

Full Length Research Paper

Effect of Myopic LASIK Surgery on Ocular Alignment and Binocular Vision in Patients with Manifest or Intermittent Exotropia

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Abstract

To evaluate the effect of myopic lasik surgery on ocular alignment and binocular vision in patients with manifest or intermittent exotropia. 26 patients (52 eyes) with exotropia (9 patients manifest exotropia and 17 patients intermittent exotropia). Patients seeking myopic refractive surgery with mild amblyopia, ametropia or anisometropia were consecutively included in this study. Amblyopic eyes with visual acuity <20/60 and patients with vertical strabismus were excluded from the study. Myopic LASIK surgery was performed on 44 eyes. Ocular alignment and binocular function remained unchanged postoperatively in all except three patients with high anisometropia who experienced an improvement in binocular function. In these patients, the preoperative manifest deviation became intermittent in two patients and latent in one patient after surgery with improving fusion and stereopsis. Manifest or intermittent exotropia is not a contraindication for myopic LASIK surgery provided some specific recommendations are taken in consideration, such as an adequate preoperative examination and consecutive surgery of both eyes starting with the dominant eye, and aiming at emmetropia for the dominant eye and for the non-dominant eye.

Keyword: LASIK, Manifest exotropia, Intermittent exotropia.

INTRODUCTION

Refractive laser surgery has continuously been developing and expanding since it was first introduced in the early 1990s (Mandava et al., 1996). Nowadays, it is a widely performed procedure amongst a large proportion of ophthalmology clinics throughout the world. Every year, approximately 1.5million patients worldwide undergo laser assisted in situ keratomileusis (LASIK) (Kowal et al., 2005). Reviews of complications of refractive surgery have discussed infection, scarring, cataract formation, strabismus and corneal decompensation. In addition, there have been several small case series of diplopia after refractive surgery (Schuler et al., 1999).

Diplopia and strabismus have been reported as complications after refractive surgery (Holland et al., 2000), cautioning the ophthalmologists to include an orthoptic examination in the preoperative evaluation and to define patients at risk (Yap and Kowal, 2001; Kushner and Kowal, 2003; Godts et al., 2004; Kowal, 2000).

Myopic exotropia in anisometropia have been proposed as a separate indication for refractive surgery (Nemet et al., 2002).

Our study aimed to evaluate the effect of myopic LASIK surgery on ocular alignment and binocular function in patients with preoperative intermittent or manifest exotropia.

MATERIALS AND METHODS

This study includes 26 patients with exotropia (9 patients manifest exotropia and 17 patients intermittent exotropia) Myopic LASIK surgery was performed on 44 eyes. Of them, twelve patients were male and 14 were female. The patient's age ranged between 19 and 38 years (mean 4.9 years). Patients seeking myopic refractive surgery with mild amblyopia, ametropia or anisometropia were consecutively included in this study.

Amblyopic eyes with visual acuity <20/60 and patients with vertical strabismus were excluded from the study.

For the purpose of refractive surgery, the ophthalmological examination included visual acuity, manifest and cycloplegic refraction, anterior and posterior segment evaluation, intraocular pressure, corneal topography, ultrasonic pachymetry, pupillometry and fundus cyclotorsion. The uncorrected visual acuity and best-corrected visual acuity (BCVA) were measured at a distance (6 m) and near (33 cm). Subjective manifest refraction was measured, obtaining minimum minus correction. Cycloplegic refraction was determined 40 min after instillation of cyclopentolate 1%. Fundus cyclotorsion was measured with indirect ophthalmoscope.

All patients had laser in situ keratomileusis (LASIK) for the correction of myopia and myopic astigmatism.

A complete orthoptic examination was carried out before and 1, 2 and 3 months after surgery. The ocular alignment was measured with the alternate prism cover test at 6 m and 33 cm. Measurements were carried out with and without correction, after fixating a light and an accommodative target that was at a distance and near. The maximum deviation was recorded. Ocular motility was evaluated with the alternate cover test in the nine directions of gaze. Binocular vision was measured with the Gobin's 15-prism dioptre (Gobin and Bierlaagh, 1994), measuring peripheral fusion or suppression scotoma. Fusion or suppression range was measured at a distance and near with the prism bar. Stereo acuity was measured with the Titmus test and retinal correspondence was evaluated in the synoptophore. All binocular vision tests were evaluated with optimal spectacle correction or contact lens correction before refractive surgery and without correction postoperatively.

As all patients were at high risk for postoperative diplopia as defined by Yap and Kowal, 2001; Kushner and Kowal, 2003; Godts et al. 2004; Kowal, 2000, they were informed about that risk. Surgery was only performed after having obtained patients' informed consent.

To avoid a switch of dominancy, the dominant eye was operated first in all nine patients in whom both eyes were treated. The dominant eye was operated first, and was targeted at emmetropia. The treatment of the non-dominant eye, targeted at emmetropia, was considered only if emmetropia was achieved in the dominant eye. The time between the two surgeries ranged from 1 week to 4 weeks.

The postoperative treatment of the patients Tobradex four times daily, tapered over 4 weeks. The follow-up ranged from 6 to 18 months (mean 11.9 months).

RESULTS

This study includes 26 patients with exotropia (9 patients

manifest exotropia and 17 patients intermittent exotropia) 12 patients were male and 14 were female. The patient's age ranged between 19 and 38 years (mean 4.9 years). Table 1.

In all patients, the exodeviation was more important at near than at distance. The exodeviation of two patients was latent at a distance and intermittent at near. In 15 patients, the exodeviation was intermittent at a distance and at near. 9 Patients had a manifest exodeviation at near and at distance.

Preoperative angle of deviation

The near deviation range from 25-90 Δ with a mean of \pm S.D 52.77 \pm 15.39 the range of distance deviation was 30-90 Δ with a mean \pm S.D 61.85 \pm 19.39.

Postoperative angle of deviation

The near deviation range from 20-80 Δ with a mean of \pm S.D 50.10 \pm 15.9 the range of distance deviation was 25-80 Δ with a mean \pm S.D 59.85 \pm 19.8. Table (2), Shows the range and mean of preoperative and postoperative angle of deviation in distance and near.

Little change in ocular alignment was observed after surgery. There was insignificant statistical difference between preoperative angle and postoperative angle.

None of the patients had an increase in their deviation postoperatively. In the two patients with high anisometropia (patients 2 and 12), deviation became intermittent to latent postoperatively, resulting in an improvement of binocular vision.

Fusion was present in 6 patients (22%). Fusion was absent in 20, table (3) shows the incidence of fusion and absent fusion.

All patients had normal retinal correspondence (NRC) when measured with the synoptophore.

Postoperatively Patient No. 12, who had minimal peripheral fusion at distance, developed postoperatively good peripheral and central fusion with stereopsis of 60". Patient No. 2, who had no preoperative binocular vision, developed peripheral fusion postoperatively, with stereopsis of 400". The ocular motility remained the same in all patients and no difference in excyclotorsion was noticed.

The refractive error improved in all patients after treatment. Some patients needed additional surgery to correct a residual astigmatism to obtain emmetropia. None of the patients lost any line of visual acuity. Patients 2, 5, 7 and 12 experienced an improved postoperative visual acuity.

No major intraoperative or postoperative complications were seen. Patients 3 and 14 presented with a transient intraocular pressure rise, which normalised a few days after treatment with glaucom drugs. In patient 13, corneal epithelialisation was

Table 1. Summarises the patient's age, sex, preoperative refractive error, BCVA, ocular deviation

Case No.	Sex	Age [years]	Refraction Spherical equivalent		Angle before treatment Δ		BCVA		Types of DEVIATION
			Rt	Lt	Near	Dist.	Rt	Lt	
1	♀	23	- 4.0	- 3.0	50XT	50XT	20/20	20/20	Intermittent
2	♀	32	- 10.0	-6.0	90XT	90XT	20/60	20/40	Manifest
3	♂	24	- 3.0	- 10.0	60XT	60XT	20/20	20/30	Intermittent
4	♀	36	+ 1.0	-3.0	40XT	50XT	20/40	20/30	Intermittent
5	♂	30	-6.0	-1.0	35XT	50XT	20/40	20/20	Intermittent
6	♀	21	- 3.0	- 2.0	70XT	90XT	20/25	20/20	Manifest
7	♀	31	+ 1.0	- 1.5	60XT	70XT	20/30	20/20	Manifest
8	♂	19	- 2.0	-1.0	90XT	90XT	20/20	20/30	Manifest
9	♀	29	- 3.0	- 3.0	70XT	70XT	20/30	20/25	Manifest
10	♀	22	- 2.0	+ 1.0	25XT	35XT	20/40	20/30	Intermittent
11	♂	27	- 2.0	- 4.0	70XT	90XT	20/30	20/40	Manifest
12	♂	20	- 1.0	+ 3.0	50XT	50XT	20/30	20/60	Intermittent
13	♀	28	- 2.0	-1.0	60XT	70XT	20/30	20/20	Intermittent
14	♀	23	- 2.0	- 2.0	30XT	50XT	20/30	20/30	Manifest
15	♂	21	- 5.0	- 2.0	80XT	90XT	20/40	20/20	Manifest
16	♀	34.5	- 3.0	- 5.0	60XT	60XT	20/40	20/40	Intermittent
17	♂	19.5	- 1.0	- 2.0	30XT	30XT	20/20	20/30	Intermittent
18	♀	24	- 1.0	- 3.0	50XT	60XT	20/20	20/30	Intermittent
19	♀	24	- 3.0	- 2.0	70XT	90XT	20/40	20/40	Manifest
20	♂	25.5	- 4.5	-3.5	70XT	80XT	20/60	20/30	Intermittent
21	♀	23	- 2.0	- 2.0	50XT	70XT	20/20	20/20	Manifest
22	♀	19	- 3.0	-4.0	50XT	60XT	20/20	20/40	Intermittent
23	♂	20	- 1.0	- 3.0	35XT	35XT	20/20	20/30	Intermittent
24	♀	27.5	- 2.0	- 1.0	30XT	30XT	20/20	20/20	Intermittent
25	♀	19.5	- 4.0	-5.0	60XT	80XT	20/30	20/40	Intermittent
26	♂	22	- 3.0	- 3.0	80XT	90XT	20/20	20/30	Manifest

Table 2. Shows the range and mean of preoperative and postoperative angle of deviation in distance and near

		Near angle Δ	Distance angle Δ
preoperative	Range	25-90 Δ	30-90 Δ
	mean \pm SD	52.77 \pm 15.39	61.85 \pm 19.39.
Postoperative	Range	20-80 Δ	25-80 Δ
	mean \pm SD	50.10 \pm 15.9	59.44 \pm 19.7
P-value		0.433	0.412

Table 3. Incidence of fusion and absent fusion

XT (n=26)	
N (%)	
Fusion	6(14.8%)
Absent fusion	20 (85.1%)

delayed, requiring a more intense postoperative care. No postoperative topographic decentration.

DISCUSSION

Nemet *et al.* 2002 reported improvement of exotropia after LASIK for myopic anisometropia. These results are predictable under preoperative contact lens simulation. Refractive surgery is a good option in case of a positive contact lens test or in patients with anisometropia who wore contact lenses but became intolerant to them.

In our series little change in ocular alignment was observed after surgery. In two patients with high anisometropia deviation became intermittent to latent postoperatively, resulting in an improvement of binocular vision. Godts *et al.* (2006) advocate performing refractive surgery on the dominant eye first to avoid this switch of fixation or dominance

None of our patients presented with postoperative diplopia, dominance problems or binocular vision problems. On the basis of the results obtained in this study and study of Godts *et al.* (2006). We may conclude that preoperative intermittent or manifest exotropia is not a contraindication for lasik surgery provided some specific recommendations are taken into account (Holland *et al.*, 2000), such as an adequate orthoptic examination, consecutive surgery of both eyes starting with the dominant eye, and aiming at emmetropia for the dominant eye and for the non-dominant eye (Yap and Kowal, 2001; Kushner and Kowal, 2003; Godts *et al.*, 2004).

Monovision is prohibited in patients with intermittent or manifest exotropia due to an unreliable fusional mechanism which may experience decompensation of a previously-compensated exotropia as a result of the iatrogenic anisometropia produced by monovision. (Godts *et al.*, 2006).

Kushner (1995) described fixation switch as a possible mechanism behind diplopia and decompensated phoria. Changing fixation to fixate with the non dominant eye will result in a secondary deviation that gives a larger tropia of the non-paretic eye, following Hering's law. This will often exceed the well-established fusional amplitudes.

Patients can be informed that no worsening in their ocular motility will occur after surgery. However, Godts *et al.* (2006) advocate that we still consider it advisable to inform the patients preoperatively about the possible risk of postoperative manifest decompensation.

CONCLUSION

Manifest or intermittent exotropia is not a contraindication for myopic LASIK surgery provided

some specific recommendations are taken in consideration, such as an adequate preoperative examination and consecutive surgery of both eyes starting with the dominant eye, and aiming at emmetropia for the dominant eye and for the non-dominant eye.

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