Original Research Article

A study to compare anti-inflammatory effect of topical prednisolone acetate and topical bromfenac after phacoemulsification

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Received: 21-10-2020 / Revised: 13-11-2020 / Accepted: 24-12-2020

Abstract

Background: Phacoemulsification can result in postoperative inflammation which increases the risk of complications like increased intraocular pressure (IOP), uveitis, cystoid macular oedema and pain. We aimed to evaluate the effectiveness of topical non-steroidal anti-inflammatory drug bromfenac and topical prednisolone in controlling intraocular inflammation after uneventful cataract surgery and compared anterior chamber inflammation and pain between two different treatments.**Methods:** 200 patients undergoing phacoemulsification cataract surgery with posterior chamber intraocular lens implantation were randomly assigned to receive either Bromfenac (0.09%) eye drops or prednisolone acetate (1%) eye drops as their postoperative anti-inflammatory medication with 100 cases in each group. Rest all the postoperative medications were common in both the groups. The patients were examined on day 1, day 7, day 21, and day 42 after surgery. Postoperative inflammation was evaluated using slit-lamp to assess the signs of inflammation in the form of aqueous cells and flare. Assessment of pain was done subjectively on each follow up visit.**Results**: Both the drugs were equally effective in controlling postoperative inflammation and pain.**Conclusions**: Bromfenac (0.09%) is an effective drug in controlling ocular inflammation after uneventful cataract surgery having effect similar to topical Prednisolone acetate (1%) with minimal side effects and less frequent dosing.

Keywords: Bromfenac, Cataract, Inflammation, Prednisolone acetate, phacoemulsification

Introduction

Cataract occurs due to protein denaturation in the lens.[1] It is clouding of the normally clear and transparent lens of the eye. Mostly both the eyes are affected. It is one of the leading causes of blindness in the world today, accounting for about 50% of blindness worldwide.Senile cataract is the most common type of acquired cataract affecting people equally of both sexes above the age of 50 years. It is the most common cause of blindness, accounting for nearlyhalf(47.8%) of all cases of blindness.[2] According to World Health Organisation[WHO] an estimated 20 million people worldwide are blind because of bilateral cataract.[3] WHO defines blindness as visual acuity of less than 3/60, or a corresponding visual field loss to less than 10°, in the better eye with the best possible correction. It is estimated that over 90% of the world's visually impaired lives in developing countries.[4]Cataract surgery induces inflammatory process in the

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postoperative period. These inflammatory processes may be associated with many complications like keratitis, corneal oedema, cystoid macular oedema, uveitis and increased intraocular pressure.[5] Corticosteroids control the inflammatory process by inhibiting the release of arachidonic acid from phospholipids by inhibiting the enzyme phospholipase A2 and hence decrease the release of pro-inflammatory mediators like prostaglandins and cytokines. By inhibiting the enzyme cyclooxygenase and leukotrienes, the release of prostaglandin is decreased and by inhibiting the enzyme lipo-oxygenase release of cytokines is decreased.[6]

NSAIDs have anti-inflammatory effects by acting on cyclooxygenase pathway and analgesic effects through inhibition of prostaglandins. NSAIDs act on cyclo-oxygenase and prevent the formation of PG. Cyclo-oxygenase are responsible for the conversion of arachidonic acid to endoperoxides in ocular tissue. [7] With the use of topical steroids there is increased risk of raised IOP, glaucoma, increased risk of infection, delayed wound healing. So, NSAIDS should be preferred over steroids after cataract surgery to decrease intraocular inflammation.This study was conducted to compare the efficacy of topical prednisolone acetate (1%) and topical bromfenac (0.09%) in patients undergoing uneventful phaco-emulsification to control postoperative intraocular inflammation.

Materials and method

This Prospective hospital-based study was conducted on 200 patients attending the Ophthalmology OPD of Muzaffarnagar medical college and hospital with a clinical diagnosis of cataract requiring surgery. The study was approved by the Ethical Committee, and the authors did not had any financial interest in the products used in this study. 200 patients who underwent uneventful phacoemulsification with posterior chamber intraocular lens implantation were randomized into two groups (group 1 and group 2) of 100 patients each to receive topicalsteroids in group 1 and topical NSAIDs in group 2.

Inclusion criteria

Patients attending the eye OPD of Muzaffarnagar medical college who underwent uncomplicated phaco-emulsification.

Both male and female above 40 years of age were included.

Exclusion criteria

1. Patient who were non-compliant
2. Individual having hypersensitivity reactions to topical NSAIDS or Steroids
3. Any eye disease
4. Glaucoma patient.
5. Severe dry eye patient.
6. Cases where there were intraoperative complications.
7. Patients with any systemic illness (such as tuberculosis, diabetes etc.)
8. Patients with ocular trauma
9. Patient taking medication for any other eye diseases.

Patients were randomly divided into two groups:
Group1 and Group2.

Group 1 Patients were given Prednisolone acetate eye drops 6 times per day in postoperative 1st week, 5 times per day in postoperative 2nd week, 4 times per day in postoperative 3rd week and gradually tapered in 6 weeks duration.

Group 2 Patientswere given Bromfenac eye drop 4 times per day × 6 weeks.Patients in both the groups were given topical antibiotic Moxifloxacin (0.5%) four times a day for six weeks along with oral medications. They were examined on day 1, day 7, day 21 and day 42 postoperatively. Visual acuity, detailed Slit lamp examination, fundus examination and intraocular pressure was recorded on each visit.

GRADING:

1. Cells in the anterior chamber (slit-lamp examination, using a 1 mm slit beam):[8]

a) Grade 0: None.
b) Grade 0.50: 1–5 cells.
c) Grade 1: 6–15 cells.
d) Grade 2: 16–25 cells.
e) Grade 3: 26–50 cells.
f) Grade 4: >50 cells.

2. Flare in the anterior chamber (slit-lamp examination, using a 1 mm slit beam):[8]

a) Grade 0: None.
b) Grade 1: Faint.
c) Grade 2: Moderate (iris/lens details clear).
d) Grade 3: Marked (iris/lens details hazy).
e) Grade 4: Intense (fibrin/plastic aqueous).

3. Grading of pain: (subjective)

a) Grade 0 no pain
b) Grade 1 mild pain
c) Grade 2 moderate pain
d) Grade 3 severe pain
e) Grade 4 very severe pain

Ophthalmic examination: All subjects were examined for detailed ocular examination using-

Snellen's chart ,Slit lamp biomicroscope,Direct ophthalmoscope ,Indirect ophthalmoscope,Applanation tonometer

Slit lamp examination: Grading of anterior chamber cells and flarewas done by slit lamp using the narrowest slit which was 1mm wide and 1mm height. The Cells and flarewere graded according to SUN (standardization of uveitis nomenclature) working group grading scheme.

Pain: Patientswere asked to rank their eye pain subjectively on a pain scale from grade 0 to 4.

Statistical analysis: Appropriate Statistical methods using SPSS 19.0 were carried out. Qualitative data were evaluated by Chi Square test.

Observation and Results

Anterior Chamber cells

Day 1

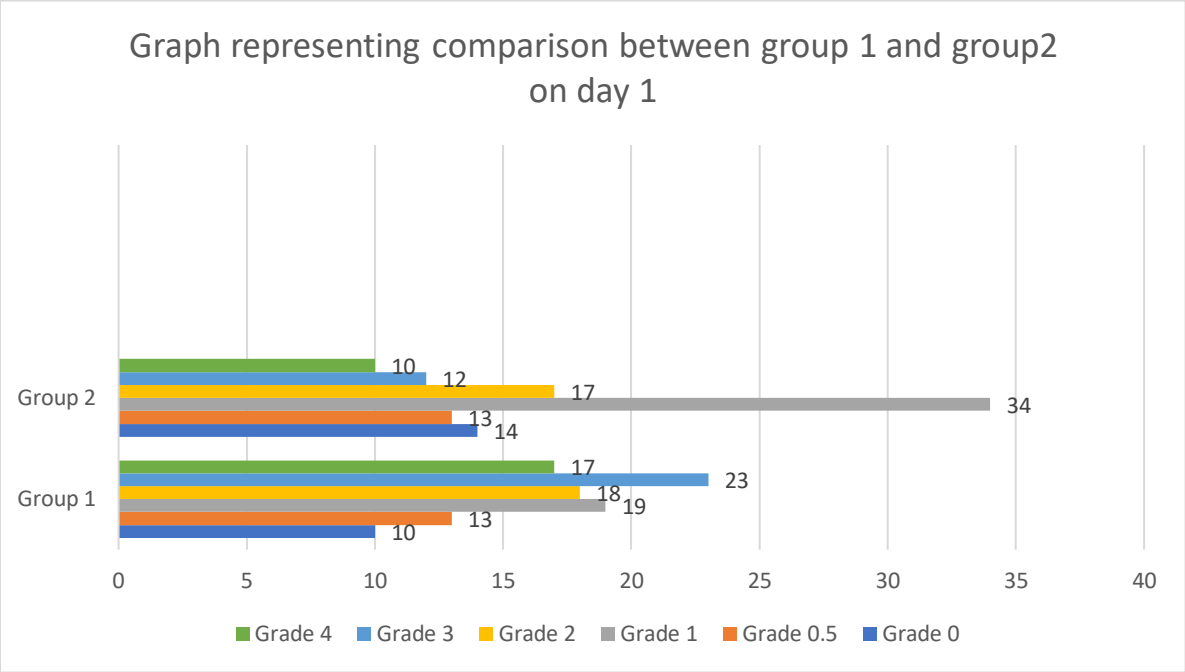

Fig 1: Clustered bar representing comparison between prednisolone acetate and bromfenac on day 1 (anterior chamber cells)

Maximum number of patients were observed with grade 3 AC cells in group1.
Minimum number of patients were observed with grade 4 AC cells in group 2.

Day 7

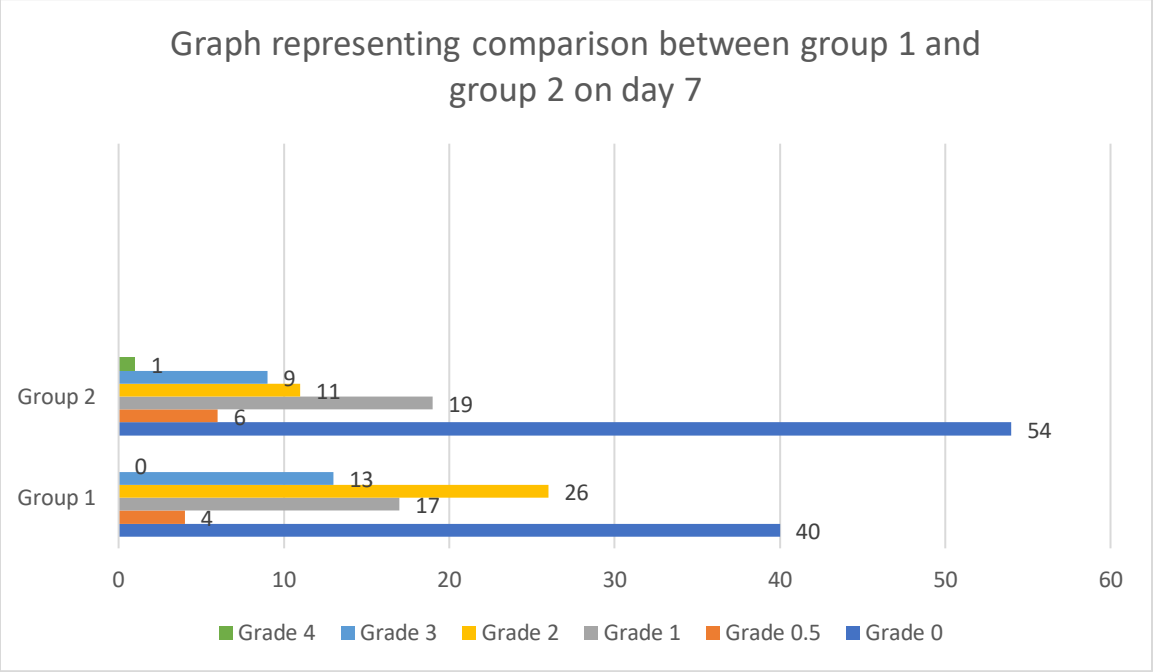

Fig 2:Clustered bar representing comparison between prednisolone acetate and bromfenac on day 7 (anterior chamber cells)

Maximum number of patients were observed with grade 0 anterior chamber cells.In group 1 no patients were observed with cells of grade 4 and one patient was observed with grade 4 AC cells in group 2.

Day 21

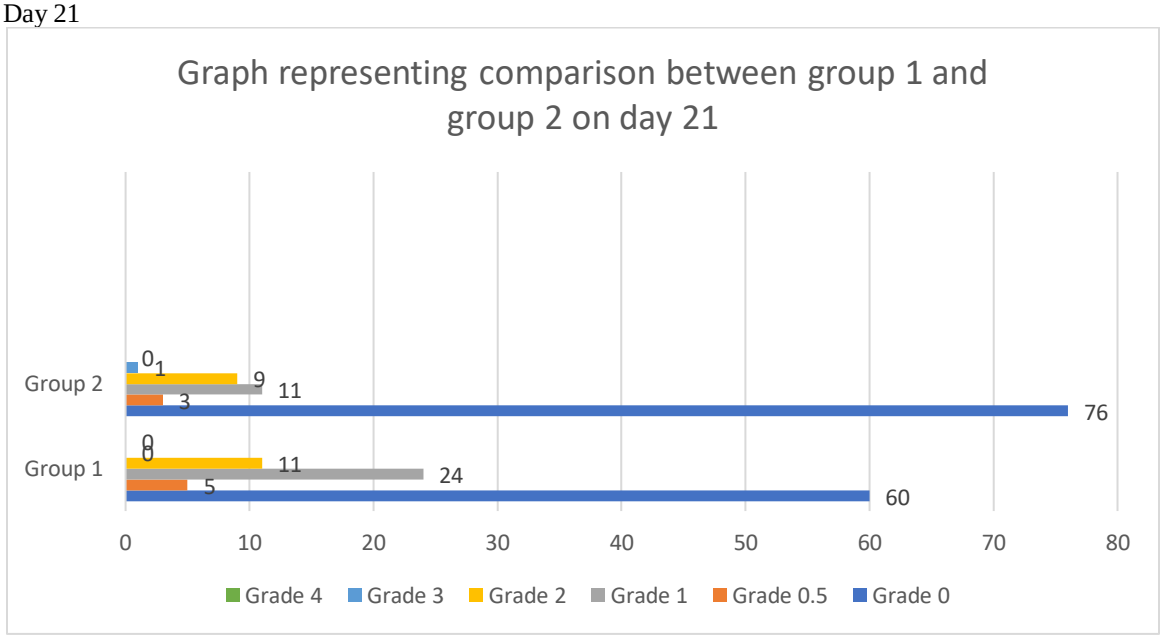

Fig 3:Clustered bar representing comparison between prednisolone acetate and bromfenac on day 21 (anterior chamber cells)

We observed the maximum number of patients with no cells.No patient was observed with grade 4 AC cells.

Day 42

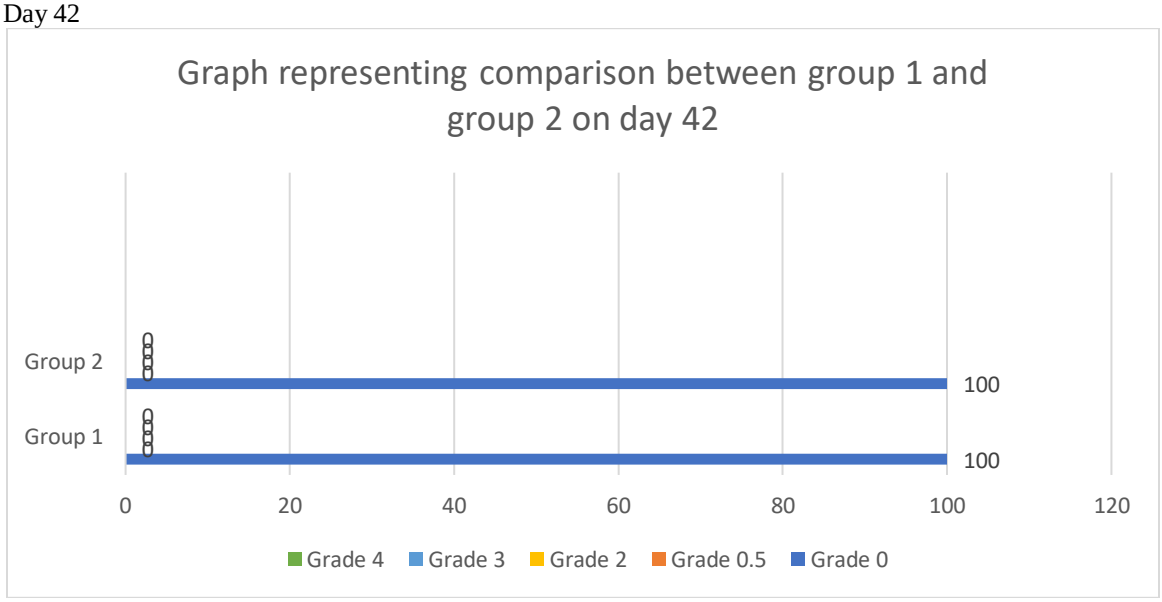

Fig 4: Clustered bar representing comparison between prednisolone acetate and bromfenac on day 42 (anterior chamber cells)

None of the patients were observed with cells on day 42.

Anterior Chamber Flare

Day 1

Table 1: Comparison of group 1 (prednisolone acetate) and group 2 (bromfenac) anterior chamber flare on day 1

	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4
Group 1	32	39	23	6	0
Group 2	65	18	9	7	1

Chi square value=5
Degree of freedom=3
P value=0.2

Day 7

Table 2: Comparison of group 1 (prednisolone acetate) and group 2 (bromfenac) anterior chamber flare on day 7

	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4
Group 1	71	23	6	0	0
Group 2	83	9	7	1	0

Chi square value=NaN
Degree of freedom=3
P value=NaN

Day 21

Table 3: Comparison of group 1 (prednisolone acetate) and group 2 (bromfenac) anterior chamber flare on day 21

	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4
Group 1	93	7	0	0	0
Group 2	94	5	1	0	0

Chi square value=NaN
Degree of freedom=3
P value=NaN

Day 42

Table 4: Comparison of group 1 (prednisolone acetate) and group 2 (bromfenac) anterior chamber flare on day 42

	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4
Group 1	100	0	0	0	0
Group 2	100	0	0	0	0

Chi square value=0
Degree of freedom=1
P value=1

Pain

Day 1

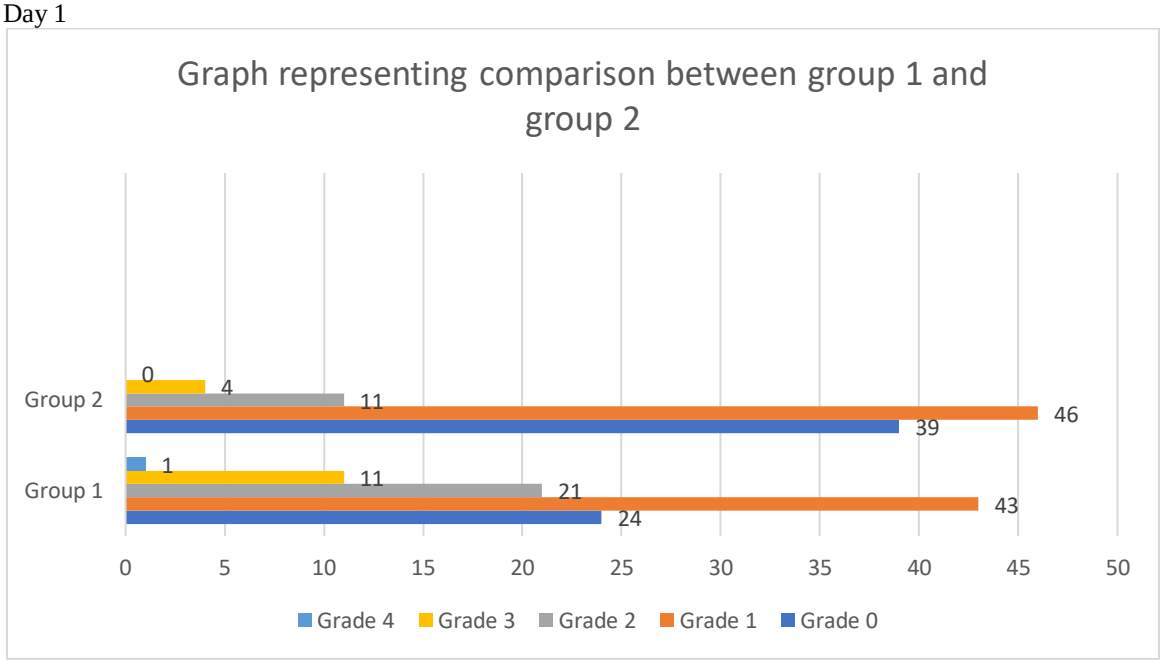

Fig 5: Clustered bar representing comparison between prednisolone acetate and bromfenac on day 1 (pain) Maximum number of patients were observed with mild pain.

One patient in group 1 was observed with very severe pain on day 1.

Day 7

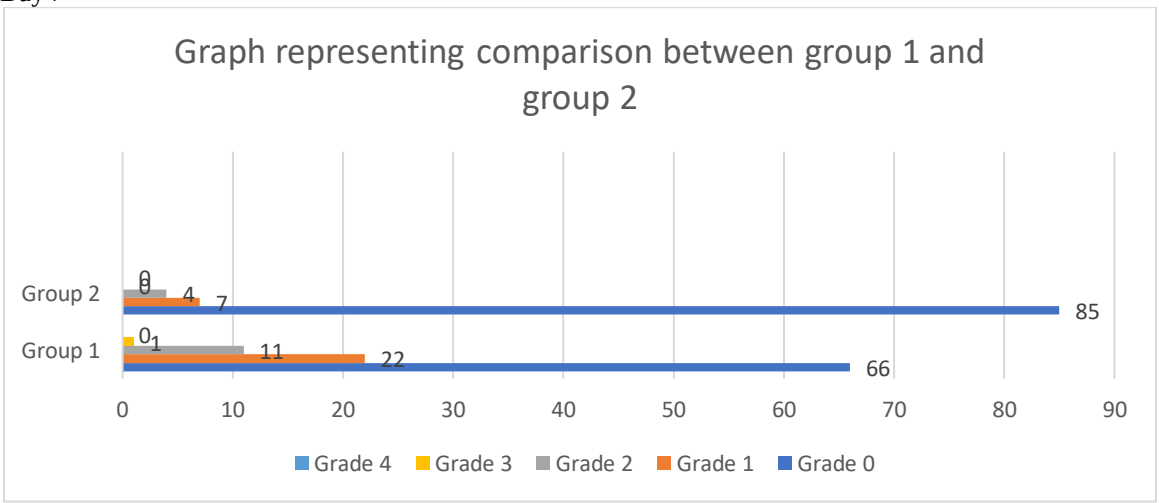

Fig 6: Clustered bar representing comparison between prednisolone acetate and bromfenac on day 7 (pain) Maximum number of patients were observed with no pain.

One patient was observed with severe pain.
None of the patients was observed in group 2 with severe and very severe pain.
Day 21

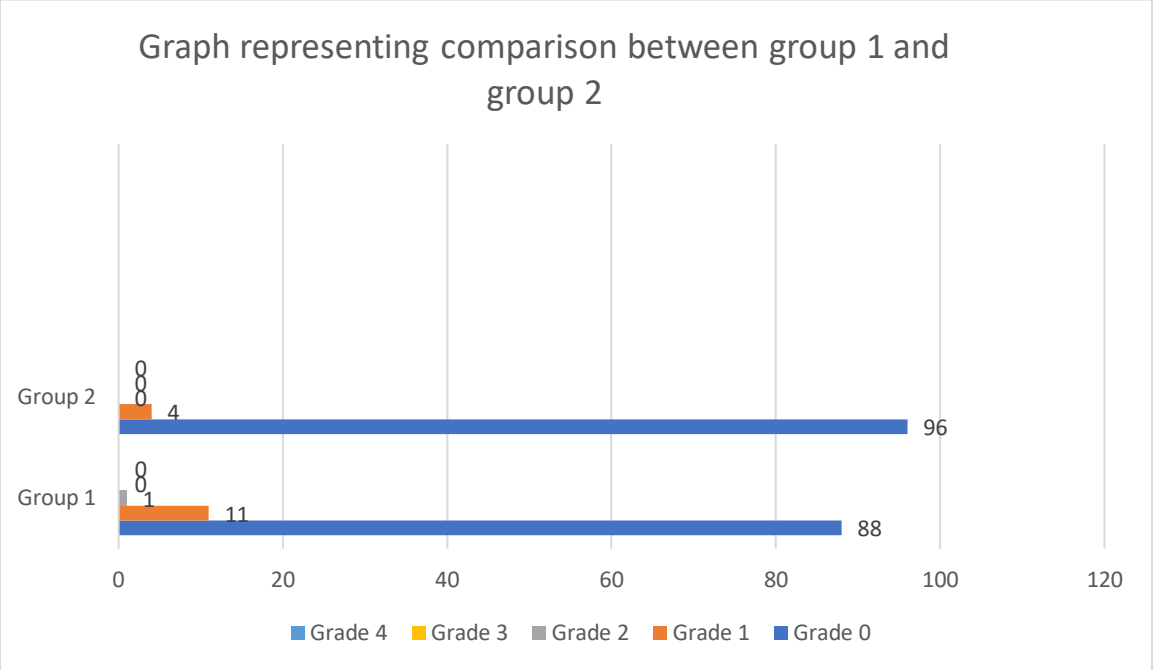

Fig 7: Clustered bar representing comparison between prednisolone acetate and bromfenac on day 21 (pain)

Maximum number of patients were observed with no pain in group 2.
On day 21 one patient was observed with moderate degree of pain in group 1, whereas no patient was observed in both the groups with grade 3 and grade 4 pain scale.
Day 42

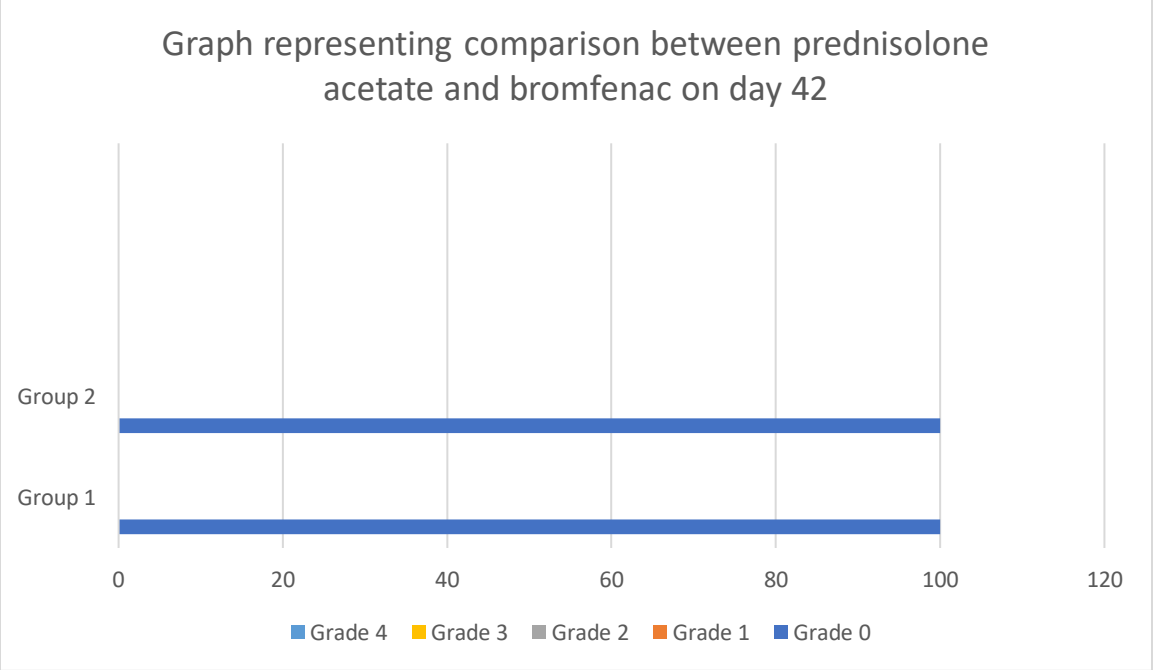

Fig 8: Clustered bar representing comparison between prednisolone acetate and bromfenac on day 42 (pain)

No patient was observed with pain in both the groups on day 42.

Table 5: Comparison of group 1 and group 2 on day 42

	Group 1	Group 2	P value
Cells	100	100	1
Flare	100	100	1
Pain	100	100	1

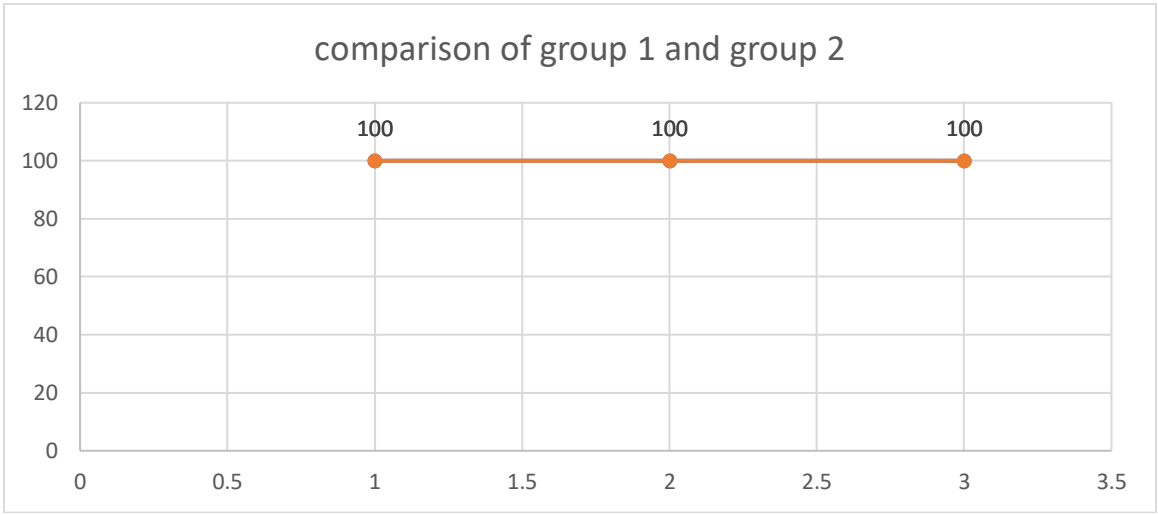

Fig 9: Scatter diagram representing group 1 and group 2 comparison for anterior chamber cells, anterior chamber flare and pain on day 42.

The difference between the group 1 (prednisoloneacetate) and group 2 (bromfenac) was not significant as P value is 1.

Discussion

We performed a prospective hospital-based study to compare the efficacy of topical steroid prednisolone acetate (1%) with topical NSAID bromfenac (0.09%) after uneventful cataract surgery. The anti-inflammatory and analgesics action of the drugs (prednisolone acetate and bromfenac) used in this study were assessed by comparing the signs of inflammation (aqueous cells and flare) and pain in both the groups. Inflammation after cataract surgery is due to the breakdown of blood-aqueous barrier which can be assessed by fluorophotometry or slit-lamp examinations after cataract surgery.

Corticosteroids inhibit the release of arachidonic acid and production of all by-products, including prostaglandins. [9] NSAIDs inhibit prostaglandins by acting on cyclooxygenase pathway via arachidonic acid cascade and function as anti-inflammatory and analgesic effects. Demographic details: - Kawaguchi *et al*. found that bromfenac has a more rapid onset of anti-inflammatory activity than diclofenac on measuring aqueous flare levels post cataract surgery.Group A (prednisolone acetate) had the mean age of 59.54 years, Group C (bromfenac) had the maximum mean age of 62.60 years.Patricia Abreu Ferreira da Cunha *et al*. did a prospective, randomized, double-blind, parallel-group study of 108 patients who underwent phaco-emulsification and intraocular lens implantation. The average age was 71 years in both the groups. Trivedi H R et al did a study in which 100 post cataract patients were divided into two groups, Bromfenac 0.09% and prednisolone acetate 1%. It was observed that Group A (bromfenac) has mean age of 58.82 years with a standard deviation of 5.329 and Group B (prednisolone acetate) has mean age of 58.34 years with standard deviation of 5.479. In our study we observed group 1 had mean age of 60.64 and group 2 had mean age of 56.88.Patricia Abreu Ferreira da Cunha *et al*. did a prospective, randomized, double-blind, parallel-group study of 108 patients who underwent phaco-emulsification and intraocular lens implantation. Group I comprised 28 female patients and 19 male patients, and Group II comprised 45 female patients and 16 male patients. Trivedi H R *et al.* did a study in which 100 post cataract patients were divided into two groups, Bromfenac 0.09% and prednisolone acetate 1%. In Group A 72% patients were female and 28% were male

as compared to 66% females and 34% males in Group B. In our study both groups have 47% was male and 53% was female.Results- Kawaguchi *et al*. found that bromfenac had a more rapid onset of anti-inflammatory activity than diclofenac on measuring aqueous flare levels post cataract surgery.They noted that at each follow-up visit, flare was much lower in the bromfenac group than in the diclofenac group. We also observed that Flare was decreasing at each visit in the bromfenac group.

Simone *et al*. observed that prednisolone acetate was more effective in reducing intraocular inflammation by day 7 after cataract surgery than ketorolac although, difference was resolved by day 28. In a study done by el-Harazi *et al*. it was found that ketorolac tromethamine 0.5% may be as effective and safe as prednisolone acetate 1% in controlling inflammation following cataract extraction. But we found that prednisolone 1% was more effective in controlling postoperative intraocular inflammation in terms of reducing anterior chamber cells and flare.

Takamatsu *et al*. found that bromfenac ophthalmic solution exerted anti-inflammatory effects that was more than diclofenac ophthalmic solution.Subjects at 2 facilities were divided into bromfenac and diclofenac treatment groups after uncomplicated cataract surgery. Both the facilities were divided into bromfenac and diclofenac groups. A retrospective analysis of data from the first facility included a total of 228 eyes from 157 subjects, whereas a prospective analysis from the second facility included a total of 58 eyes from 30 subjects. Early differences in the flare level seen between the two treatment arms disappeared by the 28th postoperative day. However, in our study the difference in flare was seen till the 28th day and was comparable on the 42nd day. However few patients in the bromfenac group still had mild anterior chamber cells on the 42nd day.

Patricia Abreu Ferreira da Cunha *et al*. did a prospective, randomized, double-blind, parallel-group study of 108 patients who underwent phaco-emulsification and intraocular lens implantation.After random assignment, 47 eyes received the fixed combination of topical 0.3% gatifloxacin/ 1% prednisolone drops and 61 eyes received the same dosage of the individual components as separate solutions four times a day. we observed at the end of 42nd day less than two cells in both the groups (grade 0.5) whereas Flare was similar for both groups during the study, gradually decreasing over time in each follow up visit which was similar to finding of cunha da *et al.*

Trivedi H R *et al*. did a study in which 100 post cataract patients were divided into two groups, Bromfenac 0.09% and prednisolone acetate 1%. At the end of 30th day they observed no patients with anterior chamber cells. It was found that all patients in both the groups had no signs of anterior chamber flare at any day post-surgery and here we observed that at the end of 21st day one patient in the bromfenac group had cells of grade 3 whereas no patient was observed with anterior chamber flare in both groups.

Misra *et al*. conducted a study of 60 patients and confirmed that topical 1% prednisolone acetate is more effective than topical 0.1% dexamethasone sodium in controlling postoperative inflammation. Kessel *et al*.concluded that topical NSAIDs are effective in controlling postoperative inflammation after cataract surgery. Donnenfeld *et al.*documented that bromfenac 0.09% ophthalmic solution was effective for the rapid resolution of ocular pain after cataract surgery. In our study we observed that prednisolone acetate is more effective in controlling postoperative inflammation as compared to bromfenac, however at the 42nd day both the drugs are equally effective in controlling pain and inflammation.In our study, all patients of cataract surgery had excellent post-operative management of inflammation as well as pain, with either prednisolone or bromfenac. (P value = 1)

Conclusion

Bromfenac (0.09%) is an effective drug in controlling ocular inflammation and pain after uneventful cataract surgery having effect similar to topical prednisolone acetate (1%) with minimal side effects and less dosing schedule leading to better compliance. So, bromfenac is a better alternative to prednisolone as it is equally potent in its anti-inflammatory properties as steroids, with fewer side effects, better tolerability and requires only four timesper day instillation and hence is more convenient.

Limitation of the study

Every person has its own body defence mechanism which helps in the healing process and this healing process cannot be counted. So, this factor has not been taken into consideration. It'seffect cannot be determined by any study and methods.

The two groups did not show statistically significant differences in improvement for any of the variables. There were no side effects with topical bromfenac and it was well tolerated. Hence, P value is 1.

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Conflict of Interest: Nil
Source of support:Nil