Section: Ophthalmology

Original Research Article

A STUDY TO EVALUATE THE ANALGESIC EFFECT OF KETOROLAC ADDED TO LOCAL ANAESTHETIC AGENTS IN PERIBULBAR BLOCK DURING CATARACT SURGERY

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ABSTRACT

Background: Effective perioperative analgesia in cataract surgery improves patient comfort and may reduce perioperative complications. This randomized controlled study evaluates the analgesic effect of adding Ketorolac to local anesthetic agents in peribulbar block. **Materials and Methods:** 120 patients undergoing cataract surgery were randomized into two groups of 60 each. Group A received peribulbar block containing lidocaine, hyaluronidase, adrenaline and ketorolac (20 mg total per block). Group B received an identical mixture without ketorolac. Postoperative pain was measured by VAS immediately, at 1, 2, and 4 hours; analgesic requirement, intraocular pressure (IOP), hemodynamic parameters, and adverse events were recorded. **Result:** Group A demonstrated significantly lower mean VAS scores at all time points and fewer patients requiring postoperative analgesics (1 vs 8; p=0.038). Hemodynamic parameters and IOP changes were clinically similar, and no adverse effects were observed. **Conclusion:** Addition of ketorolac to peribulbar local anesthetics provides superior postoperative analgesia in cataract surgery without detectable safety concerns.

INTRODUCTION

Cataract remains a leading cause of preventable blindness worldwide. In India, it accounts for a large share of the population's avoidable visual impairment. Surgical extraction of the cataractous lens with intraocular lens implantation is the definitive therapy. Advances in microsurgical techniques have reduced surgical morbidity and improved outcomes, yet optimal perioperative analgesia continues to be an important determinant of patient satisfaction and comfort.[1-3]

Regional anesthesia techniques—retrobulbar, peribulbar and sub-Tenon—have largely replaced general anesthesia for routine cataract surgery in many settings. Peribulbar block provides analgesia and akinesia sufficient for phacoemulsification and small-incision cataract surgery, while avoiding some of the risks associated with intraconal injections.[4]

Ketorolac tromethamine, a potent NSAID, has been used systemically and topically to reduce perioperative pain and inflammation. Its potential role as an adjuvant to local anesthetics for peribulbar block is attractive because it could reduce postoperative analgesic requirements and improve early postoperative comfort without opioid-related adverse effects.[5]

MATERIALS AND METHODS

Study Design: Prospective randomized controlled trial conducted at the Regional Institute of Ophthalmology and Government Ophthalmic Hospital, Chennai.

Inclusion Criteria:

Adults with visually significant cataract (BCVA < 6/18) scheduled for cataract extraction under regional anesthesia were included in this study.

Exclusion Criteria:

Patients with active renal disease, NSAID hypersensitivity, coagulation disorders, or those unable to use a visual analogue scale were excluded.

Randomization: Simple computer-generated randomization allocated patients into two equal groups of 60 each.

Interventions

- Group A (Ketorolac group): Peribulbar block containing 5 mL of the anesthetic cocktail composed of 2% lidocaine, hyaluronidase (5 IU/mL), adrenaline (standard small dose), and ketorolac (4 mg/mL) — total ketorolac dose 20 mg per block.

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- Group B (Control group): Identical anesthetic cocktail without ketorolac.

Outcomes: Primary outcome was postoperative pain measured by the Visual Analogue Scale (VAS, 0-10) at immediate post-op, 1, 2, and 4 hours. Secondary outcomes included time to first analgesic, total postoperative analgesic requirement, intraocular pressure changes, hemodynamic stability, surgeon and patient satisfaction, and adverse events.

Statistical Analysis: Data were analyzed using standard statistical tests (t-tests for continuous variables, chi-square for categorical variables). A p-value <0.05 was considered statistically significant.

Review of Literature

Several studies have evaluated the role of NSAIDs, including ketorolac, in ocular surgery analgesia. Howaydia et al. (2020) demonstrated enhancement of onset of globe anesthesia and shorter onset times with ketorolac in a peribulbar block mixture. Chen et al. (2017) and Vlajkovic et al. showed reduced intraoperative and postoperative pain scores when ketorolac was used as an adjunct in retinal surgeries and as preemptive analgesia, respectively.

Topical NSAIDs have also been used to reduce postoperative inflammation and pain after corneal and surface procedures. The clinical rationale for adding ketorolac to peribulbar anesthetic mixtures is twofold: improved analgesic efficacy through systemic and local cyclooxygenase inhibition, and potential reduction in postoperative opioid or systemic analgesic requirements.

Concerns about bleeding risk due to platelet function inhibition with NSAIDs have historically tempered enthusiasm for their use perioperatively. However, when used judiciously and in controlled doses, ketorolac has been found safe in many perioperative settings including ophthalmic procedures.

RESULTS

Baseline Characteristics

Characteristic	Group A (n=60)	Group B (n=60)	p-value (summary)
Age (mean ± SD)	59.53 ± 5.22	63.37 ± 4.51	<0.01
Gender (M/F)	24/36	32/28	0.143
Systolic BP (mmHg)	127.73 ± 9.09	137.73 ± 9.09	<0.01
Diastolic BP (mmHg)	82.93 ± 6.05	91.73 ± 5.66	<0.01
Surgical time (min)	24.31 ± 5.87	26.51 ± 7.32	0.08

This table presents a comparative analysis of baseline characteristics between two patient cohorts, Group A and Group B, each comprising 60 subjects. The primary aim is to assess the statistical significance of differences in demographic and clinical parameters.

Age differed significantly between the groups ($p < 0.01$), with Group B showing a higher mean age (63.37 ± 4.51 years) compared to Group A (59.53 ± 5.22 years). Systolic and diastolic blood pressures were also significantly elevated in Group B ($p < 0.01$), indicating possible underlying cardiovascular variability between cohorts.

Gender distribution (M/F) did not show a statistically significant difference ($p = 0.143$), suggesting balanced randomization in terms of sex.

Surgical time was slightly longer in Group B (26.51 ± 7.32 min) than in Group A (24.31 ± 5.87 min), although this difference did not reach statistical significance ($p = 0.08$), indicating comparable procedural durations.

In summary, while both groups were similar in gender distribution and surgical time, significant differences were observed in age and blood pressure parameters, which may influence clinical outcomes and should be considered in further analyses.

Figures

A total of 120 patients completed the study. Key results are summarized below. Group A patients reported lower mean VAS scores at each postoperative timepoint. Only 1 patient in Group A required supplementary analgesia during the 4-hour observation period, compared with 8 patients in Group B (chi-square p = 0.038).

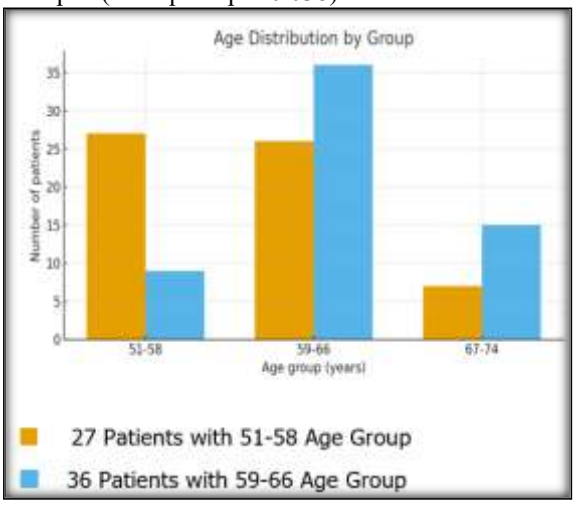

Figure 1: Age distribution by group

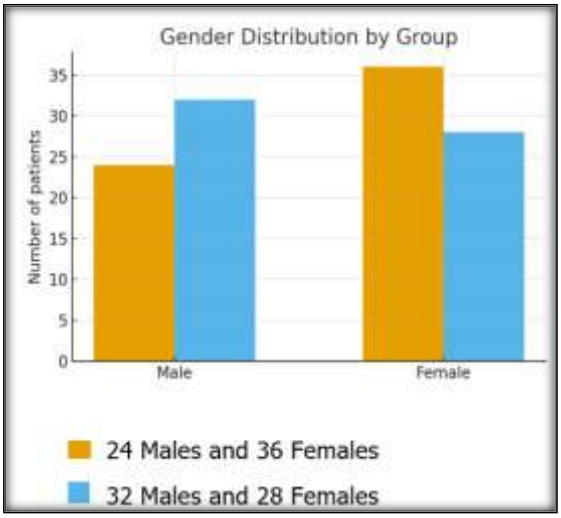

Figure 2: Gender distribution by group

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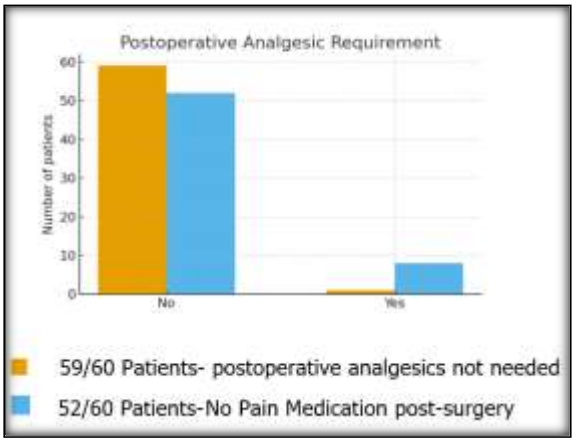

Figure 3: Postoperative analgesic requirement (No/Yes)

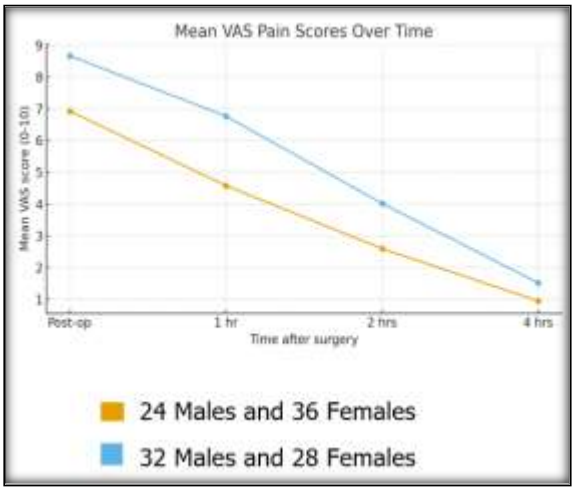

Figure 4: Mean VAS pain scores over time

Table: Mean VAS Scores (mean ± SD)

Table: Mean VAS Scores (mean ± SD)				
Timepoint	Group A Mean (SD)	Group B Mean (SD)	Mean Difference	p-value (approx.)
Post-op	6.93 ± 1.26	8.67 ± 1.13	-1.74	<0.001
1 hr.	4.58 ± 2.04	6.77 ± 1.10	-2.19	<0.001
2 hrs.	2.60 ± 1.71	4.02 ± 1.30	-1.42	<0.001
4 hrs.	0.95 ± 0.87	1.52 ± 1.16	-0.57	0.02

This table illustrates the mean Visual Analogue Scale (VAS) scores for postoperative pain assessment between Group A and Group B across four time points: immediately post-op, and at 1, 2, and 4 hours post-surgery.

At all time points, Group A consistently reported lower pain scores compared to Group B, with statistically significant differences:

- Immediately post-op, Group A had a mean VAS of 6.93 ± 1.26, significantly lower than Group B (8.67 ± 1.13), with a mean difference of -1.74 ($p < 0.001$).
- At 1 hour, the pain difference was even more pronounced (-2.19), again highly significant ($p < 0.001$).
- At 2 hours, VAS scores remained significantly lower in Group A (2.60 ± 1.71) compared to Group B (4.02 ± 1.30), ($p < 0.001$).
- At 4 hours, while the pain scores had substantially decreased in both groups, Group A continued to report lower scores (0.95 ± 0.87 vs. 1.52 ± 1.16), with the difference remaining statistically significant ($p = 0.02$).

These findings suggest that Group A experienced significantly better postoperative pain control than Group B across all observed time points, particularly in the early postoperative period. This could have clinical implications in evaluating the effectiveness of analgesic interventions used in both groups.

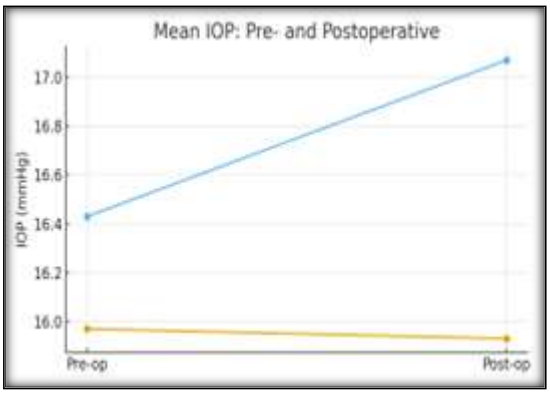

Figure 5: Mean IOP pre- and post-operative

Mean IOP (Group A pre/post): 15.97/15.93 mmHg.
Mean IOP (Group B pre/post): 16.43/17.07 mmHg.
Differences observed were small and not clinically significant.

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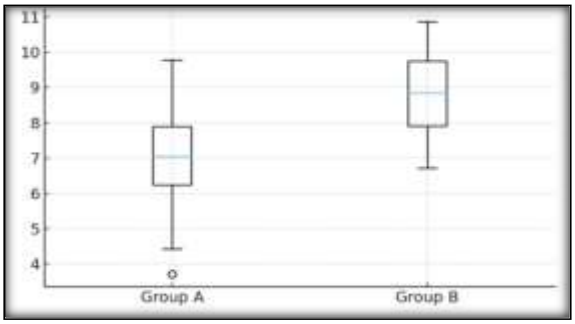

Figure 6: Distribution (boxplot) of VAS scores for groups (illustrative)

DISCUSSION

The addition of ketorolac to a peribulbar anesthetic mixture resulted in lower postoperative pain scores and reduced the need for rescue analgesia in the early postoperative period. This suggests a meaningful clinical benefit that can improve patient comfort and potentially outpatient recovery experience.

Mechanistically, ketorolac's inhibition of cyclooxygenase reduces prostaglandin-mediated pain and inflammation. When administered in proximity to the orbital tissues, a local effect in addition to systemic absorption may contribute to an enhanced analgesic profile.

No adverse effects attributable to ketorolac were observed in our cohort. This is consistent with several studies that report a favorable safety profile for perioperative NSAID use in ophthalmic surgeries when clinically appropriate, although caution should be exercised in patients with renal impairment or active peptic ulcer disease.

Limitations of this study include a relatively short follow-up for analgesic outcomes (4 hours for primary pain measurements) and exclusion of high-risk patients (e.g., CKD, anticoagulated). Future studies could examine longer-term pain, wound inflammation markers, and possible effects on cystoid macular edema incidence.

Clinical implications: Given the statistically and clinically significant reduction in early postoperative pain and analgesic requirements, adding ketorolac to the peribulbar mixture could be considered in routine cataract anesthesia protocols for eligible patients.

CONCLUSION

The randomized study demonstrates that adding ketorolac to local anesthetic agents in peribulbar block improves early postoperative analgesia after cataract surgery without observable adverse effects. Implementation of this strategy may enhance perioperative patient comfort and reduce additional analgesic use.

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