Post-traumatic angle recession glaucoma: a risk factor for bleb failure after trabeculectomy

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Abstract

In order to determine if post-traumatic angle recession is a risk factor for failure of glaucoma filtering surgery independent of age or race, the surgical results of trabeculectomy performed in 35 consecutive patients with angle recession glaucoma were compared with those of 35 matched patients with primary open angle glaucoma. A postoperative intraocular pressure of ≤21 mm Hg (with or without glaucoma medication) was found in 15 of the 35 (43%) patients with angle recession glaucoma compared with 26 of the 35 (74%) patients with primary open angle glaucoma. The long term success of trabeculectomy was significantly worse in angle recession glaucoma when the results were analysed using Kaplan-Meier survival curves. Bleb failure occurred a mean period of 3·1 (SD 1·2) months after trabeculectomy in angle recession glaucoma compared with 9·4 (5) months in primary open angle glaucoma (p≤0·001). The finding that post-traumatic angle recession is a risk factor for failure of trabeculectomy, supports the use of antimetabolite therapy to suppress fibrosis after trabeculectomy in these patients.

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Previous studies have identified factors which increase the risk of failure of glaucoma filtering surgery. These include general factors such as youth and race (blacks are more at risk) and ocular factors such as aphakia, previous failed glaucoma filtration surgery, active anterior segment neovascularisation, and chronic ocular inflammation.[1–6] Late post-traumatic angle recession glaucoma has been considered refractory to therapy in several studies reporting the results of glaucoma filtering surgery.[4 7–9] However, because traumatic glaucoma often occurs in young black or mixed race patients the question of whether traumatic angle recession is an independent risk factor for failure of filtering surgery, irrespective of age or race, has not been answered.

For this reason we retrospectively compared the surgical results of trabeculectomy in patients with post-traumatic angle recession glaucoma with those of a matched control group of patients who underwent trabeculectomy for primary open angle glaucoma.

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Materials and methods

We reviewed the records of 35 consecutive patients who underwent trabeculectomy for medically uncontrolled post-traumatic angle recession glaucoma between January 1985 and December 1991 and who had at least 3 months' postoperative follow up. The mean degree of angle recession was 310° (range 120° to 360°). A control group was identified by matching the angle recession glaucoma patients with 35 consecutive patients of similar age, sex, and race characteristics, who had undergone trabeculectomy for medically uncontrolled primary open angle glaucoma (Table 1). If trabeculectomy had been performed in both eyes, only the results of the first eye of both groups were analysed. Patients with subluxed or dislocated lenses or with additional ocular pathology were excluded from this review.

In both groups, the surgery was performed using a technique similar to that described by Cairns.[10] In all patients, a fornix based conjunctival flap was used. A 4 mm by 4 mm limbus-based scleral flap was dissected into clear cornea. A 1×2 mm deep scleral block was removed and a peripheral iridectomy was performed. The scleral flap was closed with two to four interrupted 10–0 nylon sutures and the conjunctiva was closed with interrupted 10–0 nylon sutures. Subconjunctival injections of gentamicin 20 mg and betamethasone acetate 1·5 mg were administered. Postoperatively, topical homatropine 1% was instilled twice daily for 1 week and topical chloramphenicol four times daily for 4 weeks. Topical prednisolone 1% was used four times daily for 3 months after surgery.

Surgery was considered a success when the intraocular pressure was below or equal to 21 mm Hg with or without medication and a failure when the intraocular pressure was higher than 21 mm Hg with or without medication, when further glaucoma drainage surgery was required, if phthisis bulbi developed, or if the eye lost light perception.

Comparisons between the two groups were performed using Student's t test and the Mann-Whitney U test. Kaplan-Meier survival curves were drawn and intercurve analysis was performed using the log rank test. Categorical data were analysed using the χ^2 test or Fisher's exact test. A finding was considered significant at a p value of $<0·05$.

Results

The mean follow up was shorter in the traumatic glaucoma group (21·2 (SD 3·4) months; range 3 to 72 months) than in the primary open angle glaucoma group (33·8 (4·2) months; range 3 to 72 months), p=0·02. Although the mean preoperative intraocular pressure was higher in the group with traumatic glaucoma, this difference was not statistically significant. The mean intraocular pressure decreased from a preoperative level of 39·2 (10·1) mm Hg (range 20–60 mm Hg) to a postoperative level of 22·9 (9·6) mm Hg (range 2–64 mm Hg) in the traumatic glaucoma group, and

Table 1 Patient characteristics

	Traumatic glaucoma	POAG*
Number	35	35
Age (years)		
Mean (SD)	49·9 (12)	50·5 (14)
Range	22–74	20–69
Sex		
Female	10	10
Male	25	25
Race		
Black	12	12
Mixed race	23	23
Preoperative intraocular pressure (mm Hg)	39·2 (10·1)†	34·5 (10·1)†
Degrees of angle recession		
Mean (SD)	310 (14)	
Range	120–360	
Cause of angle recession		
Assault	29 (83%)	
Accident	2 (6%)	
Denial of trauma‡	4 (11%)	
Time between trauma and trabeculectomy		
Mean (month (SD))	125 (24)	
Range	1–552	

*POAG indicates primary open angle glaucoma.
†No significant difference with Student's *t* test.
‡With other ocular or periocular signs of previous trauma.

from 34·5 (10·1) mm Hg (range 24–70 mm Hg) to 16·6 (6·2) mm Hg (range 2–45 mm Hg) in the primary open angle glaucoma group. The mean percentage of intraocular pressure reduction was 30·9% (6·2%) in the traumatic glaucoma group and 40·9% (4·6%) in the primary open angle glaucoma group, but this difference was not statistically significant.

The mean intraocular pressure for each group at each period of postoperative follow up is shown in Figure 1. Postoperatively the difference between the mean intraocular pressure of the two groups was statistically significant at 1, 3, and 6 months and at 2, 3, and 4 years (p=0·025, 0·032, 0·05, 0·04, 0·01, and 0·03 respectively). Although the mean postoperative intraocular pressures were higher in the traumatic glaucoma group at 1, 5, and 6 years, statistical significance was not demonstrated.

Of 35 patients with angle recession glaucoma, 15 (43%) were successfully treated and of the 35 patients with primary open angle glaucoma, 26 (74%) were successfully treated. Using a Kaplan-Meier cumulative survival curve, the long term success rate after 6 years of follow up was 0% for traumatic glaucoma and 76% for primary open angle glaucoma (Table 2, Figure 2). The mean time between trabeculectomy and bleb failure was 3·1 (1·2) months (range 0·5–24 months) in the angle recession glaucoma group and 9·4 (5) months (range 1–48 months) in the primary open angle glaucoma group (p<0·001). Of 20 failures in the 35 eyes with angle recession glaucoma, 19 (54%) were secondary to bleb fibrosis and one (3%) was secondary to endophthalmitis with subsequent progression to phthisis bulbi. Of the nine failures in the 35 eyes (26%) with primary open angle glaucoma, all were due to bleb fibrosis. The number of failures secondary to bleb fibrosis was higher in the angle recession glaucoma group than in the primary open angle glaucoma group, a difference that was statistically significant (p=0·039).

Surgical complications are listed in Table 3. The mean number of complications per patient was higher in the post-traumatic angle recession glaucoma group (1·25 (0·35) complications per patient) compared with the primary open angle glaucoma group (0·89 (0·27) complications per patient), but this difference was not statistically significant.

Factors influencing the surgical outcome were analysed and are summarised in Table 4. Age at the time of surgery, preoperative visual acuity and preoperative intraocular pressure were not found to influence the results in either group.

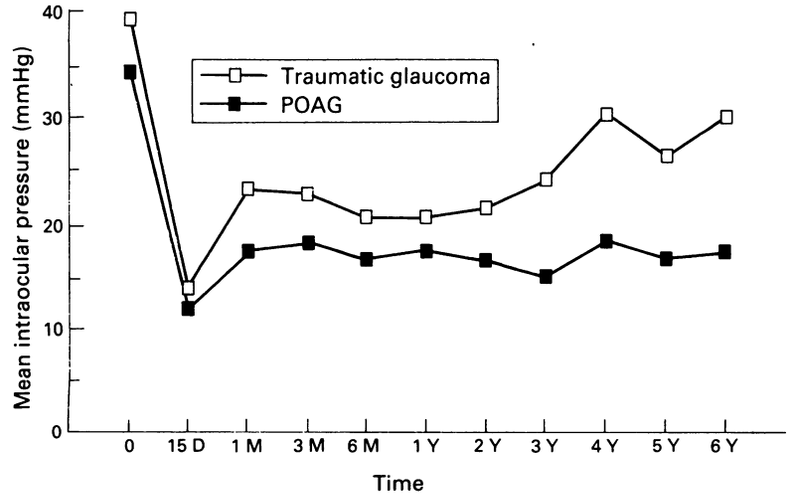

Figure 1 Mean intraocular pressure after trabeculectomy in traumatic and primary open angle glaucoma at different follow up periods from surgery to 6 years. The difference between each curve is statistically significant at 1 month, p=0·025; 3 months, p=0·032; 6 months, p=0·05; 2 years, p=0·04; 3 years, p=0·01; and 4 years, p=0·03. No statistically significant differences were shown at the preoperative, the 15 day, 1, 5, and 6 year periods. POAG indicates primary open angle glaucoma, D: day, M: month, Y: year.

Discussion

Glaucoma occurs as a late complication of trauma and has been reported to develop in 2% to 10% of patients with post-traumatic angle recession.[11–16] The presence of angle recession is regarded as a sign of previous blunt trauma and reduced

Table 2 Surgical and visual outcome

	Traumatic glaucoma	POAG*
Follow up (months (SE))		
Mean	21·2 (3·4)	33·8 (4·2)
Range	3–72	3–72
Reduction of IOP (% (SE))	30·9 (6·2)	40·9 (4·6)†
Overall success rate	15/35 (43%)	26/35 (74%)
Overall failure rate	20/35 (57%)	9/35 (26%)
Long term surgical success‡		
15 days	0·971 (0·012)	1·000 (0·000)
1 month	0·864 (0·028)	0·989 (0·001)
3 months	0·723 (0·028)	0·962 (0·015)
6 months	0·618 (0·043)	0·945 (0·019)
1 year	0·520 (0·048)	0·890 (0·029)
2 years	0·390 (0·054)	0·860 (0·035)
3 years	0·321 (0·057)	0·837 (0·041)
4 years	0·186 (0·061)	0·764 (0·062)
5 years	0·079 (0·055)	0·764 (0·062)
6 years	0·000 (0·000)	0·764 (0·062)
Medication per patient (SE)		
Preoperatively	2·23 (0·18)	2·36 (0·15)
Postoperatively	1·1 (0·2)	0·77 (0·17)§
Visual acuity: same or better	30/35 (86%)	27/35 (77%)
Worse**	5/35 (14%)	8/35 (23%)

*POAG indicates primary open angle glaucoma.
†p=0·2.
‡Cumulative probability of survival using Kaplan-Meier life table analysis with standard error.
§The reduction of glaucoma medication is statistically significant in both groups, p<0·001, but the difference between the two groups is not statistically significant.
**Postoperative visual acuity at least two lines worse than preoperative visual acuity.

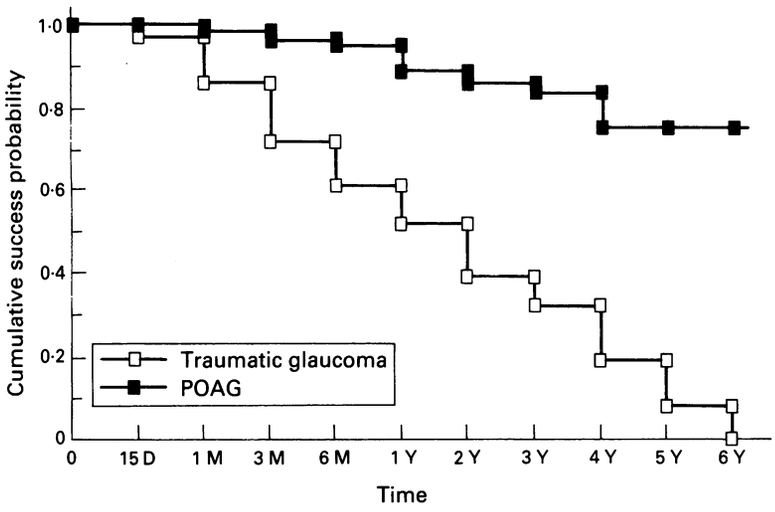

Figure 2 Cumulative success probability after trabeculectomy in traumatic and primary open angle glaucoma using Kaplan-Meier life table analysis. Intercurve analysis using the log rank test showed a statistically significant difference, with better long term success in those patients with primary open angle glaucoma, p<0·001. POAG indicates primary open angle glaucoma, D: day, M: month, Y: year.

aqueous drainage probably occurs because of other pathological changes within the trabecular meshwork.[11-18] Because eyes with traumatic glaucoma respond to topical corticosteroid provocation in the same way as those with primary open angle glaucoma, it has been suggested that only eyes with an underlying tendency to open angle glaucoma will develop a late increase in intraocular pressure after blunt trauma.[19 20]

The question of whether eyes with angle recession respond to filtering surgery in the same way as those with primary open angle glaucoma has not been answered. However, a previous study showed that the results of Molteno implantation of patients with angle recession glaucoma were poor.[9] It was found that the overall success rate of angle recession glaucoma (6/13, 46%) was worse than in patients with aphakic or pseudophakic glaucoma (9/16, 56%) or in patients undergoing this surgery after a previous failed trabeculectomy (10/14, 71%).[9] Because the patients studied were young and black, it was not clear whether the drainage surgery failure was related to these established risk factors alone or whether it was related to local ocular factors as well. We, therefore, retrospectively reviewed the results of filtering surgery performed on consecutive patients with angle recession glaucoma and compared them with the results of patients with primary open angle glaucoma matched for age, race, and sex.

Despite a shorter follow up in patients with angle recession glaucoma, our results clearly indicate that the presence of angle recession is a risk factor for failure of trabeculectomy independent of, and in addition to, age or race. When compared with patients with primary open angle glaucoma, patients with angle recession glaucoma had less postoperative intraocular pressure reduction, a lower overall 'success rate,' poorer success using cumulative survival curve analysis, and more postoperative bleb fibrosis. Patients with angle recession glaucoma required more postoperative intraocular pressure lowering medication than those with primary open angle glaucoma (1·1 (0·2) versus 0·77 (0·17) per patient). It should be noted that the mean period after injury was 10·4 (2·0) years and in only one patient was trabeculectomy performed within 6 months of injury. This suggests that duration of time from injury to surgery did not play a role in determining the likelihood of success or failure following trabeculectomy. Other recognised ocular risk factors for bleb failure such as aphakia, ocular inflammation, and anterior segment neovascularisation did not influence these results as patients with these conditions were excluded from analysis.

The reason for the poor success rate of trabeculectomy in post-traumatic angle recession glaucoma in unknown. Bleeding during surgery was more common in patients with angle recession glaucoma and, of 35 patients, nine (26%) had a postoperative hyphaema compared with six of 35 patients (17%) with primary open angle glaucoma, but this difference was not statistically significant. No difference was found between the groups in terms of postoperative inflammation or other operative complications. Our results could be explained by the early active fibroblast proliferation that occurs after filtering surgery in post-traumatic angle recession glaucoma. The mean time between surgery and bleb failure was significantly shorter in the angle recession glaucoma group (3·1 (SE 1·2) months; range 0·5–24 months) than in the primary open angle glaucoma group (9·4 (5) months; range 1–48). In an eye that has been severely damaged by trauma, a change in the characteristics of the aqueous humour may be responsible for this phenomenon. This could occur secondary to the presence of stimulatory growth factors, or perhaps

Table 3 Postoperative complications

	Traumatic glaucoma	*POAG**
Early:		
Early positive Seidel test	8/35 (23%)	7/35 (20%)
Shallow anterior chamber	4/35 (11%)	6/35 (17%)
Choroidal detachment	5/35 (14%)	2/35 (6%)
Hyphaema	9/35 (26%)	6/35 (17%)
Corneal abrasion	1/35 (3%)	1/35 (3%)
Anterior chamber inflammation	1/35 (3%)	–
Late:		
Bleb fibrosis		
Total	19/35 (54%)	9/35 (26%)
After 1 month	13	3
After 3 months	5	1
After 6 months	–	1
After 1 year	–	3
2 years and more	1	1
Cataract formation	–	2/35 (6%)
Endophthalmitis	1/35 (3%)	–

*POAG indicates primary open angle glaucoma.

Table 4 Factors influencing the outcome

	Traumatic glaucoma			*POAG**		
	Total	*No*	*Success (%)*	*Total*	*No*	*Success (%)*
Age						
>50 years	19	9	47	18	15	83
≤50 years	16	6	38	17	11	65
Visual acuity						
>6/60	21	10	48	26	21	81
≤6/60	14	5	38	9	5	56
Preoperative IOP						
>35 mm Hg	23	10	43	12	9	75
≤35 mm Hg	12	5	42	23	17	74

*POAG indicates primary open angle glaucoma.

the absence of a fibroblast growth inhibitory factor in the aqueous of these eyes.[1 21]

Because of the poor surgical results in patients with angle recession irrespective of age or race, the presence of this gonioscopic finding should alert the clinician to the possibility of an increased risk of failure of drainage after trabeculectomy. Antimetabolite therapy should therefore be considered with the primary procedure in these patients.

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