The Effect of Trabeculectomy on Cataract Formation or Progression

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Purpose: To determine the effect of trabeculectomy on cataract formation or progression in patients with chronic glaucoma.

Methods: This controlled clinical trial was performed on patients over 50 years of age with glaucoma who were referred to Imam Hossein Hospital, Tehran, Iran, from 2006 to 2007. Trabeculectomy was indicated only in one eye while the fellow eye had well-controlled intraocular pressure with medication(s). The fellow eyes served as controls. Lens opacity was evaluated using three criteria: visual acuity (VA), and Lens Opacification Classification System III (LOCS III) photographs and scores.

Results: Overall 82 eyes of 41 patients including 53.7% male and 46.3% female subjects with mean age of 62.5±9.3 (range 50-75) years were evaluated. Cataract progression in operated eyes was statistically significant according to VA (P=0.02), LOCS III photographs (P=0.05) and LOCS III scores (P=0.01). However, compared to fellow control eyes, cataract progression was significant according to VA (P=0.023) and LOCS III scores (P=0.057) but not based on LOCS III photographs. Mean VA reduction was 2 Snellen lines in operated eyes; there were 3 cases of cataract formation or progression without reduced VA.

Conclusion: Cataracts seem to progress following trabeculectomy; therefore it might be advisable to perform a combined procedure in older patients with moderate lens opacities.

Key words: Trabeculectomy; Cataract

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INTRODUCTION

Cataract formation or progression is a common event following uneventful trabeculectomy (Tx) and has been reported to range from 6 to 58 percent in different studies.[1-13] There is no agreement on risk factors for this condition which have been reported to include older age, female sex, diabetes mellitus, systemic hypertension, obesity, myopia, pre-existing lens opacity, pseudoexfoliation syndrome, longstanding use of miotics, flat anterior chamber, hypotony, significant decrease in intraocular pressure (IOP) and postoperative inflammation.[2,3,7,8] On the other hand, it has been suggested that cataract extraction following successful Tx may compromise bleb function and lead to IOP rise. Therefore it would be prudent to combine cataract surgery with Tx in older patients with significant cataracts.[1] However there is no consensus on performing a combined procedure in patients with mild to moderate lens opacities. This study, aimed to evaluate the effect of Tx on cataract formation or progression.

METHODS

In a controlled clinical trial, consecutive phakic patients with glaucoma who were referred to Imam Hossein Medical Center, Tehran, Iran from 2006 to 2007 and required Tx alone in one eye were evaluated for eligibility. Exclusion criteria included monocular patients, those with best corrected visual acuity (BCVA) worse than 20/400, previous intraocular surgery, inflammation, neovascular glaucoma, traumatic glaucoma, corneal and retinal lesions, concomitant ocular anomalies (such as coloboma, microphthalmia, aniridia), combined cataract and glaucoma procedures, bilateral Tx, complications during (vitreous loss, lens trauma) or after Tx (significant or unresolving choroidal effusions requiring surgery), and follow-up less than 3 months.

Informed written consent was obtained from all patients. Demographic characteristics and general medical data included age, sex, and history of diabetes mellitus and high blood pressure (BP). Snellen BCVA was determined following refraction. A complete ophthalmologic examination including slitlamp biomicroscopy, applanation tonometry, gonioscopy and dilated fundus examination were performed in both eyes of all subjects.

Slitlamp lens photographs were taken from both eyes with dilated pupils and retroillumination, and compared with standard 8.5×11 inch, graded Lens Opacification Classification System III (LOCS III) photographs. The LOCS III system includes three rows of photographs; 6 in the upper row grading nuclear opacities based on color (NC1 to NC6), 5 in the middle row grading cortical opacities (C1 to C5), and 5 in the lower row grading posterior subcapsular opacities (P1 to P5). LOCS III employs a decimal scoring system: for nuclear opacities this ranges from 0.1 to 6.9 (each photograph is equivalent to a 1.13 score) and for cortical and posterior subcapsular opacities the figure ranges from 0.1 to 5.8 (each photograph is equivalent to a 1.16 score). When different types of opacities are present simultaneously, the scores are summed up (Fig. 1). In the photographic scoring system, however, the additive effect of different lens opacities together is considered for scoring the lens opacity.[14]

Figure 1 Lens Opacification Classification System III

Tx was performed when the level of IOP was considered too high for the level of glaucomatous damage, in the presence of progressive visual field defects, or increased cupping despite full medical treatment with topical antiglaucoma medications including beta-blockers,

prostaglandin analogues and carbonic anhydrase inhibitors. We used a standard Tx technique using a fornix-based conjunctival flap, a triangular (4×4×4 mm) scleral flap and an internal block 2×1 mm in size followed by peripheral iridectomy. The scleral flap was fixed with a single 10-0 nylon suture and the conjunctiva was repaired with 9-0 vicryl. No antimetabolites were used in any case. At the conclusion of surgery, a subconjunctival injection of dexamethasone 4 mg, gentamicin 20 mg and atropine 0.25 mg was given. Postoperative medications included chloramphenicol 0.5% eye drops every 6 hours, dexamethasone 1% drops every 3 hours and atropine 1% drops every 12 hours which were tapered according to the degree of inflammation.

Postoperative visits were scheduled 1 and 3 days, 1 and 2 weeks, and 1, 2 and 3 months after Tx. At each follow-up visit, wound leakage, IOP, anterior chamber depth, intraocular inflammation, and the fundus were checked. At the third month visit, all preoperative examinations were repeated and lens photographs were taken from both eyes and compared. Lens opacity was considered to be progressive when the difference between pre- and postoperative scores in the same eye was more than 0.7 units. Decreased BCVA was defined as loss of BCVA of at least 2 lines of Snellen acuity. The patient was excluded if BCVA was reduced due to causes other than increased lens opacity such as uncontrolled glaucoma, cystoid macular edema or age-related macular degeneration.

Data were analysed using *t*, paired-*t*, Chi-square and McNemar tests with significance level set at 0.05.

RESULTS

The study included 82 eyes of 41 patients with mean age of 62.5±9.3 (range 50-75) years. Mean decrease in IOP was 13.0±5.3 mmHg three months after Tx (Fig. 2). Demographic and ocular characteristics are summarized in Table 1.

BCVA decreased by at least two Snellen lines in 9 (22%) eyes and 2 (4.9%) control eyes (P=0.02, table 2). Lens opacity increased in 12 (29.3%) operated eyes and 5 (12.2%) control eyes (P=0.07, table 3). Cataract progression in the case group was statistically significant according to VA (P=0.02), and LOCS III photographs (P<0.001) and scores (P=0.01, table 4). However, compared to the fellow eye, cataract progression was significant according to VA (P=0.023) and LOCS III scores (P=0.057) but not based on LOCS III photographs. Mean VA reduction was 2 Snellen lines in the case group and there were 3 cases of cataract formation or progression without reduction in VA.

Photographs and LOCS III scores of two representative patients are shown in figures 3 and 4. Lens opacity increased in 15% of female and 25% of male subjects; all of them had shallow anterior chamber and 50% of them had hypotony (IOP<6 mmHg). Presumptive risk factors such as sex, age (cutoff at 60 years), diabetes mellitus (known cases), systemic hypertension (BP>130/85 mmHg), pseudoexfoliation, myopia (higher than 6 diopters), and significant IOP reduction (>5 mmHg) had no correlation with increased lens opacity after Tx. Eyes with chronic angle closure glaucoma were associated with significantly more progression of lens opacity (P=0.03).

Table 1 Patient characteristics before trabeculectomy

	No (M±SD)	%
Male	22	53.7
Female	19	46.3
History of diabetes mellitus	6	14.6
History of hypertension	6	14.6
Pseudoexfoliation	5	12.2
Right eye	18	43.9
Left eye	23	56.10
Chronic open angle glaucoma	29	70.7
Chronic angle closure glaucoma	12	29.3
Intraocular pressure (mmHg)	(26.5±5.3)	-
Cup/disc ratio	(0.62±0.23)	-

M, mean; SD, standard deviation.

Table 2 Lens opacity according to visual acuity

	BCVA: No (%)		
	Decreased	Unchanged	Total
Operated eyes	9 (22.0)	32 (78.0)	41 (100)
Fellow eyes	2 (4.9)	39 (95.1)	41 (100)
Total	11 (13.4)	71 (86.6)	82 (100)

BCVA, best-corrected visual acuity.
Chi-square test, P=0.023.

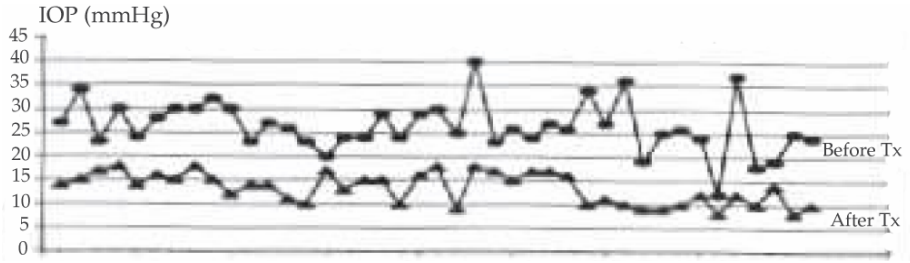

Figure 2 Intraocular pressure (IOP) in operated eyes before and after trabeculectomy (Tx)

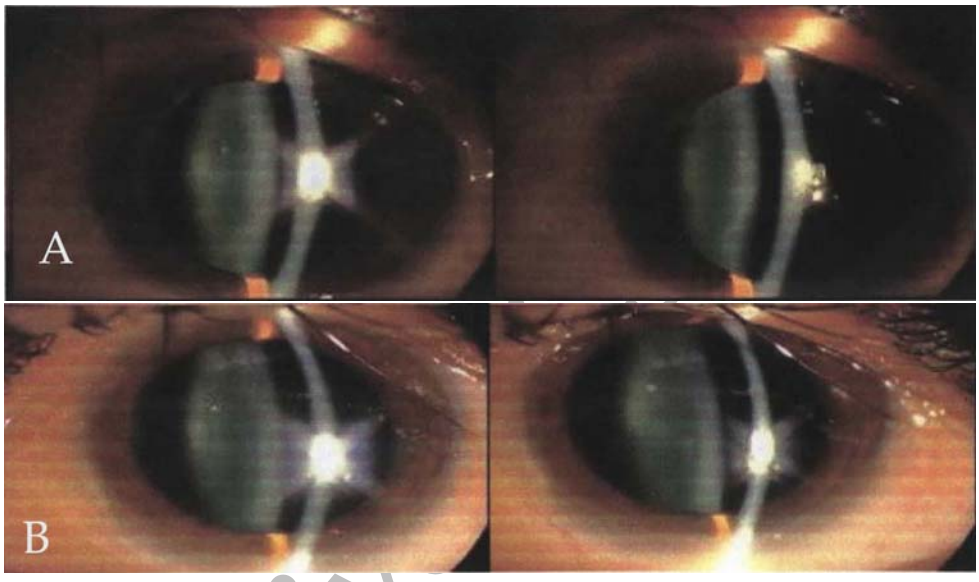

Figure 3 Slitlamp photographs of an eye undergoing trabeculectomy; (A) Lens opacity before trabeculectomy was NC_2-C_1-P_1 with a LOCS III score of 2×1.3+1.16+1.16=4.48. (B) Lens opacity and LOCS III score remained unchanged 3 months after surgery.

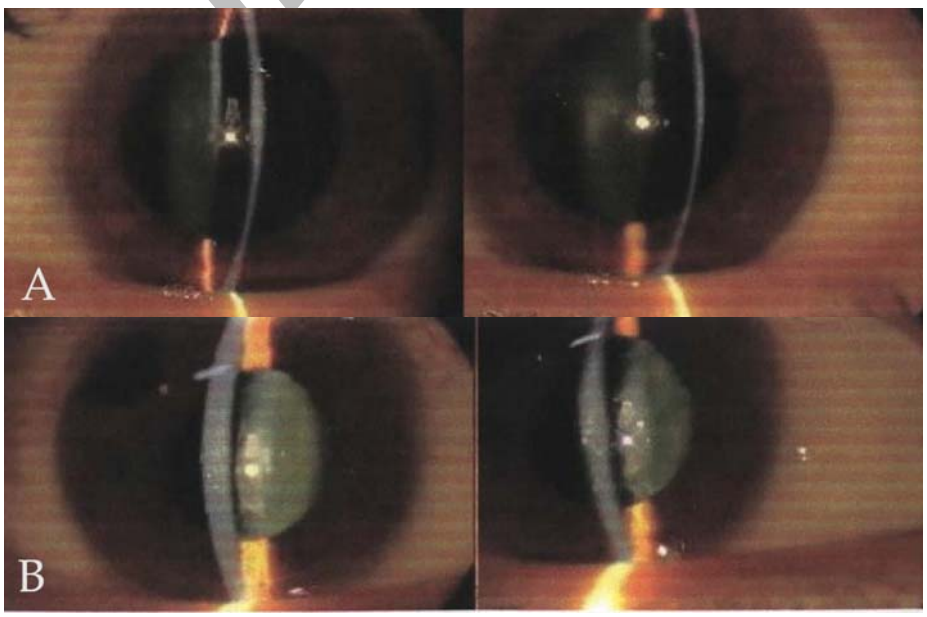

Figure 4 Slitlamp photographs from another eye that underwent trabeculectomy; (A) Lens opacity before trabeculectomy was NC_2-C_1-P_1 with a score of 2×1.3+1.16+1.16=4.58. (B) Lens opacity increased to NO_2-C_4-P_1 and the opacity score reached 2×1.3+4×1.16+1.16=8.06 three months after surgery.

Table 3 Lens opacity 3 months after trabeculectomy based on LOCS III photographs

	Lens Opacity: No (%)		
	Increased	Unchanged	Total
Operated eyes	12 (29.3)	29 (70.7)	41 (100)
Fellow eyes	5 (12.2)	36 (87.8)	41 (100)
Total	17 (20.7)	65 (79.3)	82 (100)

LOCS, Lens Opacification Classification System.
Chi-square test, P=0.057.

Table 4 Lens opacity before and 3 months after trabeculectomy based on LOCS III scores

	After Tx: No (%)		
Before Tx:	+	-	Total
+	21 (51.2)	0	21 (51.2)
-	12 (29.3)	8 (19.5)	20 (88.8)
Total	33 (80.5)	8 (19.5)	41 (100)

Tx, trabeculectomy; LOCS, Lens Opacification Classification System.
McNemar test, P<0.001.

DISCUSSION

This controlled clinical trial demonstrated that lens opacities progress based on BCVA criteria and lens photographs using the LOCS III scoring system 3 months after uncomplicated Tx. Increased lens opacity in operated eyes was significant based on BCVA, and LOCS III photography and opacity scores. However, the difference between operated and control eyes was not significant according to LOCS III photographs whereas it was based on LOCS III scoring system (tables 3 and 4). The reason may be the summation of opacity scores in different parts of the lens in the sco-ring system, whereas in photographs, opacities in different parts of the lens are considered separately.

Mills[3] reported a 15.2% incidence of cataract progression based on BCVA, of which 45% occurred during the first 6 months after Tx. In our study, 22% of operated eyes experienced decreased BCVA due to cataract formation or progression which is in line with the mentioned study. In 1979, D´Ermo et al[6] reported a 35% prevalence of lens opacities in 90 eyes of 75 patients 5 years after Tx according to decreased BCVA. Visual loss was severe (BCVA <20/50) in 25% and mild (BCVA >20/50) in 10% of cases. The reason for the difference between our results and that of the mentioned study may be that, in addition to longer follow-up, a cut-off BCVA value of 20/50 was employed instead of a 2-line decrease. In 1998, Daugeliene et al[2] performed mitomycin-C (MMC) Tx on 24 patients aged 21 to 76 years and found a 58% rate of mild lens opacity with or without decreased BCVA. Using antimetabolites, smaller sample size and including mild lens opacities can be the reasons for the different results. In 2003, Adelman and coworkers[8] performed Tx with MMC or 5-fluorouracil on 34 eyes of younger patients (12-58 years) of whom 24% required cataract extraction over 5 to 58 months of follow-up. They suggested that increased lens opacity can be seen up to several months or even years after Tx and is not related to age. Younger patients, smaller sample size, use of antimetabolites, longer follow-up, the effect of other factors such as age and nutrition and finally considering cataract extraction instead of grading lens opacities may explain the different results obtained in the mentioned study. In 2000, Daugeliene et al[9] performed Tx with MMC on 41 eyes and followed them with slit-lamp photographs 1 and 3 months after Tx. They reported mild but progressive lens changes especially in the anterior portions as early as 1 month after surgery.

Age over 60 years has been reported as a risk factor for increased lens opacity after Tx[2,6,8] but we did not find any relationship between age and increased lens opacity in our study. In the current study, increased lens opacity was seen in 15% of female versus 25% of male subjects. Although not statistically significant this is in contrast to the report by Daugeliene et al[2] who reported a 3-fold incidence of increased lens opacity in female patients. Shallow anterior chamber and hypotony have also been reported as risk factors for increased lens opacity after Tx.[2-5,9] In our study all patients with increased lens opacity had shallow anterior chambers and 50% of them had hypotony (IOP<6 mmHg).

In summary, lens opacities were found to increase following Tx in 29.3% of eyes based on LOCS III grading system and in 22% based on decreased BCVA, these figures are in the average range reported by other investigators (6 to

56%).[2-11] Our study has 3 advantages: (1) having a matched control group, i.e. the fellow eyes, to exclude the effect of aging; (2) quailtative and quantitative evaluation of lens opacities using LOCS III standard photographs and scores; and (3) use of BCVA reduction as a complementary criterion. We encountered cases in which photographs showed no progression but BCVA was reduced due to light scattering, on the other hand we observed eyes with some increase in lens opacity based on photography with no change in BCVA due to the off-center location of the opacities.

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