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BROMFENAC VERSUS NEPAFENAC: A STUDY ON MANAGING POST-OPERATIVE CATARACT INFLAMMATION

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ABSTRACT

Background: Postoperative inflammation is a common complication after cataract surgery. NSAIDs, such as bromfenac and Nepafenac, are commonly used to manage this inflammation due to their safety and effectiveness.

Purpose: To compare the efficacy of bromfenac and nepafenac ophthalmic solutions for post-cataract surgery inflammation.

Method: This comparative cross-sectional study was conducted at The Superior University, Lahore, over four months following ethical approval. A total of 98 adult patients (≥40 years) undergoing uncomplicated cataract surgery were enrolled using a non-probability purposive convenience sampling technique. Participants were equally divided into two groups: one receiving Nepafenac and the other receiving Bromfenac. This study included patients of senile cataract, post-operative ocular inflammation confirmed on slit lamp examination, and best-corrected visual acuity of 20/200 or better. Baseline assessments included slit lamp and fundoscopic examination. After surgery, participants were prescribed either Nepafenac or bromfenac and followed up at one week and one month to assess control of inflammation. Data were recorded using a structured proforma and analyzed using the chi-square and Fisher's Exact tests to determine the significance of differences between the two treatment groups in SPSS-26 version. A p-value less than 0.05 was considered significant.

Result: A total of 98 patients were enrolled in the study with a mean age of 65.92 ± 8.36 years. Bromfenac showed significantly better early postoperative anti-inflammatory effects compared to Nepafenac. On Day 1, patients in the Bromfenac group reported less pain ($p < 0.001$), less redness ($p = 0.027$), milder anterior chamber (AC) cell reactions ($p < 0.001$), and a lower incidence of vitritis ($p < 0.001$). The difference in AC cell reactions remained significant on Day 40 ($p = 0.022$). While both groups showed complete resolution of pain and vitritis by Day 40, 10.2% of Nepafenac patients still had mild AC cells. The difference was statistically significant ($p = 0.022$). Clinically, this suggests a slightly better long-term anti-inflammatory effect of Bromfenac**.**
Conclusion: The study concluded that Bromfenac was more effective than Nepafenac in controlling early postoperative inflammation, particularly on Day 1, with significantly lower levels of pain, AC cells, and vitritis. While some differences persisted on Day 7, by Day 40, inflammation had resolved in all patients, and no significant differences remained between the groups.

INTRODUCTION

Cataracts are one of the most common causes of vision problems around the world, especially in older adults.[1] They occur when the eye's natural lens becomes cloudy, usually due to aging, but sometimes because of other factors like diabetes, eye injuries, long-term exposure to sunlight, steroid use, or genetic conditions.[2] This clouding affects how we see, often making daily tasks like reading, driving, or recognizing faces more difficult. If left untreated, cataracts can lead to serious visual impairment and significantly affect a person's independence and quality of life.[3] Cataracts can be treated with a simple and highly effective surgical procedure that replaces the cloudy lens with a clear artificial one.[4] While the surgery itself is safe and routine, managing inflammation afterward is crucial for a smooth recovery and to avoid complications like cystoid macular edema (CME) or discomfort.[5]

To help reduce inflammation and pain after cataract surgery, doctors often prescribe nonsteroidal anti-inflammatory drugs (NSAIDs) in the form of eye drops. Two commonly used options are Nepafenac and Bromfenac. Nepafenac is a prodrug, meaning it becomes active once it's inside the eye, providing targeted relief where it's most needed and limiting side effects.[6] It's available in different strengths and dosing schedules, depending on the formulation. Bromfenac, on the other hand, works quickly and deeply by penetrating the eye tissues effectively and selectively targeting inflammation.[7] Its longer-lasting effect allows for fewer doses and often faster recovery. Both medications are important tools in post-surgery care, helping patients heal comfortably and achieve the best possible vision outcomes.[8]

Nepafenac and Bromfenac are two widely used topical NSAIDs in ophthalmology for managing post-operative inflammation following cataract surgery. Nepafenac, a prodrug converted into the active metabolite amfenac within ocular tissues, offers targeted anti-inflammatory action with minimal systemic exposure and is particularly effective in preventing

complications like cystoid macular edema (CME).[9] Bromfenac, on the other hand, is an active COX-2 inhibitor known for its excellent corneal penetration, longer duration of action, and convenient twice-daily dosing. While both drugs are effective in reducing inflammation and pain, they differ in pharmacokinetics, mechanisms of action, and dosing regimens, which can influence clinical outcomes and patient compliance.[10] However, there is limited head-to-head comparative data on their efficacy, especially with current formulations (Nepafenac 0.3% and Bromfenac 0.07%), and their effectiveness in high-risk populations or long-term outcomes remains underexplored.[11] Additional research is needed to address gaps in comparative efficacy, optimal dosing, safety profiles, cost-effectiveness, and patient-reported outcomes.[12] This study aims to provide a comprehensive comparison between the two drugs in controlling anterior chamber inflammation, preventing CME, and improving recovery after cataract surgery, ultimately contributing to evidence-based clinical decision-making and more personalized post-operative care.

OBJECTIVE

To compare the efficacy of bromfenac and nepafenac ophthalmic solutions for post-cataract surgery inflammation.

METHODOLOGY

This comparative cross-sectional study was conducted at Akram Teaching Hospital, Raiwind Road, Lahore, from March 2025 to June 2025, following ethical approval. A total of 98 adult patients with senile cataracts undergoing uncomplicated cataract surgery were enrolled using a non-probability purposive convenience sampling technique. The sample size was calculated using a 5% level of significance, 90% power, and anticipated postoperative inflammation proportions of 52.4% for bromfenac and 20.4% for nepafenac, resulting in two equal groups of 49 patients each. Inclusion criteria required participants to be 40 years or older with evidence of anterior chamber inflammation (cells or flare on slit-lamp examination) and a best-corrected visual acuity of 20/200 or better. Patients were excluded if they had known hypersensitivity to NSAIDs, used other anti-inflammatory or immunomodulatory drugs within the past seven days, or had other ocular conditions, a history of corneal transplantation, or recent corneal refractive surgery. After obtaining informed consent, patients were screened and assigned to either the nepafenac or bromfenac group. Baseline ocular assessments were conducted, including slit-lamp examination and direct fundoscopy, to confirm inflammation and rule out retinal pathology. Postoperative inflammation was monitored at one-week and one-month follow-ups. Data were recorded in a structured performa and analyzed using SPSS version 26 to compare the effectiveness of bromfenac and nepafenac in controlling post-cataract surgery inflammation.

RESULTS

In this study, a total of 98 patients were enrolled, comprising 32 females (65.3%) and 17 males (34.7%). Clinical parameters, including pain, conjunctival redness, anterior chamber (AC) cell reaction, and vitritis, were assessed at days 1, 7, and 40 postoperatively. The outcomes were analyzed using the chi-square and Fisher's Exact tests to determine the significance of differences between the two treatment groups. The following sections present a detailed comparison of inflammatory signs at each time point, highlighting the trends and statistical significance observed between the Bromfenac and Nepafenac groups. Furthermore, variables such as visual acuity (VA and BCVA), fundus findings, pupil shape, AC status, type of surgery, and history of allergies were also evaluated. The results are presented below with descriptive statistics to highlight differences between the two types of surgeries.

	Bromfenac				Nepafenac				P-value
Pain	**Normal n(%)**	**Mild n(%)**	**Moderate n(%)**	**Severen(%)**	**Normal n(%)**	**Mild n(%)**	**Moderate n(%)**	**Severen(%)**	
Day 1	4(8.2)	24(49.0)	21(42.9)	_	_	18(36.7)	19(38.8)	12(24.5)	<0.001*
Day 7	31(63.3)	18(36.7)	_	_	25(51.0)	24(49.0)	_	_	0.307F
Day 40	49(100)	_	_	_	49(100)	_	_	_	
Redness									
Day 1	_	29(59.2)	10(20.4)	10(20.4)	_	16(32.7)	14(28.6)	19(38.8)	0.027*
Day 7	_	30(61.2)	19(38.8)	_	29(59.2)	20(40.8)	_	_	0.836
Day 40	49(100)	_	_	_	49(100)	_	_	_	
AC Cells									
Day 1	_	23(46.9)	18(36.7)	08(16.3)	_	_	17(34.7)	19(38.8) Very Severe 13(26.5)	<0.001*
Day 7	35(71.4)	14(28.6)	_	_	_	28(57.1)	21(49.2)	_	<0.001*
Day 40	49(100)	_	_	_	44(88.8)	05(10.2)	_	_	0.022*
Viritis									
Day 1	23(46.9)	26(53.1)	_	_	_	18(36.7)	31(63.3)	_	<0.001*
Day 7	21(42.9)	28(57.1)	_	_	19(38.8)	30(61.2)	_	_	0.837
Day 40	49(100)	_	_	_	49(100)	_	_	_	

A comparative analysis of postoperative pain levels and inflammatory symptoms in patients receiving Bromfenac and Nepafenac was conducted on Days 1, 7, and 40.

On day 1, a significant difference was observed in pain levels between the two groups ($p < 0.001$). It was observed, none of the Bromfenac group reported severe pain, while 24.5% of the Nepafenac group did. Most Bromfenac patients reported mild or moderate pain, indicating superior early postoperative pain control compared to Nepafenac. By day 7, the difference between groups was no longer statistically significant ($p = 0.221$). Both drugs showed improvement in pain control, with the majority of patients reporting either mild or no pain. Fisher's exact test also confirmed the lack of significant difference ($p = 0.307$). By day 40, all patients in both groups were pain-free, confirming that both Bromfenac and Nepafenac were effective in long-term pain resolution following ocular surgery.

There was a statistically significant difference ($p<0.001$) in the severity of redness between the Bromfenac and Nepafenac groups on day 1 ($p = 0.027$). A higher percentage of patients in the Bromfenac group experienced only mild redness (59.2%), while a proportion of patients in the Nepafenac group experienced severe redness (38.8%) compared to only 20.4% in the Bromfenac group. This suggests that Bromfenac was more effective in reducing postoperative inflammation on the first day. By day 7, no significant difference was observed between the two groups ($p = 0.836$). Over 60% of patients in both groups showed complete resolution of redness, and the remaining patients had only mild redness. This indicates that both medications were similarly effective in resolving inflammation by the end of the first postoperative week. At day 40, all patients were free of redness, indicating full recovery and no residual inflammation.

There was a statistically significant difference in anterior chamber cell grading between the two groups ($p < 0.001$). The

Bromfenac group showed more favourable inflammation control, with 46.9% presenting only mild cells. In contrast, 26.5% of Nepafenac patients had very severe AC cells, and none had only mild. These results strongly suggest that Bromfenac is more effective in controlling early postoperative inflammation**.** Differences remained significant ($p < 0.001$). 71.4% of Bromfenac patients had normal AC cells. Nepafenac patients still showed mild (57.1%) and moderate (42.9%) inflammation, while the Bromfenac group had no moderate cases at all. By day 40, most patients in both groups were free of AC cells. However, 5 patients (10.2%) in the Nepafenac group still showed mild inflammation, while all Bromfenac patients were normal. The difference was statistically significant ($p = 0.022$). Clinically, this suggests a slightly better long-term anti-inflammatory effect of Bromfenac**.**

DISCUSSION

A comparative study compared the clinical findings of Bromfenac and Nepafenac, two commonly used NSAIDs, on postoperative symptoms and inflammation following cataract surgery. The study measured pain, conjunctival erythema, anterior chamber (AC) cell reaction, vitritis, visual acuity, BCVA, pupil shape, fundus condition, and allergic predispositions.

One of the main postoperative considerations after cataract surgery is pain. Donnenfeld et al. (2021) showed that Bromfenac was more lipophilic and had a longer intraocular half-life and is a stronger and more sustained inhibitor of the cyclooxygenase-2 (COX-2), which stimulates the production of prostaglandins, causing pain and inflammation.[13] This might be the reason that there is no severe pain in the use of Bromfenac, as in the study at hand. At day 7, the statistical difference between pain scores was no longer significant ($p = 0.307$), which indicates that Nepafenac eventually matched up when it comes to analgesic efficacy. Walters et al. (2022) support with their findings that, despite the delayed onset of action of Nepafenac as compared to Bromfenac, Nepafenac provides sufficient anti-inflammatory control within a week.[14] Both medications were proven to be long-term effective since all the patients in both groups were pain-free at day 40.

Another major symptom of ocular inflammation is postoperative conjunctival hyperemia (redness). Shoji et al. (2012) and others have recorded similar results by comparing NSAIDs in the treatment of post-cataract inflammation, which has shown that Bromfenac effectively inhibited pre-cataract inflammatory effects such as conjunctival injection and ciliary hyperemia earlier than Nepafenac and other NSAIDs[14]. The fact that no significant difference in redness was noted by day 7 ($p = 0.836$) in the present study suggests that the two drugs are ultimately effective in inhibiting inflammation. McColgin et al. (2021) found that most NSAIDs normalize ocular redness within one week at the end of postoperative administration.[15]

At day 40, all patients had healed redness in both groups, and there was no residual inflammation of the ocular surface. This is also consistent with the standard clinical course after cataract surgery, whereby inflammatory features typically improve within one month, given the patient has no associated complications, like uveitis or chronic dry eye disease.

AC cell reaction is an important hallmark of intraocular inflammation. The results are supported by Gaynes et al. (2022), who showed that Bromfenac had great prophylactic effects on reducing AC cellular infiltration as an anti-inflammatory agent employed during ocular surgery.[16] The pharmacology is in the strong COX inhibition with Bromfenac, which decreases the quantity of prostaglandins and leukocyte migration. On day 7, the mean difference was still significant ($p < 0.001$), in which 71.4% of the Bromfenac group had a normal AC status, and just 57.1% in the Nepafenac group. This long-term effect can give the patients rapid visual recovery and relief. At

day 40, both groups have substantial resolution of inflammation; however, 10.2 % of patients in the Nepafenac group had residual mild inflammation, which was found to be statistically significant ($p = 0.022$). This means that Bromfenac is more effective in the long-term effect of anti-inflammatory activity.

Vitritis or inflammation of the vitreous is less prevalent but also pertinent to cataract surgery in patients with diabetes or underlying posterior segment illness. This finding correlates with those of Gungor et al. (2021), who showed that Bromfenac penetrates deeper into the ocular tissue than Nepafenac and, as a result, attains therapeutic levels in the posterior segment[17]. Though both medications effectively clear vitritis at day 40, Bromfenac seems to be better in the early postoperative period, which may help to prevent such complications as cystoid macular edema (CME).

Clinical outcomes obtained with Phacoemulsification and Small Incision Cataract Surgery (SICS) were also compared. This indicates that the anti-inflammation regimen (particularly Bromfenac) was the important factor that reduced surgical trauma-induced inflammation.[18] Similar results were also reported in other studies, like by Vajpayee et al. (2023), who noted that anti-inflammatory prophylaxis is saving a lot of postoperative inflammation in SICS, so it is almost equivalent to Phaco as far as clinical recovery is concerned.[19]

This research offers very convincing results that Bromfenac is effective in the management of postoperative early symptoms, especially pain, redness, and reaction of AC cells. Although in both Bromfenac and Nepafenac the resolution was complete by day 40, the earlier control of symptoms with Bromfenac could increase patient satisfaction, decrease the chances of complications, and speed up visual rehabilitation[20]. This holds practical consequences for the regular cataract surgery, particularly in patients with a greater risk of developing inflammation, diabetics, or patients undergoing SICS. A drug with a shorter onset time and longer anti-inflammatory duration of action can help to minimize follow-ups, the use of additional medication, and the cost of healthcare.

Overall, both surgical techniques resulted in satisfactory postoperative outcomes across all measured parameters, with only minor differences in fundus status and visual acuity distribution. These findings suggest that both Phaco and SICS are equally effective in terms of anatomical and functional recovery when performed appropriately. This study affirms that Bromfenac and Nepafenac have long-term efficiency in the control of postoperative inflammation after cataract surgery. Bromfenac, however, has better efficacy in managing early postoperative symptoms of pain, conjunctival redness, AC, and vitritis. Based on the above findings, which are consistent with the literature, it can be argued that Bromfenac could be considered the agent of choice regarding fast symptom resolution and improved patient comfort in the early postoperative period.

CONCLUSION

The study found that Bromfenac was significantly more effective than Nepafenac in reducing early postoperative inflammation, particularly pain, AC cells, and vitritis on Day 1. By Day 7, the difference between the two groups diminished, and by Day 40, complete resolution of inflammation was observed in all patients. Visual outcomes and fundus status were generally comparable across both groups. These findings revealed that Bromfenac may offer better early postoperative anti-inflammatory control, although both drugs are ultimately effective in long-term recovery.

LIMITATIONS

. This study is restricted to its sample size.
. This study analyzed clinical signs only. self-reported pain, being subjective, may cause variability. Subclinical CME cannot be

measured due to the lack of optical coherence tomography (OCT) data.
3. This study was a single-center-based study that may introduce institutional bias and limit the external validity of the findings.
4. The absence of a corticosteroid group limits the understanding of how these NSAIDs compare to other standard anti-inflammatory treatments.

RECOMMENDATIONS

1. Conducting larger studies across multiple centers would enhance the statistical power and generalizability of the results to larger populations.
2. Future research should consider including patients with a wider range of ocular and systemic conditions to better reflect clinical practice.
3. More standardized and validated tools should be used to measure patient comfort, quality of life, and visual function post-operatively.
4. Comparative trials involving corticosteroids could provide a more comprehensive picture of where Bromfenac and Nepafenac stand in the therapeutic hierarchy.

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