

Visual outcomes and patient's satisfaction after LVC surgery: Cross sectional study among patients who experienced LVC procedure for myopia

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ABSTRACT

Background: Despite a percentage of failure due to the recurrence of myopia after surgery, which produces diminished gratification for the patient and surgeon, laser vision correction (LVC) surgery is the most frequent therapy for myopia with great results. To evaluate patient satisfaction with LVC surgery results, this provides an opportunity to investigate in our region. This study aims to measure the visual outcomes of LVC procedures on myopic patients, mainly effectiveness and patient satisfaction after the surgery. *Methodology:* From January 2020 to September 2021, a cross-sectional study was conducted in Saudi Arabia. A total of 884 male and female patients of all ages, who are residents of Saudi Arabia, had previous myopic Laser Vision Correction (LVC). Online Google surveys were used to collect demographic data, age, gender and patient location. SPSS 26 was used for data entry and analysis. *Results:* There have been a total of 884 participants, 61.8% aged between 20 - 30 years old. 43.1% were males, and 57.9% were females. 37.6% had the surgery 1 - 4 years ago, 35.5% had it less than a year ago, and 26.9% more than five years. 68.6% were completely satisfied, 26.5% were satisfied, 1.8% was not completely satisfied, 2.5% were not satisfied, and 0.7% was very unsatisfied. *Conclusion:* The study shows a high level of satisfaction compared to international figures. Dry eye is the most common complication after surgery. Satisfaction with surgery results was significantly associated with gender, age, and place of residence in the Kingdom.

Keyword: Laser Vision Correction, Myopia, Patient's Satisfaction.

1. INTRODUCTION

Laser vision correction (LVC) surgery is the most common treatment for myopia with excellent outcomes despite a percentage of failure by the



reappearance of myopia after the surgery that causes decreased gratification for the patient and the surgeon. During the LVC procedure, the surgeon operates by using a laser to reform the corneal center and curvature, which corrects the refraction error of the eye (Salah-Mabed et al., 2020). Patient satisfaction has always been measured in various types of medical care and has been considered as an indicator of treatment quality. A high level of postoperative satisfaction is desirable in the field of ocular surgeries as well as there is a demonstrated link between patient satisfaction and the usage of medical services. Patients who are dissatisfied with their current service provider may choose to switch to another, so satisfaction surveys and studies that are well-designed can provide crucial data to healthcare providers regarding the quality of their service and communication (Bailey et al., 2003). The prevalence of myopic recurrence after LVC surgery has been recorded in which is considered a challenge for ophthalmologists because of the patient's dissatisfaction with the results (Lim et al., 2016). However, 6.8 % percent of patients critically need retreatment or reoperation to correct the refraction after LVC surgery (Naderi et al., 2018).

Previous studies showed that LVC surgery is performed primarily due to its relatively little pain and rapid visual outcome. On the other hand, laser-assisted subepithelial keratectomy (LASEK) is generally performed in patients with thin corneas and high myopia (Lim et al., 2016). Having a thin cornea is one of the risk factors for performing LVC due to the possibility of corneal ectasia and other possible complications (Said et al., 2011). Generally, Post-surgical regression non-corneal and corneal causes have been discussed by a group of researchers who concluded that non-corneal causes could include preoperative refraction in accuracies or insufficient laser delivery, while Corneal causes include biomechanical changes of the cornea after keratectomy (Lim et al., 2016). Corneal haze was clinically detected following the LVC procedure, and it was attributed to deeper ablation in comparison to PRK (Alio & Javaloy, 2013). Also, Mabed et al., (2020) conducted a retrospective study to assess changes in corneal anatomy and vision quality after LVC was performed with the Wave Light® for patients with mild to high myopia and concluded that LVC surgery had demonstrated safety, stability, and predictability, which was most likely due to the spherical-shaped aberration and the use of large optical zones.

Another retrospective interventional case series study was conducted by Artini, et al. to evaluate the predictive factors of LVC procedures found that 96.1% of patients with high myopia and 69.9% of patients with very high myopia responded well to the corrective treatment. A high degree of astigmatism was also found to be a key factor in the final visual acuity (Artini et al., 2018). It is essential to understand the inflammatory and healing reactions after photoablations. Although significant inflammatory cell infiltration has been reported in both photorefractive keratectomy (PRK) and LVC, it is less seen in LVC (Alio & Javaloy, 2013). Idiopathic variations that cause calcium deposits post-refractive surgery, although rare, it has been reported in a case report (Pelsor, 2011). Post-LVC refractive Night vision disturbance, significant regression, and low predictabilities have been reported in many studies (Lin et al., 2014). The aim of this study is to measure the visual outcomes of LVC procedures on myopic patients, mainly effectiveness and patient satisfaction after the surgery.

Transient Light Sensitivity Syndrome (TLSS) is one of the common complications characterized by unusual photosensitivity following LVC surgery by weeks; this complication can be prevented by intensive steroidal therapy after femtosecond LVC (Alio & Javaloy, 2013). In multiple studies, 5-28% of patients required retreatment post-LVC (Vestergaard et al., 2013). Primary results of creating a femtosecond laser-assisted mini flap over a regressing previously operated on eye seem to be an effective treatment to improve the regression (Garcia-Gonzalez & Teus, 2013). However, a previous study reported patient satisfaction after LVC surgery with ranges of 82% to 98%, and younger patients were more satisfied than older patients, so it might depend on patient age. In our study, we aim to measure the visual outcomes and patient satisfaction after the LVC procedure in Saudi Arabia (McGhee et al., 2000).

Few studies were done in Saudi Arabia exploring the outcomes of LVC Surgery, and this offers an opportunity to explore in our area. As it was said, Patient satisfaction has always been measured in various types of medical care and has been considered as an indicator of treatment quality. Therefore, it should be studied up close.

2. METHODOLOGY

Study design

This study is a cross-sectional study that was done in Saudi Arabia from January 2020 to September 2021.

Participants, recruitment and sampling procedure

The study included 884 male and female patients of all ages who are residents of Saudi Arabia, had previous myopic Laser Vision Correction (LVC) to assess their outcome of the procedure, in addition to their overall satisfaction of the procedure.

Inclusion criteria

All ages of male and females who are experienced LVC surgery for Myopia in Saudi Arabia.

Exclusion criteria

We excluded people who never have had previous LVC Surgery for Myopia and who did not agree to participate.

Sample size

The sample size of 884 was estimated using the Qualtrics calculator with a confidence level of 95% and a margin of error of 5%.

Data collection and tool

Online Google form questionnaires were used for collecting the demographics of the patients, age, gender, and place of residence. SPSS 26 was used for data entry and data analysis. Descriptive statistics: Categorical variables, including primary variables, were described using frequencies, and Continuous variables for normally distributed data were described using mean and SD. Inferential statistics: Univariate analysis was conducted for a categorical variable using the Chi-square test to check for all the possible risk factors. The prevalence was given in percentage with a 95% confidence level. Tests with a P-value < 0.05 were considered significant.

3. RESULTS

Of all 884 studied participants, 61.8% were aged between 20- 30 years old, 18.1% were aged between 31- 40 years old, and 8.6% were aged between 41- 50 years old. 43.1% were males, and 57.9% were females. 31% of all samples live in Abha, 19.7% in Medinah and 11.1% live in Dammam (Table 1). Table 2 shows 4% of all participants had hypertension, 6% had diabetes, and 90% had no co-morbidities. 37.6% had the surgery 1- 4 years ago, 35.5% had it less than a year ago, and 26.9% more than five years. Regarding satisfaction with the surgery, 68.6% were completely satisfied, 26.5% were satisfied, 1.8% was not completely satisfied, 2.5% were not satisfied, and 0.7% was very unsatisfied. Only 5.9% of the sample had to do another vision correction surgery after the initial surgery. Only 12.4% had to wear glasses again after the surgery. Regarding complications, 51% reported dry eyes, 15% had light sensitivity, 12% reported eye pain, 5% reported under-correction of vision, 1% reported over-correction, and 1% had an eye infection. 71.7% of all participants reported that their visual acuity is much better than before surgery, 21.5% better than before surgery, 7% better than expected, 9% as expected, 7% worse than before surgery, and 2% much worse than before surgery. Quality of life was reported to be better in 95.7% of participants, and 95.5% would advise their family and friends to do the surgery (Figure 1). According to table, there was a significant association between satisfaction and age (20 - 30 years old), female gender, and place of residence (Abha) (P= 0.01) (Table 3).

Table 1 Sociodemographic characteristics of participants (n=884)

Parameter	No.	Percent	
Gender	Male	372	43.1
	Female	512	57.9
Age	Less than 20	32	3.6
	20 - 30 years old	546	61.8
	31 - 40 years old	160	18.1
	41 – 50 years old	76	8.6
	51 - 60years old	52	5.9
	More than 60	18	2.0
Residence area	Abha	274	31.0
	Dammam	98	11.1
	Riyadh	96	10.9
	Taif	42	4.8
	Al-Qassim	14	1.6
	Medina	174	19.7
	Tabuk	10	1.1

Jazan	40	4.5
Jeddah	84	9.5
Makkah	34	3.8
Yanbu	18	2.0

Table 2 Level of satisfaction and other factors associated with LASIK surgery outcomes (n=884)

Parameter	No.	Percent	
Co-morbidities	Hypertension	36	0.04
	diabetic	54	0.06
	Other	28	0.03
	No	800	0.90
How long has the laser vision correction surgery been	less than one year	314	35.5
	1-4 years	332	37.6
	More than 5 years	238	26.9
Satisfaction with results	Satisfied	234	26.5
	completely satisfied	606	68.6
	not satisfied	22	2.5
	Not completely satisfied	16	1.8
	Not satisfied or dissatisfied	6	7.
History of another vision correction procedure after the initial laser surgery	Yes	52	5.9
	No	832	94.1
Wearing glasses after the operation	Yes	110	12.4
	No	774	87.6
Complications after the surgery	dry eyes	452	51.0
	light sensitivity	138	15.0
	Not enough correction	46	5.0
	eye pain	114	12.0
	The growth of bumps in or around the cornea	10	1.0
	eye infection	14	1.0
	overcorrection	10	1.0
	loss of sight	8	1.0
	No complications	404	45.0
	Duration of eye infection after LASIK surgery, if present	less than a week	152
Two weeks		28	3.2
three weeks		22	2.5
More than three weeks		20	2.3
I've never had an infection		662	74.9
Vision acuity compared to the vision before surgery	Much worse than before surgery	2	2.
	worse than expected	6	7.
	worse than before	14	1.6

	surgery		
	Much better than before surgery	634	71.7
	Better than expected	6	7.
	Better than before surgery	190	21.5
	As expected	8	9.
	Same as before surgery	24	2.7
If vision better than it was with glasses/contact lenses	Yes	600	67.9
	No	116	13.1
	Like glasses/contact lenses	168	19.0
Life changed for the better after laser vision correction	Yes	846	95.7
	No	38	4.3
Advise friends and family about laser vision correction	Yes	844	95.5
	No	40	4.5

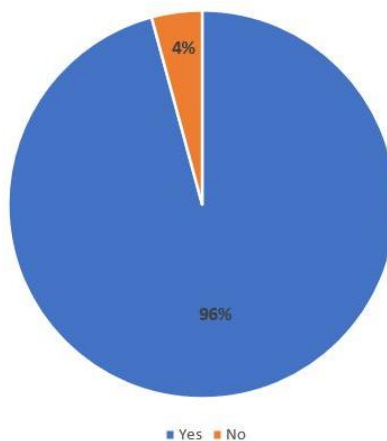


Figure 1 Life changed for the better after laser vision correction

Table 3 Significant association between satisfaction of participants with LASIK surgery and sociodemographic characters

		How satisfied are you with the process?					Total (N=844)	P value
		Satisfied	completely satisfied	not satisfied	Not completely satisfied	Not satisfied or dissatisfied		
Gender	Male	106	246	14	3	2	371	0.001
		45.3%	40.6%	63.6%	18.7%	33.3%	42%	
	Female	128	360	8	13	4	513	
		54.7%	59.4%	36.4%	81.3%	66.7%	58%	
Age	Less than 20	6	26	0	0	0	32	0.001
		2.6%	4.3%	0.0%	0.0%	0.0%	3.6%	
	20 - 30 years old	142	392	6	4	2	546	
		60.7%	64.7%	27.3%	25.0%	33.3%	61.8%	
	31 - 40 years old	40	108	4	4	4	160	

	17.1%	17.8%	18.2%	25.0%	66.7%	18.1%	
41 – 50 years old	20	46	2	8	0	76	
	8.5%	7.6%	9.1%	50.0%	0.0%	8.6%	
51 - 60 years old	16	34	2	0	0	52	
	6.8%	5.6%	9.1%	0.0%	0.0%	5.9%	
More than 60	142	392	6	4	2	546	
	60.7%	64.7%	27.3%	25.0%	33.3%	61.8%	
Abha	82	174	10	6	2	274	
	35.0%	28.7%	45.5%	37.5%	33.3%	31.0%	
Dammam	20	74	2	2	0	98	
	8.5%	12.2%	9.1%	12.5%	0.0%	11.1%	
Riyadh	26	70	0	0	0	96	
	11.1%	11.6%	0.0%	0.0%	0.0%	10.9%	
Taif	10	28	2	2	0	42	
	4.3%	4.6%	9.1%	12.5%	0.0%	4.8%	
Al-Qassim	2	12	0	0	0	14	
	0.9%	2.0%	0.0%	0.0%	0.0%	1.6%	
Accommodation area	42	122	2	4	4	174	0.001
	17.9%	20.1%	9.1%	25.0%	66.7%	19.7%	
Medina	0	10	0	0	0	10	
	0.0%	1.7%	0.0%	0.0%	0.0%	1.1%	
Tabuk	4	34	2	0	0	40	
	1.7%	5.6%	9.1%	0.0%	0.0%	4.5%	
Jazan	18	64	0	2	0	84	
	7.7%	10.6%	0.0%	12.5%	0.0%	9.5%	
Jeddah	20	14	0	0	0	34	
	8.5%	2.3%	0.0%	0.0%	0.0%	3.8%	
Makkah	10	4	4	0	0	18	
	4.3%	0.7%	18.2%	0.0%	0.0%	2.0%	
Yanbu							

4. DISCUSSION

Patients with low to high myopia, with or without astigmatism, may benefit from LASIK. LASIK has been demonstrated to improve myopia from -2.00 to -20.00 D; however, it is often recommended for patients with mild to moderate myopia, ranging from -0.5 D to -9.00 D, because these individuals are more likely to develop emmetropia (Artini et al., 2018; Keratomileusis et al., n.d.). This procedure is also reported as safe and efficacious in patients with hyperopia and astigmatism (Lindstrom et al., 2000). LASIK is now the most used laser therapy for refractive error. Patients have very minimal discomfort compared to methods that do not generate a flap, and it may be used for a wide range of refractive problems, with recovery time to baseline being only a few days (Keratomileusis et al., n.d.). It is essential to clarify with the patient the realistic expectations of LASIK. Because LASIK does not address presbyopia, the patient should be warned that reading glasses may still be required (Wilkinson et al., 2017).

In this study, 68.6% were completely satisfied, 26.5% were satisfied, 1.8% was not completely satisfied, 2.5% were not satisfied, and 0.7% was very unsatisfied. The majority of previous studies revealed a high level of satisfaction and quality of life after LASIK, but the small number of patients with negative feedback could impact the other patients' attitudes and ophthalmic personnel. Due to the lack of subjective feedback, it is necessary to present the patient's clinical outcomes (to assess safety and efficacy) along with a more sensitive, multi-dimensional, patient-oriented questionnaire that focuses on specific vision quality in order to uncover and evaluate reasons for any subtle dissatisfaction (Lazon De La Jara et al., 2011). Myopic patients in the Al-Jouf area of Saudi Arabia expressed high levels of satisfaction (81.9%) and quality of life (76.5%), according to research the achievement of goals was high in 82.8% of patients while 9% and 8.1% of patients were not sure and disagreed about goals achievement, respectively (Alolaywi et al., 2017). This was lower than reported in another study as the mean score for the overall satisfaction was 2.64 ± 0.8 . A total of 98.5 percent of patients were happy or extremely satisfied with their operation, and 98.5 percent thought their primary surgical aim had been met. 93.5 percent of patients said the LASIK therapy improved their quality of life, and 93.0 percent said they would recommend it to others (Bamashmus et al., 2015).

Brown et al., (2009) evaluated answers from 13,655 consecutive patients who completed their 1-month postoperative evaluation. There was a high degree of satisfaction indicated for both the quality of postoperative care offered (98.6%) and the visual outcomes acquired (95.0%). The majority of patients (94.2 percent) said the operation improved their lives. According to another research, 97.9% of participants were happy with the pace of visual improvement, 93.8 percent accomplished the goals for which they underwent surgery, 97.9% expressed increased quality of life, and 97.9% were satisfied with the overall LASIK outcome (McGhee et al., 2000). The total patient satisfaction percentage following primary LASIK surgery was 95.4 percent, according to a meta-analysis of 19 publications (2097 of 2198 subjects; the range of patient satisfaction for the 19 articles was 87.2 percent -100 percent). Patient satisfaction was 95.3 percent (1811 of 1901 patients) after myopic LASIK and 96.3 percent after hyperopic LASIK (286 of 297 subjects) (Solomon et al., 2009).

Regarding complications after surgery, visual abnormalities such as glare, halo, or star-bursting patterns around lights, haze, and impaired contrast sensitivity may occur in certain individuals. According to the FDA, visual impairments usually resolve three to six months following the treatment (Lazon De La Jara et al., 2011). In our study, 51% reported dry eyes, 15% had light sensitivity, 12% reported eye pain, 5% reported under-correction of vision, 1% reported over-correction, and 1% had an eye infection. This was comparable to the Saudi study in Al-Jouf region as reported no complications among 43.2% of subjects for dry eye and 53.3% for burning sensation though 21.6% and 14.4% were not sure along with 35.1% and 34.2% who experienced dry eye and burning sensation, respectively (Bamashmus et al., 2015). Due to a lack of tear production, one of the most prevalent transitory adverse effects of LASIK is dry eyes. This is because the lacrimal reflex is disrupted as a result of nerve tissue being cut during the surgery (Toda, 2018). Jabbur et al., (2004) conducted a retrospective analysis on consecutive unsatisfied patients who sought a refractive consultation after having refractive surgery elsewhere. Blurred distant vision (59.0 percent), glare and night-vision disturbances (43.5 percent), and dry eyes were the most prevalent subjective complaints (21.1 percent). Overcorrection (30.4 percent) and uneven astigmatism were the most prevalent consequences (29.8 percent).

Levinson et al., (2008) looked examined the data of individuals who underwent LASIK surgery abroad. A total of 157 eyeballs from 109 individuals were examined. Poor distant vision (63 percent), dry eyes (19 percent), and glare and halos were the most prevalent complaints (5 percent). Of our studied sample, 12.4% had to wear glasses again after the surgery. Another study reported that most of the patients did LASIK to get rid of their glasses and to have good visual results regarding reading, driving, swimming at daylight or at night. The majority of subjects (95.5%) would advise their families and friends to do the surgery. Another study revealed that the surgery achieved their goal, and 83.8% would praise LASIK for friends (Bamashmus et al., 2015).

5. CONCLUSION

The study shows a high level of satisfaction compared to international figures. Dry eye is the most common complication after surgery. Satisfaction with surgery results was significantly associated with gender, age, and place of residence in the Kingdom.

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Ethical consideration

Ethical approval was obtained from Research Ethics Committee at King Khalid University with the IRB approval number (HAPO-06-B-001).

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Conflict of interest

The authors declare that there are no conflicts of interest.

Data and materials availability

All data associated with this study are present in the paper.

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