

# A Comparative Study of Vision Outcome Between Small Incision Cataract Surgery (SICS) and Phacoemulsification as Well as Comparison of Mydriatic Effects Between Two Drugs in Cataract Surgery Patients

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## ABSTRACT

**Aims:** Knowing the Mydriatic effect of Tropicamide and Cyclopentolate as well as the difference in vision improvement between phacoemulsification and small-incision cataract surgery.

**Study type and place:** A prospective & cross-sectional study. Total number of cases 1446 were collected over a period of 6 month was conducted in Nagapattinam Government medical college.

**Objectives:** To know the prevalence of cataracts on the basis of age and sex, To find the major systemic co-morbidities in cataract patients, To compare the pupil dilation between Tropicamide and Cyclopentolate, To compare the visual acuity after cataract surgery using SICS and phacoemulsification, To find drug utilization in pre- and post-operative cataract surgery

**Utilizing statistical analysis:** The SPSS software package was used to compute and analyze the data. A 0.05 p value was deemed significant.

**Results:** Among 1446 patients, gender distribution showed that 934 (65%) were female and 509 (35%) were male; According to age category, the majority of the patients in our study who have cataracts are between the ages of 60 and 79. The distribution of patients by eye wise was as follows: right eye (845, or 58%); left eye (601, or 42%); There were 624 cases of immature cataract (43%), 475 cases of mature

cataract (32.8%), 289 cases of hyper-mature cataract (19.9%), and 58 cases of pseudophakia (4%). Patients undergoing cataract surgery frequently have diabetes and high blood pressure. One of the risk factors for cataract is diabetes (73.5%). SICS is more successful than phacoemulsification in terms of improving visual acuity, and since the pupil dilated larger with duration, it is Cyclopentolate rather than Tropicamide;

**Conclusions:** By comparing visual acuity measured using the Snellen chart, there was a substantial difference in the visual outcome on the first postoperative day. Small-incision cataract surgery is more effective than phacoemulsification.

The difference in pupil diameters between Cyclopentolate and Tropicamide demonstrates that the latter is less effective than the former.

**Keywords:** Cyclopentolate, Diabetic mellitus, small incision cataract surgery, immature cataract, and female

## INTRODUCTION

The Latin term for "water fall" is where the word "cataract" first appeared. The natural intraocular crystalline lens, which aids in concentrating the light that enters the eye through the retina, becomes clouded in a cataract. If the cloudiness of the lens is not corrected, it could result in blindness and

reduce eye sight. Cataracts develop gradually, painlessly, and without the help of glasses. The most effective method of treating cataract sufferers is surgery, which involves removing the damaged lens and replacing it with the artificial implantation of a clear intraocular lens (IOL) [1],

Ageing, the production of free radicals, diabetes, and protein denaturation by oxidative stress or any inducer, etc., are all causes of cataract formation. Antioxidant, antioxidant enzymes, and anti - denaturing agents shield eye lenses from protein denaturation and reduce the damage caused by free radicals[2],

In The World the primary preventable cause of blindness is a cataract. According to the World Health Organization (WHO), a cataract is defined as having a better eye's visual acuity (VA) of less than 3/60 and causing loss. Age-related cataract, which affects about 20 million people and accounts for 48% of global blindness, is said to be prevalent in low- and middle-income nations and affects 90% of the population [3],

In India, 50 to 80% of people who are blind on both sides are said to have cataracts. The implementation of initiatives to lessen the burden of cataract blindness by the "vision 2020: the right to sight" initiative has been promised support by international organizations for the elimination of preventable blindness [4], Seven Indian states participated in a 1994 experiment to combat cataract blindness: Andhra Pradesh, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, and Uttar Pradesh [5],. The number of cataract procedures performed annually increased from about 1.2 million in 1980 to 3.9 million in 2003. Updated statistics from the world health organization (WHO) [4],

The national blindness survey estimated prevalence 8% of people in India over the age of 50yr was blind as of 2006–2007. 62.6% of all blindness is caused by cataracts. 20 lakhs new cases of cataract

found and increase the burden every year [6],.

Because exposure to indoor cooking smoke is a key risk factor, the prevalence of cataract rises with ageing populations and affects women more than men, the uneducated, and people living in rural areas [3],.

According to their placement on the lens, cataract types can generally be classified, as Cataract affecting the center of the lens (Nuclear cataract), Cataract that affect the edges of the lens (cortical cataracts); Cataract that affect the back of the lens (posterior sub capsular cataract), Cataract in new born (congenital cataract) [7],.

Cataract surgery is one of the most frequently done surgical procedures and has a very high success rate. Manual small-incision cataract surgery is also known as MSICS. It has the advantage of a self-sealing, suture-less wound. In addition, MSICS provides a number of advantages over phacoemulsification, including less time spent operating, less dependence on technology, and reduced costs [1],.

#### **Aims:**

To Know the Mydriatic effect of Tropicamide and Cyclopentolate as well as the difference in vision improvement between phacoemulsification and small-incision cataract surgery.

#### **Objectives:**

1. To know the prevalence of cataracts on the basis of age and sex.
2. To find the major systemic co-morbidities in cataract patients.
3. To compare the pupil dilation between Tropicamide and Cyclopentolate
4. To compare the visual acuity after cataract surgery using SICS and phacoemulsification
5. To find drug utilization in pre- and post-operative cataract surgery

## MATERIALS & METHODS

**Study design:** In a cross-sectional and prospective study among 1446 patients, small-incision cataract surgery operations were done in 1098 (76%), and phacoemulsification operations were done in 348 (24%). We collected 173 subjects' data in each to compare the outcome of the surgery according to their visual acuity and the data with full follow-up. And to find the mydriatic effects, we took 50 patients in each group, one with tropicamide and the other with cyclopentolate.

### Materials:

**Study place:** Ophthalmology Department of the Government Medical Hospital, Nagapattinam

**Study duration:** 6 months (April 2022–September 2022).

### Inclusion criteria:

- Patient with cataracts coming to the ophthalmology department.
- Patients with immature cataracts, mature cataracts, and hyper-mature cataracts.
- Cataract patients between the ages of 40 and 90 years.
- Both genders of patients with cataracts

### Exclusion criteria:

- Patients with traumatic cataracts and juvenile cataracts
- Patients not willing to study and patients with causes of blindness other than cataracts
- Patient who was operated on for an ophthalmic condition outside the tertiary care hospitals.
- Patient below 18–39 and above 95 years old.

## STATISTICAL ANALYSIS

The SPSS software package was used to compute and analyze the data. A 0.05 p value was deemed significant.

## RESULT

A total 1446 patients were having cataract during the study period in Ophthalmology department of Nagapattinam medical college.

### Total number of patients according to gender wise:

Female patients were 934 and male patients 509. Female patients are mostly getting affected (65%)

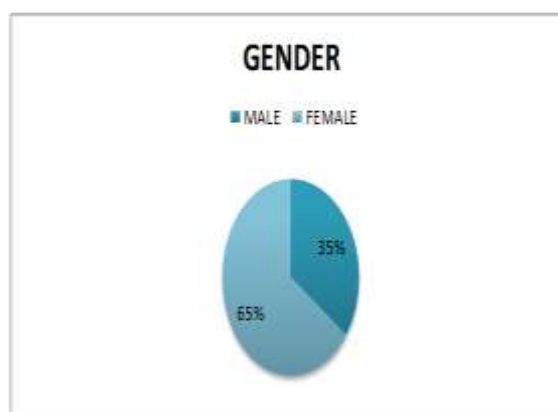


Figure1. Gender wise distribution.

### Age wise distribution:

According to age group 36.3% patients were aged between 60-69, 30.5 % patient were aged between 70-79, 15.5 patients were aged between 80 -89, 9.6% patients were aged between 50-59, 6.5% patients were aged between 90 above, 1.4% patients were aged between 40-49.

In age, wise distribution, mean age of getting cataract is 60- 79 yrs.

### Eye wise distribution:

Patients were distributed according to eye wise the right eye 845(58%), left eye 601(42%).

### Symptoms of cataract patients:

According to their symptoms wise Cloudy vision were found in 542(37.4 %), Blurred vision were in 320 patients(22 %), Cloudy +blurred vision were in 210 (14.5%), Double vision + Sensitive to light 124 (8.5%), Sensitive to light were in 119 patients (8.22 %),Double vision were in 83

patients (5.7%), Fading of colours were in 48 patients (3.3 %).

Cloudy vision is the most occurring symptom in cataract patients. 37.4%

**Type of cataract:**

Immature cataract 624 (43%), Mature cataract 475(3.8), Hyper mature 289(19.9%), Pseudophakia 58(4%)

Immature senile cataract is seen in increased rate of cataract type.

**Comorbidities condition in cataract patient:**

Based on patients with comorbidities male were 461(53%) and female were 415 (47%), Total- 876. Distribution of patients without comorbidities female 345(61%) and Male were 215 (39%), Total- 567. comorbidities patient having higher risk to get cataract.

Comorbidities distribution according to their disease condition Diabetic mellitus (DM) 215(24.5 %), Hypertension (HT) 98 (11.1 %), DM+ HT- 271(31.1 %), DM+BA 61 (6.9%), Bronchial asthma (BA) 53(6%)

,Thyroid disorder 11(1.2%), DM+HT+CAD 98(11.1%) , coronary artery diseases (CAD) -52 (6 %)

In our study Diabetic mellitus+ hypertension is often associated with the patient undergoing cataract surgery. Diabetic (73.5%) is the one of the risk factors for cataract.

**Comparison of pupil dilation between 0.8% Tropicamide and 1.0% Cyclopentolate:**

Both drugs were prescribed in the hospital according to the need of the patient and the availability of the drug, and pupil dilation is mentioned in the case sheet itself. We just collect the data and calculate the difference between both drugs. In this study, we take 50 patients in each group, totaling 100 patients.

Comparison of mean pupil size of Group 1 and Group 2 before dilation in table ,

- Group 1 – Tropicamide
  - Group 2 – Cyclopentolate;
- Mean pupil size of both groups is 3.5.

**Table 1: Comparison of pupillary diameter after 15 minutes ,30 minutes, and 45 minutes of drug administration;**

Groups	Mean of normal pupil size (mm)	Pupil size after 15 mins	Pupil size after 30 mins	Pupil size after 45 mins
1	3.5	3.5	4.5	6.5
2	3.5	4.2	5.5	7.2
Difference		0.7	1.0	1.3

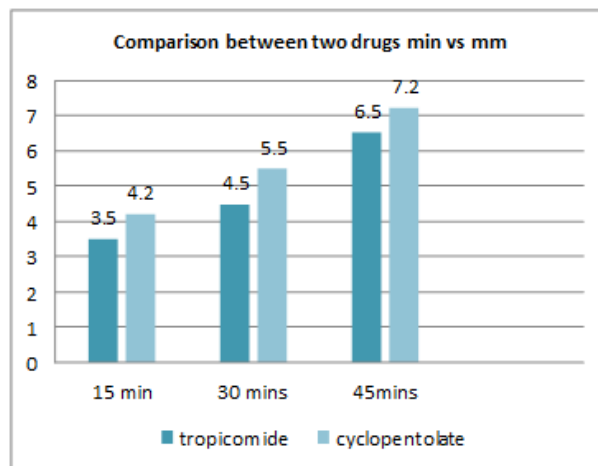


Figure 2: comparison between tropicamide and cyclopentolate

**Visual acuity difference between SICS and phacoemulsification:**

Among 1446 cases SICS Operation were done in patient 1098 and PHACO were done in 348.

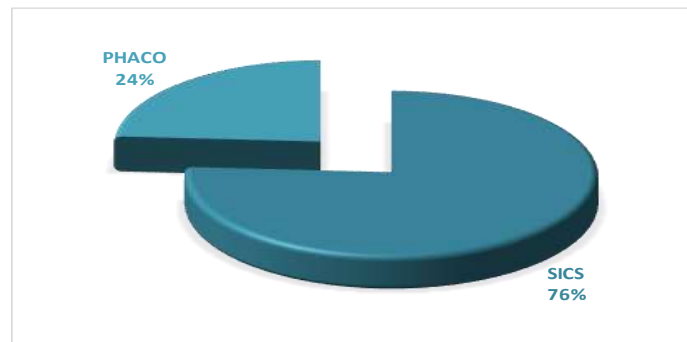


Figure 3: Percentage between SICS and phacoemulsification

We took 173 subjects in each operation to compare the outcome of the surgery according to their visual acuity. Patients came for regular follow-up;

Table 2: Before surgery

BCVA	SICS	PHACO	X <sup>2</sup>	P-VALUE
6/18	71(68.50) [0.09]	66(68.50) [0.09]	4.2585	0.118926
6-24- 6/60	89(85.50) [0.14]	82(85.50) [0.14]		
<6/60	13(19.00) [1.89]	25(19.00) [1.89]		

- The result is not significant greater than  $p < .05$
- There is a not significant & no relationship between the two variables
- SICS is more likely done than phacoemulsification.

Table 3; Post surgery [After 1week]

UCVA	SICS	PHACO	X <sup>2</sup>	P-VAULE
6/18	33(40.50) [1.39]	48(40.50) [1.39]	8.9863	0.011185
6-24 -6/60	131(118.50)[1.32]	106(118.50) [1.32]		
< 6/60	9(14.00)[1.79]	19(14.00)[1.79]		

- The result is significant at  $P < .05$
- There is a significant relationship between the two variables

Table 4: Post surgery: [After 1 month]:

UCVA	SICS	PHACO	X <sup>2</sup>	P-VALUE
6/6 -6/18	158(146.00)( 0.99 )	134(146.00)( 0.99 )	12.6635	0.001779
6/24-6/60	12(22.00 ) [4.55]	32(22.00 ) [4.55]		
<6/60	3(5.00 ) ( 0.80 )	7(5.00 ) [0.80 )		

- The result is significant  $p < .05$
- There is a significant & relationship between the two variable

Table 5: Compared between SICS and phacoemulsification

Visual acuity	SICS Before Surgery	After SICS 1 WEEK	SCIS 4 WEEK	PHACO Before surgery	After PHACO 1 WEEK	PHACO 4 WEEK
GOOD < 6/18	71	33	158	66	48	134
BORDERLINE 6-24- 6/60	89	131	12	82	106	32
POOR <6/60	13	9	3	25	19	7

Table 6: Pre and post cataract management:

Class	Drug	Number of drugs	Percentage (%)
Antibiotic	Ciprofloxacin	1446	100%
	Gentamycin	1446	100%
	Moxifloxacin	230	15.9 %
Analgesic	Diclofenac	410	28.35%
	Paracetamol	1446	100%
Antacids	Ranitidine	1446	100%

Corticosteroids	Prednisolone	628	43.4%
Benzodiazepines	Diazepam	1446	100%
Diuretics	Mannitol	108	7.4%
Beta blockers	Timolol	25	1.7%
Proton pump inhibitors	- Pantoprazole	210	14.5%
	- Omeprazole	81	5.6%
Vitamins	Vitamin B complex	1446	100 %
Carbonic anhydrase inhibitors	Acetazolamide	739	51 %
Mydriatic	Tropicamide	492	34%
	Cyclopentolate	954	65.9%
Inj.vaccine	TT.0.5 CC IM Stat	1446	100%
Anesthetics	Xylocaine	1446	100%

In pre-and post-cataract management specific drugs given to every patient shown (100%) as standard drug.

Some drugs were added according to their need and for their complaints.

#### Standard treatment:

These medications are given to every patient undergoing cataract surgery.

**Pre-operative drugs:** Injections: TT 0.5 CC IM Stat, Xylocaine TDS; Tablets: Ciprofloxacin 0.25 mg HS, Diazepam 0.25 mg HS; Eye drops: Antibiotic eye drops 4 times.

#### Post-operative drugs

Injection: Gentamycin 80mg IM BD;  
Tablets: Ciprofloxacin 500 mg BD, Paracetamol 500 mg BD, BCT 10 mg BD, Ranitidine 150 mg BD  
Cyclopent or Homide OD, Antibiotic + Steroids drops hourly

#### On the day of surgery:

- Tab. Acetazolamide 250 mg stat
- Tropicamide +phenylephrine
- Eye drops in R/L eye
- Beta dine 5% solution once R/L Eye

#### Additional treatment:

- Analgesic – Tab. Diclofenac 50mg BD
- Steroids (Corticosteroids) – Tab. Prednisolone 10mg
- Diuretics – Inj.Mannitol 100 ml IV stat
- Beta blockers – Timolol 0.5 % E/D
- PPI – Tab. Pantoprazole 40mg BD , Tab. Omeprazole 20 mg BD

- Usual prescription pattern was one antibiotic, one anti-inflammatory agent and one mydriatic,

- In those mostly topical ophthalmic preparations is prescribed.

#### DISCUSSION

In an attempt to describe the study, "A Comparative study of vision outcome between small incision cataract surgery (SICS) and phacoemulsification as well as comparison of Mydriatic effects between two drugs in cataract surgery patients" The present study has generated data on disorder severity patterns in cataract patients, with age and sex-wise distribution and their comorbidities condition.

Cataract is mostly affected in people at the age between 60-79 years, Adhikari. k et al.; study found that maximum numbers of patients were encountered in the age group of 45-65 years. [14]. Female patients (65%) are mostly affected in gender-wise were male 35%. This was in accordance with the retrospective study conducted by Dr. Rajendran N et al.; the prevalence of cataract according to this study is more among females with 58.6% among the patients with cataract were females while 41.4% were males [8].

In that immature cataracts are most common in the cataract type, Adhikari K et al. Int J Basic Clin Pharmacol, in their retrospective, observational hospital based study. Around 48.4% of cases with IOL implantation in their retrospective, observational hospital research had immature senile cataracts.[14]. In comorbidities, diabetes mellitus and hypertension (73.5%) are often associated with the patient undergone cataract surgery.

Diabetes is one of the risk factors for cataracts. Prashanth J P et al., in accordance with their retrospective study analysing the case records of patients who had undergone cataract surgery the hypertension and diabetes contributed to a considerable proportion among the co-morbid individuals accounting for about 78%. [11]

By comparing visual acuity improvement, SICS is more effective than phacoemulsification. Complication-wise, after surgery, SICS has more symptoms than phacoemulsification, but symptoms reduce in a few days. The study of Ferdosh et al., Found that Phacoemulsification produced good result, however small incision cataract surgery was frequently employed due to its reduced cost. The intensity of SICS and Phacoemulsification were almost similar in terms of the number of patients who underwent surgery per day and the frequency of surgery schedule. This result is backed by the research of Hamid and Habibullah who discovered that there was no significant difference between uncorrected visual acuity after small incision cataract surgery and phacoemulsification. This outcome was impacted by the common risk factors detected in both groups, namely the formation of various eye disorders following surgery such as postoperative complications, But Hamid and Habibullah argued that SCIS provided better results due to cost-effectiveness problems. [15]

The comparison of pupil size between two mydriatic drugs shows that there is a slight difference in pupil dilation; comparing onset of action and duration of action, Cyclopentolate is more potent than Tropicamide. [12]

In pre and post cataract management Overall antibiotic, anti-inflammatory agent, antacids, Benzodiazepine, Vitamins, Mydriatic, Anesthetics are most commonly prescribed as standard to all. In that mostly topical ophthalmic preparations are prescribed Tropicamide and Cyclopentolate eye drop is given preoperatively and

postoperatively for inducing Mydriatic in elderly. According to patient need some proton pump inhibitors, NSAID, steroids, Carbonic anhydrase inhibitors are given. Dr. Atul S Raut et al, the similarity of result found in their study. [9]

## CONCLUSION

In this study, we concluded that patients with cataract are mostly found to be female patients and also the patient with DM as comorbidities these are the risk factors. Comparison of cataract surgery vision outcome SICS is effective than phacoemulsification. In Mydriatic effects comparison, the difference in pupil diameters between Cyclopentolate and Tropicamide demonstrates that the latter is less effective than the former.

### Declaration by Authors

**Ethical Approval:** Approved

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**Conflict of Interest:** The authors declare no conflict of interest.

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