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ORIGINAL ARTICLE

Effect of Upper Eyelid Blepharoplasty on Vision and Corneal Tomographic Changes Measured By Pentacam

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ABSTRACT

Purpose: The aim of this study is to determine whether any change occurs in corneal astigmatic values measured by a pentacam and any subjective visual acuity changes occurs following the upper eyelid blepharoplasty.

Methods: This is a prospective study; 43 eyes of 23 patients with dermatochalasis underwent pentacam and surveyed for blurred vision before, 1 and 3 months after blepharoplasty surgery. In the course of those 3 measurements, both refractive and keratometric data were recorded and analyzed. The changes in refractive sphere, cylinder and cylindrical axis from both preoperative and postoperative readings were compared statistically.

Results: Compared to preoperative measurements, 26 eyes (60%) had a measurable increase in corneal astigmatism after the surgery. Increased astigmatism observed by pentacam in the first and the third month after surgery, showed statistically significant results according to Wilcoxon test with ($p=0.028<0.05$) and ($p=0.048<0.05$) values, respectively. The mean change in astigmatism was reported as 0.15D. Regarding the astigmatism axis, no significant change was detected; in the 1 month ($p=0.435>0.05$) and 3 months ($p=0.560>0.05$) postoperative measurements compared to preoperative values. Two patients (4.34%) reported visual acuity change 3 months after the surgery.

Conclusion: We discovered statistically significant astigmatic changes; however, these were clinically insignificant visual acuity changes in compatibility with prior studies. Patients undergoing blepharoplasty surgery should be advised that this procedure may potentially alter vision. It is also very important to advise the patients to undergo cataract and/or refractive surgery after having upper eyelid surgery that this procedure may induce vision changes.

Keywords: Pentacam, upper eyelid blepharoplasty, vision

INTRODUCTION

Dermatochalasis is defined as excessive folds of skin in the eyelids, occasionally with protrusion of fat through the orbital septum. Upper eyelid blepharoplasty is an eyelid procedure commonly used to treat dermatochalasis which is performed more frequently due to the increase of the ageing population in recent years. It is performed both as a functional procedure for patients suffering from superior field vision loss and as a cosmetic procedure for rejuvenation of the periocular area. The major complications of upper

eyelid blepharoplasty are orbital hemorrhage, blindness, infections, lagophthalmos and tearing.¹ The frequency and the range of complications have changed relative to the increasing number of these surgeries and to the increasing experience of the surgeons. We therefore begin our discussion in regard to postoperative blurred vision, bruising, pain and itching. Most of these complications take one or two weeks to resolve, except for blurred vision.² Recent literature indicates that procedures of the upper eyelid, e.g. upper blepharoplasty, ptosis repair and gold weight implantation, may alter the pressure on

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the cornea and change the corneal curvature. Such changes may alter corneal refraction and astigmatism and may cause persistent blurred vision.²⁻⁸ Some investigators have reported measurable refractive changes by the use of corneal topography.^{4,5,7}

Our study aims to prospectively examine the changes in corneal curvature by using a Pentacam (Scheimpflug camera, Oculus) to determine whether there occurs any change in the corneal tomography and at the same time note any subjective visual acuity changes in the first and the third month following the blepharoplasty surgery.

MATERIAL AND METHODS

A prospective study was conducted of patients, all of whom underwent upper eyelid blepharoplasty surgery. Written informed consent was obtained from all patients. The study was conducted in compliance with the principles of the Declaration of Helsinki. The Institutional Review Board of Bagcilar Research and Training Hospital has approved our study.

A total of 43 eyelids of 23 patients having dermatochalasis were operated on at the Istanbul Medicine Hospital - Ophthalmology Clinic from January 2013 to June 2013. Patients with keratopathy, cataract and poor fixation, along with contact lens wearers, were excluded from the study. Of 23 patients, 21 were female and 2 were male. The patients' ages ranged from 21 to 73 with an average age of 46.3. For each patient, a complete ophthalmologic evaluation was obtained prior to the upper eyelid blepharoplasty surgery, including visual acuity, manifest refraction, anterior segment and fundus examination and corneal tomography using a Pentacam.

All patients had routine upper eyelid blepharoplasty surgery under local anesthesia. The aim of surgery was to remove the maximal amount of redundant skin. The pinch technique was used to make an assessment of the amount of excessive skin after marking the skin crease. The upper limit of the skin incision was then marked and the skin was removed. The wounds were closed with interrupted 6.0 Prolene sutures, which were removed 10 days after surgery.

All patients were surveyed for any corneal astigmatic change via Pentacam and for any subjective visual acuity change 1 month and 3 months after the surgery. All refractions were expressed in plus following cylinder form for consistency.

Recorded data for 43 eyelids were analyzed to observe changes in the refractive sphere, cylinder and cylindrical axis. With-the-rule astigmatism was defined as the steep axis at $90^\circ \pm 20^\circ$. Against-the-rule astigmatism was defined as the steep axis at $180^\circ \pm 20^\circ$. Axes outside these parameters were identified as oblique. Statistical analysis was performed on

data using a paired *t*-test and a Wilcoxon test using SPSS 21.0 program.

RESULTS

Of the 43 eyes of 23 patients, 17 (40%) showed no postoperative change in astigmatism compared to preoperative measurements one month after the surgery. According to the same measurement, 26 eyes (60%) showed a measurable increase in corneal astigmatism, 17 of which showed an increased with-the-rule astigmatism. Three months after surgery, 17 of 43 eyes (40%) showed no postoperative change in astigmatism, and 26 eyes (60%) showed a measurable increase in astigmatism.

Preoperatively, the average sphere of patients was reported as 0.18 D, the average cylinder as 0.77 D with the axis of 88° , the average keratometry as 43D with the toricity 1.1 D and the axis of toricity as 91.9° . In the postoperative first month, the average sphere was reported as 0.15 D, the average cylinder as 0.84 D with the axis of 90° , the average postoperative keratometry as 43.07 D with toricity 1.3 D and the axis of toricity as 96° . In the postoperative third month, the average sphere was reported as 0.135 D, the average cylinder as 0.82 D with the axis of 90° , the average postoperative keratometry as 43.05D with toricity 1.2 D and the axis of toricity as 94° .

Increased astigmatism observed via Pentacam in the first and the third month after surgery, compared to the preoperative measurements, showed statistically significant results according to a Wilcoxon test with ($p=0.028 < 0.05$) and ($p=0.048 < 0.05$) values respectively. No statistically significant change was observed between the first-month and the third-month values ($p=0.515 > 0.05$) (Table 1).

Regarding the astigmatism axis, we did not discover any significant change in the 1-month ($p=0.435 > 0.05$), and 3-month ($p=0.560 > 0.05$) postoperative measurements compared to pre-operative values. Neither was any statistically significant change observed between the first-month and the third-month values ($p=0.669 > 0.05$) (Table 2). A total of two patients (4.34%) reported visual acuity change 3 months after the blepharoplasty surgery. One of them required a new prescription whereas the other did not.

DISCUSSION

A widespread number of patients who had upper blepharoplasty surgery commonly make complaints concerning postoperative blurred vision. The symptom is widely due to dry eye and is usually temporary. In the case of edema being the primary cause, blurred vision may subside as the edema resolves

TABLE 1. Corneal astigmatic changes by pentacam; preoperative, first and third month after the surgery values with Wilcoxon test. Plastic and reconstructive surgery (ESOPRS) in Barcelona, 19–21 September 2013.

				Changes according to preop		Changes according to postop 1 month	
		AVG ± SD	Med (Min-Max)	AVG ± SD	<i>p</i>	AVG ± SD	<i>p</i>
Astigmatism (D)	Preop	1.1 ± 0.8	1 0.1–3.7				
	Postop 1 month	1.3 ± 0.8	1 0.4–3.7	−0.15 ± 0.68	0.028		
	Postop 2 month	1.2 ± 0.7	1 0.4–3.7	−0.13 ± 0.64	0.048	0.02 ± 0.26	0.515

TABLE 2. Corneal astigmatism axis by Pentacam; preoperative, postoperative first and third month values with paired samples *t*-test.

				Changes according to preop		Changes according to postop 1 month	
		AVG ± SD	Med (Min-Max)	AVG ± SD	<i>p</i>	AVG ± SD	<i>p</i>
Astigmatism Axis (°)	Preop	91.9 ± 24.0	94 40–135				
	Postop 1 month	95.1 ± 22.2	95 53–133	−3.3 ± 27.1	0.435		
	Postop 3 month	94.2 ± 22.0	95 50–133	−2.3 ± 26.0	0.560	0.9 ± 14.2	0.669

itself within 1 to 3 weeks following the surgery.² As for long term visual complaints, the cause may be due to the changes of the shape of the cornea. Prior studies have hypothesized that eyelid-corneal interaction may be a significant factor in post-operative corneal astigmatism.

Upper eyelid blepharoplasty or ptosis surgery repositions and tightens the upper eyelid vertically, leading to increased pressure vectors on the anterior cornea, which results in corneal curvature changes causing visual change.^{4,9}

In our study, by the use of a Pentacam, we observed that one month after surgery 60% of total 43 eyes showed a statistically significant increase in corneal astigmatism. In the postoperative third month, there was no significant change in astigmatism compared to the post-operative first-month values. When we examined the subjective visual changes, two patients made complaints concerning blurred vision, one of whom subsequently required a new prescription. This observation indicates that the data are statistically, rather than clinically, significant.

Corneal changes, including both topographic and refractive characteristics, may be examined using different devices. Corneal topographic measurements give information in regard to the entire corneal surface. The Pentacam analyser that we used in our study is the first automatically rotating Scheimpflug camera. During the rotating scan, which takes a maximum of 2 seconds, up to 50 Scheimpflug images of the anterior eye segment are captured. A Pentacam gives a qualitative assessment of the cornea, including topography and elevation data of the anterior and posterior corneal surfaces, and

overall pachymetry. The major benefit of a Pentacam is that it accurately measures both the anterior and posterior corneal surfaces pre- and post-operatively.

Brown et al.⁵ studied corneal shape changes in the 1-month and 3-month post-operative periods following blepharoplasty and ptosis surgeries, using standard keratometry and corneal video keratography (CVK). They have reported that these surgeries may result in visually significant astigmatic changes in the central and peripheral cornea.

After blepharoplasty, the average dioptric change was reported as 0.55 D and 11% of patients showed astigmatic changes greater than 1.00 D.

Zinkernagel et al.⁷ used Orbscan 2 (Bausch & Lomb) both before and 3 months after surgery. The average change in total astigmatism after ptosis surgery was reported as 0.25 D, while after blepharoplasty surgery with a reduction of large fat pads it was reported as 0.21 D, and after skin-only blepharoplasty surgery as 0.09 D. Their findings demonstrate that small corneal topographic changes occur after blepharoplasty without reduction of large amounts of fat and that these changes are unapt to affect visual acuity.

However, Dogan et al.¹⁰ used a Pentacam to obtain corneal parameters with dermatochalasis patients both pre-operatively and 3 months after blepharoplasty. According to those results, upper eyelid blepharoplasty surgery does not lead to significant changes in the main corneal indices.

It is worth noting from the literature in regard to ptosis surgeries that astigmatic changes may occur after ptosis surgery as in the case of

blepharoplasty surgery.^{4,6,11} As shown by Holck and Gingold, astigmatic changes after ptosis surgery may be transient and tend to regress after 6 months' to 12 months' time.^{4,6} Since our study focused only on the first 3 months after the surgery, we cannot comment on the regression of acquired astigmatism. Eyelid abnormalities and procedures performed on eyelids additionally induce changes in the refractive state of the eye. In several studies, the mass effect of periocular lesions has been shown to affect corneal astigmatism.^{12–21}

Since most astigmatic changes induced by upper eyelid procedures are low in magnitude, patients who require high visual acuity in daily living may notice these changes prospectively.

In our study, even though we determined significant astigmatic changes statistically (4.34%), no significant blurring of vision was observed clinically. Shao et al. observed 5.7% of patients had subjective visual acuity changes one year after the blepharoplasty and ptosis surgery.³ Parbhu et al.² focused on patients' post-operative experience with blepharoplasty and compared patients' pre-operative expectations with their actual post-operative experience. They indicated that the patients underestimated the degree of swelling and blurred vision and that pre-operative counseling is important in order to improve patient satisfaction.

To conclude, in this study we focused on the post-operative astigmatic changes and subjective visual acuity changes following blepharoplasty surgery, took quantitative measurements by means of a Pentacam before the surgery and in the first and third month after the surgery. We discovered significant astigmatic changes statistically, but insignificant visual acuity changes clinically. Furthermore, as distinct from other studies, we examined both parameters together and observed that these two did not cohere. There were a certain number of limitations to our study, as our sample size and follow-up period were relatively limited.

We should advise patients undergoing blepharoplasty surgery that this procedure potentially alters vision and that they may have to change their spectacle or contact lens prescriptions post-operatively. This is also important for patients planning to undergo cataract or refractive surgery after upper eyelid surgery. It is worth noting that assessment of the correct lens power and astigmatism after corneal shape change must be made accurately.

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DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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