



## Original Article

## Visual outcomes after LASIK (laser-assisted in-situ keratomileusis) for various refractive errors.

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**OBJECTIVE:** To evaluate and compare the refractive status of myopic and hyperopic patients before and after one day, seven days and one month of LASIK (laser assisted in-situ keratomileusis) surgery.

**METHOD:** 131 eyes of 66 patients of which 33 were myopic and 33 patients were hypermetropic, underwent femtosecond LASIK surgery. Follow-ups were made after one day, 7 days and one month of LASIK surgery and then a pre and post-LASIK comparison of best unaided visual acuity were performed using LogMAR visual acuity chart. The patients mean age was  $24.1 \pm 4.1$  years. The mean post-operative spherical equivalent (SE) for myopia was  $-0.50 \pm 0.7D$ . The mean post-operative spherical equivalent (SE) for hyperopes was  $-0.24 \pm 0.5D$ . Uncorrected visual acuity after 1 day, 7 days and one month of LASIK surgery was to be evaluated.

**RESULTS:** Out of 66 patients 65.15% were females and 34.85% were male. 33 patients were myopic while the other 33 were hyperopic. After one month of LASIK surgery using femtosecond laser for flap creation, the mean percent success of myopia was  $98.6 \pm 3.1\%$  and mean percent success of hyperopia was  $97.4 \pm 4.9\%$ . P-value was less than 0.001. After one day of LASIK, 80.3% of right eyes and 72.7% of left eyes show 100 percent success. After 7 days of LASIK, 84.4% of right eyes and 83.3% of left eyes shows 100 percent success. After one month of LASIK surgery, 84.4% of right eyes and 83.3% of left eyes shows 100 percent success.

**CONCLUSION:** LASIK surgery using femtosecond laser is a safe and predictable procedure for the correction of myopic and hyperopic refractive errors. LASIK is associated with faster recovery of vision and greater comfort in the early postoperative period.

## INTRODUCTION:

The reasons for correcting refractive errors are to enhance the patient's visual acuity, visual functions and visual comfort. The refractive error may be treated by glasses, contact lenses or refractive surgery. Glasses are the simplest and most popular form of correcting refractive errors. Contact lenses are cosmetically much better option although the cleaning and maintenance of contact lenses is cumbersome. Slight risk of infection to the cornea is present, if the contact lenses are not cleaned and removed properly before use. With the advent of more predictable laser treatments all the refractive surgeries are increasingly gaining popularity. Excimer laser corneal refractive surgery has become a safe and effective method of eliminating refractive errors. Surface ablation procedures including photorefractive keratectomy (PRK), laser epithelial keratomileusis (LASEK) and LASIK/epi-LASIK have gained popularity due to an increased safety profile by eliminating flap-related complications.<sup>1</sup>

LASIK is a procedure that reshapes the cornea by removing tissues from the cornea to enable light to enter into the eyes and make that light be properly focused on the retina to give clearer vision to the patient. In myopia, as the cornea becomes steep so the central part of the cornea is made flatter with the help of Femtosecond laser, and thus decreasing the refractive power of the cornea by making the parallel rays of light coming from infinity come to focus at retina, and thus correcting the refractive error. LASIK is an accurate and safe method for the correction of myopic refractive errors. LASIK is an effective procedure for correcting myopia of -4 to -15D and of small degree of myopia. After LASIK, eyes having moderate degree of myopia with flatter corneas have better visual prognosis as compared with the eyes having moderate degree of myopia with steeper corneas.<sup>2-4</sup>

Among all the refractive errors, hyperopia remains difficult to correct and LASIK results may vary, some people may achieve 6/9 vision or less. Some patients may still need to wear glasses or contact lenses following LASIK vision correction procedure though their prescription level becomes typically much lower than before. Long term follow up studies are needed to confirm the stability of the refraction and visual outcomes after LASIK.<sup>5</sup> The visual outcomes of LASIK surgery in which the flap was created with femtosecond laser in 1000 consecutive eyes having low myopia (less than 3D) are very good. The percentage of eyes gaining post-operative uncorrected visual acuity of 6/6 or better is higher in patients treated with the help of LASIK surgery in which flap was created with the use of femtosecond laser. In astigmatism, the cornea is more curved in one direction. Laser can correct astigmatism by selectively ablating the cornea in required direction. LASIK is safe and effective in correction of astigmatic refractive errors. Although some complications that occurred more frequently in the correction of higher refractive

errors. LASIK seems to be relatively safe as compared to the other refractive methods for correcting myopia, hyperopia and astigmatism.<sup>6,7</sup>

## AIMS AND OBJECTIVES:

- To evaluate the refractive status of myopic and hyperopic patients before and after one day, seven days and one month of LASIK surgery.
- To compare the improvement in refractive status of myopia and hyperopia after one month of LASIK surgery.

## PATIENTS AND METHODS:

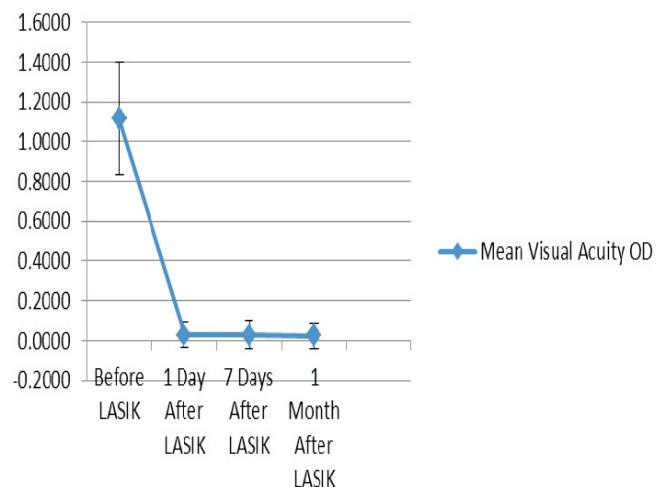
This institutional based descriptive case series study was conducted at College of Ophthalmology and Allied Vision Sciences (COAVS) Lahore from August to December 2015. Patients were selected from a private Hospital who underwent LASIK with the help of femtosecond laser flap creation procedure. 66 patients were included in the study from which 33 were myopic and 33 were hyperopic.

Vision of all the subjects was checked using a distance LogMAR visual acuity chart before LASIK surgery and after one day, 7 days and one month of LASIK surgery. Then a comparison was made to evaluate the percent success of myopia and hyperopia after LASIK surgery.

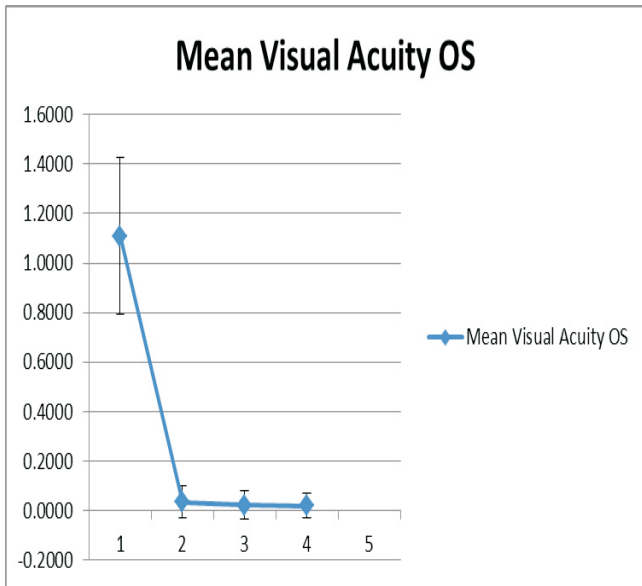
The data was recorded on the Performa, fed on the computer using the SPSS 13.0 software. The results were analyzed and tabulated using the same software.

## RESULTS:

### Mean Visual Acuity OD



The above Line graph shows improvement in mean visual acuity of right eye before LASIK surgery and after 1 day, 7



The above Line graph shows improvement in mean visual acuity of left eye before LASIK surgery and after 1 day, 7 days and one month of LASIK surgery.

Table no.1A: Percent\_success\_after 1 day LASIK\_OD

% improvement	Frequency	Percent
84.62	2	3
87.5	4	6.1
90.65	1	1.5
92.31	1	1.5
93.75	5	7.6
100	53	80.3
<b>Total</b>	<b>66</b>	<b>100</b>

Table no.1B: Percent\_Success\_after 1 day LASIK\_OS

% improvement	Frequency	Percent
0	1	1.5
81.31	1	1.5
83.33	1	1.5
84.62	3	4.5
87.5	2	3
91.45	2	3
92.31	2	3
93.75	6	9.1
100	48	72.7
<b>Total</b>	<b>66</b>	<b>100</b>

Table no.2A: Percent\_Success\_after7daysLASIK\_OD

% improvement	Frequency	Percent
81.25	2	3
84.62	2	3
87.5	2	3
93.75	4	6.1
100	56	84.8
<b>Total</b>	<b>66</b>	<b>100</b>

Table no.2B: Percent\_Success\_after7daysLASIK\_OS

% improvement	Frequency	Percent
0	1	1.5
81.25	2	3
82.91	2	3
87.5	2	3
92.31	2	3
93.75	2	3
100	55	83.3
<b>Total</b>	<b>66</b>	<b>100</b>

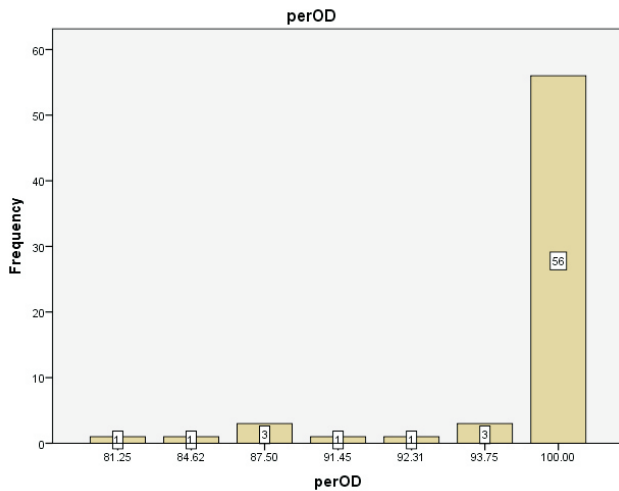
Table no.3A: Percent\_Success\_after1monthLASIK\_OD

% improvement	Frequency	Percent
81.25	1	1.5
84.62	1	1.5
87.5	3	4.5
91.45	1	1.5
92.31	1	1.5
93.75	3	4.5
100	56	84.8
<b>Total</b>	<b>66</b>	<b>100</b>

Table no. 3B: Percent\_Success\_aftr1monthLASIK\_OS

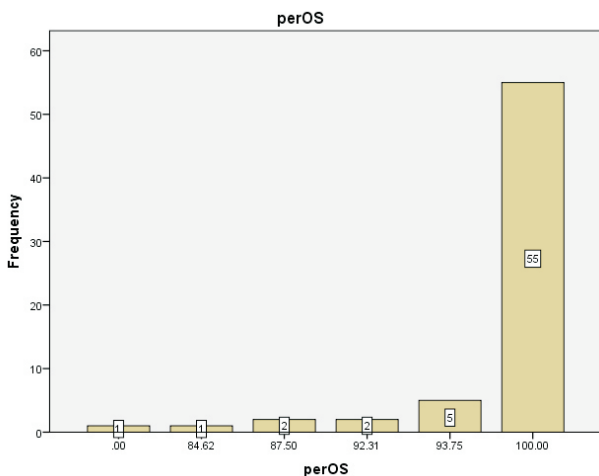
% improvement	Frequency	Percent
0	1	1.5
84.62	1	1.5
87.5	2	3
92.31	2	3
93.75	5	7.6
100	55	83.3
<b>Total</b>	<b>66</b>	<b>100</b>

**Frequency Distribution Chart of Percent Success of Right Eyes:**



In this chart, 84.4% of myopic and hyperopic right eyes show 100% success after LASIK surgery. 4.5% of myopic and hyperopic right eyes show 93.5% success after LASIK surgery. 1.5% of myopic and hyperopic right eyes show 92.3% success. 1.5% of myopic and hyperopic right eyes show 91.4% success. 4.5% of myopic and hyperopic right eyes show 87.5% success. 1.5% of myopic and hyperopic right eyes show 84.6% success. 1.5% of myopic and hyperopic right eyes show 81.25% success.

**Frequency Distribution Chart of Percent Success of Left Eyes:**



In this chart, 83.3% of myopic and hyperopic left eyes show percent success of 100. 7.5% of myopic and hyperopic left eyes show percent success of 93.7. 3.0% of myopic and hyperopic left eyes show percent success of 92.3 and 87.5. 1.5% of myopic and hyperopic left eyes show percent success of 84.6.

Table no. 4 **One-Sample Test**

	Test Value = 0					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Myopia	182.16	32	0	98.636	97.533	99.739
Hyperopia	113.82	32	0	97.455	95.711	99.199

In this table, mean percent success of myopia is  $98.6 \pm 3.1$  and mean percent success of hyperopia is  $97.4 \pm 4.9$ ,  $p < 0.001$

**DISCUSSION:**

We planned to include LASIK surgery for the treatment of refractive errors myopia and hypermetropia by using Femtosecond laser for flap creation. 131 eyes of 66 patients from which 33 were myopic and 33 patients were hypermetropic, who underwent femtosecond LASIK surgery. Follow-ups were made one day, 7 days and one month after LASIK surgery then a pre- and post-LASIK comparison of best unaided visual acuity was performed using LogMAR visual acuity chart. Mean percent success of myopia is  $98.6 \pm 3.1$  and mean percent success of hyperopia is  $97.4 \pm 4.9$  after one month of LASIK surgery which was done by using femtosecond laser for flap creation. After one day of LASIK, 80.3% of right eyes and 72.7% of left eyes show 100 percent success. After 7 days of LASIK, 84.4% of right eyes and 83.3% of left eyes show 100 percent success. After one month of LASIK surgery, 84.4% of right eyes and 83.3% of left eyes show 100 percent success.

People with higher refractive correction wearing heavy spectacles have lowest quality of life. People wearing contact lenses have better quality of life than spectacle wearers and people undergone refractive surgeries scored significantly better quality of life than both.<sup>8</sup>

Different studies have been done which showed that among all the refractive surgeries LASIK is considered as most elective procedure and gives most satisfactory visual outcomes.<sup>9</sup>

According to other studies, it is clear that in refractive error the best uncorrected visual acuity can be achieved by the help of femtosecond flap creation technique in LASIK.<sup>10</sup>

In recent studies, the results of correcting myopia with the help of LASIK surgery using femtosecond laser flap creation technique are safe and promising. For the treatment of hyperopia, LASIK surgery using femtosecond laser flap creation technique is also safe, feasible and effective.

Some relevant studies done on the same topic shows that excellent uncorrected visual acuity can be obtained for low to moderate myopia that ranges from 0.25D to 6D and in great



majority of eyes LASIK is safe and effective procedure in minimal loss of visual acuity, results may variable for high myopia (<6D). Using the same procedure, eyes having low to moderate hyperopia that ranges from 0.25D to 6D were treated and the results were similar to the eyes treated with LASIK for low to moderate myopia.<sup>12</sup>

According to international studies, LASIK is associated with faster recovery of vision and greater comfort in the early postoperative period but with a somewhat higher risk of complications, such as loss of two or more lines of best corrected visual acuity on a Snellen chart. LASIK is a promising and safe corneal refractive procedure for the correction of myopia and hyperopia.<sup>13, 14</sup>

In myopic patients undergoing LASIK surgery, mean uncorrected visual acuity after 7 days was  $1.01 \pm 0.06$  (20/20, logMAR  $0.01 \pm 0.03$ ) and  $p < 0.001$ . Mean uncorrected visual acuity after one month was  $1.05 \pm 0.05$  (20/20, logMAR  $-0.02 \pm 0.03$ ) and in our study the percent success for myopes was  $98.6 \pm 3.1$ .<sup>15</sup>

In hyperopic patients undergoing LASIK, on the distance eyes, 86% achieved uncorrected visual acuity of 20/20 and binocularly 95% of patients achieved 20/20. In our study, the mean percent success of hyperopia is  $97.4 \pm 4.9$ .<sup>16</sup>

#### CONCLUSION:

LASIK surgery using femtosecond laser is a safe and predictable procedure for the correction of myopic and hyperopic refractive errors. LASIK is associated with faster recovery of vision and greater comfort in the early postoperative period. In most myopic patients, correction of visual acuity is relatively stable and excellent. In hyperopic patients the correction of visual acuity is also stable with minimum difference if comparing with visual outcomes of myopia after LASIK.

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