Original Article

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Ropivacaine versus Bupivacaine-lidocaine Mixtures used in Peribulbar Blocks for Cataract Surgery: A Randomised, Triple-blind Clinical Study

Anaesthesia Section

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ABSTRACT

Introduction: Till recently, for providing anaesthesia for cataract surgeries peribulbar blocks were most commonly employed using various proportions of 0.5% bupivacaine and 2% lidocaine mixtures. As both these anaesthetic agents were reported to produce cardiovascular and Central Nervous System (CNS) side-effects, safer agents like levobupivacaine and ropivacaine are being introduced into clinical practice.

Aim: To make a comparative evaluation of the characteristics of peribulbar blocks with 0.75% ropivacaine vis-à-vis the popularly used bupivacaine plus lidocaine mixtures.

Materials and Methods: A randomised, single centre and triple-blind clinical study was undertaken between August 2021 and December 2021 comparing ropivacaine versus bupivacaine-lidocaine mixtures. A total of 90 patients attending the hospital for cataract surgeries were allocated into three groups of 30 each. Peribulbar blocks were given with 6 mL of 0.75% ropivacaine in group R, 6 mL of 1:1 mixture of 0.5% bupivacaine and 2% lidocaine in group BL, and 6 mL of 1:1 mixture of 0.5% bupivacaine and 2% lidocaine with adrenaline in groups BLA. The primary outcome measure was the total duration of analgesia (pain in the eye of grade >2). The secondary outcome measures studied were the time to onset of the motor and sensory blocks, the total analgesic requirement in the first 24 hours after surgery and changes in the Intraocular Pressures (IOP) after administration of the block. For statistical analysis, Analysis of Variance (ANOVA) and posthoc test of Tukey's Honestly Significant Difference were used for parametric data and Chi-square test was used for non parametric data and a p-value of 0.05 was considered statistically significant.

Results: The demographic characteristics and the baseline vital signs were comparable in all the three groups. Duration of the analgesia of the block was 4.2±0.79 hours, 3.6±1.08 hours, and 3.8±0.55 hours in groups R, BL and BLA, respectively. The total duration of analgesia was significantly longer in group R. The total analgesic consumption was 58.3 ±18.9, 75±25.42 and 68.3±24.5 and patients of group R had a significantly decreased consumption. There was a significant reduction in IOP in the patients of group R compared to other groups and the differences observed at 5 minutes,10 minutes and 25 minutes intervals were found to be statistically significant. Burning sensation in the eyes while injecting the drug for the peribulbar block was reported by 2, 10 and 12 patients, respectively in groups R, BL and BLA and the patients of group R were found to have less number of burning sensation episodes which was statistically significant (p-value=0.0084). More number of patients and surgeons in groups R had greater satisfaction levels.

Conclusion: In peribulbar blocks, 6 mL of 0.75% ropivacaine produces satisfactory block characteristics with prolonged analgesia, reduced IOP, stable haemodynamics and optimal surgical operating conditions and patient satisfaction levels.

Keywords: Adrenaline, Intraocular pressure, Regional blocks

INTRODUCTION

Ophthalmic surgeries for extraction and implantation of the lens of the eye, popularly called cataract surgeries, are usually performed under peribulbar blocks, using mixtures of 0.5% bupivacaine and 2% lidocaine (with or without adrenaline). Regional blocks are simple and safe to perform and are economical for the patients and don't have the complications associated with general anaesthesia [1]. Further, they provide excellent postoperative analgesia, reducing the need for postoperative analgesics and this is especially useful for the geriatric age group of cataract patients who usually have multiple co-existing diseases like diabetes mellitus, hypertension and kidney diseases necessitating restricted use of analgesic medicines. A 6-15 mL of 1:1 mixture of 0.5% bupivacaine and 2% lidocaine with or without adrenaline is the local anaesthetic drug combination used most commonly. Lidocaine used in the mixture is believed to provide quicker onset of the motor and sensory block and bupivacaine to provide a longer duration [2].

Several case studies reported in medical journals reveal that bupivacaine is associated with severe cardiac arrhythmias and neurotoxic effects in the event of an inadvertent intravascular injection while administering the blocks [3-7]. Several published case reports in the medical journals indicate that adverse neurological sequelae and transient neurological symptoms are associated with the use of lidocaine in nerve blocks [8-10].

Hence safer alternative drugs like ropivacaine and levobupivacaine are being used in recent times in place of the mixtures of bupivacaine and lidocaine. Ropivacaine has a significantly higher threshold for cardiotoxicity and CNS toxicity than bupivacaine due to its less lipophilic and stereoselective properties [3,11]. Cardiotoxicity and CNS toxicity, arising because of inadvertent intravascular injection, is low [12]. Resuscitation of patients with cardiac toxicity resulting from ropivacaine is reported to be more successful than bupivacaine-induced cardiac toxicity [13]. Further, when used as a mixture, the concentrations of bupivacaine and lidocaine get reduced from 0.5% and 2% to 0.25% and 1%, respectively, thereby weakening their potential to produce the nerve block [14].

Ropivacaine is a pure S (-) enantiomer and blocks the impulse conduction in the nerve fibres by producing reversible inhibition of

sodium ion influx and causes vasoconstriction of the orbital blood vessels leading to the lowering of IOP which is considered to be a desirable feature in cataract surgeries [15,16]. Bupivacaine given for peribulbar blocks produces a burning sensation in the eye whereas no such symptoms are reported during ropivacaine injection [17]. Compared to bupivacaine on a milligram-to-milligram basis, the potency of ropivacaine is two-thirds of the sensory block and half of the motor block [18]. Ropivacaine is used in concentrations of 0.75% and 0.5% in regional blocks and is reported to yield satisfactory sensory block but a weak motor block. Comparison of different concentrations of ropivacaine 1.0%, 0.75% and 0.5% had shown that the concentration of 0.75% was optimal in producing satisfactory block characteristics [19,20].

It was also desired to assess the effect of adding adrenaline to the bupivacaine plus lidocaine mixture vis a vis bupivacaine plus lidocaine alone in enhancing the block characteristics [21]. Hyaluronidase was added as an adjuvant at a concentration of 25 IU/mL for the patients in all three groups, as it is believed to hasten the onset time and enhance the quality of the peribulbar blocks [22]. In the backdrop of the above facts, this study was undertaken to evaluate the block characteristics of a 1:1 mixture of 0.5% bupivacaine and 2% lidocaine (with or without adrenaline) versus 0.75% ropivacaine. The primary outcome measure was the total duration of analgesia (pain in the eye of grade >2). The secondary outcome measures studied were the time to onset of the motor and sensory blocks, the total analgesic requirement in the first 24 hours after surgery, and changes in IOP after administration of the block.

MATERIALS AND METHODS

A randomised, single centre and triple-blind clinical study was conducted in the Medical College Hospital, Gayatri Vidya Parishad Institute of Health Care and Medical Technology, Marikavalasa, Visakhapatnam, Andhra Pradesh, India, from August 2021 and December 2021. The Institutional Ethical Committee (IEC) approval was obtained vide RC No: GVPIHCMT/ IEC/ 20210315/01 dated 15.03.2021, and the study was registered with the clinical trial registry of India vide CTRI/2021/08/035884 before enrollment of the patients for the study.

Details of the study protocol, the methods of various clinical examinations and all consequent risks and benefits were explained to all the participants, and written informed consent was obtained in the presence of two witnesses.

Inclusion criteria: The patients of both sexes of age between 20-80 years, who were of American Society of Anaesthesiologists (ASA) physical status grades I and II, attending the hospital for cataract extraction and implantation of Intraocular Lens (IOL) surgery were included in the study.

Exclusion criteria: Patients who were unwilling for the regional block, those who had undergone previous ophthalmic surgery such as buckling surgery, those having high myopia (axial length of eye ball greater than 26 mm), glaucoma, ocular infection, orbital anomaly, posterior staphyloma and those on anticoagulant therapy were excluded from the study.

Sample size calculation: Power analysis and sample size calculations were based on a population mean and SD of 4±0.79 hours and 2.2±1.08 hours concerning the duration of analgesia noted in the two groups of patients (n=10), respectively from a pilot study and using the formula:

$$N=Z^2 * (SD^2)/d^2$$

where N=sample size in each group; Z=Normal deviate or Unit normal deviate (1.96) SD^2=Pooled variance of the two groups, given by the formula $SD^2=(n_1-1)\ (SD_1^2)+(n_2-1)\ (SD_2^2)/(n_1+n_2-2)$ where n_1 and SD_1 are sample size and SD of group1; n_2 and SD_2 are sample size and SD of group 2, d=precision or allowable error (<20% of the difference of the means of the two groups). With 80% power and 5% alpha error, a sample size of 26 patients per group was calculated and incorporating a compensation for an assumed dropout rate of 10%, a final sample size of 30 patients in each group was felt necessary.

The primary outcome measure studied, was the total duration of analgesia as measured by the time elapsed from the total sensory block to the time when patients complained of pain in the eye of >grade 2 intensity on a numerical rating scale. The secondary outcome measures studied were the time to onset of the motor and sensory blocks, the total analgesic requirement in the first 24 hours after surgery and changes iop after administration of the block. Alterations in Pulse Rate (PR), Mean Arterial Pressure (MAP), Respiratory Rate (RR) and peripheral capillary oxygen saturation (SpO_2), number of supplemental injections given to obtain the adequate block, complications encountered in the intraoperative and postoperative periods and patient and surgeon satisfaction levels with the anaesthetic technique were noted for statistical analysis.

Patients were allocated to three study groups of 30 each (n=30) through a computer-generated random grouping software: group R (ropivacaine group), group BL (bupivacaine and lidocaine group) and group BLA (bupivacaine, lidocaine and adrenaline group). Patients of the group R were given 6 mL of 0.75% ropivacaine; those of group BL were given 3 mL of 0.5% bupivacaine and 3 mL of 2% lidocaine and those of group BLA were given 3 mL of 0.5% bupivacaine and 3 mL of 2% lidocaine with adrenaline (adrenaline 1 in 2 lakh concentration i.e., 5 µg/mL). Hyaluronidase 150 IU (concentration of 25 IU/mL) was added to the anaesthetic agents for all the patients in the three groups.

A convenient sample of 100 consecutive patients was taken for the study from among those attending the medical college hospital during the study period. These participants were screened as per the study protocol.

Study Procedure

All the patients were examined in the preanaesthetic clinic. Physical examination, relevant investigations, and a B-scan echography to know the axial length of the eyeball were carried out, wherever indicated. The envelope method was used for patient randomisation. Patients were advised to follow standard fasting guidelines on the day of surgery and alprazolam 0.25 mg was given as premedication the night before the surgery. In the preoperative room intravenous access was established with a 20-gauge intravenous cannula and standard monitoring equipment was employed like non invasive blood pressure, pulse-oximeter and electrocardiogram. The anaesthesiologist assessing the block characteristics, the surgeon and the patients were blinded for the drugs being administered. All the relevant clinical data for statistical analysis were recorded on a separate data sheet for each patient.

Using all aseptic precautions, peribulbar blocks were administered after disinfecting the skin over the eyelids with 5% povidone-iodine. Patients were advised to fix their eyeballs in the neutral gaze position and a transcutaneous dual-injection technique was used through the lower eyelid in the inferotemporal quadrant and in the upper eyelid in the superonasal quadrant with a 25 mm long and 24-gauge short bevel needle [23]. After a negative aspiration test for blood for excluding inadvertent intravascular injection, total of 6 mL of the drug was injected over 30-40 seconds; 4 mL in the lower eyelid and 2 mL in the upper eyelid. Gentle intermittent digital pressure was exerted over the eyeball to facilitate the spread of the anaesthetic solution and lower the IOP [24].

In the operation theatre routine monitoring equipment were applied and PR, MAP, RR and SpO_2 were monitored and recorded throughout the operation period at every five-minute interval till the

end of the surgery and then at every 30 minutes in the postoperative ward till complete recovery. IOP was measured with Perkins's hand-held applanation tonometer before administration of the block and at 5, 10, 15 and 20 minutes after the block after instilling a drop of 0.5% proparacaine hydrochloride topical solution. A mixture of air and oxygen was insufflated under the drapes during the surgery to prevent rebreathing.

Adverse events such as bradycardia, hypotension, bradypnoea, headache, nausea and vomiting were noted and appropriately treated. Postoperative pain was assessed using a numerical rating scale on 0-10 gradings [25] and, if the score is >grade 2 intensity, rescue analgesia was provided with tablet diclofenac 50 mg orally and the time when rescue analgesia was given was noted for assessing the total duration of analgesia of the block. Assessment of the movements of the eyeball and regression of sensory block was not done in the postoperative period so as to avoid causing postoperative infection of the operated eye. All the patients were assessed regarding the occurrence of the pain of grade >2 intensity on a numerical rating scale while administering the block and their responses were noted and the differences in the occurrence of pain were analysed for statistical significance. On the 1st postoperative day, patients and surgeons were requested to grade their satisfaction level regarding the anaesthetic technique on a 3-point verbal rating score [26]. A score of 2 or 3 was taken as an acceptable satisfaction level both in the case of the patients and the surgeons and a score of one was taken as an unsatisfactory level.

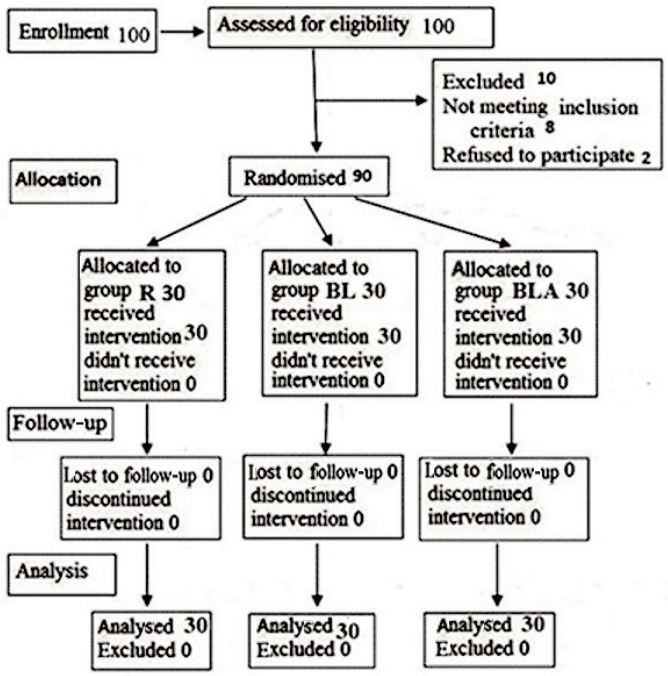
STATISTICAL ANALYSIS

Quantitative data were expressed as mean±SD and the qualitative non parametric data as the number and percentages and Microsoft excel 2013 was utilised for compiling the data. The differences between the groups regarding the parametric data were analysed by using ANOVA and the Post Hoc Tukey's HSD beta (honestly significant difference beta) test was used for intergroup comparisons. For analysing the non parametric data the Chi-square test was used. Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS), Inc./IBM, Chicago, IL and p-values of ≤0.05 were considered as statistically significant.

RESULTS

As no patient in any group dropped out from the study, the data of all the patients were included in the statistical analysis. The particulars of the patients participating in the study in the various study phases are depicted as a flow diagram as per Consolidated Standards of Reporting Trials (CONSORT) guidelines [Table/Fig-1]. The demographic characteristics such as age, gender, height, weight, the axial length of the eyeball, ASA grade, duration of the surgery and side of the eye operated were comparable in all the three groups as shown in the table [Table/Fig-2]. Baseline vital signs such as HR, MAP, SpO_2 and RR were comparable in all the groups.

The onset time of sensory block was shorter in group R compared to the other two groups, but this difference was not found to be statistically significant. The onset time of the motor block of the eyeball (akinesia) was shorter in group BLA compared to the other two groups. The onset time of paralysis of the eyelids was shorter in group BLA compared to the other two groups, but this difference was not found statistically significant. Duration of the analgesia was longer in group R compared to the other two groups and this difference was found statistically significant at a p-value 0.02034. The addition of adrenaline as an adjuvant to the anaesthetic mixture of bupivacaine and lidocaine had the effect of increasing the total duration of the block attained as seen in a pairwise comparison of groups BL and BLA though this difference was not statistically significant. The total analgesic consumption (diclofenac sodium in milligrams) on the day of surgery was lower in comparison to the other two groups and this difference was statistically significant at p-value 0.00330 [Table/Fig-3]. Changes noted in IOP at baseline and at intervals of 5,10,15,20 and 25 minutes after the administration of the block are shown as line diagram [Table/Fig-4]. There was a significant reduction in IOP at all intervals noted in the patients of



[Table/Fig-1]: Flow diagram showing patients progress through the study phases.

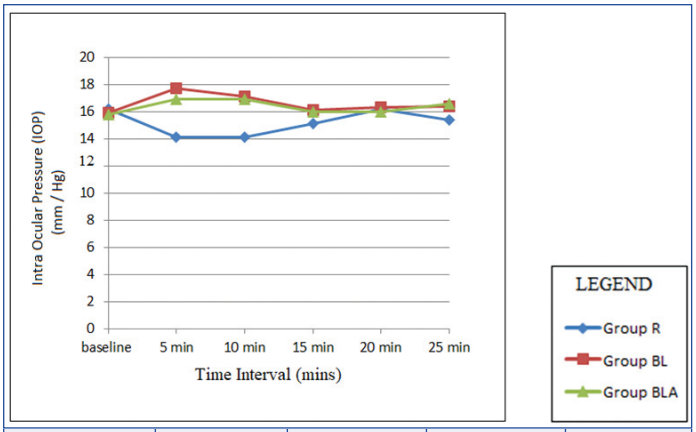
Parameters	Group R	Group BL	Group BLA	p-value
Age (years) (mean±SD)	60.8±12.44	54.5±7.92	55.9±10.29	0.054528
Sex (numbers) male/females	17/13	12/18	14/16	0.429078
Height (cm) (mean±SD)	150.4±6.08	154.8±8.23	152.1±6.53	0.055099
Weight (kg) (mean±SD)	49.8±7.3	48.6±9.21	52.6±1.27	0.114054
Axial length eyeball (cm) (mean±SD)	22.4±0.79	22.7±0.83	22.7±0.70	0.297095
ASA grade (numbers) Grade I/Grade II	18/12	13/17	17/13	0.391606
Surgery duration (min)	27.3±5.70	26.9±9.73	26.7±5.40	0.992181
Side of the eye (numbers) Right/Left	14/16	12/18	12/18	0.833446

[Table/Fig-2]: Demographic particulars.
n=30 in all the 3 groups; SD: Standard deviation; R: Ropivacaine group; BL: Bupivacaine lidocaine group; BLA: Bupivacaine lidocaine with adrenaline group

Block characteristics mean (±SD)	Group R	Group BL	Group BLA	p-value
Onset of sensory block (min)	2±0.69	2.3±0.8	2.2±0.66	0.20463
Onset of motor block (min)	3.4±0.89	3±1.6	2.9±1.17	0.17837
Onset of lid akinesia (min)	2.2±1.18	2.1±1.25	2±1.27	0.87141
Analgesia duration (hours)	4.2±0.79	3.6±1.08	3.8±0.55	0.02034*
Pairwise comparison R:BL	4.2±0.79	3.6±1.08	....	0.01694*
Pairwise comparison R:BLA	4.2±0.79	....	3.8±0.55	0.15536
Pairwise comparison BL:BLA	....	3.6±1.08	3.8±0.55	0.6164
Analgesic consumption 1st day (mg)	58.3±18.9	75±25.42	68.3 ±24.5	0.00330*
Pairwise comparison R:BL	58.3±18.9	75±25.42	....	0.01764*
Pairwise comparison R:BLA	58.3±18.9	....	68.3±24.5	0.22106
Pairwise comparison BL:BLA	....	75±25.42	68.3 ±24.5	0.50695

[Table/Fig-3]: Block characteristics.
*The result is significant at p<0.05; n=30 in all the 3 groups; R: Ropivacaine group; BL: Bupivacaine lidocaine group; BLA: Bupivacaine lidocaine with adrenaline group

group R compared to other groups; and the differences observed in the reduction of IOP at 5 minutes, 10 minutes and 25 minutes intervals were found to be statistically significant [Table/Fig-4].



Time intervals	Group R	Group BL	Group BLA	p-value
Baseline	16.2±1.62	15.9±2.11	15.8±1.80	0.78971
5 min	14.1±1.54	17.7±1.29	16.94±1.63	0.00001*
10 min	14.1±1.54	17.1±5.98	16.9±1.59	0.00001*
15 min	15.1±2.16	16.1±1.92	16.0±1.62	0.06592
20 min	16.2±1.32	16.3±1.77	16.0±1.63	0.189623
25 min	15.4±1.43	16.4±1.83	16.6±1.63	0.01509*

[Table/Fig-4]: Intraocular Pressure changes (mm/Hg).
*The result is significant at p<0.05; R: Ropivacaine group; BL: Bupivacaine lidocaine group; BLA: Bupivacaine lidocaine with adrenaline group

There were a few cases of hypotension, bradycardia, headache, nausea and vomiting noted during the surgery and in the postoperative period in the three groups of patients and the differences in the incidence were not statistically significant. Burning sensation in the eyes while injecting the drug for the peribulbar block was reported by 2, 10 and 12 patients, respectively in groups R, BL and BLA and less number of patients in group R had incidence of burning and the differences observed were found to be statistically significant at a p-value of 0.0084. No patient in any group required a supplementary injection for obtaining a successful block and none had chemosis conjunctiva or fall in SpO_2 levels during the course of surgery. There were no instances of systemic toxicity, drug allergy, oculocardiac reflex and dry mouth in any of the patients.

Patient satisfaction levels with the anaesthetic technique were analysed and it was observed that more patients in groups R had greater satisfaction levels in comparison with those of groups BL and BLA and the differences were statistically significant at a p-value of 0.0379. Surgeons operating on the patients of group R had expressed satisfaction levels about the anaesthetic technique in more cases than the other two groups and the differences in the numbers noted were statistically significant at a p-value of 0.0173 [Table/Fig-5].

Side-effects and satisfaction scores	Group R	Group BL	Group BLA	p-value
Bradycardia	2 (6.6)	4 (13.3)	3 (10)	0.6904
Hypotension	2 (6.6)	3 (10)	3 (10)	0.8718
Nausea and/or vomiting	3 (10)	5 (16.6)	4 (13.3)	0.7494
Headache	4 (13.3)	3 (10)	5 (16.6)	0.7494
Patients with acceptable satisfaction levels	22 (73.3)	14 (46.6)	13 (43.3)	0.0379*
Surgeons with acceptable satisfaction levels	20 (66.6)	13 (43.3)	12 (40)	0.0173*
Patients with burning sensation of eyes on injection	2 (6.6)	10 (33.3)	12 (40)	0.0084*

[Table/Fig-5]: Side-effects, patient and surgeon satisfaction scores (numbers and %).
R: Ropivacaine group; BL: Bupivacaine plus lidocaine group; BLA: Bupivacaine plus lidocaine plus adrenaline group; *The result is significant at p<0.05; n=30 in all the four groups

DISCUSSION

Regional blocks like the peribulbar blocks are most commonly used for performing cataract surgeries in the elderly population of patients because of their safe and simple nature. Traditionally mixtures of 0.5% bupivacaine and 2% lidocaine were used in various proportions in volumes ranging from 6-15 mL. It is also believed that the addition of adrenaline to the anaesthetic drug mixture enhances the block characteristics besides prolonging the block duration. However, there are several case reports published recently which indicate that lidocaine used in nerve blocks produces hypersensitivity reactions and transient neurological symptoms. The use of bupivacaine in nerve blocks is reported to result in severe cardiotoxicity in the event of an inadvertent intravascular injection. In the search for a safer and more effective local anaesthetic agent, levobupivacaine and ropivacaine were introduced into recent clinical practice. The safety profile of ropivacaine used in regional blocks was brought forth by several recent studies. As ropivacaine is considered a weak local anaesthetic agent in comparison with bupivacaine, it was decided to use an equipotent concentration of 0.75% ropivacaine for comparison with a 0.5% bupivacaine-lidocaine mixture.

In the present study, comparative evaluation of 0.75%, ropivacaine was done against a mixture of 0.5% bupivacaine plus 2% lidocaine and a mixture of 0.5% bupivacaine plus 2% lidocaine with adrenaline as it was aimed to assess the effect of adding adrenaline as an adjuvant to the anaesthetic agents bupivacaine and lidocaine. The results show that ropivacaine 0.75% used alone in a volume of 6 mL was better than that of a mixture of bupivacaine 0.5% plus lidocaine 2% (with or without adrenaline added). The addition of adrenaline delayed the onset time of the block and reduced the total duration of the block.

A literature review of other works revealed that Gioia L et al., [27] compared a 1:1 mixture of 2% plain lidocaine and 0.5% plain bupivacaine with ropivacaine in 8 mL volume given through a single injection technique and reported that the onset of motor block was longer in the ropivacaine group. In the present study onset times of motor block were observed as 3.4±0.89 minutes, 3±1.6 minutes and 2.9±1.17 minutes in groups R, BL and BLA, respectively. The earlier onset of motor block in the present study may be due to the employment of hyaluronidase and the dual injection technique used in the present study. They reported that supplemental injections were required in the lidocaine bupivacaine group for obtaining adequate surgical block. In the present study, it was noted that no case needed supplemental injections and this could be due to the dual injection technique and hyaluronidase employed in the present study.

Comparing ropivacaine with bupivacaine in peribulbar blocks, Jaichandran VV et al., concluded that the patients of their ropivacaine (0.75%) group had an earlier onset of sensory block. In the present study onset of sensory block of 2±0.69 minutes and akinesia 2.2±1.18 minutes were observed in the ropivacaine (0.75%) group and these findings are in near agreement with theirs. They reported that in 97% of cases there was no requirement for supplemental injections whereas in the present study no case required any supplemental injections for obtaining a complete block [28].

Trivedi L et al., evaluated 60 patients subjected to small incision cataract surgery under ropivacaine 0.75% or bupivacaine 0.5% with the addition of hyaluronidase and concluded that the ropivacaine group had shown a greater reduction in IOP (p<0.05) than the bupivacaine group [29]. In the present study, statistically

significant reductions in IOP were noted at almost all intervals in the patients of group R compared to the other groups and these findings are in total agreement with their observations.

Borazan M et al., compared bupivacaine 0.5% and lidocaine 2% mixture with levobupivacaine 0.75% and ropivacaine 1%. They found all agents convenient for cataract surgery [30]. The results of the present study differ from theirs as the patients of the ropivacaine group of the present study had a longer duration of analgesia, reduced IOP, reduced injection pain and improved surgeon and patient satisfaction levels regarding the anaesthetic technique in comparison to patients given a mixture of bupivacaine 0.5% and lidocaine 2%. This difference could be due to the use of hyaluronidase and the double injection technique employed in the present study.

Comparing the effects of ropivacaine 0.75%; and bupivacaine 0.5%-lidocaine 2% combination on IOP, quality of block, and degree of postoperative pain in peribulbar blocks, Ozcan AA et al., [31] found ropivacaine better than bupivacaine-lidocaine mixture, as it reduced the intraocular pressure and postoperative pain [31]. These findings are in total agreement with the observations of the present study. Varshney R et al., concluded that ropivacaine was a good alternative for peribulbar anaesthesia compared to bupivacaine/lignocaine as it has a faster onset and lesser toxic effects than other comparable local anaesthetic agents [32]. The findings of the present study are in partial agreement with their observations regarding the faster onset of the block. Nociti JR et al., made a comparative study between ropivacaine and bupivacaine and concluded that no patient in their ropivacaine group complained of a burning sensation during the injection but 22.5% of the patients given bupivacaine reported a burning sensation [33]. In the present study burning sensation while giving an injection was reported in less number of patients in the ropivacaine group in comparison to patients of other groups.

Limitation(s)

Duration of motor and sensory block could not be assessed postoperatively by examination of the patient's operated eye as the patient's eye was bandaged postoperatively. Hyaluronidase and adrenaline added as adjuvants to the local anaesthetic drugs could have acted as confounding variables in this study.

CONCLUSION(S)

On the basis of the findings of the present study, it is concluded that ropivacaine 0.75% used in a volume of 6 mL with 150 IU of hyaluronidase for peribulbar blocks performed by transcutaneous double injection technique produces a longer duration of analgesia, reduced IOP, stable haemodynamic profile, reduced injection pain and improved surgeon and patient satisfaction levels regarding the anaesthetic technique in comparison to a mixture of bupivacaine 0.5% and lidocaine 2% (with or without adrenaline added) and hence is a better agent than the others. The addition of adrenaline to the bupivacaine and lidocaine mixture had no statistically significant effect on the block characteristics. Large-scale multicentre studies including ASA grade 3 and 4 patients and excluding confounding variables are warranted for better validation of the study findings.

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