

Study on the Effect of Topical Pre-operative Nonsteroidal Anti-inflammatory Drugs in Maintaining Mydriasis during Small Incision Cataract Surgery

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Abstract

A prospective, randomized, double masked, single centered comparative study done in the Bangladesh Naval Ship Patenga, Chattogram, Bangladesh, from July 2021 to June 2022, to assess the clinical benefits and effectiveness of prophylactic pre-operative topical administration of NSAIDs in maintaining mydriasis during small incision cataract surgery. Thirty patients underwent small incision cataract surgery with intra ocular lens implantation were randomized to compare the efficacy of topical NSAIDs drops (Group-A) and placebo drops (Group-B) in maintaining peroperative mydriasis. Balanced salt solution containing non preservative adrenaline was used in all patients. Pupil size was measured prior to the corneal incision and after the completion of the operation. The two groups were analyzed with respect to the changes in pupillary diameter at the beginning and at the end of the operation. The change in pupil size was significantly different among the two groups at the end of the surgery. The mean vertical and horizontal diameter of the two groups were near about similar at the beginning of the surgery. Significant differences were seen after IOL implantation with the NSAIDs group having the larger mean diameter in both vertical ($P=0.003$) and horizontal ($P=0.008$) pupillary measurements at the conclusion of surgery. Topical NSAIDs has been shown to be a more effective inhibitor of meiosis during per operative uncomplicated small incision cataract surgery and provides a more stable mydriatic effect during surgery compared to the placebo group.

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Introduction

In developed countries, phacoemulsification is the method of the first choice for performing cataract surgery. However, in many developing countries, cataract is the leading cause of blindness and phacoemulsification is very expensive and not available everywhere. Phacoemulsification is difficult in hard nucleus and hypermature cataract, requires expensive equipments, expensive disposable and expensive foldable lens. Significant efforts are being undertaken to increase the output of cataract surgical services in such countries. Small incision cataract surgery has emerged as the most suitable alternative to the phacoemulsification to achieve a best unaided visual acuity with rapid

postsurgical recovery and minimal surgery related complications.¹

During cataract surgery all the manipulations are done behind the iris in the posterior chamber of eye. If the visibility of the structure of the PC can be increased by maintaining the dilatation of the pupil then surgery can be performed more easily. Maintaining of mydriasis is necessary to facilitate proper continuous curvilinear circular capsulorrhexis, safe delivery of the nucleus,

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uncomplicated complete removal of the cortex and implantation of intra ocular lens.² It has been reported that when pupillary diameter >6 mm is maintained during surgery then the incidence of posterior capsular rupture is reduced by half.³

Topical adrenergic agonists such as phenylephrine in combination with a cholinergic antagonist such as tropicamide are used to dilate pupil pre-operatively. Nevertheless, in many eyes subsequent onset of miosis begins soon after the surgeon makes entry to the anterior chamber.⁴

Surgical trauma triggers the inflammatory cascade in the eye and thereby releasing a great number of mediators such as prostaglandins, prostacyclins, thromboxane A₂, Leukotriens, lipoxyns and platelet activating factor. These substances are involved in pain, conjunctival hyperemia, miosis, change in intraocular pressure, posterior synechiae, posterior capsular opacity and cystoid macular oedema.⁵

When release of these chemical mediators is inhibited with topical NSAIDs pre-operatively then mydriasis is adequately maintained during surgery thereby decreasing per-operative complications such as posterior capsular rupture.⁶ Abdel in Cairo, Egypt showed that topical NSAIDs is effective in maintaining adequate per operative mydriasis during cataract surgery.⁷ Our study is specifically aimed to measure the pupillary diameters at the beginning of the surgery and at the conclusion of the surgery and also determine the impression that pre-operative NSAIDs give whiter eyes post-operatively. We therefore looked for a clinically observable difference in post-operative inflammation on the first post-operative day.

Methods

This was a prospective, randomized, double masked, single centered, placebo-controlled study in patients undergoing small incision cataract surgery (SICS) in Bangladesh Naval Ship Patenga (BNS Patenga), Chattogram, Bangladesh, from July 2021 to June 2022. Consecutive patients selected for elective extracapsular cataract extraction (ECCE) with posterior chamber intraocular lens (PCIOL) implantation were underwent through ophthalmic examination. Thirty patients who met the inclusion/exclusion criteria were included in this study.

Inclusion criteria:

1. Fifty years age or older.
2. Regardless of race or gender diagnosed with senile cataract.
3. Scheduled for surgery by SICS with IOL implantation.

Exclusion criteria:

1. Pregnancy or lactational stage.
2. Known hypersensitivity to NSAIDs.
3. Concurrent medication with systemic drugs with autonomic side effects.
4. Previous ocular surgery.
5. History of recurrent uveitis and/or evidence of iris sphincter atrophy.
6. Use of any topical ophthalmic medications.
7. Non compliance with the protocol.

All patients received pre-operative dilating drops. In addition, Group-A received topical NSAIDs and Group-B received Placebo drops 3 times daily for 3 days prior to days of surgery.

All surgery was performed by the same surgeon using standard ECCE technique with a corneal incision under local anaesthetic. Balanced salt

solution containing adrenaline was used for irrigating the anterior chamber. Pupillary diameter was recorded in millimeters using a caliper by the surgeon prior to the corneal incision and at the end of the operation following reformation of the anterior chamber. Research Ethics Committee of the BNS, Bangladesh, approved this study and informed written consent from all patients were taken prior to this study.

Results

Among 30 patients, 20 were assigned for topical NSAIDs (Group-A) eye drop, while the rest 10 were assigned for placebo (Group-B) eye drop. No intra-operative complications were encountered among these 30 cases. There was also no treatment related toxicity related to the use of topical NSAIDs and placebo eye drops. With respect to maintenance of mydriasis during cataract surgery, the average pre-operative vertical pupillary diameter was comparable ($P=0.10$) for both groups (8.55 ± 0.89 in Group-A and 8.36 ± 0.76 in Group-B). The vertical pupillary diameter size at the end of the surgery was significantly ($P=0.04$) different (4.90 ± 1.04 for Group-A and 4.30 ± 0.90 for Group-B). Total reduction of vertical pupillary diameter from the beginning of the surgery to the end of the surgery was significantly less in NSAIDs Group-A (3.45 mm) compared to the placebo Group-B (4.1 mm) (Table-I). Similarly, the average pre-operative horizontal pupillary diameter was comparable ($P=0.24$) for both groups (8.50 ± 0.62 for Group-A and 8.20 ± 0.79 for Group-B). The size of the pupil at the end of surgery was significantly ($P=0.024$) different in two groups (5.20 ± 0.89 in Group-A and 4.30 ± 1.00 in Group-B). The total reduction of horizontal pupillary diameter from the beginning of the surgery to the end of the surgery was

significantly less in NSAIDs Group-A (3.21 mm) compared to placebo Group-B (3.91 mm) (Table-II).

Table-I: Vertical pupillary diameter at two stages of cataract surgery (n=30)

Parameter	NSAIDs (n=20)	Placebo (n=10)	Rmk (P)
Before anterior chamber entry	8.55 ± 0.89	8.36 ± 0.76	0.10
At the end of the surgery	4.90 ± 1.04	4.30 ± 0.90	0.04
Difference between two steps	3.45 ± 0.98	4.04 ± 0.90	0.003

Table II: Horizontal pupillary diameter at two stages of cataract surgery (n=30)

Parameter	NSAIDs (n=20)	Placebo (n=10)	Rmk (P)
Before anterior chamber entry	8.50 ± 0.62	8.20 ± 0.79	0.24
At the end of the surgery	5.20 ± 0.89	4.30 ± 1.00	0.024
Difference between two steps	3.20 ± 0.78	3.91 ± 0.69	0.008

Discussion

During SICS surgery, various manipulations (surgical trauma) like incision, iris manipulation, anterior chamber shallowing and prolong irrigation liberate various chemical mediators which play an important role in causing meiosis. In the current study, topical NSAIDs showed a tendency towards a better effect in the maintenance of mydriasis that was evident at the end of surgery.⁸

NSAIDs specifically inhibit cyclooxygenase enzyme and thereby the synthesis of all pro-inflammatory prostaglandins is downstreamed.⁹ Corticosteroids also inhibit prostaglandins and leukotriens and they down regulate several other inflammatory mediated events. Consequently,

corticosteroids possess far broader anti-inflammatory properties, but it also causes raised intra ocular pressure and in the long-term cystoid macular oedema.

Some of the ophthalmic suspension of the NSAIDs structured as a pro-drug. After administration, it penetrates the cornea and distribute optimally into the iris/ ciliary body and retina/choroid, to provide superior inflammation suppression. On the other hand, active forms of conventional NSAIDs tend to accumulate on the ocular surface and decrease in activity and concentration as they penetrate the ocular surface with time.

It is now well established that NSAIDs reduce intra-operative meiosis during cataract surgery.¹⁰ Our result of maintenance of pupillary dilatation at the conclusion of surgery both in vertical (P=0.003) and horizontal (P=0.008) is comparable to the study done by Sarkar *et al.*¹¹ Moreover, Atanis *et al.* in the Philippines showed that topical NSAIDs is more effective inhibitor of meiosis during cataract surgery.¹²

Our study found a statistically significant reduction in the degree of redness on the first postoperative day in eyes pretreated with topical NSAIDs. This bears out our clinical impression prior to commencing this study. Topical NSAIDs used for 3 days before cataract surgery is reported to be more effective in maintaining mydriasis then the regimen of 1 day pre-operatively.

However, this study provides little support for the routine use of pre-operative NSAIDs in extra-capsular cataract surgery, as the effect of these drugs though statistically significant in some parameters, was small and probably of little

clinical benefit that needs big sample size and more study. Further masked prospective studies are required to assess the usefulness of NSAIDs during this surgical procedure. There is also a need for more clinical investigations to ascertain whether the topical preparations of NSAIDs are useful in the prevention of post-operative cystoid macular oedema and posterior capsular opacity.

Conclusion

NSAIDs are clearly effective in maintaining the mydriasis of pupil intra-operatively and hasten visual recovery when compared with placebo that have poor corneal penetration. There is no level I evidence to suggest that pre-operative use of NSAIDs has long term effect on visual outcome after Extra Capsular Cataract Extraction operation. To conclude, this study provides supportive evidence that NSAIDs are effective in maintaining intra-operative mydriasis during uncomplicated extra capsular cataract extraction compared to the placebo group.

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