

# Dry eye and corneal sensation following cataract surgery

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**Abstract:** Aim:To evaluate dry eye and corneal sensation changes after small incision cataract surgery and phacoemulsification

Materials and method :A crosssectional study with 60 uncomplicated cataract patients between age 40 and 75yrs who had undergone surgery have been taken for the study.

Dry eye and corneal sensation changes have been analysed after phacoemulsification and SICS by schirmer's test and Cochet-Bonnet esthesiometer

The study was conducted over a period of 3 months in the ophthalmology department of saveetha medical college hospital ,Thandalam

Results :The study was conducted over a period of 90 days postoperatively the corneal sensation was found out to be decreased 35% in GroupA(SICS) and 30% in Group B(phaco emulsification) when compared to the cataract eye before cataract surgery.

Out of the patients 8% showed dry eye symptoms with reduced value in Schirmer's test and of which 10% belongs to Group B

Keywords: Dry eye, Schirmer test, Corneal Sensation, Phacoemulsification, SICS-Small incision cataract surgery, Cochet -Bonnet esthesiometer

## Introduction

Cataract is the leading cause of blindness in the world. At the same time cataract surgery is the most successful and rewarding surgery in the field of ophthalmology. However, after cataract surgery many patients complain of foreign body sensation, irritation ,redness, blurring of vision which are considered as unwanted effects of the surgery<sup>(1)</sup>.

These effects are worse in the elderly population and those with ocular surface disorder. These persist in some patients until they are managed by subsequent effective treatment<sup>(2)</sup>. Some studies have reported aggravation of dry eye symptoms and signs after

cataract surgery<sup>(3,4)</sup> .Thus inspite of a perfect cataract surgery and a good snellen visual acuity the patients may remain dissatisfied.

Dry eye syndrome is a multifactorial disease of pre-corneal tear film that results in ocular discomfort, visual disturbance and tear film instability with potential damage to the ocular surface<sup>(5)</sup>. Factors that are responsible for development of dry eye after cataract surgeries include prolong use of antibiotic-steroid eye drops, decrease tear film break-up time due to surface irregularity at the site of the incision, decrease mucin production from the conjunctiva secondary to incision placement, decrease corneal sensation due to surgical incision which disrupts the cornea-lacrimal gland loop leading to reduced tear secretion, poor tear film production and stability due to surgically induced ocular inflammation and exposure to light from the operating microscope.<sup>(6,7,8)</sup>This also results in reduced corneal sensation post surgery .The symptoms of dry eye may be temporary but they affect the quality of life of the patient.<sup>(9)</sup>

Therefore, a proper counselling is necessary about the evanescent nature of the condition.<sup>(10)</sup>

In the current study we use various modes of measurement such as schirmer's test and cochet bonnet esthesiometer to access incidence of dry eye syndrome and corneal sensation issues in patients who underwent small incision cataract surgery and phacoemulsification.

### **Materials and method**

This prospective cross sectional study was conducted in the department of Ophthalmology after approval by ethics committee. It was performed on 60 pairs of eyes of 60 patients who are performed surgery for bilateral cataract .

#### **Exclusion criteria:**

- Patients with preexisting
- Ocular diseases
- Ocular allergies
- Corneal opacities
- Signs of vitamin A deficiency

Slit lamp microscopy is done to eliminate the presence of any ocular surface disorders

#### **Inclusion criteria:**

Patients who have performed surgery for bilateral senile cataract

#### **Procedure:**

**Schirmers test** without anesthesia was evaluated by

inserting a schirmer paper strip in the lower fornix

at the junction of middle and lateral third of the

lower eye lid margin for 5 minutes. The wetness of

the strip was measured after that cornea was

anesthetized. The wet area of 10mm or less was considered as dry eye.

Cornea Sensation was recorded with a Cochet-Bonnet esthesiometer and graded as normal (5mm to 6mm) or reduced (<5mm). The filament was extended to a full length of 6cm and retracted incrementally in 0.5 cm steps until the patient can feel its contact. Length was recorded in superior, temporal, inferior and nasal quadrants.

The patients are divided into 2 groups A and B

Group A consisting of people undergoing small incision cataract surgery and group

Group A is further divided into A1-SICS superior incision and A2-SICS temporal incision

Group B consist of phacoemulsification with superior incision

### **Results**

Data from the 60 eyes of 60 patients including were studied for dry eye changes over a period of 3 months between age group of 40-75 years

**Table1: Percentage of patients showing decreased schirmers test**

Schirmer Test	DAY 7	DAY 30	DAY 90
Group A(undergone SICS)	20%(12)	18%(11)	10%(6)
Group B(undergone phacoemulsification)	10%(6)	8%(5)	6%(4)
Total patients	30%(18)	27%(16)	17%(10)

**Table 1:** Shows the prevalence of dry eye tested by schirmer test post operatively .The dry eye is reduced as the days progress post operatively

**Table 2 shows the prevalence of the dry eye categorised based on type of surgery used**

Study parameter	Decreased schirmer (DAY 90)
Group A1(SICS with superior incision)	12%(7)
Group A2(SICS with temporal incision)	16%(8)
Group B (Phacoemulsification)	8%(5)

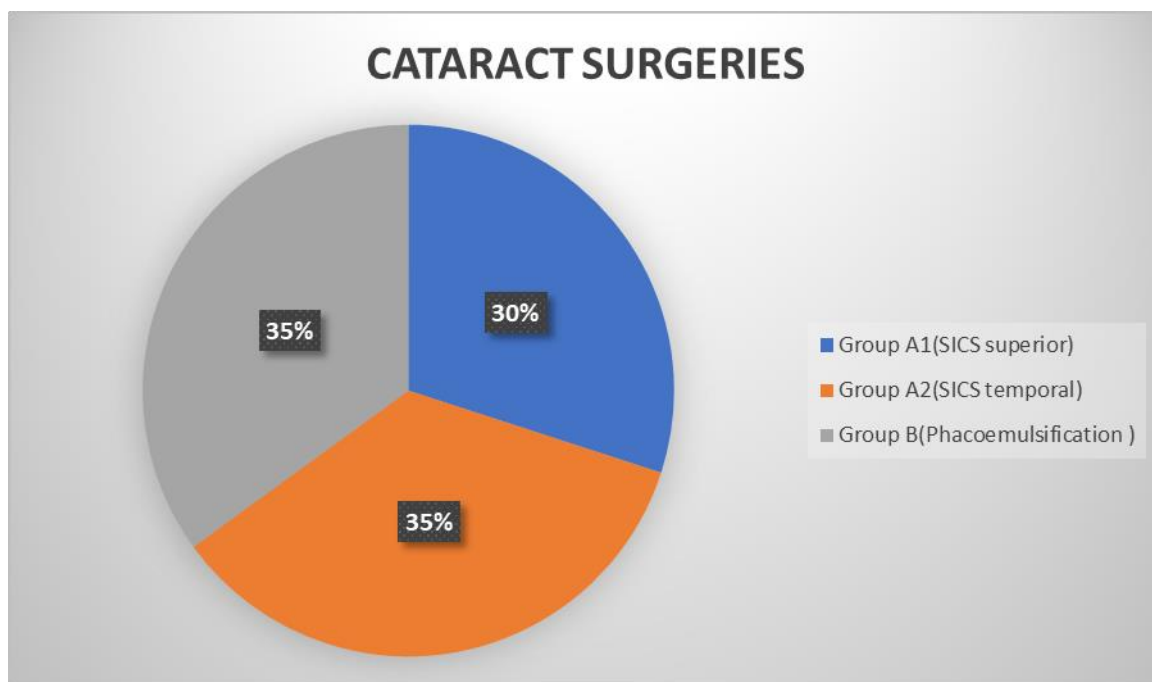
**Table2:**Percentage of patients showing dry eye changes in different study parameters in different groups at 90th postoperative day.

The result shows the prevalence of dry eye is more in Group A2(SICS with temporal incision)16% followed by Group A1(SICS with superior incision)12% and B(phacoemulsification)8%

**Corneal sensation**

Groups	CS diminished	CS Normal
1.Group A1(SICS superior)	9(50%)	9(50%)
2.Group A2(SICS Temporal)	12(57.1%)	9(42.9%)
3.PHACO corneal	18(85.7%)	3(14.3%)
Total	39(65%)	21(35%)

**Table 3:corneal sensation representation among the study parameters**



**Chart 1: Distribution of decreased corneal sensation according to study parameters**

As seen from the pie chart corneal sensation is seen diminished in a higher rate in patients who underwent treatment via phacoemulsification and SICS Temporal incision

### Discussion

A difficulty in accessing dry eye is there because there is no gold standard test .For this study schirmer test Is used to determine the dryness of the eye in cataract patients. The results of the study show that there is increased dryness of the eyes in patients performed SICS(28%) when compared to the patients who performed phacoemulsification (8%) on the 90 th day of the study.

Among the small incision cataract surgery temporal incision can be cited as the most predominant cause of dry eye post cataract surgery. The observation could be explained by the fact that temporally placed incision cause more damage to corneal innervations as the large nerves of long ciliary nerve trunk enter the limbus predominantly at 9-oclock and 3-oclock position. Other observation in current study was the recovery process of the corneal nerves. About 44 corneal nerve bundles entering the cornea around the limbus centripetally<sup>(11)</sup> and larger nerve fibers that run from the 9oclock to the 3 o'clock position and bifurcate to achieve homogenous distribution over the entire cornea<sup>(12)</sup>.It is vulnerable to any damage within that region. Temporal corneal incisions created during phacoemulsification can reduce the corneal sensitivity in the surgical area and other areas far from the incision site. The damage to the corneal nerves may expand when longer phacoemulsification time is needed to break up a dense cataract. Neurogenic inflammation also can develop after corneal incisions. Inflammatory mediators can reduce corneal sensitivity. Disruption of the normal corneal innervation can reduce the tear flow and blink rate and cause instability of the tear hyperosmolarity and tear film. <sup>(13)</sup>. With corneal healing postoperatively, new neurite cells emerge and after 25 days, neural growth factor is released to regenerate the subepithelial corneal axon. Thus, the recovery of the corneal nerves explains the improvement of the dry eye symptoms post operatively.<sup>(14,15)</sup>

Conversation On contemplating the boundaries of the three kinds of medical procedures done, there was a critical lessening in the corneal sensation following phacoemulsification medical procedure. There are many papers which have demonstrated some changing levels of lessening of corneal sensation following cataract medical procedure<sup>(16,17)</sup> In our study likewise it was seen that among 60 patients, 39 patients had lessened corneal sensation following cataract medical procedure. This investigation showed a diminished corneal sensation following phacoemulsification along the width of passage at limbus on contrasting and the other two types(SICS with temporal and superior).

An experiment by Schirmer, tracked down that after the SICS there was a finished loss of sensitivity in the area of the cornea encased by the curve of incision and didn't recuperate in the vast majority of people even following two years following the medical procedure. (17)

#### Diminished corneal sensitivity following cataract

medical procedure utilizing limbal incision or corneal incision point was detailed by John, which is comparable in pattern with our investigation. There were no huge contrasts in either the pace of lessening or recuperation of corneal sensitivity as per the incision sites(18). There was a critical lessening in corneal sensation as long as 90 days following predominant just as fleeting clear corneal and phacoemulsification in a study led by Lyne et al 1982, which didn't recuperate even 90 days following a medical procedure. John et al 1988, considered corneal affectability after phacoemulsification<sup>(19)</sup>, utilizing a level scleral cut at 12 o'clock position. Lessened sensation was noted in 90% along the width of the passage at the limbus. However sensation never recuperated to ordinary levels. In the present examination it showed 85.17% of phacoemulsification along the width of passage at limbus. An examination in Korean

populace by Woo et al 2006, tracked down that the corneal affectability was altogether lower at the temporal and fleeting limbal entry point destinations after medical procedure than at the different locales. The level of SICS superior was half furthermore, SICS temporal was 57.1% in our examination. <sup>(20)</sup>

### Conclusion

In conclusion, we observed that cataract surgery is capable of aggravating dry eye and affecting dry eye test values. Therefore, precautions should be taken during the preoperative period. Before surgery, patients should be informed about the possible increase in dry eye symptoms. Intraoperative exposure to the microscopic light should be minimized. The surgeon should be aware of the fact that grooved incisions, despite their advantages in other respects, can aggravate dry eye symptoms and signs in preoperatively healthy patients.

Cataract surgery is one of the most cost-effective interventions in the field of medicine, resulting in immediate visual restoration . phacoemulsification is being increasingly used in the management of cataract patients because of its earlier refractive stabilization, and milder postoperative inflammation, which paves way for a faster visual restoration. Corneal sensation was found to be reduced because most of the surgical procedures involving the anterior segment of the eye disrupt the normal corneal innervation. It is advised to identify the factors that affect the intensity neural regeneration after cataract surgery which can help in enhancing restoration of corneal sensitivity.

### REFERENCES

- [1] Cho YK, Man Soo Kim. Dry Eye After Cataract Surgery and Associated Intraoperative Risk Factors. *Korean J Ophthalmol*. 2009 June; 23(2): 65–73.
- [2] Li XM, Hu L, Hu J, and Wang W. Investigation of Dry Eye Disease and Analysis of the Pathogenic Factors in Patients after Cataract Surgery. *Cornea*. 2007; 26(Suppl. 1): S16-S20.
- [3] Ram J, Sharma A, Pandav SS, Gupta A, Bamberg P. Cataract surgery in patients with dry eyes. *J. Cataract Refract Surg*. 1998 Aug; 24(8): 1119-24.
- [4] Ram J, Gupta A, Brar GS, Kaushik S, Gupta A. Outcomes of phacoemulsification in patients with dry eye. *J Cataract Refract Surg*. 2002 March; 28: 1386-1389.
- [5] The definition and classification of dry eye disease: report of the definition and classification subcommittee of the international dry eye workshop (2007). *Ocul Surf* 2007;5:75–92.
- [6] Sutu C, Fukuoka H, Afshari NA. Mechanisms and management of dry eye in cataract surgery patients. *Curr Opin Ophthalmol* 2016;27:24–30.
- [7] Cho YK, Kim MS. Dry eye after cataract surgery and associated intraoperative risk factors. *Korean J Ophthalmol* 2009;23:65–73.
- [8] Li XM, Hu L, Hu J, Wang W. Investigation of dry eye disease and analysis of the pathogenic factors in patients after cataract surgery. *Cornea* 2007;26(9 Suppl 1):S16–20.
- [9] Yao K, Bao Y, Ye J, et al. Efficacy of 1% carboxymethylcellulose sodium for treating dry eye after phacoemulsification results from a multicenter, open-label, randomized, controlled study. *BMC Ophthalmol* 2015;15:28. <https://doi.org/10.1186/s12886-015-0005-3>.

- [10] Kohli P, Arya SK, Rai A, Handa U. Changes in ocular surface status after phacoemulsification in patients with senile cataract. *Int Ophthalmol* 2018. <https://doi.org/10.1007/s10792-018-0953-8>. [Abstract].
- [11] Al-Aqaba MA, Fares U, Suleman H, Lowe J, Dua HS Architecture and distribution of human corneal nerves. *Br J Ophthalmol* 94, 2010, 784–9.
- [12] Muller LJ, Vrensen GF, PelsL, CardozoBN, Willekens B Architecture of human corneal nerves. *Invest Ophthalmol Vis Sci* 38, 1997, 985–94.
- [13] The International Dry Eye Workshop. *Ocul Surf* 5(2), 2007, 75–193.
- [14] Lekhanont K, Rojanaporn D, Chuck RS, Vongthongsri A Prevalence of dry eye in Bangkok, Thailand. *Cornea* 25, 2006, 1162–7.
- [15] Cho YK, Kim MS Dry eye after cataract surgery and associated intraoperative risk factors. *Korean J Ophthalmol* 23, 2009, 65–73.
- [16] Kohlhaas M. Corneal sensation after cataract and refractive surgery. *J Cataract Refractive Surgery* 1998; 24:1399-1409.
- [17] Schirmer KE, Mellor LD. Corneal Sensitivity after cataract extraction. *Arch Ophthalmol* 1961;65:433-6
- [18] John T. Corneal sensation after small incision, sutureless, one- handed phacoemulsification. *J Cataract Refractive Surgery* 1995;21:425-8.
- [19] Lyne A. Corneal sensitivity after surgery. *Trans Ophthalmol Soc* 1982;102:302-5.
- [20] Woo SW et al. Changes in corneal sensitivity after cataract surgery. *Journal of the Korean Ophthalmological Society*. 2006;47:1251-8

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