

An Analysis of Tear Film Secretion and Stability in Patients Undergoing Phacoemulsification and the Effect and Need of Lubricating Eye Drops Used Postoperatively

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Conflict of interest: Nil

Abstract:

Purpose: This study aims to evaluate tear film stability and tear secretion in patients undergoing Phacoemulsification. And study the effect and need of lubricating eye drops Used postoperatively.

Methods and Material: A prospective randomized comparative cohort study of 140 eyes was carried out, having cataract and who have fulfilled inclusion and exclusion criteria and operated within period of 12months. Study population randomly distributed in two groups,

Group-A- 70 eyes of study population received lubricating eye drops postoperatively.

Group-B- 70 eyes of study population who did not receive lubricating eye drops postoperatively.

Patients are evaluated for dry eye using Schirmer's test, TFBUT, OSDI score preoperatively and postoperatively on day 7, day 35, and day 90.

Results: Mean Schirmer's test and TBUT value decreased significantly in group A as compared to group B on post op day 7 and day 35. Mean OSDI score value is increased significantly more in group A as compared to group B On post op day 7 and day 35 Mean Schirmer's test and TBUT decreased on day 90 in group A and increased in group B. Mean OSDI score on day 90 decreased in Group A and increased in group B.

Conclusion: We concluded that Phacoemulsification surgery causes dry eye postoperatively which is more in those who have not received lubricating eye drops postoperatively.

Keywords: Phacoemulsifications, Dry eye, Schirmer's test, TFBUT, OSDI score.

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Introduction

Dry eye is defined as a multifactorial disease of ocular surface that results in asthenopic symptoms and tear film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface. [1] Phacoemulsification may affect tear film stability by various mechanisms such as use of topical anesthesia and eye drops containing preservatives like benzalkonium chloride. Exposure to light from operating microscope in eyes with longer operative times also causes decrease in the number of goblet cells. Surgery also disrupts normal organization of the corneal innervations

which might affect the ocular surface environment after cataract surgery which will also contribute to dry eye.[2]

In this study-We have used various measurements to assess the incidence and severity pattern of dry eye syndrome among patients who will undergo phacoemulsification using Schirmer's test ,Tear film break up time (TFBUT), Scoring system for dry eye symptoms based upon globally accepted OSDI (Ocular surface disease index).

Aims

- To evaluate tear film stability and tear secretion in patients undergoing phacoemulsification.
- To study the effect and need of lubricating eye drops used postoperatively (Polyethylene glycol 400 0.4%, Propylene Glycol 0.3%).

Objectives:

- To study the preoperatively dry eye symptoms based upon globally accepted OSDI (Ocular surface disease index), Schirmer’s test and, TFBUT (Tear film break Up time) in study population.
- To assess postoperatively dry eye symptoms based upon globally accepted OSDI (Ocular surface disease index), Schirmer’s test and, TFBUT in study population.
- To evaluate the difference between pre and post-operative dry eye symptoms based upon globally accepted OSDI (Ocular surface disease index) and Schirmer’s test, TFBUT in study population.
- To study the effect of lubricating eye drops used postoperatively, in half the study population using globally accepted OSDI (Ocular surface disease index), Schirmer’s test and, TFBUT (Tear film break Up time)

Materials and Methods

A prospective comparative randomized cohort study of 140 eyes was carried out having cataract and undergone phacoemulsification who have fulfilled inclusion and exclusion criteria are evaluated using Schirmer's test, Tear film breaks up time (TFBUT), Ocular surface disease index (OSDI) score preoperatively as well as postoperatively.

Inclusion Criteria

- Patients who are having cataract and undergoing Phacoemulsification cataract surgery with intraocular lens implantation
- Patients between 60 to 80 years of age

Exclusion Criteria

- Cataract caused by an etiology other than ageing e.g., trauma, uveitis, drug induced, etc.
- Pre-existing ocular surface disorders of lids, conjunctiva, cornea and sclera.
- Exposure to chemicals or radiation.
- Use of contact lens.
- Patients on chronic ocular medications for diseases like Glaucoma.
- Patients who have undergone corneal refractive surgery or any other ocular surgery.
- Patients who are receiving concomitant medications that could cause dry eyes such as antihistamines, antidepressants, birth control pills and who have autoimmune diseases.
- Patient with pre-existing dry eye symptoms.

Patients of study population underwent Phacoemulsification surgery.

Study Population is randomly distributed in two groups, Group-A- 70 eyes of study population received lubricating eye drops postoperatively. Group-B- 70 eyes of study population did not receive lubricating eye drops postoperatively. Post operatively Schirmer’s test, TFBUT test, OSDI score were evaluated on day 7, day 35, day 90.

Results

Mean Schirmer’s test value preoperatively in group A and B was 18.84 and 19.01 respectively, post-operative day 7 value of mean Schirmer’s test significantly decreased in Group A and Group B to 9.09 and 8.36 respectively (P value of both groups = 0.00),decrease is more in Group B than in Group A.

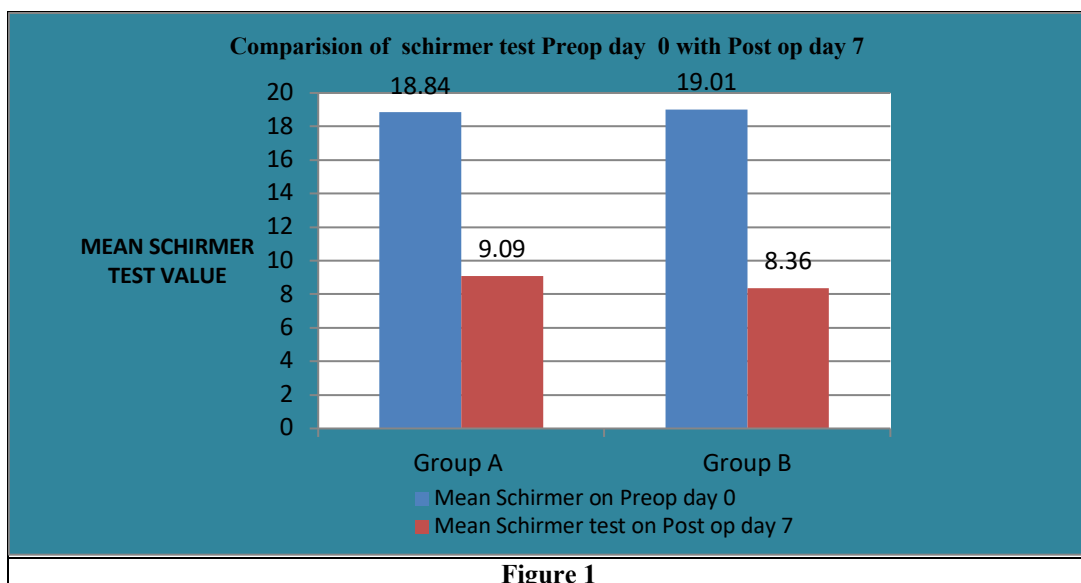


Figure 1

As compared to preoperative value, post-operative day 35 value of mean Schirmer’s test significantly decreased in Group A and Group B to 14.9143 and 13.07 respectively (P value of both groups = 0.00), decrease is more in Group B than in Group A.

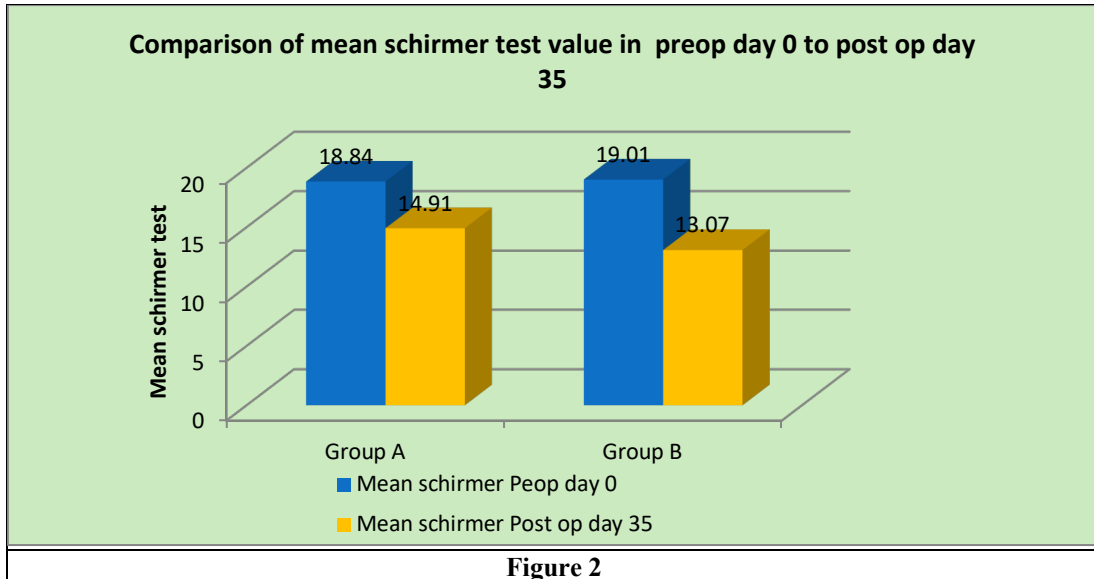


Figure 2

As compared to pre-operative value, post-operative day 90 value of mean Schirmer’s test increased in Group A to 19.0429 ,P value =0.184 and in group B decreased to 16.3857, P value =0.00.

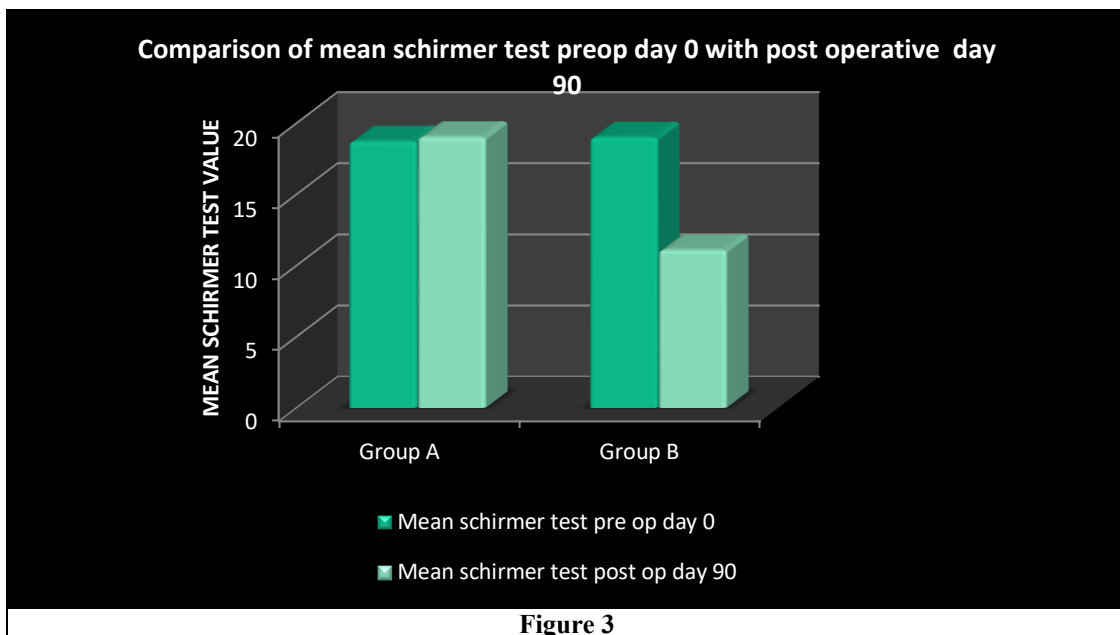


Figure 3

Table 1: Course of Mean schirmer’s test values in subsequent visits in study population

	Group	N	Mean	Std. Deviation
Schirmer's test day0	Group B	70	19.01	2.695
	Group A	70	18.84	3.001
Schirmer’s test day 7	Group B	70	8.36	1.022
	Group A	70	9.09	.775
Schirmer’s test day 35	Group B	70	13.0714	2.32392
	Group A	70	14.9143	2.61956
Schirmer’s test day 90	Group B	70	16.4714	2.94747
	Group A	70	19.0429	2.80494

Mean TFBUT test value preoperatively in group A and B was 21.36 and 20.41 respectively, post-operative day 7 value of mean TFBUT test significantly. Decreased in Group A and Group B to 9.20 and 7.86 respectively (P value of both groups = 0.00), decrease is more in Group B than in Group A.

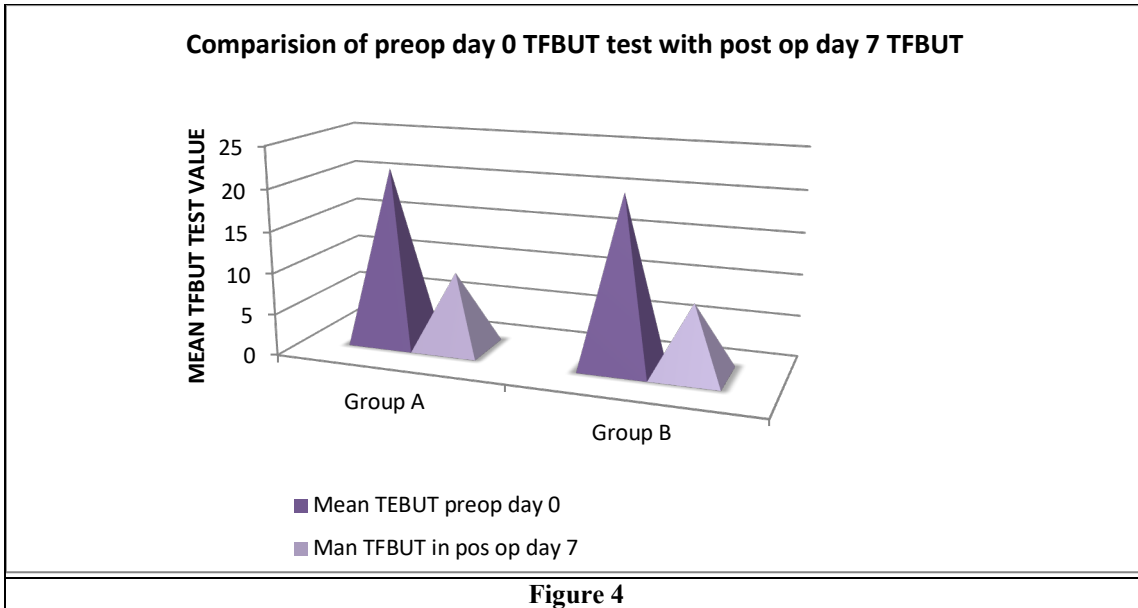


Figure 4

As compared to pre-operative value, post-operative day 35 value of mean TFBUT test. Significantly decreased in Group A and Group B to 16.3571 and 13.6143 respectively (P value of both groups = 0.00), decrease is more in Group B than in Group A

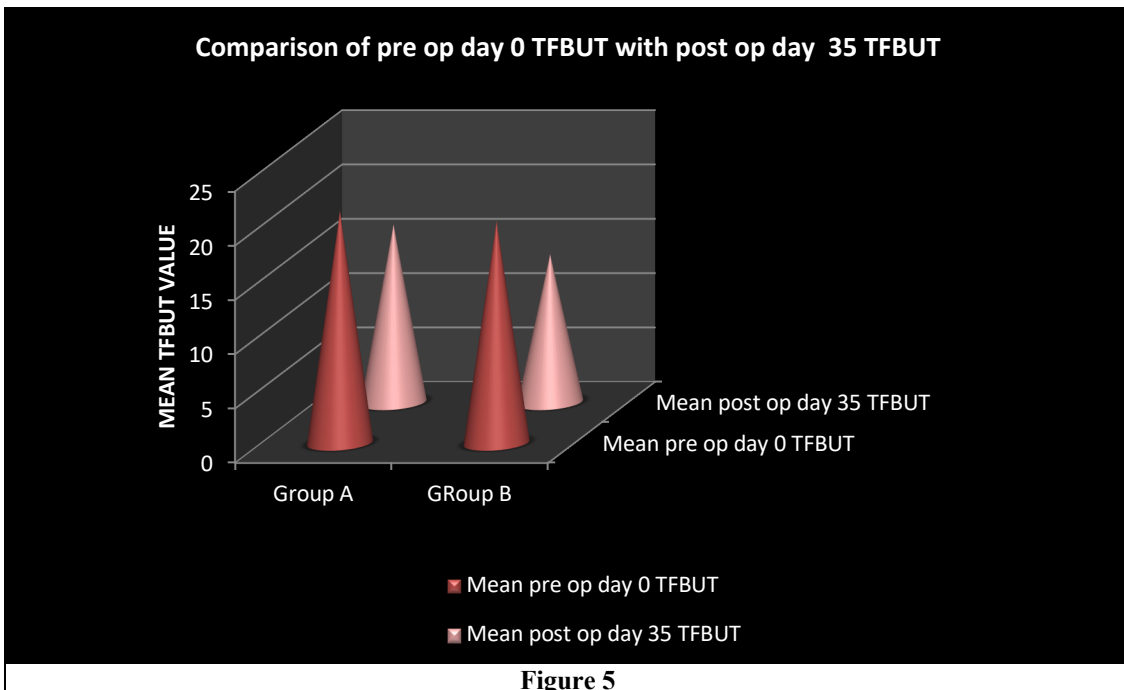


Figure 5

As compared to pre-operative value, post-operative day 90 value of mean TFBUT test decreased in Group A to 21.30, P value = 0.825 and in group B decreased to 17.7143, P value = 0.00.

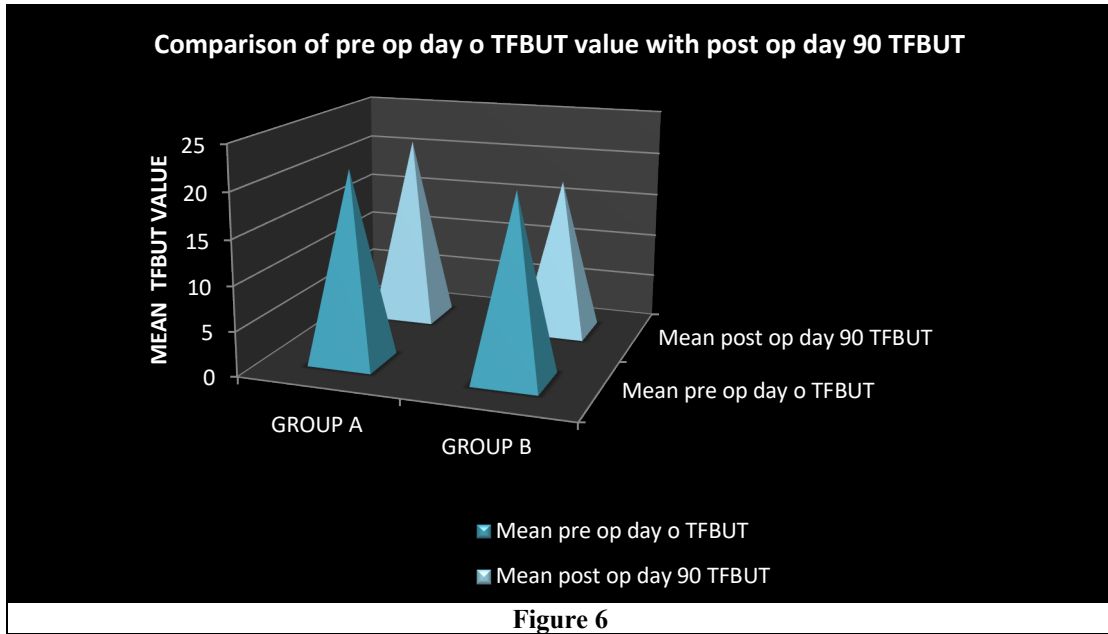


Figure 6

Table 2: Course of Mean TFBUT test values in subsequent visits in study population

	Group	N	Mean	Std. Deviation	Std. Error Mean
TFBUT Day 0	Group B	70	20.41	2.810	.336
	Group A	70	21.36	3.452	.413
TFBUT Day 7	Group B	70	7.86	.873	0.104
	Group A	70	9.20	.672	.080
TFBUT Day 35	Group B	70	13.6143	2.32375	.27774
	Group A	70	16.3571	2.53689	.30322
TFBUT Day 90	Group B	70	17.7143	2.56590	.30668
	Group A	70	21.3000	3.23634	.38682

Mean OSDI score value preoperatively in group A and B was 13.09 and 12.09 respectively, postoperative day 7 value of mean OSDI score value significantly increased to in Group A and Group B to 30.77 and 38.16 respectively (P value of both groups = 0.00), increase is more in Group B than in Group A.

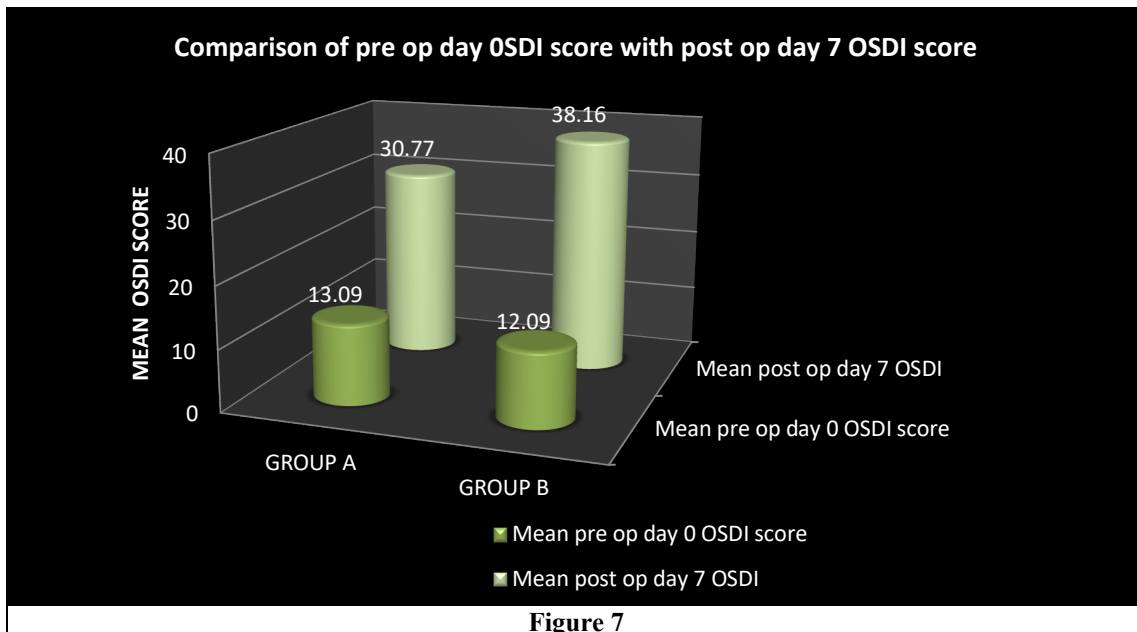
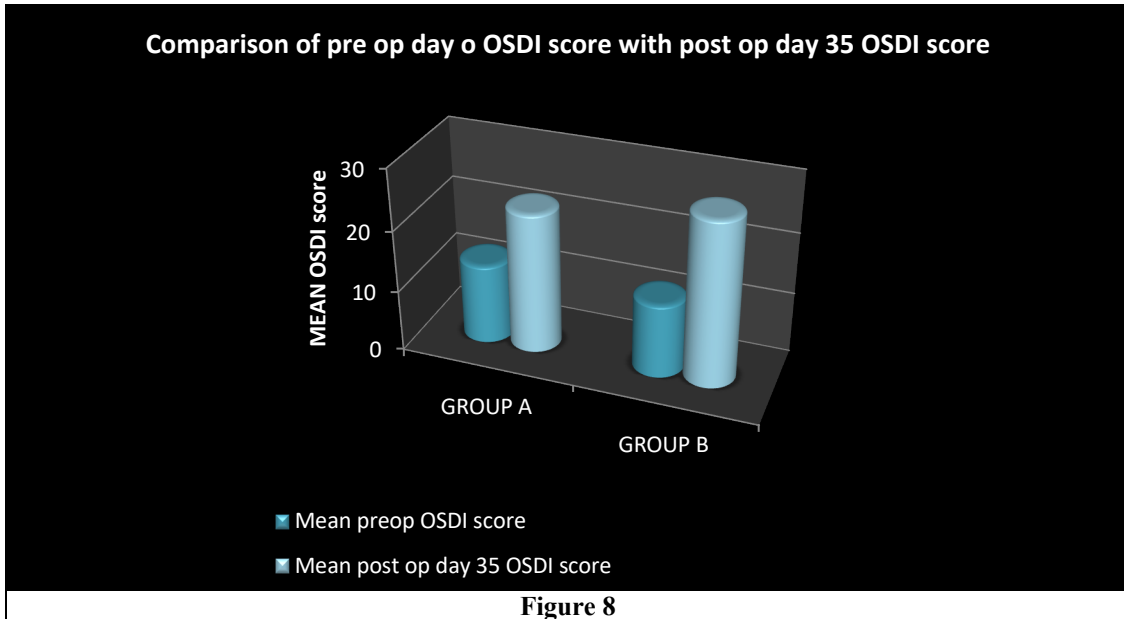


Figure 7

As compared to pre-operative value, post-operative day 35 values of mean OSDI score .Significantly increased in Group A and Group B to 22.9857 and 27.0429 respectively (P value of both groups = 0.00), increase is more in Group B than in Group A.



As compared to pre-operative value, post-operative day 90 value of mean OSDI score decreased in Group A to 12.09, P value = 0.300 and in group B increased to 15.785, P value =0.00.

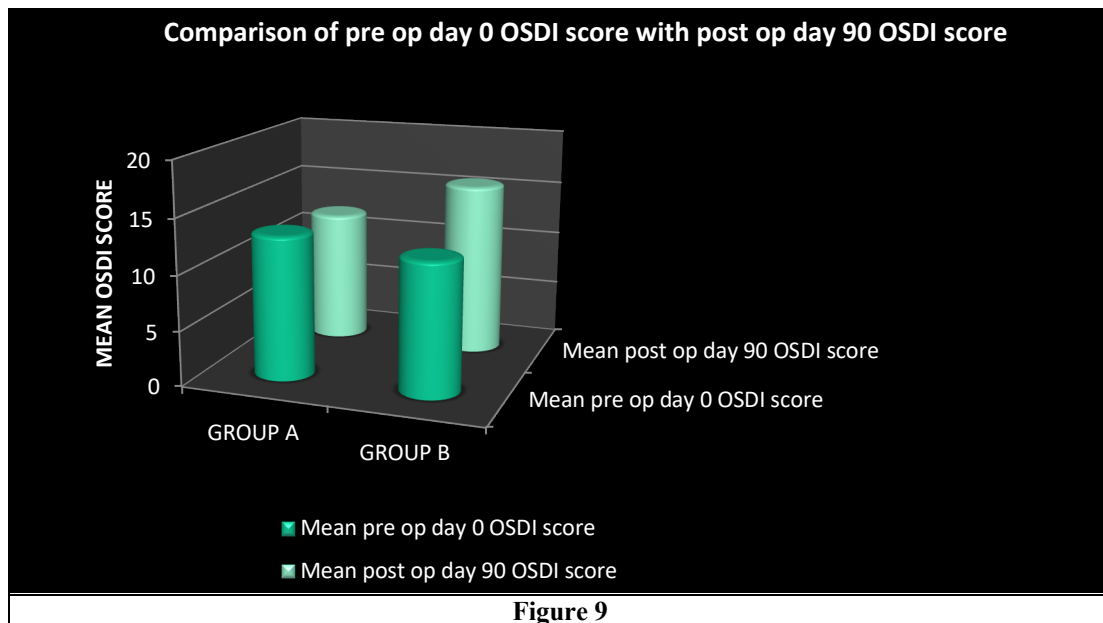


Table 3: Course of Mean OSDI score values in subsequent visits in study population

	Group	N	Mean	Std. Deviation	Std. Error Mean
OSDI Day0	Group B	70	12.09	1.871	.224
	Group A	70	13.09	2.739	.327
OSDI Day7	Group B	70	38.16	7.250	.867
	Group A	70	30.77	4.582	.548
OSDI DAY 35	Group B	70	27.0429	4.09466	.48941
	Group A	70	22.9857	4.62975	.55336
OSDI DAY 90	Group B	70	15.7857	3.30959	.39557
	Group A	70	12.9000	2.91000	.34781

Discussion

Phacoemulsification is increasingly applied in the management of cataract patients because of its early refractive stabilization, reduced induced astigmatism, and milder postoperative inflammation, all resulting in faster visual rehabilitation. Dry eye disease is one of the commonest ocular disorders. Phacoemulsification may affect tear film stability by following mechanisms

Cornea is innervated by long ciliary nerves of ophthalmic branch of the trigeminal nerve. In normal conditions, these nerves send afferent stimuli to brainstem and parasympathetic and sympathetic signals stimulate lacrimal gland for tear production and secretion. For normal blinking and tearing reflexes, intact corneal innervations are necessary. Damage to this circuit causes dry eye. Phacoemulsification causes denervations of cornea resulting in decreased blinking and reduction in tear production thus leading to increased epithelial permeability decreased epithelial metabolic activity and impaired epithelial wound healing.[3,4]

In healing process, neural growth factor is released to regenerate the sub epithelial corneal axon, this process is completed approximately within 1 month and this recovery of the nerves may explain why dry eye signs and symptoms are prominent in early post-operative period and improve thereafter.[5] Vigorous irrigation of the cornea intraoperatively and ocular surface manipulation deteriorate tear film stability and may reduce goblet cell density and thus cause shortened TBUT postoperatively.[6,7] Exposure to microscope light may also aggravate dry eye symptoms postoperatively. The use of topical anesthesia, topical eye drops containing preservatives like benzalkonium chloride administered preoperatively and postoperatively may also cause tear film instability and decrease the number of mucin

expressing cells and lead to dry eye postoperatively.[8,9] Dry eye is frequently associated with symptoms of discomfort and visual disturbance also impairs quality of life (QoL), including aspects of physical, social, and psychological functioning.[10] Sahu PK et al have conducted study to evaluate dry eye following Phacoemulsification. They concluded that there was a significant deterioration of all dry eye test values following Phacoemulsification surgery along with an increase in subjective symptoms. These values started improving after 1-month postoperatively, but preoperative levels were not achieved till 2 months after surgery.[11]

In our study we found similar results in those group in which lubricant eye drop was not used post operatively and decrease in dry eye test values (Schirmer's test and TFBUT), which was significantly low on post op day 7 which improved over next follow up but have not reached preoperative value till 3 months. Sanchez et al. have conducted study to assess the effect of hydroxypropyl (HP-Guar) added to regular post-phacoemulsification treatment in dry eye signs and symptoms patients were evaluated preoperatively and postoperatively at 1 month. They have divided study population in two groups after phacoemulsification, to the usual treatment group (UT), and HP gaur group who received HP gaur in addition to usual treatment found that HP-Guar group shows statistical better results compared with the UT group in OSDI.[12] In our study we studied OSDI for pre op and Day 7, 35, 90 which gives better idea of progression of dry eye and effect of lubricating eye drops on subsequent visit. It shows OSDI score is highest on post op day 7 then it reduces and pt symptoms improve in subsequent visit. OSDI score almost returns to normal in those receiving post op lubricant drops and as compared to preoperative value it continues to remain higher in those who have not received lubricant drop.

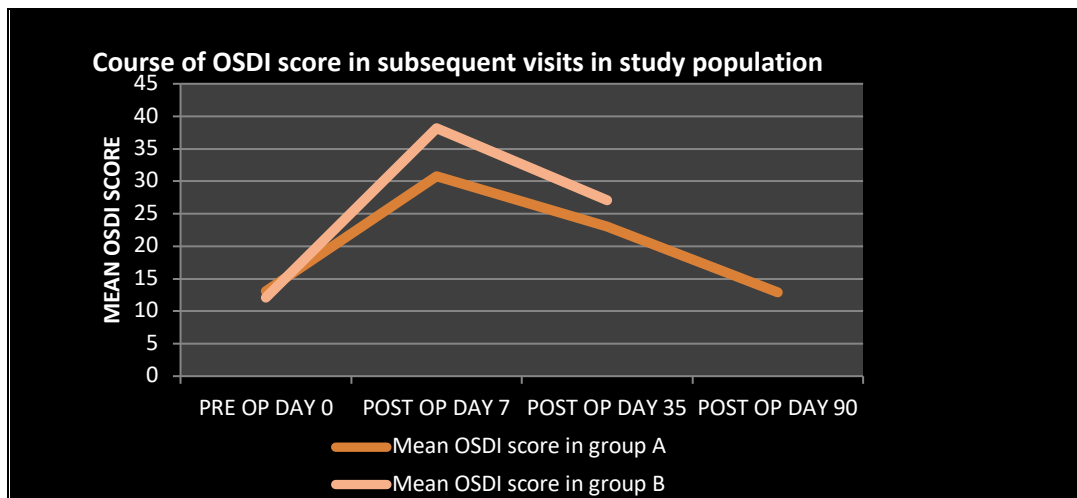


Figure 10

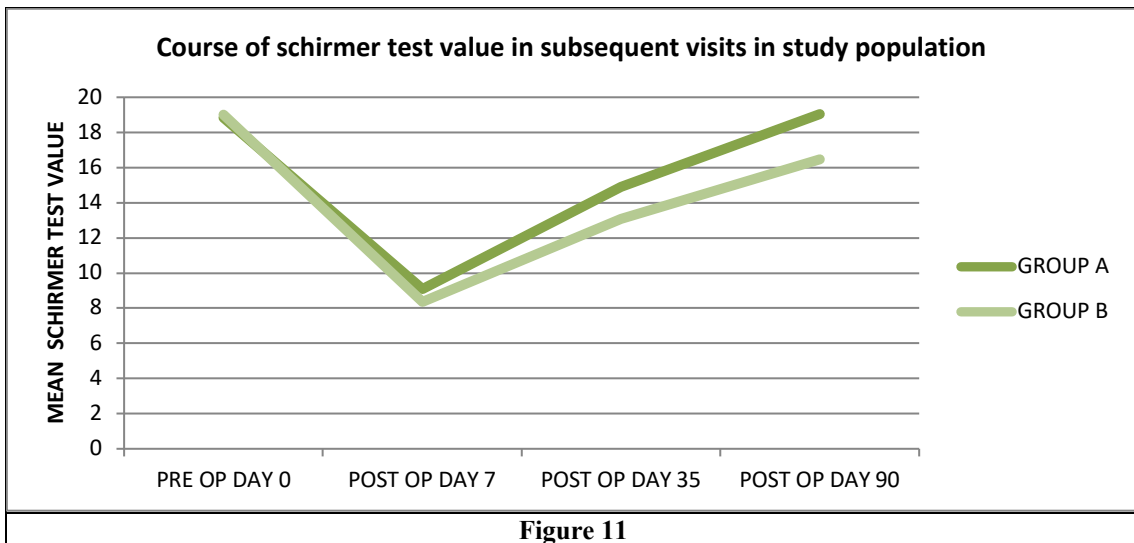
GROUP A- Mean OSDI score pre op day 0 value was 13.09, in post op day 7 was 30.77, post op day 35 was 22.9857, post op day 90 value was 12.9. GROUP B –Mean OSDI score pre op day 0 values was 12.09, in post op day 7 was 38.16, post op day 35 was 27.0429, post op day 90 value was 15.785.

Hamed et al found that patients who underwent phacoemulsification surgery suffered from dry eye with significant results at 1st week post-operative that improved over time to return to the normal values within 12 weeks postoperatively. The mean value of Schirmer’s test I result on 1st week post-operative shows statistically significant difference

from pre-operative assessment (p-value= 0.001). Both 4th weeks, 12th week results have significant difference from preoperative value It showed dry eye scores peaked at 1 week after surgery which gradually improved over 12 weeks and returned to normal values that were close to preoperative values.[9] In our study we found similar results.

GROUP A- Schirmer’s test pre op day 0 value was 18.84, in post op day 7 was 9.09, post op day 35 was 14.9143, post op day 90 value was 19.0429.

GROUP B - Schirmer’s test pre op day value was 19.01, in post op day 7 was 8.36, post op day 35 was 13.0714, post op day 90 value was 16.4714.



It shows Schirmer’s test values decreases post operatively in those who have received lubricant and those who have not received post operatively.

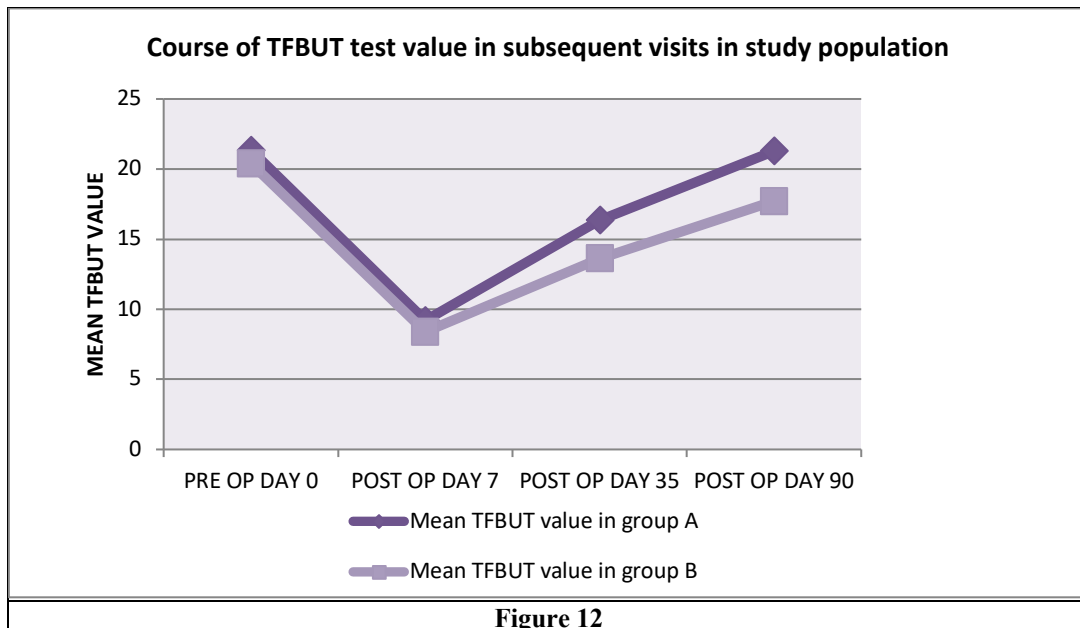
Maximum decrease is in day 7 follow up then it increases and almost returns to normal in those who received lubricant drop as compared to those who have not in which it increases but continues to be lower than pre op value. Ke Yao et al studied the efficacy and safety of carboxymethylcellulose sodium (CMC) 1% ophthalmic solution combined with conventional therapy in treating dry eye signs and symptoms after phacoemulsification were evaluated. They found that TBUT was significantly longer in the treatment group compared with the control group at day 7 (P=0.0475) and day 30

(P = 0.0258) after surgery. Compared with baseline, TBUT significantly increased in patients in the treatment group (P<0.001 at both day 7 and day 30) and thus concluded that Treatment with CMC 1% can provide significant improvement in tear film stability after phacoemulsification for age-related cataract.[9]

In our study we found out that

GROUP A- TFBUT test pre op day 0 value was 21.36, in post op day 7 was 9.2, post op day 35 was 16.3571, post op day 90 value was 21.30.

GROUP B - TFBUT test pre op day 0 value was 19.01, in post op day 7 was 7.86, post op day 35 was 13.6143, post op day 90 value was 17.7143



Thus our study concludes that phacoemulsification causes post-operative dry eye, more in those who have not received lubricating eye drops post operatively compared to those who received the same post operatively thus lubricating eye drops used post operatively reduces the extent of dry eye after phacoemulsification. In our study patients were not followed for more than period of 3 months post-operatively. Even though our study was justified statistically, this period was too short to evaluate the exact clinical course and long-term effects of phacoemulsification on tear film secretion and stability. We did not divide the both groups of study population into subgroups according to their degree of dry eye severity after phacoemulsification, due to this severity of dry eye in both groups at each visit after surgery is not assessed. Other test parameters like rose Bengal test, lissamine green test, and Tear Meniscus height were not included in our study. These points need to be studied further.

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