

## Comparison of pupil dilation between intracameral lidocaine & conventional topical mydriatics during phacoemulsification

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### Abstract

**Objective:** To compare the results of pupil dilation by an intracameral injection of non preserved lidocaine 1% during phacoemulsification cataract extraction and compare the results with those using conventional topical mydriatics.

**Setting:** Department of Ophthalmology, Civil Hospital / Dow University of Health Sciences Karachi Pakistan .

**Methods:** A prospective comparative case series study was conducted. The study included 114 patients who were given topical mydriatics (60 eyes) or intracameral lidocaine (54eyes) to dilate the pupil for phacoemulsification and intraocular lens implantation. The topical group received 3 drops of cyclopentolate 1% and phenylephrine 5% given 5 minutes apart starting 60 minutes before surgery. The intracameral group received preservative-free lidocaine 1% (0.2 to 0.3 mL) injected just before the procedure began. No epinephrine was added to the irrigating solution. In both groups, the horizontal pupil diameter was measured before and after pupil dilation using the same caliper. Total surgical time, need for a mydriatic agent during the procedure, and subjective surgical performance were recorded.

**Results:** The mean age, sex, cataract density, baseline horizontal pupil diameter, and mean duration of the surgery were the same between the topical group and intracameral group. The mean pupil dilation was  $4.52 \text{ mm} \pm 0.08 \text{ (SD)}$  in the intracameral group and  $4.06 \pm 0.09 \text{ mm}$  in the topical group; the difference between groups was statistically significant ( $P=.001$ ). There was no significant difference between groups in the overall subjective surgical performance ( $P=.74$ ). No patient in the intracameral group and 4 patients in the topical group required an intracameral mydriatic injection

**Conclusion:** During phacoemulsification, intracameral preservative-free lidocaine 1% provided rapid, effective mydriasis. This was comparable with that of topical mydriatics.

**Key words:** Lidocaine, topical mydriatics, phacoemulsification

### Introduction

Cataract surgery requires adequate mydriasis. This is usually achieved by topical and/or intracameral administration of anti cholinergic agents, sympathomimetic mydriatic agents, or both, with the most common used being cyclopentolate, tropicamide, and phcnylephrine<sup>1-2</sup>. These regimens, however, have disadvantages such as slow onset of dilation, which increases the time before surgery can begin<sup>3-5</sup>, and adverse ocular and systemic effects, which are especially important in high-risk groups (eg, children, hy-

pertensive patients)<sup>6-8</sup>. In addition, their effect has a tendency to dissipate during surgery<sup>2</sup> Intracameral injection of lidocaine has been used as an alternative to reduce the potential disadvantages of commonly used mydriatics.<sup>9-10</sup> This study assessed pupil dilation by an intracameral injection of preservative-free lidocaine and compared the results with those of conventional topical mydriatics.

### Patients and methods

A prospective comparative uncontrolled case

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series study in 114 patients with senile cataract scheduled for phacoemulsification and intraocular lens (IOL) implantation. Exclusion criteria were previous ocular surgery or laser procedures, iris abnormalities, pseudoexfoliation, systemic diagnosis affecting pupil dilation such as diabetes mellitus or Homer's syndrome, and use of topical ocular medications (except artificial tears). All patients signed an informed consent, and hospital ethics committee approval was obtained.

The patients were randomly assigned to 1 of 2 groups. The topical group was given 3 drops each of cyclopentolate 1% and phenylephrine 5% at 5-minute intervals starting 60 minutes before surgery. The intracameral group received 0.2 to 0.3 mL of non preserved lidocaine 1% injected into the anterior chamber at the beginning of surgery.

In both groups, horizontal pupil diameter was measured with a caliper using the operating microscope in the operating room. Measurements were taken 1 hour before surgery in the topical group and just before surgery in the intracameral group. The light intensity of the microscope was the same in both groups. The measurements were repeated with the same caliper just before surgery began in the topical group and 90 seconds after intracameral injection in the intracameral group.

All patients were given 3 drops of tetracaine 1% at 5-minute intervals before surgery. The procedures were performed by the same surgeon (AR.) using a quick-chop method<sup>11</sup>. Hydroxypropyl methyl-cellulose 2% was used as an ophthalmic viscosurgical device and balanced salt solution (BSS) as the irrigating solution. In all eyes, a single-piece foldable IOL (AcrySof, Alcon) was implanted in the bag. No epinephrine was added to the irrigating solution.

Total surgical time, need for mydriatics during the procedure, and the subjective surgical performance were recorded at the end of the operation. Subjective surgical performance<sup>12</sup> was graded during capsulorhexis, phacoemulsifica-

tion, cortex aspiration, and IOL implantation on a scale of 0 to 2 (0 = uncomplicated; 1 = slightly complicated; 2 = complicated). Lens opacity was graded using the Lens Opacities Classification System III (LOCS III).

Data were entered using SPSS software (version 11.5, SPSS, Inc.). An independent t test and Mann-Whitney U test were used for statistical analysis. A P value less than 0.05 was considered statistically significant.

## Results

The topical group comprised 24 men and 36 women with a mean age of 65 years  $\pm$  8.6 (SD) and the intracameral group, 24 men and 30 women with a mean age of 67.3  $\pm$  9.9 years. Table 1 shows the patient characteristics. Age, sex, cataract density, baseline pupil size, and duration of surgery were not statistically different between the 2 groups. All patients had brown irises and nuclear opalescence and nuclear cataract of LOCS III grade 4 or more with variable amounts of cortical and posterior sub capsular cataract.

Statistically significant pupil dilation was achieved in both groups ( $P < .001$ ); however, the dilation was significantly greater in the intracameral group (Table 1). Subgroup analysis did not show significant differences in pupil response between men and women in the topical group or in the Intracameral group ( $P = .39$  and  $P = .57$ , respectively; independent t test). Overall subjective surgical performance at each stage of phacoemulsification was not statistically different between the 2 groups (Table 2).

No patient in the intracameral group required a mydriatic agent during the procedure; however, 4 patients in the topical group had an injection of 0.2 mL intracameral epi-nephrine 0.01% at the time of IOL implantation because of pupil constriction and poor visibility of the capsule.

## Discussion

Topical mydriatic agents have been used to dilate the pupil during cataract surgery for many years. Disadvantage of these agents however, resulted

Table 1: Patient demographics

	Group		P Value*
	Topical Mid-riatic	Intracameral Lidocaine	
Number of eyes	60	54	
Sex (n)			
Female	36	30	
Male	24	24	.23
Mea age (y)	65±8.6	67.3±9.9	.24
Mean surgical time (min)	11.6±2.0	12.1±1.7	.31
Mean baseline pupil diameter (mm)	2.5±0.25	2.6±0.33	0.065
Mean pupil diameter after drug use (mm)	6.6±0.77	7.18±0.48	.001
Mean increased in pupil diameter (mm)	4.06±0.09	4.52±0.08	.001

Table 2: Surgical performance ranking

	Ranking						P Value*
	Intracameral Group			Midriatic Group			
	0	1	2	0	1	2	
Capsulorhexis	54	0	0	58	2	0	.34
Phacoemulsification	50	4	0	56	4	0	.91
Cortex Removal	48	6	0	52	8	0	.87
Lense Implantation	48	6	0	52	8	0	.87
Overall	-	-	-	-	-	-	.74

Key: 0=uncomplicated; 1=slightly complicated; 2=complicated

in a search for a safe alternative<sup>4-8</sup>.

Lidocaine is an antiarrhythmic drug as well as an effective local anesthetic agent. It acts by blocking sodium channels, leading to inhibition of membrane potential. Intracameral injection of preserved lidocaine is used widely for local anesthesia and relief of discomfort in cataract surgery<sup>1-14</sup>. Lidocaine causes no additional inflammation or endothelial cell loss, and studies confirm its safety.

Lincoff et al<sup>19</sup>. report the effect of lidocaine on iris paralysis and mydriatics. They found the pupil dilated after accidental intraocular injection of lidocaine without administration of a mydriatic drug. Lee et al.<sup>9</sup> reported immediate pupil dilation after intracameral injection of preserved lidocaine 1% in previously undilated phakic eyes during trabeculectomy. Cionni et al.<sup>10</sup> used intracameral lidocaine injection to in-

duce mydriatics in phacoemulsification without the administration of preoperative dilating eye drops. However, they added epinephrine to the infusion solution during routine procedures to maintain pupil dilation.

This study shows that injection of 0.2 to 0.3 mL of preservative-free lidocaine 1% in the anterior chamber provides persistent, stable, satisfactory pupil dilation for safe phacoemulsification and IOL implantation. Although the mean pupil diameter was significantly greater in the intracameral group, the overall surgical performance and duration of surgery were not significantly different between the 2 groups.

In the present study, no additional mydriatic drug was used in the infusion fluid in either group. Nevertheless, 2 patients in the topical group required intracameral injection of mydriatics during the procedure.

The injection of intracameral lidocaine has advantages over topical mydriatics. It shortens the time it takes for the pupil to dilate preoperatively, does not have systemic topical mydriatic side effects, and provides better pupil dilation as well as a simultaneous anesthetic effect for phacoemulsification.

In this study, the amount of pupil dilation was not significantly different during the surgeries, which lasted 8 to 13 minutes. However, it is not clear how long the pupil dilation lasts after an intracameral lidocaine injection. Therefore, we recommend future studies of the duration of pupil dilation after intracameral lidocaine injection and a comparison of its effect with the effects of other intracameral mydriatics.

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