Original Article

The Effect of Trabeculectomy on Corneal Curvature

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Purpose: To determine and evaluate pattern of changes in corneal curvature produced by trabeculectomy.

Material and Methods: 50 consecutive eyes that had trabeculectomy operations were enrolled. The visual acuity, subjective refraction and keratometry readings were recorded pre-operatively and post operatively at one week and one month. All postoperative keratometry readings were compared with the preoperative values by paired t-test. All changes in subjective refraction were analyzed by vector analysis.

Results: After trabeculectomy only 29 patients (34 eyes) turned up for regular and timely follow up. Vertical steepening was found in 19 eyes (P=.000 and P=0.009). Vertical flattening was found in 15 eyes (P=.013 and P=0.022). Horizontal steepening was found in 12 eyes (P=0.005 and P=0.13) and horizontal flattening was found in 22 eyes (P=.010 and P= 0.013). Power vector analysis showed surgically induced change in subjective refraction with a mean of -1.14D (SD ± 1.53, P=0.000), cylinder with a mean of 1.80(SD ±1.41, P=0.000) and axis with a mean of 84.42 (SD ± 47.63, P=0.000). Patients with visual acuity < 6/18 (11 eyes) did not complain of change in vision post operatively, while patients with visual acuity >6/18 complained of decreased vision post operatively.

Conclusion: The trabeculectomy procedure results in significant change of corneal curvature in both meridians. This effects post operative visual acuity which in turn may adversely effect the compliance of patients towards surgical treatment.

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Glaucoma is the greatest mystery of ophthalmology. It is defined as "multifactorrial optic neuropathy with characteristic acquired loss of optic nerve fibers[1] leading to specific patterns of visual field loss. It may or may not be associated with increased intraocular pressure. Glaucoma is among the leading causes of blindness in the developing world[2].

Glaucoma mainly managed surgically by performing trabeculectomy because of our socioeconomic conditions. It is guarded filtration technique developed in 1960s[3,4]. For the same reason trabeculectomy is being performed at early stages of disease when vision is fairly good [5]. Evaluating the out come of surgery in terms of visual rehabilitation present particular difficulties and even after successful trabeculectomy patients often complain of reduction in vision. We all know vision is regarded as the most precious of our senses and its loss is catastrophic. Visual process is also most complex to study because it involves several different braches of science. The eye is an optical instrument i.e. photo sensor with brain as data processor.

In eye, refraction mainly occurs at the level of cornea and lens and any change in curvature will affect vision. Corneal astigmatism following cataract extraction is now well recognized [6]. The purpose of this study was to evaluate whether trabeculectomy produces changes in corneal curvature or not.

MATERIAL AND METHODS

Fifty eyes of forty patients without previous history of trauma or intraocular surgery who underwent a standardized fornix-based trabeculectomy were evaluated .There was no gender specification and age ranged from 40-80 years. There was no corneal abnormality preoperatively on examination. All patients had no post-operative shallow anterior chamber, macular oedema, retinal hemorrhages and changes in choroidal thickness associated with acute hypotony.

Procedures

1. Pre-operative assessment included recording visual acuity (Snellen's chart), k-reading of central cornea (CANON RK-5 auto refractor) and refraction.
2. Cairns-type trabeculectomy was performed in all cases. Fornix-based conjunctival flap was lifted and a partial tenonectomy performed. A 5×3mm partial thickness rectangular scleral flap was dissected and a 4 ×2 mm trabeculectomy done. A peripheral iridectomy was performed, and scleral flap was secured, then conjunctiva was closed.
3. Postoperative assessment included recording visual acuity (Snellen's chart), k-reading of central cornea(CANON RK-autorefractor) and refraction at 1week and 1month.
4. The result of k- reading compared by t-test [7].
5. Vector analysis for change in refraction done [8].

RESULTS

Patients with very good post-operative intraocular pressure often complain of reduction in vision. Patients with pre-operative visual acuity < 6/18 (11eyes) did not complain of change in vision post-operative, while patients with visual acuity > 6/18 did complain of decreased vision post-operatively.

Trabeculectomy affects corneal curvature in a complex manner. When results were compared by applying tests of significance i.e. 2-tailed and 1-tailed revealed that the results are highly significant except one .Only 29 patients turned up for follow up timely and regularly. Vertical steepening was as found in 19 eyes, (P=.000 P=.018 by 2 tailed test and P= .000, P=.009 by 1 tailed test). Vertical flattening was found in 15 eyes, (P=.027, P=.045 by 2 tailed test and P=.013, P=.022 by 1 tailed test). Horizontal steepening was found in 12 eyes, (P=.011, P=.27 by 2 tailed test and P=.005, P=.13 by 1 tailed test). Horizontal flattening was found in 22 eyes, (P=.021, P=.026 by 2 tailed test and P=.010, P=.013 by 1 tailed test) (Table 1). Power vector analysis revealed significant change in refraction, specially astigmatic component (sphere-1.14 ± 1.15) cylinder (1.80 ± 1.42) and axis (84.4 ± 47.6) and test of significance revealed that P= .000 by both 2 and 1 tailed test. Vector analysis was done in 24 eyes as in 10 eyes refraction was not possible because of lenticular changes (Table 2).

Table 1: Vertical and horizontal steeping and flattening

	Vertical				Horizontal			
	Steepening No. of eyes 22		Flattening No. of eyes 15		Steepening No. of eyes 22		Flattening No. of eyes 15	
	2 tailed	1 tailed	2 tailed	1 tailed	2 tailed	1 tailed	2 tailed	1 tailed
Pair 1 D0-D1	0.000	0.000	0.027	0.013	0.011	0.005	0.021	0.010
D0-D2	0.018	0.009	0.045	0.022	0.27	0.13	0.026	0.013

- D0 = Dioptric value Pre-Op
- D1 = Dioptric value one week Post-Op
- D2= Dioptric value one month Post-Op

Table 2: Power Vector Analysis

	No	Mean	Standard deviation	2 Tailed
Sphere	24	-1.14	(± 1.15)	0.000
Cylinder	24	1.80	(± 1.42)	0.000
Axis	24	84.42	(± 47.63)	0.000

DISCUSSION

Clinical study revealed that trabeculectomy produces significant changes in corneal curvature .Wound gape following cataract extraction has been shown to produce an change in corneal curvature .Since trabeculectomy also produces a form of wound gape[9] ,a similar change would be expected post-operative. But changes in corneal curvature after trabeculectomy do not appear to behave as in the same manner as they do after cataract extraction, rather changes are very complex. An explanation for this difference in behavior may be the result of the partial thickness scleral flap created during trabeculectomy. Moreover in trabeculectomy the surgically produced gape which is posteriorly placed and is overlaid by scleral flap which is capable of spreading any support from the sutures inserted into it over the whole of the wound gape. The overlying conjunctiva also gives support. This cannot be the entire explanation however, as in this study, the scleral flap sutures in trabeculectomy are not usually inserted under undue tension.

The cause of induced astigmatism may be related to the use of cautry during surgery, producing a contraction of the sclera [10].

The changes in corneal curvature affected the central cornea and achieved statistical significance level [11]. These changes are adequate enough to have a significant affect on visual function in patients specially with good pre-operative visual acuity. Astigmatism induces distortion of image. The retinal image in an uncorrected eye is distorted causing differential magnification in the two principal meridians. Although oblique astigmatism produces only 0.4 degree of tilt per diopter mono-ocularly, it will produce major alterations in bin-ocular perception [12]. Corneal curvature changes has been reported by Rosen et al(1992)[13], Claridge et al (1995)[14], Dietz et al(1997) [15] , Mehmooda et al (2006) [16] etc.

CONCLUSION

Irregular corneal astigmatism after trabeculectomy is a annoying problem for both patient and surgeon. The impact of the procedure on the visual prognosis of glaucoma patients must therefore be carefully evaluated.

Long term studies are required to investigate modifications in surgery to minimize the curvature changes as these changes affect post-operative visual acuity which in turn may adversely affect the compliance of patients. Small flap trabeculectomy (micro trabeculectomy) is recommended by S.A Vernon [17] as it produces smaller changes in corneal curvature that resolve sooner than previous reports of larger flap technique.

Full counseling of the patient should be done and informed consent be made. Patient should be warned of changes pre- operatively as many will have normal vision prior to surgery and may be distressed by the significant changes that occur. This effects post operative visual acuity which in turn may adversely

effect the compliance of patients towards surgical treatment.

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Answer: Apocrine Hidrocystoma

Apocrine hidrocystoma is a very common solitary smooth cyst arising from the glands of Moll along the eye lid margin. It is considered a true adenoma of the secretory cells of Moll rather than retention cyst. These lesions typically are translucent or bluish and transilluminate. They may be multiple and often extend deep beneath the surface, especially in the canthal regions.

Treatment for superficial cysts is marsupialization. Deep cysts require complete excision of the cyst wall. These cysts are also known as cystadenomas or sudoriferous cysts.

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