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Delayed Suprachoroidal Haemorrhage after Glaucoma Operations

C. R. CANNING, M. LAVIN, A. C. E. McCARTNEY, R. A. HITCHINGS, Z. J. GREGOR

London

Summary

Delayed suprachoroidal haemorrhage occurred in 13 eyes in a consecutive series of 432 cases undergoing trabeculectomy or anterior chamber (A/C) tube drainage operations. Aphakia and vitrectomy were associated with an increased risk of haemorrhage, whilst advanced age, myopia, systemic hypertension and high pre-operative intraocular pressure were not. Haemorrhage occurred more often after A/C tube drainage operations than after trabeculectomy. An explanation for this may be that eyes requiring A/C tube drainage operations have had multiple previous operations including lens extraction and vitrectomy, have a higher pre-operative intraocular pressure and a greater fall in pressure after operation when compared to eyes undergoing trabeculectomy. Post-operative hypotony should be avoided in high-risk eyes.

Suprachoroidal haemorrhage is a rare but devastating complication of glaucoma surgery. Although earlier reports of glaucoma filtering surgery do not mention suprachoroidal haemorrhage,[1-3] recent studies have shown that this complication occurs in one to two per cent of such operations.[4,5]

Delayed suprachoroidal haemorrhage (DSCH) occurs hours or days after glaucoma surgery. The usual onset is sudden, with severe pain and loss of vision. DSCH occurs in hypotonous eyes, and may be associated with coughing, straining, in a restless patient recovering from an anaesthetic, or may occur spontaneously. The prognosis for visual recovery after massive haemorrhage is poor, although some eyes have regained functional vision after early intervention to drain the blood externally,[4-9]

We describe a consecutive series of 432 eyes operated for glaucoma, 13 of which developed a suprachoroidal haemorrhage. Risk factors are assessed in the context of the whole group.

Methods

The case notes of 432 consecutive patients who had either had trabeculectomy or anterior chamber (A/C) tube drainage operations under the care of four surgeons at Moorfields Eye Hospital were reviewed. Anterior chamber tube drainage surgery involved placing a silicone tube into the anterior chamber; this drained to an episcleral plate, either as a two piece Shocket-type device,[10] or as an integral one piece device.[11] In four eyes Molteno plates were used.

The prevalence of the following risk factors was examined: hypertension and other systemic vasculopathies, causes of high venous pressure, high myopia, previous eye operations, pre-operative ocular inflammation, pre- and post-operative intraocular

From Moorfields Eye Hospital, City Road, London.

Correspondence to: Mr R. A. Hitchings, Moorfields Eye Hospital, City Road, London EC1V 2PD.

pressure, and post-operative valsalva episodes.

Suprachoroidal haemorrhage was diagnosed clinically by the presence of a dark mass pushing the retina forward, with blood often breaking through into the vitreous cavity. Ultrasound was used to confirm the diagnosis in some cases. Blood was found in all cases where external scleral drainage was done. A haemorrhage causing a subtotal detachment and not breaking through into the vitreous cavity was considered 'limited'.

The standard error of the difference between means and the chi squared test were used to compare subgroups.

Results

The 432 patients in this study comprised 265 males and 167 females. The mean age of the patients was 48.6 years (± 20.82). Trabeculectomy was performed on 254 eyes and tube drainage on 178. The aetiology of the glaucoma is listed in Table I.

Thirteen eyes had a delayed suprachoroidal haemorrhage; in twelve of these the haemorrhage was massive. The 'risk' factors studied are detailed in Table II. Only aphakia ($p<0.01$) and vitrectomy ($p<0.01$) were significantly associated with haemorrhage. Five of the 13 eyes with haemorrhage had had a trabeculectomy, and eight an A/C tube drainage operation. The clinical features of these patients are listed in Table III.

Several differences were apparent between the trabeculectomy and tube drainage groups (Table IV). In particular, eyes undergoing tube surgery had a mean intraocular pressure drop from pre- to day one post-operation of 34 mm Hg, compared to 21 mm Hg for trabeculectomies. More eyes in the tube group had had vitrectomies (19% vs 5%) and more were aphakic (49% vs 11%). The tube drainage group had on average had three previous eye operations, whereas less than half the trabeculectomy group had had any previous ocular surgery.

One eye had a limited haemorrhage, and this was the only one whose visual acuity improved. In one other eye the acuity remained unchanged. The rest did not regain pre-operative visual acuity, including all eight where the haemorrhage was drained.

Table I *Major causes of glaucoma*

PRIMARY:	
Congenital	67
Chronic simple glaucoma	133
Acute angle closure	27
Chronic narrow angle	19
SECONDARY:	
Aphakic	48
Rubeotic	30
Post-detachment operations	23
Uveitis	14
Pigmentary	13
Trauma	10
Failed glaucoma operations*	19

*These patients also originally had other causes for their glaucoma.

Discussion

Delayed suprachoroidal nonexpulsive haemorrhage (DSCH) is an uncommon but serious complication of glaucoma operations. A number of factors, both systemic and ocular, have been implicated by association in the pathogenesis. Many reports however do not record the prevalence of such factors in patients who did not have DSCH, making the predictive value of such factors uncertain. Systemic factors include advanced age,[7,8] hypertension,[8,10] diabetes, other vascular disease, general anaesthesia,[4,7] Valsalva manoeuvre and other causes of raised episcleral venous pressure[7,8] and 5-fluorouridine administration.[8] Local ocular and orbital factors include previous ocular surgery,[5] particularly lens extraction[5,8] and vitrectomy,[5] high myopia[4,7], nanophthalmos,[7] inflammatory eye disease, uncontrolled high pre-operative intraocular pressure,[5,7] and prolonged post-operative hypotony.[8]

In the series reported here, myopia, advanced age, systemic hypertension and high pre-operative intraocular pressure were not significantly associated with haemorrhage. Aphakia and vitrectomy were, although the reason for this is not known. Either may reduce the resistance to fluid accumulation in the suprachoroid. Such suprachoroidal effusions are common after glaucoma operations in general, and Gressel *et al.*[8] found serous choroidal effusions after trabeculectomy in all aphakic eyes which went on to develop

Table II *Factors associated with suprachoroidal haemorrhage*

	No haemorrhage (419 eyes)	*Haemorrhage (13 years)*	*Significance*
Age (years)	49 (SD 20.81)	39 (SD 20.82)	NS
Myopia >−6 dioptres	31	2	NS
Mean pre-operative blood pressure (mm Hg)	99 (SD 13.84)	103 (SD 16.19)	NS
Mean IOP pre- to post-operative (mm Hg)	34 (SD 8.91)	38 (SD 8.44)	NS
General anaesthesia	421	13	NS
Cataract extraction with or before glaucoma operation	115	11	p>0.01
Vitrectomy with or before glaucoma operation	40	7	p<0.01

SD = standard deviation.
NS = not significant at the 5 per cent level.

Table III *Clinical features of patients with delayed haemorrhage*

Age	*Sex*	*Aetiology of glaucoma*	*Aphakia*	*Vitrectomy*	*BP pre-op (mm Hg)*	*VA pre-op (mm Hg)*	*VA final*	*Time from operation to hge*	*Time from hge to drain of hge*
a) *Trabeculectomy*									
58	M	CSG, aphakic	×	×	180/100	6/60	PoL	2 days	12 days
69	M	aphakic	×	×	160/100	6/36	HM	1 day	2 days
23	M	congenital	×	×	150/80	6/60	HM	1 day	4 wks
15	F	congenital	×		110/70	6/60	HM	4 days	9 days
37	M	congenital	×	×	130/90	6/12	CF	1 day	14 days
b) *Tube drainage*									
34	M	CNAG	×	×	150/85	HM	NPL	2 days	2 mths (enucleated)
79	M	rubeotic	×		140/90	6/36	CF	1 hr	4 days
40	M	uveitis	×	×	135/90	PoL	NPL	4 days	—
57	F	CNAG	×	×	170/100	HM	HM	3 days	—
14	M	congenital			90/60	HM	6/60	2 days	—
42	M	uveitis	×		140/90	HM	Pol	3 days	4 days
26	F	congenital			130/90	HM	NPL	1 day	—
15	M	congenital	×		120/80	6/60		3 days	—

Aetiology—CSG = chronic simple glaucoma; CNAG = chronic narrow angle glaucoma.
Visual Acuity (VA)—CF = count fingers; HM = hand movements; PoL = perception of light NPL = no perception of light.

DSCH. In our series, large choroidal effusions were present in only two of the thirteen eyes that subsequently developed DSCH, and in one case the haemorrhage was limited. It seems unlikely, therefore, that large displacements of the posterior ciliary artery cause rupture through stretching.

The intact lens-iris diaphragm and vitreous resist scleral deformation during hypotonia, whereas in the aphakic and/or vitrectomised eye scleral folding may place added stress on the ciliary arteries. In addition, the vitreous and lens may limit the extent of haemorrhage if an artery does rupture.

The incidence of suprachoroidal haemorrhage in two reported series of eyes undergoing trabeculectomy was 1.6%[5] and 2%.[4] In the present series we have found a similar incidence, namely 5/254 (2%). Each of these eyes was either aphakic or vitrectomised at the time of surgery (Table III), emphasising the importance of these risk factors.

The incidence of DSCH in A/C tube drain operations in our series, however, was 8/178

Table IV *Comparison of trabeculectomy and tube drainage eyes*

	Trabeculectomy (254 eyes)	*Tube drain (178 eyes)*	*Significance*
Suprachoroidal haemorrhage	5	8	NS
Age (years)	56 (SD 18.76)	37 (SD 18.58)	$p<0.001$
Pre-operative IOP (mm Hg)	32 (SD 11.32)	37 (SD 10.06)	
Post-operative IOP day 1 (mm Hg)	11 (SD 8.88)	3 (SD 8.26)	
Cataract extraction with or before glaucoma operation	28 (11 per cent)	88 (49.4 per cent)	
Vitrectomy with our before glaucoma operation	13 (5.1 per cent)	34 (19.1 per cent)	
Myopia	29 (11.5 per cent)	21 (11.8 per cent)	

(4.4%). Eyes in this group had a higher pre-operative intraocular pressure, a greater fall in pressure after the operation, and previous operations including cataract extraction and vitrectomy were more common. This suggests that the presence of an A/C tube drain does not itself constitute an independent risk factor.

Although one series of 75 tube operations in neovascular glaucoma recorded 4 eyes suffering DSCH,[10] two other large series did not list this complication.[12,13] The overall frequency in these three series is 4/264 (1.5%), which is much less than that seen in our study. These reports do not list the prevalence of aphakia or vitrectomy in their patients. In addition, it is likely that case selection for tube surgery varies between centres, and these factors together may explain the varying prevalence of DSCH in tube surgery.

DSCH is primarily a complication of hypotony. In an attempt to reduce the severity and duration of postoperative hypotony, we have used ligating sutures about the tube implant to temporarily obstruct outflow.[14] This is an effective method for reducing the severity and duration of hypotony,[14,15] although some patients develop post-operative pressure spikes and may require reoperation.

A case history from our series emphasised the importance of hypotony. A 40 year old male with a myopic, aphakic, vitrectomised eye underwent a tube drain. The tube was tied with a temporary suture. The post-operative intraocular pressure (IOP) was 21 mm Hg, and the pressure remained unacceptably high in the ensuing days (Figure). The ligature was therefore divided and the IOP fell to 2 mm Hg. Six hours later DSCH occurred.

The results of treatment for the condition have been mixed. Several reports summarise the effects of early operative intervention on the visual outcome in eyes with massive suprachoroidal haemorrhage.[4,6] Six of the eight eyes which had drainage of the haemorrhage with reformation of the anterior chamber regained their pre-operative visual acuity. The time from haemorrhage to drainage of blood in successful cases, where reported, was within a week. Our experience does not con-

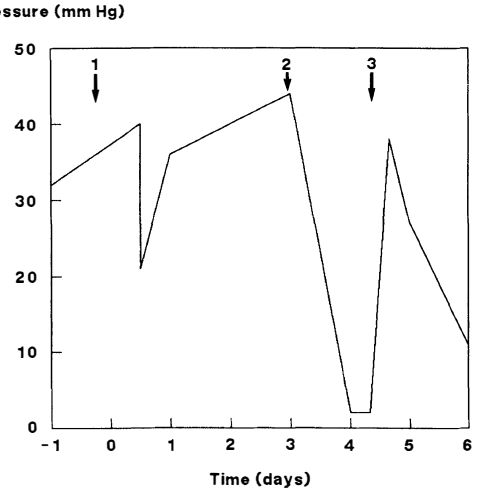

Fig. *Intraocular pressure changes in an eye with an A/C tube drain which was initially tied with a suture. (1) A/C tube drain operation; (2) Suture cut; (3) DSCH occurred.*

firm this relatively good prognosis—all 8 eyes in which the haemorrhage was drained failed to regain their preoperative visual acuity. Only three of the eyes in our series were operated within a week of the haemorrhage, however. This delay may be an important factor in the eventual visual outcome. Early drainage of the haemorrhage does seem to offer the best chance of visual improvement.

Our results indicate that aphakia and vitrectomy are associated with a greater risk of DSCH after trabeculectomy and tube drainage surgery. We do not feel that the prevalence of this complication warrants abandoning such surgery in favour of cycloablative procedures in these eyes. Instead, attention should be directed at controlling post-operative hypotony.

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