DRY EYE AFTER LASIK

Mohan Sivakami[1], Ramakrishnan Sivakalai[2], Muruganantham Periyanayagi[3], Vadivelu Sharmila Devi[4], Thangaraj Vimala[5]

[1]Senior Assistant Professor, Department of Ophthalmology, Regional Institute of Ophthalmology and Government Ophthalmic Hospital, Madras Medical College, Chennai, Tamil Nadu.
[2]Senior Assistant Professor, Department of Ophthalmology, Regional Institute of Ophthalmology and Government Ophthalmic Hospital, Madras Medical College, Chennai, Tamil Nadu.
[3]Senior Assistant Professor, Department of Ophthalmology, Regional Institute of Ophthalmology and Government Ophthalmic Hospital, Madras Medical College, Chennai, Tamil Nadu.
[4]Senior Assistant Professor, Department of Ophthalmology, Regional Institute of Ophthalmology and Government Ophthalmic Hospital, Madras Medical College, Chennai, Tamil Nadu.
[5]Senior Assistant Professor, Department of Ophthalmology, Regional Institute of Ophthalmology and Government Ophthalmic Hospital, Madras Medical College, Chennai, Tamil Nadu.

ABSTRACT

BACKGROUND

Myopia (short-sightedness) is reaching epidemic proportions, especially in Asia, due to urbanization and increased screen and text–based activity throughout all aspects of our daily lives. One of the most promising and exciting developments in the world of correction of myopia, namely refractive surgery has been the advent of Laser Assisted in Situ Keratomileusis (LASIK). Dry eye is considered to be the most common complication of LASIK.[1]

The purpose of this study was to retrospectively investigate the incidence of dry eye in patients undergoing myopic LASIK at our tertiary care hospital and also to determine significant risk factors, if any, for developing dry eye in this cohort of patients.

MATERIALS AND METHODS

The study was conducted at the Cornea and Refractive Surgery Services, Aravind Eye Hospital, Madurai. This was a retrospective observational study of all eligible patients undergoing myopic LASIK. 100 patients i.e., 200 eyes were studied.

RESULTS

The mean age of patients undergoing LASIK was 24±4. Majority of them were females (59%). There was no difference in the gender and low scores in the Schirmer's test. Pre-operative and post-operative Schirmer's test and TBUT values revealed no dry eye. There was no correlation between pre-operative degree of myopia and post-operative low scores in Schirmer's test.

CONCLUSION

Patients who underwent LASIK did not report and were not found to develop any significant dry eye in the postoperative period.

KEYWORDS

Dry Eye, Myopia, Lasik, Schirmer's Test, TBUT.

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Myopia (short-sightedness) is reaching epidemic proportions, especially in Asia, due to urbanization and increased screen and text–based activity throughout all aspects of our daily lives. One of the most promising and exciting developments in the world of correction of myopia namely refractive surgery has been the advent of Laser Assisted in Situ Keratomileusis (LASIK). Laser assisted in situ keratomileusis (LASIK), is a safe and effective method with many advantages over other existing refractive procedures, including early and painless recovery of vision, less regression, and the absence of subepithelial haze.[2] Patient satisfaction with the outcome is usually very high because LASIK can give them a high quality of vision almost immediately following surgery.[2] It has been frequently reported in the western literature that patients experience discomfort, ocular fatigue, dryness, grittiness and burning or a temporary worsening of the symptoms of dry eye in the early post-operative period and that these symptoms disappear over time. It is also considered that dry eye is the most common complication of LASIK.[1]

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Corresponding Author:
Dr. Ramakrishnan Sivakalai,
Senior Assistant Professor,
Department of Ophthalmology,
Regional Institute of Ophthalmology and Government Ophthalmic Hospital,
Madras Medical College,
Chennai, Tamil Nadu.
E-mail: drrskalai@gmail.com
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MATERIALS AND METHODS

The study was conducted at the Cornea and Refractive Surgery Services, Aravind Eye Hospital, Madurai. This was a retrospective observational case series of all eligible patients

undergoing myopic LASIK. 200 eyes of 100 patients during the time period May 2007 to April 2008 were studied.

Inclusion Criteria

1. Patients aged 18 years and above of either sex.
2. All myopic refractive errors
   a. Simple myopia
   b. Compound myopic astigmatism
   c. Simple myopic astigmatism
3. Willingness to participate in the study and available for follow up.

Exclusion Criteria

1. Patients undergoing Photo Refractive Keratotomy (PRK).
2. Hypermetropia
3. Patients with systemic diseases, those on medications for collagen vascular disorders, Diabetes Mellitus, Hypertension
4. Repeat Refractive surgery / Retreatment

Pre-Operative Evaluation

I. All patients underwent a detailed evaluation including:

1. Detailed history
2. Uncorrected visual acuity
3. Automated refraction
4. Cycloplegic refraction
5. Keratometry
6. Corneal topography / ORBSCAN
7. Slit Lamp Evaluation
8. USG pachymetry
9. Dilated fundus examination by a retinal specialist
10. Schirmer test without anaesthesia
11. Tear film break up time (TBUT)

Post-OP Evaluation

At 1 month and whenever the patient came thereafter-

1. Detailed history
2. Uncorrected visual acuity.
3. Refraction
4. Slit Lamp Evaluation
5. Schirmer's test without anaesthesia
6. Tear film break up time (TBUT)

Surgical Technique

The patient's lids were first cleaned with betadine solution. Topical anaesthesia was applied.

A flying spot laser Chiron Technolas Keracar 217 was used. The Hansatome microkeratome was used to create a corneal flap. The suction ring was set to full diameter, which creates a corneal disk between 8.5 mm and 9.5 mm.

Suction was applied and a Barraquer applanation tonometer was used to verify if the IOP was greater than 65 mmHg.

The surface of the globe and suction ring were moistened, and the microkeratome was inserted into the dove tail of the ring and advanced to the edge of the toothed gear track. The microkeratome advanced mechanically and stopped 0.50mm short of a complete resection. The microkeratome was then reversed by pressing on the other end of the pedal and removed from the eye, leaving the disc in place. The suction was turned off. The excimer laser was centered, the patient being instructed to view the fixation light. The two helium neon beams were focused on the surface of the cornea and were then observed to be present at 3 O clock and 9 O clock on the pupil ensuring centration on the pupil.

An angled hook was then slid into the corneal bed and the flap was folded back briskly into the surface of the suction ring. The laser was again focused onto the surface of the stromal bed and centred. The surgeon then activated the laser with the foot pedal and the laser completed the ablation. One drop of BSS was placed on the stromal bed and a long cannula was inserted beneath the epithelial surface of flap and irrigated well. The flap was reapplied to the surface of the cornea with a cannula. Two cellulose microsponges were used to gently manipulate the cornea until the two semi radial alignment lines were properly oriented. The edge of the flap was then dried, which helps to adhere it in place. Topical antibiotics were applied. No patch was applied.

RESULTS

Age Group	Frequency
18-25	68
25-35	30
35-45	2
Total	100

Table 1. Age

The mean age of the patients was 24.59±4.00.

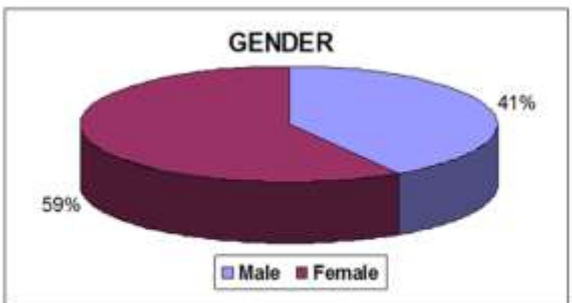

Table 2. Gender

The majority were females (59%).

Sex	Absent	Present	Total
Male	39	2	41
Female	55	4	59
Total	94	6	100

Table 3. Post-Operative Right Eye/Left Eye Schirmer's Value Less Than 15

Fisher's exact = 1.000
1-sided Fisher's exact = 0.523

There was no difference in gender and low scores in the Schirmer's test in the post-operative period. (Fisher's exact test was used).

Variable	Mean	Standard Deviation	Minimum	Maximum
Schirmer's Value Pre-Operative Right Eye	27.43	8.280749	4	35
Schirmer's Value Pre-Operative Left Eye	28.58	8.123019	3	35
Schirmer's Value Post-Operative Right Eye	28.45	7.524203	2	35
Schirmer's Value Post-Operative Left Eye	29.16	7.927347	2	35

Table 4. Schirmer's Test: Pre-Operative & Post-Operative Values: A Comparison

The pre-operative mean Schirmer's values of right eye and left eye were 27.43 with a standard deviation of 8.28 and 28.58 with a standard deviation of 8.12 respectively. The post-operative mean Schirmer's values of right eye and left eye were 28.45 with a standard deviation of 7.52 & 29.16 with a standard deviation of 7.92 respectively.

Pre-Operative Right Eye Schirmer's Less Than 15	Frequency	Percentage
Absent	89	89
Present	11	11
Total	100	100

Table 5. Pre-Operative Right Eye Schirmer's Less Than 15

11% of the patients had Schirmer's score less than 15 in their right eye in the pre-operative period.

Post-Operative Right Eye Schirmer's Less Than 15	Frequency	Percentage
Absent	96	96
Present	4	4
Total	100	100

Table 6. Post-Operative Right Eye Schirmer's Less Than 15

4% of the patients had Schirmer's score less than 15 in the right eye in the post-operative period.

Pre-Operative Right Eye Schirmer's Less Than 15	Post-Operative Right Eye Schirmer's Less Than 15		
	Absent	**Present**	**Total**
Absent	89	0	89
Present	7	4	11
Total	96	4	100

Table 7. Pre-Operative vs. Post-Operative Schirmer's Less Than 15 in Right Eye

89 patient's right eyes did not have low scores in the Schirmer's test in the pre-operative period. Among them none of them had low scores in the post-operative period. Among the 11 cases who had low scores in the right eye in the pre-operative period, only 4 had low scores in right eye in the post-operative period.

Low Scores in the Left Eye

Pre-Operative Left Eye Schirmer's Less Than 15	Frequency	Percentage
Absent	91	91
Present	9	9
Total	100	100

Table 8. Pre-Operative Left Eye Schirmer's Less Than 15

9% of the patients had Schirmer's score less than 15 in their left eye in the pre-operative period.

Post-Operative Left Eye Schirmer's Less Than 15	Frequency	Percentage
Absent	94	94
Present	6	6
Total	100	100

Table 9. Post-Operative Left Eye Schirmer's Less Than 15

6% of the patients had Schirmer's <15 in the left eye in the post-operative period.

Pre-Operative Left Eye Schirmer's Less Than 15	Post-Operative Left Eye Schirmer's Less Than 15		
	Absent	**Present**	**Total**
Absent	89	2	91
Present	5	4	9
Total	94	6	100

Table 10. Pre-Operative vs. Post-Operative Schirmer's Less Than 15 in Left Eye

Among the 91 left eyes which did not have low scores in the pre-operative period 2 eyes had low scores in the post-operative period. Mean spherical power of these two eyes

was -4.75 & the corresponding right eyes had low scores in the preoperative and postoperative period.

Low Scores in Any One of The Eyes

Pre-Operative Schirmer's Less Than 15 in Either Eye	Frequency	Percentage
Absent	88	88
Present	12	12
Total	100	100

Table 11. Pre-Operative Schirmer's Less Than 15 in Either Eye

12% of the patients had low scores in any one of the eye in the pre-operative condition.

Post-Operative Schirmer's Less Than 15 in Either Eye	Frequency	Percentage
Absent	94	94
Present	6	6
Total	100	100

Table 12. Post-Operative Schirmer's Less Than 15 in Either Eye

In the post-operative period 6% of the patients had low scores in any one of the eyes.

	Frequency	Percentage
10	1	1
12	1	1
15	1	1
<15	1	1
>10	51	51
>15	45	45
Total	100	100

Table 13. TBUT Values Pre-Operative Right Eye

	Frequency	Percentage
10	1	1
12	1	1
15	2	2
18	1	1
>10	51	51
>15	44	44
Total	100	100

Table 14. TBUT Values Pre-Operative Left Eye

TBUT Values in the Post-Operative Period	Frequency	Percentage
<10	1	1
>10	99	99
Total	100	100

Table 15. TBUT Values Post-Operative Right Eye

Tbut Values in The Post-Operative Period	Frequency	Percentage
<10	1	1
>10	99	99
Total	100	100

Table 16. TBUT Values Post-Operative Left Eye

There were no patients with low scores in the pre-operative period according to TBUT. But in the post-operative period one patient had TBUT less than 10 in both eyes.

Myopia Greater Than -6D in Right Eye	Frequency	Percentage
Absent	75	75
Present	25	25
Total	100	100

Table 17. Right Eye Spherical Power Greater Than -6D

25% of the right eyes had a spherical power greater than -6D.

Myopia Greater Than -6D in Left Eye	Frequency	Percentage
Absent	77	77
Present	23	23
Total	100	100

Table 18. Left Eye Spherical Power Greater Than -6D

23% of the left eyes had a spherical power greater than -6D.

Myopia Greater Than -6D in Right Eye/Left Eye	Frequency	Percentage
Absent	70	70
Present	30	30
Total	100	100

Table 19. High Myopia in Either Eye (Power>-6D)

30% of the patients had spherical power >-6D in the right eye or left eye.

Correlation between Right Eye spherical power and right eye post-operative Schirmer's <15.

Myopia Right Eye Greater than -6D	Post-Operative Right Eye Schirmer's Less than 15		
	Absent	Present	Total
Absent	72	3	75
Present	24	1	25
Total	96	4	100

Table 20. Myopia and Post-Operative Schirmer's in Right Eye

Correlation=-0.007 (p value=0.94)

There was no correlation between spherical power and post-operative low scores in the Schirmer's test in the right eye.

Correlation Between Left Eye Spherical Power and Left Eye Post-Operative Schirmer's <15

Myopia Left Eye Greater Than -6D	Post-operative Left Eye Schirmer's Less Than 15		
	Absent	**Present**	**Total**
Absent	74	3	77
Present	20	3	23
Total	94	6	100

Table 21. Myopia and Post-Operative Schirmer's in Left Eye

Correlation=0.109 (p value=0.28).

There was no correlation between spherical power and post-operative low scores in the Schirmer's test in the left eye.

Myopia Left Eye/Right Eye Greater than -6D	Post-Operative Left Eye/Left Eye Schirmer's Less than 15		
	Absent	**Present**	**Total**
Absent	67	3	70
Present	27	3	30
Total	94	6	100

Table 22. Myopia and Post-Operative Schirmer's Less Than 15 in Either Eye

The degree of myopia was not associated with post-operative low scores.

DISCUSSION

Laser Assisted in Situ Keratomileusis (LASIK) is an effective procedure to correct refractive errors. It offers positive surgical features such as fast and painless recovery of vision with good predictability.[3] There has been much interest in dry eye symptoms affecting patients who have undergone LASIK. Dry eye is considered the most common complication of LASIK[4] especially in the western countries. The risk of developing dry eye is correlated with the degree of myopia and the depth of laser treatment.[2] However it has been our observation that an insignificant number of our patients complain of dry eye symptoms following LASIK. We undertook simple clinical tests as a measure of their tear film function in addition to clinical history. Transection of a significant number of the afferent sensory nerve fibers in the cornea during the lamellar cut is likely the most important factor that influences the development of LASIK-associated dry eye.[5] But in our study (in which all patients had a superior hinge flap in both eyes) in the post-operative period only 6% of the patients had low scores in any one of the eye according to Schirmer's test. And only one patient had TBUT less than 10 in both eyes. This makes sense from a physiologic point of view, because many peripheral corneal nerves and all conjunctival sensory nerves remain unaffected by the formation of a LASIK flap.[6] In LASIK, the depth of the ablation is an important factor in the temporary decrease in corneal sensitivity, as well as its recovery. The nerves located in the area of the hinge are preserved following the lamellar dissection. Some studies have suggested that greater number of corneal nerves penetrate the stroma in the horizontal meridians. If this were the case, a nasal hinged flap may offer the benefit of preserving more corneal innervation. The loss of corneal sensation and presence of dry eye syndrome was greater in eyes with a superior hinged flap than with nasal hinged flap.[7] The presence of dry eye syndrome was greater in eyes with a narrow hinge flap than in eyes with a wider hinge flap.[8] It was concluded that after LASIK, hinge position and flap thickness seem to be important factors in the rate of return of corneal sensitivity.[9] However other studies found no significant difference on the development of dry eye symptoms between superior and nasal hinged flaps.[5] It was also reported that corneal sensitivity was decreased at one month and 3 months and returned to pre-operative level at 6 months after LASIK.[10] In our study, there was no correlation between pre-operative spherical power and post-operative low scores in the Schirmer's test in both eyes. Further there was no correlation between ablation depth and post-operative low scores in the Schirmer's test in both eyes.

CONCLUSION

1. Patients who underwent LASIK did not report and were not found to develop any significant dry eye in the postoperative period.
2. There was no difference in gender and low scores in the Schirmer's test in the post-operative period for the subjects studied.
3. Patients who had low scores in the Schirmer's test in the pre-operative period did not have exacerbation (in symptoms or signs) in the post-operative period.
4. There was no correlation between preoperative spherical power and post-operative low scores in the Schirmer's test in both eyes.
5. There was no correlation between ablation depth and post-operative low scores in the Schirmer's test in both eyes.

Because our results are in contrast to most available reports, we feel that a more extensive study, with the use of the dry eye questionnaire (preoperatively & postoperatively), assessment of corneal sensitivity and clinical testing may give us a better understanding of dry eye disease in our post LASIK population.

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