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Intraocular Pressure After Corneal Refractive Surgery

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ABSTRACT

Introduction: Laser in situ keratomileusis (LASIK), a refractive surgery procedure is being performed in a large number among people with refractive errors. In all the people undergoing the procedure, there is a potential risk to misdiagnose the glaucoma disease due to changes in central corneal thickness (CCT). In subjects who have undergone laser refractive interventions, intraocular tension may be lower and underestimated, and this can lead to later detection of glaucoma. **Aim:** The objective of this study was to analyze the intraocular pressure (IOP) after LASIK in patients with myopia. **Methods:** Thirty-seven patients underwent LASIK intervention to treat myopia. In total, 74 eyes were treated. Before the intervention, all patients underwent complete ophthalmologic examination, including the measurement of central corneal thickness (CCT) and measurement of IOP with non-contact tonometer. The IOP was also measured on days 1, 3 and 30 after the surgery. The mean IOP was taken for statistical analysis. **Results:** Seventy-four eyes of 37 patients (mean age 31.6) underwent LASIK intervention to treat myopia. Mean CCT before the intervention was 551.9 ±31.9μm, while mean postoperative CCT was 469.8 ±45.3μm (p<0.0001). Mean preoperative IOP was 16.4mmHg while mean postoperative IOP was 11.0mmHg (p<0.0001). The average spherical equivalent was -5.9 diopters. **Conclusions:** The reduction of IOP after LASIK refractive surgery is significant. This reduction is about 1mmHg per 1 diopter. This should be taken into account in the future in these patients because, due to the underestimation of the IOP, the glaucoma disease may be overlooked.

Keywords: Lasik, central corneal thickness, intraocular pressure.

1. INTRODUCTION

Laser in situ keratomileusis (LASIK), a refractive surgery procedure is being performed in a large number among people with refractive errors. In all the people undergoing the procedure, there is a potential risk to misdiagnose the glaucoma disease due to changes in central corneal thickness (CCT). In subjects who have undergone laser refractive interventions, intraocular tension may be lower and underestimated, and this can lead to later detection of glaucoma.

The prevalence of glaucoma is low before the age of 40, but increases with age (1). The association between myopia and open angle glaucoma disease has been reported by many authors, and myopia is known as a predisposing factor for glaucoma (2, 3, 4).

The non-contact tonometry is a method to measure intraocular pressure (IOP) without anesthesia, because it uses air blow to flatten the cornea. The higher the intensity of the air blow, the higher the IOP readings will be (5).

2. AIM

The aim of this study was to analyze the IOP after LASIK in patients with myopia.

3. METHODS

Thirty-seven patients (74 eyes) were scheduled for LASIK in order to treat myopia. The age of patients ranged from 19 to 45 years of age (average 31.6 ±6.8). Complete ophthalmologic examinations were done before the surgery, including the measurement of CCT using the Scheimpflug system (Pentacam, Oculus) and measurement of IOP with non-contact tonometer (Nidek NT-2000). The CCT was measured 30 days after the surgery while the IOP was measured on the days 1, 3 and 30 after the surgery (the average IOP was taken for statistical analysis). The patients were divided into three groups, the group with spherical equivalent (SE) of diopters from 0 to 3 diopters, 3.25 to 6 diopters and the group with above 6 diopters of SE of myopia. Statistical analysis was done using MedCalc software.

4. RESULTS

Thirty-seven patients (74 eyes) underwent LASIK intervention to treat myopia. The age of patients ranged from 19 to 45 (average 31.6 ±6.8). Twenty-one (56.8%) patients were female and 16 (43.24%) were male. The average CCT was reduced from 551.9 ±31.6μm preoperatively, to 469.8 ±45.3μm postoperatively [p<0.0001, 95% confidence interval (CI): 69.4–94.8].

The mean preoperative IOP was 16.4 ±2.7mmHg, while mean postoperative IOP was 11.0 ±2.4mmHg [p<0.0001, 95%, CI: 4.57–6.23] (Table 1). The mean SE was–5.9 diopter. The mean IOP reduction after LASIK was 5.4mmHg.

	Preoperative (mean ±SD)	Postoperative (mean ±SD)	*t*-test	*p*-value
IOP (mmHg)	16.4 ±2.7	11.0 ±2.4	18.4	p<0.0001
CCT (μm)	551.9 ±31.6	469.8 ±45.3	20.1	p<0.0001

Table 1. Preoperative and postoperative CCT dhe IOP values. SD = standard deviation.

The reduction of IOP was: at the group of myopia up to 3 diopters was 3.32mmHg (20% lower than initial IOP), at the group of myopia from 3.25 to 6 diopters the reduction of IOP was 5.58mmHg (34%) while the reduction of IOP after the correction of myopia above 6 diopters was 6.16mmHg or 38% lower than preoperative IOP. On an average, the reduction of IOP was approximately 1mmHg per 1 diopter.

On statistical analysis (independent samples *t*-test), there was a significant difference on the reduction of postoperative IOP between the group of myopia up to 3 diopters comparing to the group of myopia with 3.25 to 6 diopters and above 6 diopters of myopia. While there was no statistical difference on the reduction of IOP pressure between the group of myopia 3.25-6 comparing to the group with 6 or more diopters of myopia (Table 2).

	Myopia groups (SE diopters			t-test between different groups		
	0 - 3	3.25 - 6	>6	0 - 3 vs. 3.25 - 6	0-3 vs. >6	3.25 vs. >6
IOP (mmHg) Before LASIK	16.7	16.4	16.2	p =0.79	p =0.58	p =0.83
IOP (mmHg) After LASIK	13.4	10.8	10.1	p =0.0013	p =0.0003	p =0.2

Table 2. Intraocular pressure and statistical analysis of different myopia groups

5. DISCUSSION

The purpose of this study was to analyze the change in IOP before and after refractive surgery in myopic patients. The accuracy of IOP measurement at post-LASIK patients is critical for glaucoma diagnosis. Low IOP values after LASIK would result in a delayed diagnosis of glaucoma (6). The Goldmann applanation tonometry (GAT) is accepted as the gold standard in IOP measurement, and there is an evidence that non-contact tonometry gives higher readings than GAT, although both methods depend on CCT (7, 8).

Some authors have postulated that the non-contact tonometer is more accurate than the GAT after LASIK (9, 10), while there are some evidence that transpalpebral tonometer may be useful to control the IOP after LASIK surgery, since it does not depend on the ablation and thinning of the CCT (11). The mean reduction of IOP in our study was 5.7mmHg. Cacho et al (11) in their study noticed a reduction of IOP of 4.05mmHg after LASIK.

The reduction of IOP in the study of Hsu et al was 6.3mmHg (12). Similar reduction (6.4 and 6.5mmHg) was also showed by the authors Lin et al (13) and Shousha et al (14). In our study, the highest reduction of IOP was in patients with 6 or more diopters of myopia (6.16mmHg). The average reduction of IOP was approximately 1mmHg per 1 diopter.

6. CONCLUSION

Corneal refractive surgery for myopia changes CCT thus making the measurement of IOP underestimated. In this study, we demonstrated that refractive surgery causes a significant lowering of IOP measured by non-contact tonometer. The IOP measured after LASIK for myopia may be reduced because of the reduced corneal thickness. Special care needs to be considered for patients with high values of myopia. This should be taken into account in the future in these patients because, due to the underestimation of the IOP, the glaucoma disease may be overlooked.

- **Author's contribution**: V.A. and G.C. gave substantial contribution to the conception or design of the work in acquisition, analysis, or interpretation of data for the work. Each author participated in article preparing for drafting or revising it critically for important intellectual content, and gave final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
- **Conflict of interest statement:** No conflict of interest.
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