Possible Influence of Upper Blepharoplasty on Intraocular Pressure

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Purpose: There is anecdotal evidence that upper blepharoplasty might lead to raised intraocular pressure (IOP). If this association is confirmed, then patients with glaucoma and glaucoma suspects could be at risk if they underwent this procedure with no appropriate follow up. Here, the authors aimed to determine whether there are significant changes in IOP after upper blepharoplasty.

Methods: This prospective study evaluated the IOP at baseline and 1, 2, and 6 weeks after an upper blepharoplasty in individuals with mild to moderate dermatochalasis. Upper blepharoplasty might change the pressure exerted by the upper eyelid into the cornea, and this could affect the corneal surface and the IOP; thus, the corneal topography was also recorded before and at 6 weeks.

Results: The IOP of 40 eyes was evaluated. The mean (±SD) preoperative IOP was 14.19±2.12 mm Hg. A statistically significant increase in IOP was observed at 1 (15.15±2.27 mm Hg, $p = 0.009$), 2 (15.57±2.29 mm Hg, $p < 0.0001$), and 6 weeks (15.21±2.60 mm Hg, $p = 0.001$) postoperatively. A statistically significant increase in steep K (preoperative: 44.66±2.06, 6 weeks: 44.78±2.28, $p = 0.007$) and corneal astigmatism was also observed (preoperative: 0.78±0.43, 6 weeks: 0.89±0.45, $p = 0.006$) at 6 weeks.

Conclusions: Upper blepharoplasty resulted in a mild and statistically significant increase in intraocular pressure postoperatively. The authors' results suggest that upper blepharoplasty should be carefully evaluated in glaucoma and glaucoma suspect patients.

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Upper eyelid blepharoplasty consists of an excision of upper eyelid skin excess and is one of the most common eyelid procedures. Reduction in upper visual field and cosmetically displeasing dermatochalasis are the main complaints among individuals seeking this procedure.[1]

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Glaucoma is a group of progressive optic neuropathies that can lead to irreversible blindness in advanced stages. Increased levels of intraocular pressure are the main risk factor for the progression of glaucoma.[2,3] There is anecdotal evidence among some glaucoma specialists that upper blepharoplasty might lead to increased intraocular pressure (IOP). There are a few studies reporting acute angle closure glaucoma after blepharoplasty[4–6] and an abstract[7] reporting no significant change in IOP after this procedure was found. However, the abstract study design was retrospective, and therefore, IOP measurements were not standardized. Thus, it remains unknown if the indication of an upper eyelid blepharoplasty should be more carefully evaluated in glaucoma suspect and glaucoma patients. The purpose of this study was to prospectively investigate the possible influence of upper eyelid blepharoplasty on intraocular pressure.

METHODS

After Federal University of Sao Paulo Review Board approval and written informed consent were obtained, patients who presented with dermatochalasis were recruited for this prospective study over 1 year. All subjects were treated in accordance with the tenets of the Declaration of Helsinki.

All patients, including patients in the control group, underwent a complete ophthalmic exam, including best-corrected visual acuity, slit-lamp biomicroscopy, intraocular pressure measurement, and fundoscopic examination.

Indications for surgery included mild to moderate cosmetically displeasing dermatochalasis. Only individuals with a normal ophthalmic exam were enrolled in the present study. Patients in treatment for glaucoma and glaucoma suspects (cup to disk ratio higher than 0.5; cup to disk ratio asymmetry higher than 0.2; IOP higher than 21 mm Hg; previous history of high IOP after the use of corticosteroids) were excluded from this study. Other exclusion criteria were patients using systemic or topical steroids; shallow anterior chamber; patients who presented with blepharoptosis or other eyelid disorders; prior eyelid, refractive, or intraocular surgery; and patients with corneal surface-altering diseases and contact lenses wear.

Intraocular pressure was measured 1 week before and 1, 2, and 6 weeks after upper eyelid blepharoplasty using the Goldmann applanation tonometer. All measurements were performed without or with minimal eyelid manipulation by a single investigator around 10 AM using the same tonometer. The Goldmann tonometer was set to 10 mm Hg, and applanation was performed by rotating the dial followed by a reading. The procedure was repeated after 1 minute. If the 2 readings differed by more than 2 mm Hg, then a third reading was taken. For data analysis, the mean of 2 readings was taken, and if a third reading was necessary, then the median was considered for statistical analysis.

Because an upper blepharoplasty might change the pressure exerted by the upper eyelid into the cornea affecting the corneal surface

and the IOP, corneal topography was also recorded at baseline and at 6 weeks using a computerized topography system that evaluates the anterior curvature of the cornea using the Placido disk principle. The parameters included steep K (K1) and magnitude of corneal astigmatism.

All surgeries were performed with a single surgeon under local anesthesia (lidocaine with 1:200,000 adrenaline) and sedation. Surgical technique was the same in all cases. Initially, the skin was marked, followed by local anesthesia. A #15 blade was used to incise the skin, and only skin was excised. Bipolar cauterization was used for hemostasis, and the skin was closed with 6-0 nylon interrupted sutures. Skin sutures were removed on the seventh postoperative day.

For the statistical analysis, paired *t* tests were used to determine whether differences in the mean values were statistically significant between: (1) preoperative measurements versus postoperative measurements after 6 weeks for IOP and corneal parameters measurements. Additional analysis was performed for IOP measurements: (2) preoperative measurements versus postoperative measurements after 1 week; (3) preoperative measurements versus postoperative measurements after 2 weeks; (4) postoperative measurements after 1 week versus postoperative measurements after 2 weeks; (5) postoperative measurements after 1 week versus postoperative measurements after 6 weeks; and (6) postoperative measurements after 2 weeks versus postoperative measurements after 6 weeks.

Statistical analysis was performed with SPSS Statistics V24.0 (IBM, Armonk, NY, U.S.A.), and p values <0.05 were considered statistically significant.

RESULTS

Data were collected on 40 eyes from 20 patients. The mean age was 51.2±7.6 years, and all patients in this series were female with Fitzpatrick skin phototypes II and III. Data on 12 eyes from female individuals with Fitzpatrick skin phototypes II and III, mean age 54.8±3.8, and who did not undergo surgery were analyzed as a control group.

In the patients group, the mean preoperative IOP was 14.19±2.12 mm Hg. A statistically significant increase ($p < 0.05$) in intraocular pressure was observed in the follow-up examinations versus baseline IOP. No statistically significant differences ($p > 0.05$) were observed in IOP between 1- and 2-week measurements, 1- and 6-week measurements, and 2- and 6-week measurements. No statistically significant differences ($p > 0.05$) were observed in IOP in the control group.

A statistically significant increase ($p < 0.05$) in K1 and in the magnitude of astigmatism was observed at 6 weeks. Tables 1 and 2 show mean measurements and SDs of the studied parameters, while Tables 3 and 4 show the statistical analysis of the paired differences, p values, and 95% confidence intervals.

TABLE 1. Mean intraocular pressure

	Mean	SD
IOP preop	14.19	2.12
IOP 1W	15.15	2.27
IOP 2W	15.57	2.29
IOP 6W	15.21	2.60

IOP, intraocular pressure; preop, preoperative; W, week.

TABLE 2. Mean K1 and corneal astigmatism

Visit	Mean	SD
Preop K1	44.66	2.06
K1 6W	44.78	2.28
Preop astigmatism	0.78	0.43
Astigmatism 6W	0.89	0.45

K1, steep K; Preop, preoperative; W, week.

No complications such as ectropion, eyelid retraction, blepharoptosis, dry eye, or retrobulbar hemorrhage were observed.

DISCUSSION

The authors' results suggest that upper eyelid blepharoplasty may be associated with significant elevation in the intraocular pressure levels and with a mild but statistically significant elevation in K1 and corneal astigmatism values. Although a few studies have evaluated corneal topography before and after blepharoplasty,[8–10] to the best of the authors' knowledge, no previous study has yet prospectively evaluated the effect of upper blepharoplasty on IOP or the association between corneal topographic changes and potential IOP changes after this procedure.

One could argue that changes in IOP and corneal topography would be consequent to the upper eyelid edema inherent to the surgical procedure. However, a significant increase in IOP, K1, and magnitude of astigmatism was observed even 6 weeks after the blepharoplasty when edema was not clinically evident in any patient in this series (this study had no Asian patients who usually have a more prolonged edema).

Changes in IOP have been evaluated in Graves orbitopathy. It is well known that increased IOP is a complication of thyroid eye disease. The increased orbital contents (secondary to enlargement of the extraocular muscles, deposition of glycosaminoglycans, and infiltration of orbital fat) in a confined orbital volume contribute to elevated IOP by increasing intraorbital pressure and venous congestion. Orbital decompression reduces the intraorbital volume resulting in a reduction of the IOP.[11–16]

External pressure on the globe leads to increased IOP. Possible mechanisms associated include extraocular muscle restriction or cocontraction, eyelid squeezing by the patient, compression of the eyeball due to use of an eyelid speculum, and eyelid pressure against the globe by the examiner when measuring IOP.[17,18] Tight orbit syndrome, a condition characterized by eyelids pressing firmly against the globe, was also reported to be

TABLE 3. Statistical analysis of the paired differences

Visits			95% CI	
Paired differences	Mean (mm Hg)	SD	Lower to upper	p
IOP preop vs. IOP 1W	−0.96	2.22	−1.67 to −0.25	0.009*
IOP preop vs. IOP 2W	−1.38	2.23	−2.10 to −0.67	<0.0001*
IOP preop vs. IOP 6W	−1.02	1.85	−1.62 to −0.43	0.001*
IOP 1W vs. IOP 2W	−0.42	2.18	−1.12 to 0.27	0.23
IOP 1W vs. IOP 6W	−0.06	2.63	−0.90 to 0.78	0.88
IOP 2W vs. IOP 6W	0.36	2.09	−0.30 to 1.03	0.28

95% CI, 95% confidence interval; IOP, intraocular pressure; preop, preoperative; W, week.
* $p < 0.05$

TABLE 4. Statistical analysis of the paired differences for corneal parameters

Visits			95% CI	
Paired Differences	Mean	SD	Lower to upper	p
K1 Preop vs. K1 6W	−0.12	0.27	−0.20 to −0.03	0.007*
Astigm Preop vs. Astigm 6W	−0.13	0.28	−0.22 to −0.03	0.006*

95% CI, 95% confidence interval; Astigm, astigmatism; K1, steep K; preop, preoperative; W, week.
* $p < 0.05$

associated with high IOPs.[17] In patients who undergo upper blepharoplasty, the removal of the skin in excess leads to mass changes around the globe and upper eyelid skin stretching. This leads to an increase in the ratio contents/container with resulting higher tissue tension on the globe. Although clinically insignificant, the statistically significant increase in K1 and in the magnitude of astigmatism observed after the procedure reflects a higher tension on the cornea. This mechanism could be considered a milder version of tight orbit syndrome and could possibly explain the elevation of the IOP seen after upper blepharoplasty in this study.

The mechanism leading to a raise in intraocular pressure is different in angle closure glaucoma. Patients with narrow anterior chamber are at risk for this type of glaucoma. In these patients, pupil dilation, resulting from diffusion of anesthetic substances containing adrenaline and epinephrine, might result in obstruction of the angle, leading to acute angle closure glaucoma.[4–6] In the present study, no patient with shallow anterior chamber was included (this was one of the exclusion criteria).

Glaucoma is a leading cause of irreversible blindness. Primary open-angle glaucoma is the most prevalent type of glaucoma in the United States and is an insidious and often asymptomatic disease in the early stage. Early diagnosis depends on routine examination. The loss of ganglion cells is related to the level of intraocular pressure, and reduction of this parameter is the only proven method to treat the disease.[2]

The authors' results suggest that IOP may increase after an upper blepharoplasty, and attention should be addressed to the evaluation of this parameter. A history of glaucoma and glaucoma suspicion should be evaluated in blepharoplasty candidates. For these patients, it would be recommended to let their glaucoma specialists know that they will undergo an upper blepharoplasty and that, during the recent postoperative period, a mild increase in their IOP might be observed. Thus, it would be recommended to evaluate IOP at postoperative visits. In normal patients, a mild increase in the IOP will probably be harmless. Nevertheless, even a mild increase in the IOP is undesirable in a glaucoma suspect or in a patient with glaucoma because it can lead to optic neuropathy. The landmark study early manifest glaucoma trial (EMGT) demonstrated that an increase of 1 mm Hg of intraocular pressure was associated with an approximate 10% increased risk of glaucoma progression.[3] Thus, a complete ophthalmic exam with IOP and fundoscopy evaluation is recommended for patients who undergo upper blepharoplasty so that glaucoma patients or glaucoma suspects can be properly identified, managed, and advised before the procedure.

Limitations of this preliminary report include its small sample. However, even this relatively small sample showed statistically significant elevations in IOP after upper blepharoplasty. Future studies with a greater number of patients and longer follow-ups are needed to confirm the influence of upper eyelid blepharoplasty on intraocular pressure and determine if this trend remains with time.

In conclusion, a mild and statistically significant elevation in IOP was observed in patients who underwent upper eyelid blepharoplasty. This procedure should be carefully evaluated in glaucoma and glaucoma suspect patients.

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