



Dry: which is more and why, Lasik or PRK

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Abstract

Objective: to evaluate the severity of Dry eye (mild, moderate or severe) following laser in-situ Keratomileusis and surface ablation (photorefractive keratectomy/PRK)

Methods: Nonrandomized, prospective and comparative clinical study. A total of 40 eyes of 20 patients were divided into two groups (group X and Y). In Group X, 20 eyes were operated with Femtosecond assisted LASIK and in group Y, 20 eyes underwent surface ablation with laser epithelial removal. Dry eye was evaluated by Tear breakup time (TBUT) and Schirmer 2 tests. All patients were followed up at 1 week, 1 month, and 3 months postoperatively.

Results: Mean TBUT Preoperatively in LASIK patients was 14.55 ± 1.81 s and mean TBUT in surface ablation was 14.39 ± 1.92 s ($p=0.291$). Mean TBUT at 1 week, 1 month, and 3 months in LASIK patients was 7.55 ± 1.08 , 8.85 ± 1.43 and 9.89 ± 1.62 seconds respectively. Whereas, Mean TBUT in surface ablation patients at 1 week, 1 month and 3 months was 8.99 ± 1.83 , 10.88 ± 1.44 and 10.89 ± 1.72 seconds resp. P value was less than 0.05 between these 6 readings. Preoperative mean Schirmer values in LASIK patients was 15.19 ± 2.22 mm and surface ablation patients was 15.54 ± 1.97 mm ($p=0.345$). Mean Schirmer's values of LASIK group at 1 week, 1 month and 3 months were 10.23 ± 0.97 , 10.78 ± 2.49 and 13.73 ± 1.63 mm respectively ($p<0.05$). Mean Schirmer's in surface ablation patients was 10.82 ± 1.07 , 11.86 ± 1.82 and 15.35 ± 1.64 mm respectively ($p<0.05$).

Conclusion: LASIK and surface ablation both cause Dry eye but its higher in LASIK patients.

Keywords: LASIK, photorefractive keratectomy, surface ablation, tear breakup time, Schirmer test.

Introduction

Corneal innervation is an integral part of lacrimal gland and ocular surface function^[1] which coordinates basal and stimulated tear production, tear spreading, tear clearance and lid blinking^[2]. Corneal refractive surgeries severs central corneal nerves leading to impaired corneal sensitivity and function. The recovery happens in a progressive manner and takes around 3-9 months^[3], meanwhile patients complain of varying degrees of Dry eye symptoms. Most common symptoms are fluctuating

vision, blurred vision, stinging sensation, photophobia and visual fatigue. The nerve recovery in cornea can be best seen on confocal microscopy. Dry eye is diagnosed on assessment of patient's symptoms and signs and few diagnostic tests, like, Schirmer's test to evaluate tear secretion, tear breakup time to evaluate tear film stability, tear meniscus, ocular surface staining, tear film interferometry, tear osmolarity, anterior segment optical coherence etc.

Patients and Methods

Our study was a Prospective, nonrandomized and comparative clinical study which included 40 eyes from 20 patients, in this 20 eyes from group X underwent LASIK and 20 eyes from group Y underwent surface ablation (trans-PRK)

The study was conducted between march 2017 to march 2018. All patients were followed up at 1 week, 1 month and 3 months respectively.

In LASIK cases, flap was created using Schwind Amaris 500Hz with Femtosecond laser and ablation using Schwind Amaris excimer laser system.

The surface ablation was done using Transepithelial PRK (Trans-PRK) technique and the epithelium was removed using Schwind Amaris 500 excimer laser system with Smart pulse technology.

Inclusion and exclusion criteria's

Patients between 18-47 years, stable refraction of eye for at least 1-year, corneal thickness more than 490 μm and good corneal topography without any signs of keratoconus were Included.

Patients less than 18 years, patients taking any systemic medications for systemic diseases, like, diabetics and clinical or subclinical keratoconus and those suffering from any autoimmune diseases or immunodeficiency states were all excluded from the study.

Investigations

Tear breakup time is the time required for dry spots to appear on the corneal surface after staining and blink. It tells us the stability of the tear film. After instillation of Topical anaesthesia sodium fluorescein dye (available in strip form) is gently rubbed in the Inferior bulbar conjunctiva and patient is asked to blink repeatedly for 3-4 times and the cornea is viewed under slit lamp in cobalt blue light and patient is asked to Avoid blinking until dry spots develop and the time is noted simultaneously. The longer it takes the more stable the tear film. TBUT more than 10 seconds is considered Normal, 5-10 s is marginal and less than 5s is Low, i.e., more likelihood of dry eye syndrome.

Schirmer lacrimation test (Schirmer test), it is of 2 types- Schirmer 1 is without topical anaesthesia and Schirmer 2 is with usage of topical anaesthesia. In our study we used Schirmer 2. After instillation of 0.5% proparacaine drops, Whatman's paper is bent 5mm from above and placed over the junction of temporal and medial thirds of lower lid margin. The patient was asked to close their eyes partially. We measured the distance of tear flow on the paper in 5 min, greater the distance higher the natural tear production.

Statistical analysis

All the Analysis and calculations of the collected data were done by expert statistician and they used Paired student's *t*-test. *P* value of 0.05 was considered significant.

Results

Our study had 2 groups, group X consisting of 20 eyes who underwent LASIK procedure and group Y also consisting of 20 eyes who underwent surface ablation by Trans-PRK.

Preoperative mean TBUT in LASIK patients was 14.55 ± 1.81 s (range was from 11-18) and in surface ablation patients was 14.39 ± 1.92 s (range=11-17), so the difference was statistically insignificant (*P*= 0.291). Mean Schirmer test value in LASIK patients was 15.19 ± 2.22 mm (range=10-20) and in surface ablation patients was 15.54 ± 1.97 mm (range=10-21), the difference was statistically insignificant (*P*=0.345).

After 1 week postoperative period, values of Mean TBUT in LASIK and surface ablation patients was 7.55 ± 1.08 s (range= 6-12) and 8.99 ± 1.83 s (range= 6-12) and *P* value less than 0.0001 and the difference was statistically significant. Mean Schirmer test values in LASIK and surface ablation patients was 10.23 ± 0.97 mm and 10.82 ± 1.07 mm respectively. *P* value = 0.026 and statistically significant. In terms of severity there were- 4 severe, 14 moderate and 2 mild cases of Dry eyes in LASIK group and 2 severe. 15 moderate and 3 mild dry eyes in surface ablation group by TBUT. By Schirmer test, there were 14

moderate and 6 mild dry eye cases in LASIK group, and 13 moderate and 7 mild dry eyes.

After 1 month of postoperative period, mean TBUT in LASIK group and surface ablation group was 8.85 ± 1.43 s (range=7-13) and 10.88 ± 1.44 s (range=8-13) and P value <0.0001, so statistically extremely significant. Mean Schirmer's test values in LASIK and surface ablation groups was 10.78 ± 2.49 mm (range=8-16) and 11.86 ± 1.82 mm (range=9-16), P value <0.006 and statistically significant. Severity wise Group X had 14 moderate and 6 mild cases and group Y had 9 moderate and 11 mild dry eyes by TBUT procedure. By Schirmer's test there were 10 moderate and 10 mild cases in LASIK group, and 8 moderate and 12 mild dry eyes in surface ablation group.

After 3 months of postoperative period, Mean TBUT in LASIK group and surface ablation group was

9.89 ± 1.62 s (range=6-14) and 10.89 ± 1.72 s (range=7-14) and P value <0.0001, so statistically extremely significant. Mean Schirmer's test values in LASIK group and surface ablation groups was 13.73 ± 1.63 mm (range= 10-17) and 15.35 ± 1.64 mm (range=10-18) and P value <0.0001, so statistically extremely significant. Severity wise by TBUT, group X showed 9 moderate and 11 mild and group Y showed 8 moderate and 12 mild dry eyes. By Schirmer's test, group X showed 4 moderate and 16 mild cases, and group Y showed 3 moderate and 17 mild cases of dry eyes.

And both the Groups at 1 week, 1month and at 3 months showed Significant differences and the results improved at subsequent follow-ups.

All comparative Results are summarized in Table 1 and 2.

Table 1- Tear breakup time values

TBUT	TBUT PREOPERATIVE	TBUT 1 WEEK POSTOPERATIVE	TBUT 1 MONTH POSTOPERATIVE	TBUT 3 MONTHS POSTOPERATIVE
LASIK mean(S)	14.55 ± 1.81 s (range=11-18)	7.55 ± 1.08 s (range=6-12) 4 severe, 14 moderate, 2 mild	8.85 ± 1.43 s (range=7-13) 14 moderate, 6 mild	9.89 ± 1.62 s (range=6-14) 9 moderate, 11 mild
Surface ablation, mean(s)	14.39 ± 1.92 s (range=11-17)	8.99 ± 1.83 s (range=6-12) 2 severe, 15 moderate, 3 mild	10.88 ± 1.44 s (range=8-13) 9 moderate, 11 mild	10.89 ± 1.72 s (range=7-14) 8 moderate, 12 mild
P value	0.291	<0.0001	<0.0001	<0.0001

Table 2- Schirmer 2 test values

Schirmer test	Schirmer preoperative	Schirmer 1 week postoperative	Schirmer 1month postoperative	Schirmer 3 months postoperative
LASIK Mean(s)	15.19 ± 2.22 mm (range=10-20)	10.23 ± 0.97 mm (range=7-13) 14 moderate, 6 mild	10.78 ± 2.49 mm (range=8-16) 10 moderate, 10 mild	13.73 ± 1.63 mm (range=10-17) 4 moderate, 16 mild
Surface ablation Mean(s)	15.54 ± 1.97 mm (range=10-21)	10.82 ± 1.07 mm (range=8-13) 13 moderate, 7 mild	11.86 ± 1.82 mm (range=9-16) 8 moderate, 12 mild	15.35 ± 1.64 mm (range=10-18) 3 moderate, 17 mild
P value	0.345	0.026	0.006	<0.0001

Discussion

Eye is a very sensitive organ and Dryness of eyes can cause a variety of symptoms and signs. 90% of patients experience dry eye symptoms after corneal refractive surgeries, especially, after LASIK. Symptoms can be variable but most frequent ones are fluctuating vision and Blurred vision.

Corneal nerves (afferent) penetrate the cornea from limbus and form thick nerve bundles in the anterior one third of stroma and bend 90 degree and penetrate Bowman's layer and form the epithelial-subepithelial nerve plexus between basal epithelial cells and Bowman's layer^[4]. In surface ablation only the epithelium is removed along with small part of anterior stroma, therefore only the superficial

nerve plexus is injured but in LASIK deeper corneal stromal plexus are injured during the process of creating lamellar flap^[5], thus reason for more severe dry eyes. Deeper stromal ablation have shown slower recovery of corneal sensation.

Other contributing factors may be higher myopic corrections requiring greater refractive ablations for achieving emmetropia, reduced blink rate post-surgery, loss of goblet cells of conjunctiva, osmolarity changes, exposure keratopathy, hinge position and hinge width, amount of suction applied, long time use of contact lenses, people with Narrow palpebral fissure and very important and often missed factor is *Pre-existing underlying chronic dry eye syndrome*.

In our study we found that tear film stability, which was measured by TBUT was affected more than tear film secretion measured by Schirmer test. And Moreover both Tear film stability and Secretion were affected more in LASIK group^[6] as compared to surface ablation group as already discussed. Overall, we observed that dry eye occurred in almost all cases in our study patients and most did not regain their preoperative values.

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