

Communications

Trabeculectomy

A study of 86 cases

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During the period January, 1970, to June, 1971, all patients under the care of two of us (K.R. and V.H.S.) who required filtration surgery for uncontrolled glaucoma were submitted to trabeculectomy. In all, 86 eyes, of 66 consecutive patients were included in the series. During this period no other external drainage procedure was used.

Material

The aetiology, confirmed by preoperative gonioscopy in every case, is detailed in Table I. Eyes classed as suffering from compound glaucoma had either chronic simple glaucoma and narrow angles, or chronic angle-closure glaucoma. The high percentage of these cases in the series was related to the difficulties they presented to medical regimes of treatment.

Table I *Aetiology of glaucoma in 86 eyes*

<i>Aetiology of glaucoma</i>	<i>Eyes</i>	
	<i>No.</i>	<i>Per cent.</i>
Chronic simple	27	33
Compound	31	35
Acute congestive	15	16
Developmental	3	4
Secondary	5	6
Thrombotic	5	6
Total	86	100

Surgical technique

The method employed was based on that described by Watson (1969). In all cases some form of magnification was used. For the majority this was the operating microscope, but for fifteen cases one of us (K.R.) used a $\times 2.5$ binocular operating loupe.

A large conjunctival flap was fashioned, after which a two-thirds thickness limbus-based external scleral flap 5 mm. square was raised. In the partial-thickness scleral bed thus exposed a further 3 mm. square full-thickness scleral window was excised. The scleral flap extended forwards to the

cornea, which was easily recognizable, and the scleral window included a small portion of cornea to ensure that the whole of the trabecular meshwork and canal of Schlemm was included in the excised portion.

Slight variations in technique were practised in the method employed to excise the window. In some cases the initial incision through the sclera was made anteriorly into the anterior chamber. This released aqueous and reduced the intraocular pressure to that of the atmosphere. Thereafter the uvea fell away from the scleral window as this was excised. In other cases the initial incision through the sclera was made posteriorly, parallel to the limbus, and a cyclodialysis spatula was then introduced, separating the sclera from the underlying ciliary body, thus pre-defining the plane of cleavage, and by entering the anterior chamber reducing the intraocular pressure as above. In the remainder of the cases, when the intraocular pressure was well controlled at operation, and when the uveal tract did not bulge unduly as the scleral window was fashioned, no aqueous was released until the dissection reached the anterior chamber.

After the removal of the scleral window, a large peripheral iridectomy was performed. In many cases the iris root prolapsed back into the wound and care was taken not to cut off ciliary processes that might be lying immediately behind the iris.

The scleral flap was then replaced and sutured in position, usually with virgin silk, employing on average five sutures. The conjunctiva was then closed. In spite of reducing the intraocular pressure to nil, the loss of aqueous was minimal, and by the time the conjunctival flap was sutured the anterior chamber had usually re-formed. Following this, patients under the care of one of us (K.R.) received a subconjunctival injection of Depomedrone (Sollom, Pearce, and Rubinstein, 1969).

Results

COMPLICATIONS

Early postoperative complications were assessed for the whole group of 86 eyes.

Hyphaema was present at the first dressing in thirteen eyes (15 per cent. of all cases). Of these thirteen, four were suffering from thrombotic glaucoma. The average duration of the hyphaema was 6.2 days for all cases, 15.5 days for thrombotic cases, and 3.8 days for non-thrombotic cases.

Choroidal effusions were noted in only four eyes, but this may have been an underestimate since the rarity of a flat anterior chamber postoperatively gave little stimulus to searching for this complication.

The anterior chamber was absent at the first dressing at 24 hours in only two cases, and in both it had re-formed by the fourth postoperative day. The overall rate for this complication is thus 2.3 per cent. Transient ocular hypertension was noted in several eyes in the first few days after surgery. Digital massage was found to be an effective way of relieving it.

FOLLOW-UP

Patients whose operations had been performed before the end of January, 1971, were reviewed in early May, when gonioscopy was repeated.

Of 52 eyes reassessed in this way, posterior synechiae were found in thirteen. Many of these developed more than 3 weeks after surgery, especially in patients taken off mydriatics because of the apparent resolution of postoperative inflammation.

Peripheral anterior synechiae of over 5 per cent. were found in sixteen eyes (Table II).

Gonioscopy showed that, in all cases save one, the pillars of the peripheral iridectomy were adherent to the cornea, and the lamellar ostium was confined to the space between and behind them. The one exception had a small cyclodialysis cleft to one side of the

Table II *Peripheral anterior synechiae in sixteen eyes*

Type of glaucoma	No. of eyes affected	Per cent. of group affected	Average extent of angle occluded (per cent.)
Acute congestive	4	44	55
Chronic simple	0	0	0
Compound	7	36	30
Secondary	3	66	65
Thrombotic	2	50	38

These findings suggested that extensive peripheral anterior synechiae related to the preoperative condition of the eyes and not to surgery (Sollom and others, 1969).

iridectomy, one pillar of which was free from the cornea. The absence of a cleft in all other cases, half of which had had a cyclodialysis during the operation, suggested that this procedure did not play a significant part in the effect of the operation in reducing intraocular pressure. Two cases in which the intraocular pressure was not controlled by the operation had small peripheral iridectomies which had become sealed down to cornea by peripheral anterior synechiae.

Corrected visual acuity fell by more than one line on the Snellen chart in nine out of 45 eyes. The overall average visual loss was 0.49 lines per eye reviewed.

Hypotony of less than 10 mm. Hg occurred in five cases and of less than 5 mm. Hg in one. In no case had papilloedema, choroidal folds, or maculopathy developed. In one hypotonic eye the anterior chamber was lost one month after operation, despite a normal and uncomplicated course in the immediate postoperative period. This was due to a dehiscence of the conjunctival wound which was resutured. Hypotony has not been recorded in any case reassessed more than 4 months after operation.

Of the 52 eyes assessed from 3 to 18 months after surgery, ten required postoperative antiglaucoma medication and an intraocular pressure of less than 22 mm. Hg was not achieved in four (Figure).

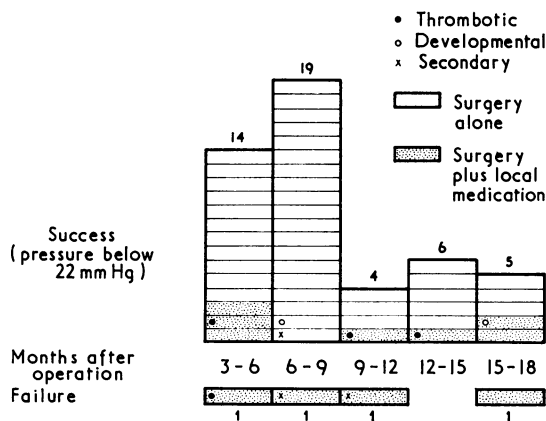


FIGURE *Results in 52 eyes followed-up for from 3 to 18 months after surgery*

As can be seen from the Figure, patients with secondary glaucoma did not do as well as those with primary glaucoma. Of 42 eyes with primary glaucoma, the tension was maintained below 22 mm. Hg without addition of antiglaucoma medication in 39 after operation, a rate of 93 per cent., and in only one case was the tension not controlled despite the addition

of local medication. Five eyes had had previous glaucoma surgery, and in one case trabeculectomy was successfully carried out over the site of a pre-existing peripheral iridectomy. The only eye suffering from secondary glaucoma to achieve a good result had originally suffered from uveitis. Two badly traumatized aphakic eyes failed despite additional local medication.

Of those cases suffering from developmental glaucoma, two eyes had buphthalmos and had had repeated failed goniotomies. Both were controlled at follow up and had not suffered any complications. The third case was a young adult whose angle was obscured by mesodermal remnants, and who required 2 per cent. pilocarpine three times a day to maintain a satisfactory tension following surgery.

Mechanism

Slit-lamp examination of the upper bulbar conjunctiva at the time of the review assessment revealed the presence of drainage blebs in most of the operated eyes. These blebs were characteristically widespread, shallow, well covered by conjunctivo-tenon, and posterior in location. None encroached on the cornea and only two were encysted. The relationship of the presence of a bleb of this type to the efficacy of the operation is shown in Table III.

Table III Relationship between presence of drainage bleb and control of intraocular pressure

Tension		Bleb	No bleb
Controlled below 22 mm. Hg	With no additional treatment	40	1
	With additional local treatment	4	3
Uncontrolled despite additional local treatment		0	4

Discussion

Previously recorded series of glaucoma operations (Scheie, 1963; Graham, 1966; Sollom and others, 1969) have achieved similar rates of success in terms of reduction of intraocular pressure (Table IV).

Table IV Comparison of control of intraocular pressure (per cent.)

Trabeculectomy (1971)		Scheie (1962)			Graham (1966)			Sollom, and others (1969)		
All cases ± medication	Primary glaucoma without medication	Iriden-cleisis	Scheie	Trephine	Iriden-cleisis	Scheie	Trephine	Stallard	Scheie Without medication	With medication
92	93	83	86	97	83	91	96	86	59	85

However, these results have been accompanied by a higher rate of early postoperative complications, especially those requiring surgical correction. Douglas and Ramsell (1969) stated that choroidal effusions occurred in 36 per cent. of a series of 100 consecutive Scheie's operations but did not state the number of cases of delayed re-formation of the anterior chamber. Scheie (1962) gave figures for three operations but did not state the

incidence of delayed anterior chamber reformation for the trephine procedure. Sollom and others (1969) gave similar figures. Most authors in the past have been content to state the number of surgical re-interventions necessary to correct flat anterior chambers. Hyphaemata also have been relatively infrequent in this series (Table V).

Table V Comparison of early complications

Operation	Trabeculectomy (1971)		Scheie (1962)						Sollom, and others (1969). Scheie	
			Iridencleisis		Scheie		Trephine			
Total number of cases	86		141		162		69		126	
Result	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
Hyphaema	13	15	22	15	20	12	20	29	22	18
Flat anterior chamber for 3 days or longer	2	3	34	24	60	37			21 out of 51	45

Visual acuity changes are very similar to those following Scheie's operation (Table VI).

Table VI Comparison of changes in visual acuity

Operation	Trabeculectomy (1971)		Sollom, and others (1969) Scheie	
	No.	Per cent.	No.	Per cent.
Total number of cases	45		126	
Reduction in visual acuity of over one Snellen line	9	20	22	18

Posterior synechiae have been the only frequent early postoperative complication in the series reported in this paper. Here the incidence compared badly with previous reports (Table VII). Two factors were responsible. Firstly, many patients had

Table VII Incidence of posterior synechiae

Operation	Posterior synechiae		Number is expressed as: Number of eyes affected Total number of eyes in group
	Number	Per cent.	
Trabeculectomies (overall)	13/44	30	
For chronic simple glaucoma	2/10	20	
For acute congestive glaucoma	4/9	45	
For compound glaucoma	3/18	17	
For other glaucomas	4/7	57	
Peripheral iridectomy for acute glaucoma (Phillips and Snow, 1967)	21/63	33	
Scheie's procedure (Sollom and others, 1969)	24/126	19	

suffered preoperative inflammation intrinsic with the aetiology of their glaucoma. Secondly, it was noted that synechiae often appeared in previously free pupils, 4 weeks after operation. Their onset was related to the cessation of mydriatic therapy because of the apparent subsidence of postoperative inflammation. After this discovery postoperative mydriasis is now maintained for 6 weeks.

The correlation between the successful control of intraocular pressure and the presence of a drainage bleb supports our suggestion that the mechanism of action of trabeculectomy is similar to that of the standard fistulizing procedures for glaucoma.

We feel that this operation offers some advantages over previously recorded techniques. All the surgical manouevres involved are performed under direct vision. The wound is securely sutured before the patient returns to the ward, and the anterior chamber almost always reforms while the conjunctival incision is being closed. The theoretical hazards of ciliary body prolapse during operation, and development of staphylomata at the site of the scleral resection in the later postoperative period have not materialized. None of the blebs have developed dangerous characteristics, and it is likely that a well-covered diffuse and posterior bleb of intact conjunctivo-tenon is safer from late infection, perforation, and encystment than the blebs resulting from most other operations in common use to-day, which result in thin limbal blebs.

The technique is not inherently difficult. Although most of the operations recorded in this paper were performed by senior staff, a substantial proportion were carried out by registrars in training.

Although the presence of trabecular meshwork in the sclerocorneal excision specimens has been demonstrated histologically in one-third of our cases, it has not proved necessary to identify Schlemm's canal precisely at the time of surgery. The technique need not be over elaborate, and can be carried out with the aid of operating spectacles, although we feel that the use of the operating microscope affords such advantages that, when available, we use it routinely. We do not think that this procedure can be carried out safely unaided by magnification.

Summary

Trabeculectomy based on the technique described by Watson (1969) was performed on 86 consecutive glaucomatous eyes requiring glaucoma filtration surgery.

Immediate and late postoperative complications were rare. Follow-up of 52 eyes for from 3 to 18 months revealed that intraocular pressure had been maintained below 22 mm. Hg in 92 per cent. of cases.

92 per cent. of controlled eyes developed external drainage blebs.

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