaraj Urs Academy of Higher Education and Research, Tamaka, Kolar-563101.
Mobile No: 9886591772
E-mail: drmanjulamims@gmail.com
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permeability of connective tissue by hydrolysis of hyaluronic acid present in the extracellular matrix. The effect of subtenon's block with the usage of hyaluronidase in terms of analgesia and akinesia was studied in different sets of people and the results were not satisfactory in all of them.[2]

This study is about the comparison of efficacy of subtenon's anaesthesia with and without hyaluronidase in the same individual with operable cataract in both the eyes which eliminates bias and mitigates the confounding factors such as age, sex, pain threshold of a person, anatomical variations when done on different individuals.

Material and Methods

A total of 39 patients who fulfil inclusion criteria were selected and subtenon's anaesthesia with hyaluronidase was used during the first eye cataract surgery followed by the other eye one month later where subtenon's anaesthesia without hyaluronidase was adopted. This study was conducted at the Department of Ophthalmology attached to Sri Devaraj Urs Medical College between January 2019 and June 2020 after obtaining written informed consent from the patient undergoing cataract surgery. Non randomised controlled trial done in the period of January 2019 and June 2020.

Sample Size

Sample size for study is estimated based on VAS score in a study by Mohammadreza Sedghipour in 2012 who reported an average variance estimate of 2.25 in VAS score.[1] To detect a difference of 1.1 in analgesia and akinesia in both groups with an alpha error of 1 % with power of 90% and confidence interval of 95 % the sample size required per group is 39 patients (78 eyes).

The inclusion criteria was all patients having bilateral operable cataract surgery with normal routine investigations were selected. and the exclusion criteria was

1. Sensitivity to the anaesthetic agent being used.
2. Pre-existing ocular muscle paresis, neurological deficit.
3. Co-existing inflammatory conditions of eye.
4. Hypertensive patients.
5. History of trauma to the eye.
6. Complicated cataracts.
7. History of previous surgical intervention in the eyes.
8. Collagen vascular diseases.

The study was approved by the institutes ethical committee.Method of Collection of Data

A total of 39 patients fulfilling the inclusion criteria were included in this study. After obtaining the written informed consent all the patients underwent similar protocol for standard cataract evaluation, which consists of detailed history, recording of visual acuity, intraocular pressure measurement, slit lamp examination, fundus evaluation and intraocular lens power calculation followed by certain basic investigations such as blood urea, serum creatinine, complete blood counts, blood sugar levels, ECG, HIV and HBsAg for which consent was taken.

The patients who are fit for cataract surgery in both the eyes were selected and posted one month apart for cataract surgery, the eye with poorer vision was operated first followed by the other eye.

All patients were on oral tab Ciprofloxacin 500mg twice daily and Ciprofloxacin 0.3% eye drops hourly one day before the surgery. Preoperatively pupils were dilated using 0.8%Tropicamide with 5% Phenylephrine drops and Flurbiprofen 0.03% drops were instilled.

Before giving subtenon's block for both the groups a test dose of the local anaesthetic injection (equal volume of 2% Lignocaine with Adrenaline 1:2,00,000 and 0.5% Bupivacaine) was given for every patient and observed for any adverse reaction.

Subtenon's block using 2.5 ml of 2% Lignocaine with 1:2, 00, 000 Adrenaline and 0.5% Bupivacaine in the ratio of 1:1 with or without Hyaluronidase (150 IU/ml) was given using 5ml disposable syringe under topical Paracaine drops.

The eye to be operated was painted with 10% povidone iodine and draped. An eyelid speculum was inserted to improve access and prevent blinking. Asking the patient to look up and inwards will assist in exposing the infero temporal quadrant. A small tent of the conjunctiva and tenon's capsule was raised with a pair colibri forceps approximately 8mm from the infero-temporal limbus. A 24 G cannula was inserted passing posteriorly, following the curvature of the globe, until its tip is perceived to passed the equator and anesthetic solution is injected.

All 39 patients underwent standard phacoemulsification with foldable lens implantation or SICS by a single surgeon.

All the drugs were obtained from the hospital pharmacy linked to RLJH KOLAR.

Statistical Methods Used For This Study

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. The following assumptions on data is made, Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis. Fisher exact test used when cell samples are very small. p value of less than 0.05 was considered significant.

Parameters Studied

Analgesia:

Data collection was assessed and graded by subjective grading called visual analogue pain scale (VAS).

Pain was assessed

a) At the time of administration of anesthesia.
b) Intraoperative.

VAS reading 0 = Grade 0 – No pain
VAS reading 1-3 = Grade 1 – Mild pain
VAS reading 4-6 = Grade 2 – Moderate pain
VAS reading 7-8 = Grade 3 – Severe pain
VAS reading 9-10 = Grade 4 – Very severe pain

Globe Akinesia

Assessed at 5 minutes, 15 minutes, 30 minutes (at the end of surgery) after administration of blockade and compared. It was graded as per modified Nicoll et al criteria as follows.

A scoring system from 0-2 was used to assess the movements in the four quadrants 0-no block; 1- partial block; and 2-complete block of the associated rectus muscle. Complete akinesia in all four quadrants gave an akinesia score of 8. All the quadrant scores are further subcategorised for ease of understanding .

Score 0-2 = Grade 0 – Complete movements
Score 3-4 = Grade 1 – Moderate movements
Score 5-6 = Grade 2 – Slight movement
Score 7-8 = Grade 3 – No movement

Lid Akinesia

Assessed at 5 mins, 10 mins and 15 mins after the administration of the injection.

Grade 0 – Complete movements
Grade 1 – Reduced movements
Grade 2 – No movement

Onset Of Action Of The Anesthetic :

Grade 0 - 0-2 min
Grade 1 – 2-5 min
Grade 2 - >5 min

Duration of Action

Time from the onset to the completion of surgery or wearing away of the anesthetic effect whichever is the earlier is noted.

Complications

Chemosis:

Grade 0 - No Chemosis
Grade 1 - Chemosis in 1 Quadrant
Grade 2 - Chemosis in 2 Quadrants
Grade 3 - Chemosis in 3 Quadrants
Grade 4 - Chemosis in 4 Quadrants

Sub-Conjunctival Hemorrhage :

Grade 0 - No Sub Conjunctival Hemorrhage
Grade 1 - Sub Conjunctival Hemorrhage 1 Quadrant
Grade 2 - Sub Conjunctival Hemorrhage 2 Quadrants
Grade 3 - Sub Conjunctival Hemorrhage 3 Quadrants
Grade 4 - Sub Conjunctival Hemorrhage 4 Quadrants

Occurrence of other complications like ecchymosis, lid hemorrhage, retro-bulbar hemorrhage, globe perforation were noted.

Results

Total number of patients who took part in our study is 39. Total number of administered sub-Tenons's anesthesia were 78. In Group A the operating eye received sub-Tenon's anaesthesia with hyaluronidase and in Group B the operating eye received sub-Tenon's anaesthesia without hyaluronidase.

Analgesia

At the time of administration, in group A 4 had no pain, 23 had mild pain, 11 had moderate pain, 1 had severe pain, very severe pain was not present in any cases. In group B, 3 had no pain, 20 had mild pain, 15 had moderate pain, 1 had severe pain and very severe pain was not present in any cases.

Severity of analgesia at the time of administration was not statistically significant. (p=0.844)

Intra Operatively

In group A (Hyaluronidase) 32 patients had no pain, 5 had mild pain, 2 had moderate pain, none of them had severe pain, and none of the patients were having very severe pain. In group B (Non-Hyaluronidase) 19 had no pain, 13 had mild pain, 7 had moderate pain, 0- none had severe pain and 0- none had very severe pain. Severity of analgesia intra operatively was statistically significant calculated by chi-square test. (p=0.008).

Globe Akinesia

5 minutes after giving injection Group A (Hyaluronidase) 3 had complete movements, 4 had moderate movements, 8 had slight movements and 24 patients had no movements. Group B (Non-Hyaluronidase) 5 had complete movements 9 had moderate movements, 13 had slight movements and 12 had no movements. Akinesia between 2 groups 5 minutes after giving injection was statistically significant. (p=0.056).

15 min after injection

Group A 0 had complete movements, 2 had moderate movements, 3 had slight movements and 34 patients had no movements. Group B had 2 complete movements 8 had moderate movements, 10 had slight movements and 19 patients had no movements. Akinesia between 2 groups 15 minutes after giving injection was statistically significant. (p= 0.002).

30 min after injection: group A 0 had complete movements, 1 had moderate movements, 2 had slight movements and 36 patients had no movements. Group B had 2 complete movements 3 had moderate movements, 8 had slight movements and 26 patients had no movements. Akinesia between 2 groups 30 minutes after giving injection was statistically significant. (p= 0.015). Repeat 3ml injection of anesthetic agent was given in patients those who did not have akinesia even after 15 Minutes and these were considered into their grades present at 15 minutes at the 30 minutes interval.

Lid Movements

5 minutes after giving injection in group A 15 had complete movements, 14 had reduced movements and 10 patients had no movements.

Group B 20 had complete movements, 15 had reduced movements and 4 patients had no movements. Lid akinesia between 2 groups 5 minutes after injection was not statistically significant. (p=0.190).

10 minutes after giving injection in group A 10 had complete movements, 11 had reduced movements and 18 patients had no movements.

Group B had 14 complete movements, 18 had reduced movements and 7 patients had no movements.

Lid akinesia between 2 groups 10 minutes after injection was statistically significant. (p= 0.027).

15 minutes after giving injection in group A 4 had complete movements, 7 had reduced movements and 28 patients had no movements. Group B had 12 complete movements, 12 had reduced movements and 15 patients had no movements. Lid akinesia between 2 groups 15 minutes after injection was statistically significant (p= 0.010).

Table:1 Onset and Duration of Action of Anesthetic Agent.

Akinesia Onset (Mins)	Group A (H)	Group B (NH)	Total
1-2	13(33.3%)	2(5.1%)	15(19.2%)
3-5	23(59%)	31(79.5%)	54(69.2%)
6-10	3(7.7%)	6(15.4%)	9(11.5%)
Total	**39(100%)**	**39(100%)**	**78(100%)**

Onset of action was statistically significant between the 2 groups. (p= 0.008).

Complications

Table:2 Sub Conjunctival Haemorrhage

SCH	Group A (H)	Group B (NH)	Total
0	35(89.7%)	33(84.6%)	68(87.2%)
1	3(7.7%)	5(12.8%)	8(10.3%)
2	1(2.6%)	1(2.6%)	2(2.6%)
Total	**39(100%)**	**39(100%)**	**78(100%)**

There was no statistical significance. (p=0.854).

Table:3 Chemosis

CHEMOSIS	Group A (H)	Group B (NH)	Total
0	30(76.9%)	29(74.4%)	59(75.6%)
1	7(17.9%)	10(25.6%)	17(21.8%)
2	2(5.1%)	0(0%)	2(2.6%)
Total	**39(100%)**	**39(100%)**	**78(100%)**

This was not statistically significant. (p=0.338).

Discussion

Analgesia: The tool used was Visual analogue scale.

At The Time of Administration:

In our study in group A 10.3% of patients did not experience any pain during administration, while in group B only 7.7% of patients did not experience pain rest all patients experienced mild to severe pain.

Intra operative analgesia:

In our study 82.1% patients in group A did not experience any kind of pain intra operatively while in group B 48.7% patients did not experience any kind of pain.12.8% patients experienced mild pain in group A and 33.3% patients experienced mild pain in group B. 5.1% and 17.9% patients experienced moderate pain in group A and group B respectively. There was statistically significant difference between two groups. (p=0.008)

However in a study done by Rowley SA there was no significant difference found in the sensory blockade in patients receiving hyaluronidase as an adjuvant.[5]

In a study by Sedghipour M et al the mean VAS score intraoperatively was 1.9 ± 1.45 in hyaluronidase group and 3.00 ± 1.55 in the group where hyaluronidase was not used. The VAS scores were statistically significant with a p value of 0.04.The results in this study are comparable with the intraoperative analgesia found in our study which showed that a better intraoperative analgesia was obtained with the use of hyaluronidase in subtenon's block.[1]

Similarly in a study by Moharib MM it was observed that the group receiving hyaluronidase experienced less intraoperative pain compared to other groups which was statistically significant with a p value of 0.002.[7]

The cases with mild pain in both the groups dint require any additional anesthesia and uneventfull cataract surgery was completed .In case of moderate pain intraoperatively 2 cases out of group A and 5 cases out of group B required additional analgesia with topical paracaine and 1 case of group B required intracameral injection of lidocaine.

This shows that a better analgesia is obtained with hyaluronidase and is useful in case of cataract surgeries which are done in a heavy number per day and increasing the comfort of the patient.

Akinesia

Globe akinesia:

In our study at 5 min after injection of anaesthesia, in group A 61.5% had no movements and in group B 30.8% had no movements. At 15 min after injection of anaesthesia, in group a 87.2% patients did not have movements and in group B 48.7% patients did not have any movements. 7.7% group A and 25.6% of group B had mild movements. Rest had moderate to complete movements. 2 (5.1%) patients in group B had complete movements after 15 min. of injection and needed repeat injection. At 30 min after injection of anaesthesia, in group A 92.3% patients did not had any movements and in group B 66.7% patients had no movements. Others had mild to moderate movements.

However in Guise P study at 9 minutes of injection significantly better akinesia was seenin the group receiving hyaluronidase but no such difference was noted post 13 minutes of injection on contrary to our study where there was significant difference in globe akinesia at 15 minutes.[4]

Similarly in Rowley SA study at 10 minutes post anesthetic injection complete akinesia was obtained in 40 cases in hyaluronidase group and 10 cases in the control group with a p value of 0.01 significance.[5]

Aslam S observed ocular movements at 5 and 8 minutes of injection of subtenon's and found better globe akinesia in hyaluronidase group with p value of 0.001 at both the times.[2]

In Sedghipour M et al study complete akinesia was noted in 33.3 % of hyaluronidase group and 4.8% of plain lignocaine group.[1]

Alwitry A observed no significant difference with the addition of hyaluronidase in terms of akinesia in their study.[6]

In our study akinesia was better at 15 minutes of injection with p value of 0.002 compared to at 5 minutes where p value was 0.056 which was not strongly significant.

Lid akinesia

Our study showed at 5 min after injection of anaesthesia, in group A 25.6% had no movements and in group B 10.3% patients did not had movements. At 10 minutes after injection of anaesthesia, in group A 46.2% patients did not have movements and in group B 17.9% patients did not had movements. 4 in group A and 12 patients in group B required lid block separately as there was complete movement after 10 min of injection. At 15 minutes after injection of anaesthesia, in group A 71.8% did not have movements and in group B 38.5% patients did not have movements.

In a study by Rowley SA eyelid movements decreased at 10 minutes more in the patientsreceiving hyaluronidase mixed drug.[5]Aslam S studied the action of hyaluronidase both in terms of

blockade of levator and orbicularis oculi separately and noted significant ($p < 0.008$) difference in hyaluronidase and non-hyaluronidase group with better benefit with use of hyaluronidase.[2]

Onset of action

In 0-2 min 13 patients of group A and 2 patients of group B onset of anesthetic effect was noted , 23 patients of group A and 31 of B it was seen at 3-5 min interval, 3 from group A and 4 from group B it was observed at 6-10 mins.

In a study by Alwitry A and Radhakrishna S better akinesia was seen in hyaluronidase group.[6] In Moharib MM the average onset of akinesia in hyaluronidase group was 30-150 seconds and in non-hyaluronidase group was 30-120 seconds in case of partial akinesia and 60- 270 seconds and 30-300 seconds in case of complete akinesia. It was not statistically significant.[7]

Duration of action of the anesthetic agent was not found to be statistically significant in both the groups and this duration was almost the end time of the surgery which was on an average around 30 minutes in the patients as akinesia will not be assessed once the eye is patched. So this study substantiates that both the groups had similar duration with or without hyaluronidase.

Complications

In both the groups there was no statistical significance in the occurrence of complications. Most common complication noted was chemosis and this is a know complication occurring with subtenons. In our study the rate of complication was less compared to normal frequency of chemosis. Subconjunctival hemorrhage also was encountered and no significant difference was found between both the groups.

In a study done by Roman SJ chemosis was seen in 39.4 % of the patients had a chemosis involving more than one quadrant this was attributed to more anterior administration of the drug. Subconjunctival hemorrhage was seen in 58 percent of the patients.Subconjunctival hemorrhage also was encountered and no significant difference was found between both the groups.

Other complications like echhymosis, lid hemorrhage, retrobulbar hemorrhage and globe rupture were not encountered.

Ocular anesthesia is very important and constantly evolving field in order to increase patient's satisfaction improve surgeon's satisfaction and in order to decrease the complications involved with the mode of administration of anesthesia.

In our study it was found that there was significant difference in analgesia intraoperatively, better akinesia , good patient and doctor satisfaction in group A and less complications overall. These components were studied in various studies but the results were varying , this was attributed various components like the type of cannula used , the dose of the hyaluronidase used.

In Guise P study akinesia was found to better at 8 minutes of duration.[4] In Roman S study better akinesia and reduced lid movements were seen with hyaluronidase. However postop pain scores were not significant in this study.[9]

Aslam S showed that akinesia was better in terms of both lid and globe in their study.[2]

In Sedghipour M et al study they produced results with better akinesia, analgesia and patient and surgeon satisfaction.[1]

Alwitry S study demonstrated a better onset of akinesia and no other benefit with the use of hyaluronidase.[6] similar results were found in Radhakrishna S study along with marginal satisfaction in the patients and doctors.[8]

In Moharib MM study results showed no difference in the onset of the akinesia but hyaluronidase group has significantly less pain score.[7]

The doses of hyaluronidase used in all these studies were varying from 75 IU/ml to 150 IU/ml. In our study we have taken 150 IU/ml. The main aim of the study was to eliminate all theconfounding factors which could be a reason for alteration of the results in both the groups such as anatomical variations in the person, the pain tolerance levels, age and sex.

Each person has a different tolerance level and hence this factor is eliminated in our study as we have taken bilateral cataract patients and allotted each eye into respective groups.

With standard dosage of hyaluronidase, same surgeon operating and with eliminating theconfounding factors the results obtained with our study can be considered more precise.

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