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Efficacy of Intra-cameral Mydriatic and Anesthetics- in Small Incision Cataract Surgery (SICS)

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Abstract

Introduction: Aim: *To observe the per operative efficacy (in term of time of papillary dilatation and its maintenance till end of the surgery) of intra-cameral mydriatic and anesthetics(tropicamide 0.02%, phenylephrine 0.31% and lidocaine 1%) (ICM) in small incision cataract surgery (SICS).* ***Materials and Methods:*** *This is a cross sectional analytical study done in the department of ophthalmology Sheikh Hasina Medical College Jamalpur, from 27 April 2022 to 24 May 2022. This study includes 52 eyes of 52 patients. All patients received 0.2 ml intra cameral injection of mydriatic and anesthetic after opening anterior chamber. The pupillary size was measured periodically upto the end of the surgery with caliper.* ***Result :*** *The mean pupil diameter was 7.6 mm±0.72 before capsulorhexis, 7.3mm± 0.78 before lens implantation and 7mm± 0.83 before sub-conjunctival injection(at the end of the surgery). In 94.2 % of the cases papillary diameter was achieved and maintained ≥6mm till the end of the surgery.* ***Conclusion:*** *Intra-cameral combination of tropicamide0.02%, phenylephrine 0.31% and lidocaine 1% could be a good alternative of standard regimen in SICS.*

Keywords: *Small incision cataract surgery, intra-cameral injection, mydriatics, anesthetics, mydriasis, stable pupil dilatation.*

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Introduction:

Small incision cataract surgery (SICS) with intraocular lens (IOL) implantation is one of the most common surgical procedures for cataract in developing countries. The key element of SICS is adequate and stable dilatation throughout the procedure. Insufficient pupillary dilation is an important factor for intra-operative complication[1,2]. As a standard procedure a specifically scheduled topical drops are used for mydriasis and anesthesia. These drugs and preservatives have some disadvantages. They can be toxic to corneal epithelium and endothelium, which may cause corneal decomposition leading to corneal opacity[3]. This routine preparation has several other disadvantages such as its slow penetration through the cornea delays the onset of mydriasis; the limited bioavailability of topically administered substances with significant systemic absorption may increase the risk for systemic side effects (e.g. from the cardiovascular system)[4]; even if good mydriasis is achieved initially with topical mydriatics (TM), the effect tends to wear off during surgery; its time-consuming and inconvenient for patients. Topical anesthesia saves the patients from the risks of globe perforations, optic nerve injury, and life threatening respiratory arrest and above all, the pain and fear perceived because of theperibulbar or retro-bulbar injections. Drug containing mydriatics and anesthetics can be analternative to the traditional preparation for cataract surgery. In 2015, the first ready-to-use, standardized, commercially manufactured medicinal product Mydrane (LaboratoiresThea, France)[5] was approved for use in several European countries. In Bangladesh, this product is also approved and available from 2022. A combination of IC mydriatics and anesthetics injected after instillation of surface anesthesia, could give better surgeon and patient comfort intra-operatively.

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This study is designed for SICS, which is commonly done in our country. Worldwide, study shows that, this preparation is used for phaco emulsification cataract surgery.

Materials and Methods:

The study was a cross sectional analytical study to see the efficacy of intra-cameral mydriatic with anesthetics in Sheikh Hasina Medical College Hospital, Jamalpur, Bangladesh from 27April 2022 to 24 May 2022. Informed consent was taken and data was collected on data collection sheet. All patients admitted for cataract surgery in this period were included. The exclusion criteria were papillary diameter < 6 mm, history of intra-ocular surgery of trauma, corneal diseases, exfoliation and pseudo-exfoliation syndrome and other ocular diseases. The age of the patients was 35 – 80 years. Cataract grading was done according to World Health Organization (WHO) grading system 2002[6].The injection is available at 1 ml/ampoule. Surface anesthesia was given and then 0.2 ml intra-cameral injection containing 0.04 mg of tropicamide, 0.62mg of phenylephrine hydrochloride and 2 mg of lidocain hydrochloride was given just after opening the anterior chamber. Pupillary diameter was measured per-operatively with a caliper by the surgeon at specific stages of operation: before corneal incision, before capsulurrhaxis, before IOL implantation and before sub-conjunctival injection. The time taken for maximum dilatation after ICM injection was measured. If any additional measure needed to obtain and maintain dilatation or anaesthesia was also noted.

Result:

55 randomly selected patients, who consented to participate in the study, were included in the study Out of 55 patients 2 patient was excluded from the study for small papillary (5 mm) and 1 patient due to incomplete data.So, the final sample size was 52 patients.

Out of 52 patients, 28 patients (53.8%) were male and 24 patients (46.2%) were female (Table I).

Table I: Gender distribution

	Number of patient	Percentage (%)
Male	28	53.8
Female	24	46.2

The age of the patients was 35 – 80 years (Table II). Most of the patients (44.2%) were 60-69 years age group followed by 70-79 years age group (26.9%).The mean age of the total population was 61.4 ±10.55.

Table II: Age distribution

Age	Number of patient	Percentage (%)
<40	1	1.9
40 – 49	5	9.6
50 – 59	6	11.5
60 – 69	23	44.2
70 – 79	14	26.9
>= 80	3	5.8

According to nuclear sclerotic grading (NS) of WHO6 46 patients (88.5%) were nuclear sclerotic. Hard nucleus (N3 & N4) was in most of the cases (71.7%) (Table III).

Table III: Distribution of nuclear sclerotic grading of cataract (WHO)

WHO grading scale	Number of patients	Percentage (%)
No NS	0	0
NS1	5	10.9
NS2	8	17.4
NS3	23	50
NS4	10	21.7

The pupillary diameter at the beginning of the surgery was 3 to <4 mm in most of the cases (n=28, 53.8%), 4 to <5 mm in 21 cases (40.4%) and 3 mm or less was in 3 cases (5.8%)(Table IV).

Table IV: Pupillary diameter at the beginning of the surgery

Pupillary diameter(mm)	Number of patients	Percentage (%)
<2	0	0
2 to <3	3	5.8
3 to <4	28	53.8
4 to <5	21	40.4
<5	0	0

The time taken for the pupil to dilate maximally within 20 – 24 second in most of the patients 21 (40.5%), followed by 15-19 seconds in 19 patients (36.5%).The mean time for maximum pupilary diameter was 18(±4.1) second (Table V) .

Table V: Time taken toachieved papillary diameter ≥6mm.

Time(Second)	Number of patients	Percentage (%)
<10	1	1.9
10 to 14	9	17.3
15 to 19	19	36.5
20 to 24	21	40.5
>= 25	2	3.9

The pupillary diameter at the beginning of the capsulorhexis was 8 to <9 mm in most of the patients 21 (40.5%), 7 to <8 mm in 18 patients (34.6%) and 6 to <7 mm was in 6 patients (11.5%) (Table VI).

Table VI: Pupillary diameter at the beginning of the capsulorhexis

Pupillary diameter(mm)	Number of patients	Percentage (%)
6 to <7	6	11.5
7 to <8	18	34.6
8 to <9	21	40.5
9 to <10	5	10.9
>=10	2	3.9

The pupillary diameter diameter before intraocular lens (IOL) implantation was 7 to <8 mm in 19 patients (36.5%), 8 to <9

mm in 16 patients (34.6%) and 6 to <7 mm was in 12 patients (23.1%) (Table VII).

Table VII: Pupillary diameter before intraocular lens(IOL) implantation.

Pupillary diameter(mm)	Number 1	Percentage (%)
<6	**1**	1.9
6 to <7	**12**	23.1
7 to <8	**19**	36.5
8 to <9	**18**	34.6
9 to <10	**1**	1.9
>=10	**1**	1.9

The pupillary diameter diameter at the end of the surgery was 7 to <8 mm in 19 patients (36.5%), 6 to <7 mm was in 16 patients (30.8%) and 8 to <9 mm in 10 patients (19.2%) (Table VIII).

Table VIII: Pupillary diameter at the end of the surgery:

Pupillary diameter(mm)	Number of patients	Percentage (%)
<6	3	5.8
6 to <7	16	30.8
7 to <8	19	36.5
8 to <9	10	19.2
9 to <10	4	7.7
>=10	0	0

Discussion:

The evolution of cataract surgery had gone through 'couching' to now 'phacoemulcification'. There was also evolution of anesthesia for cataract surgery from regional anesthesia, retro-bulbar anesthesia, peribulberanesthesia, topical anesthesia and intra-cameral anesthesia. The use of topical anesthesia for cataract surgery was first described by Smith[7]. Non-myelinated Type A-delta and Type C fibers of the fifth cranial nerve transmit the pain sensation of the cornea and ciliary body and are blocked by lower concentrations of drugs than with motor fibers. Topical anesthetics inhibit the sodium channels of nerve endings and block the nerve impulse production. The part of the drug that penetrate to the anterior chamber blocks pain arises from the iris and ciliary body and usually last up to 15-20 min. In intra-cameral anesthesia dose can be repeated per-operatively if needed[8]. It is better over periocular anesthesia in consistency of mydriasis and analgesia. No need to stop aspirin or any other anticoagulants. Patients fear and pain of taking injection in the eye is absent. Visual recovery was immediate as blinking and ocular motility were retained, so no need of pad and bandage.There was no injection related complications with intra-cameral anesthesia. There were some limitations as there was no akinesia, patient selection was an important factor. Very anxious patient, non-cooperative patient, patient with movement disorder and myotic pupil were excluded. Regarding demography, we found male preponderance (53.8%) which is also found in other studies on gender distribution of cataract surgical patients[9,10,11].Our area is one of the poorest areas of the country. Male preponderance may be due to social-economic structure of our area, where women are deprived and their expectations are low. Same findings reported by Geneauet al.[12], most of the patients(71%) were 60-79 years age group, which was similar to the study by Al-Qrainyet al.[13] in Saudi Arabia. It signifies that the age related cataract is the most common type. According to WHO cataract grading most of the cases was (Grade III &IV) 71.1%. This reflects the socioeconomic condition of the society, which is almost similar to the study done by Dariusz Ke'ciket al.[15].Thesize of the pupilat the beginning of the surgery was 3 to <5 in most of the cases (94.2%). Time taken to dilate maximally in most of the cases (77%) was within 15 to 24 seconds. At the beginning of capsulorhexis, pupillary diameter was ≥ 6mm in 96.4% (53 cases, N 55). Which was 96.8% in the study done by Labetoulle M, et al[16]. At the time of IOL implantation pupillary size was ≥6 mm in 98.1% cases which is similar to the study of Dariusz Keciket al.[15]. Pupillary diameter of ≥7mm found in 63.4% of cases at the end of the surgery.

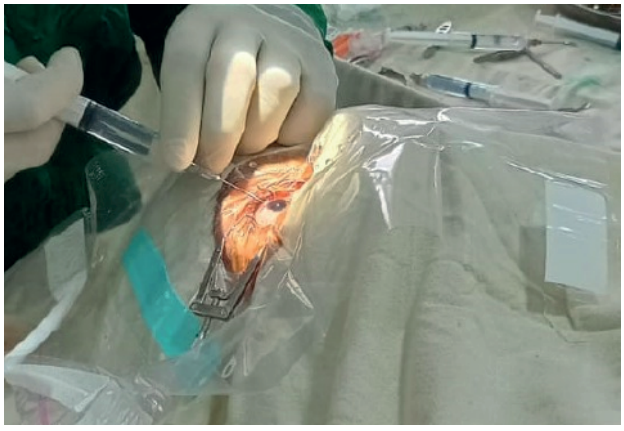

Photo- 1: Injecting intra-cameral mydriatic and anesthetics.

Photo- 2: Full mydriasis after injection.

Gradual reduction pupillary size is reported almost all studies[14,15,16]. It may be due to manipulation of iris during surgery. Surgical time also had a relation with pupillary size, greater the surgical time smaller the pupillary size[17].The decrease in patient preparation and surgical time may result in a more cost-effective cataract surgery and more patients could be scheduled on surgical days due to the faster turnover of patients. The merit of the study of use intra-cameralmydriatic and anesthetic in SICS and it is done for the first time in our country.

Conclusion:

Intra-cameral mydriatic and anesthetic gives rapid dilatation, maintenance of dilatation throughout the surgery and patient's comfort during intraocular manipulation. It reduces patient preparation and nursing time, so patient turnover is more and cost effective.It also eliminates the fear and pain of taking injection. So intra-cameral mydriatic and anesthetic injection is a better option for SICS.

Conflicts of Interest: None.

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