

# The surgical treatment of open-angle glaucoma in Nigerians

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**SUMMARY** The results of trabeculectomy and sclerectomy procedures for open-angle glaucoma in African Negroes are compared. Trabeculectomy produced fewer long-term complications, but otherwise there was little difference in their results. Excision of Tenon's capsule and the use of local corticosteroids postoperatively are probably significant in preventing failure of aqueous drainage from subconjunctival fibrosis.

Open-angle glaucoma is more common in Negroes than Caucasians and is a significant cause of blindness in Africa. For most patients in Africa surgery is the only practical form of treatment, and yet it is generally considered that drainage operations are more prone to fail in Negroes. The reason for this failure appears to be excessive fibrosis in the subconjunctival tissues (Welsh, 1970).

There have, however, been some more encouraging reports in recent years of successful glaucoma surgery in Africans (Ben Sira and Ticho, 1969; Chatterjee and Ansari, 1972; Welsh, 1972; Kietzman, 1976). These authors considered various factors as being significant in obtaining better results—in particular a trabeculectomy type of operation, excision of Tenon's capsule, and the use of postoperative local corticosteroids.

The aim of this paper is to compare the results of trabeculectomy with other operations creating a fistula and to consider what factors seem to contribute to success or failure in glaucoma surgery in African Negroes.

## Materials and methods

One hundred and twenty-three consecutive operations for open-angle glaucoma were done between November 1974 and December 1976. The patients were all African Negroes, and the author either operated or assisted the resident in all cases. The trabeculectomies were performed initially by raising a 4×3 mm half-thickness limbus-based scleral flap and excising a 3×2 mm piece of the deep sclera in

the posterior limbal region. The superficial scleral flap was replaced but not sutured, and the conjunctival incision was closed tightly.

After 19 cases the technique of the trabeculectomy was changed (the reason for this will be discussed). A more rectangular superficial scleral flap 5×2.5 mm was dissected and the entire layer under this of 5×2.5 mm excised. The posterior edge of this incision lay just over the choroid, so a potential small cyclodialysis cleft was automatically formed. The scleral flap was sutured at the corners with 8-0 virgin silk and the conjunctiva closed as before with a 6-0 continuous catgut suture. Sixty-three operations were performed by this method.

On alternate cases and in 1 eye of bilateral cases a 'traditional' filtering procedure was performed. In most cases a posterior lip full-thickness sclerectomy 4×1 mm was performed with a knife, but in order to teach different techniques to the resident staff, a posterior lip thermal sclerectomy (Scheie) or a posterior lip punch sclerectomy was done in 14 cases. Altogether 41 sclerectomies were done by all methods. (For patients having surgery on their only seeing eye a trabeculectomy was always done, because the available evidence showed fewer complications with this procedure. Hence the discrepancy with 82 trabeculectomies and 41 sclerectomies.) In every operation Tenon's capsule was dissected gently off the sclera and no attempt was made to excise it. A large peripheral iridectomy was done routinely. Postoperatively all patients were given atropine drops 1% daily for a week and betamethasone with neomycin ointment immediately postoperatively and 4 times daily for a week. Treatment with betamethasone and neomycin drops 4 times daily was continued until the eye was white and all signs of postoperative inflammation had subsided.

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Table 1 *Summary of results*

Type of operation	No. of cases followed up	Successful result		Indeterminate result		Failed	
		No.	%	No.	%	No.	%
Trabeculectomy 3 × 2 mm with superficial scleral flap not sutured	12	9	75	1	8	2	17
Trabeculectomy 5 × 2.5 mm with superficial flap sutured	39	24	62	10	26	5	13
All trabeculectomy cases	51	33	65	11	22	7	14
Sclerectomy	27	16	60	4	15	7	26

## Results

### CONTROL OF PRESSURE

It was possible to follow up 78 of these 123 operations for 3 months or more (in over three-quarters of the cases the follow-up period was at least 6 months). The operation was considered successful if the final applanation pressure was 20 mmHg or less, unsuccessful if the pressure was 35 mmHg or more, and indeterminate if the pressure was 25 to 30 mmHg. These results are shown in Table 1.

The preoperative and final postoperative pressures are given for each of the indeterminate cases in Table 2. None of the patients were receiving any medication when the pressures were recorded.

Table 2 *Pre- and postoperative pressures of indeterminate cases*

Type of operation	Initial pressure in mmHg	Final pressure in mmHg
Trabeculectomy 3 × 2 mm	65	25
Trabeculectomy 5 × 2.5 mm	35	22
	40	22
	41	25
	60	25
	42	26
	40	26
	44	28
	45	29
	43	30
	52	33
Sclerectomy	35	23
	40	26
	41	30
	60	30

### POSTOPERATIVE COMPLICATIONS

Some transient delay in the reformation of the anterior chamber postoperatively was very common. However, by the fourth day the chamber was still flat or very shallow in 2% of the trabeculectomy cases and 17% of the sclerectomy cases: 1 of these showed marked transient striate keratitis and 1 required surgical reformation. The chamber was only half formed by the fourth day in 9% of the trabeculectomy and 12% of the sclerectomy cases.

Hyphaemas were recorded if macroscopical only, and they all resolved satisfactorily. They occurred in 6% of the trabeculectomy cases and 10% of the sclerectomy cases. Slight peaking of the pupil at the operation site was quite common and so were a few posterior synechiae, but they did not seem to affect the result.

The following delayed complications were noted. Of the trabeculectomy cases 1 returned after 6 months for routine follow-up with a very shallow anterior chamber and a pressure of 35 mm; however, the drainage bleb seemed normal. The anterior chamber deepened and the pressure fell to 16 mm with atropine drops and acetazolamide, and the pressure stayed down when the acetazolamide was discontinued. Of the sclerectomy cases 1 developed an acute endophthalmitis which responded to antibiotic treatment and the eye was saved; 2 had large thin blebs with hypotony; and 1 returned blind with malignant glaucoma thought to be due to rupture of a thin conjunctival bleb and aqueous loss. All the other failures appeared to be due to lack of aqueous drainage.

### Discussion

As regards control of pressure the overall results of the trabeculectomy and sclerectomy operations appear to be similar in this series. The diminished early postoperative complication rate from trabeculectomy procedures has been well established and there is little point in commenting further on this. However, the increased incidence of late post-

operative complications in sclerectomy operations related to the thinner and more superficial drainage bleb is very significant especially for a rural African population. Many of the patients are quite young, live in conditions where minor trauma and conjunctivitis are very common, and frequently the operated eye is the only seeing one.

Thus the risk of infection or rupture of the bleb is both greater and more likely to cause blindness should it occur. Once the postoperative inflammation had subsided and drainage was well established within the first 6 months there did not appear to be any significant risk of delayed failure of drainage over the 2 years that the patients were seen. However, the risk of failure from infection or rupture of the bleb is lifelong. Kietzman (1976), comparing a large series of sclerectomies and trabeculectomies, also found the overall results similar but sclerectomies more prone to delayed postoperative complications.

There is still uncertainty as to the exact drainage mechanism of a trabeculectomy, especially since the procedure is not standard. However, it is generally thought that the external fistulisation is more significant than internal (Ridgway, 1974). Welsh (1972) found that trabeculectomies were not very successful in Africans until the technique was modified by excising part of the superficial flap of sclera to improve external drainage, and his results then were similar to those in this series (65% successful, 14% intermediate, and 21% failed). By contrast Freedman *et al.* (1976) in American Negroes found no difference in results from suturing or not suturing the scleral flap and also reported fairly similar results (successful 57%, intermediate 25%). Chatterjee and Ansari (1972) considered the beneficial result was entirely from internal fistulisation and reported uniformly good results with absence of any blebs in West African Negroes. In Kietzman's (1976) series of 221 operations from Africa a large internal piece of sclera was removed  $6 \times 3$  mm, and his results were good (74% successful and 20% intermediate). There is some evidence that this type of trabeculectomy, with the possibility of another channel of drainage—the suprachoroidal space, and a larger area of bare sclera through which the aqueous may filter, produces a greater effect (Galín *et al.*, 1975).

In this series the superficial scleral flap was initially left unsutured to encourage external fistulisation, but the technique was changed so that the superficial flap was sutured but a large area of trabecular tissue excised ( $5 \times 2.5$  mm) to include the scleral spur. It was felt that this would both enhance drainage by providing a larger area of bare sclera through which aqueous could filter, and at the same time a direct through-and-through scleral channel

was avoided. There seemed little difference in the results of the 2 different types of trabeculectomies, but there were not really enough followed up by the former method to make a valid comparison. There is not enough evidence available yet to say whether different types of trabeculectomies have different results in Africans, but with the known severity of the disease and the need to control the raised pressure by surgery alone it seems prudent to choose a method which gives the best chance for both internal and external drainage.

In this series it appears that the action of trabeculectomy is mainly as an external fistulising procedure. Most of the cases that succeeded had a drainage bleb, although in a few no external bleb was visible on slit-lamp examination. Conversely the cases that failed showed fibrosis round the drainage area, so the bleb was either absent or extremely small and fibrotic. The fact that the overall results of trabeculectomy and sclerectomy were similar might also indicate the action of trabeculectomy is mainly by external drainage of the aqueous.

Most of the patients were unable to attend regularly for follow-up, but in those who did, a marked inflammatory reaction in and around the drainage bleb persisting for up to 3 months was sometimes seen, and this was often associated with a raised intraocular pressure. This inflammation sometimes progressed to fibrosis and extinction of the bleb and a persistently raised pressure, but sometimes it was noticed that as the inflammation subsided the pressure fell and a quiet non-inflamed bleb developed. All these cases were given local corticosteroid drops until any evidence of inflammation had subsided.

Little is known about the action of aqueous on the subconjunctival tissues. It is thought that in draining blebs the aqueous has some lytic action preventing the formation of fibrous tissue (Teng *et al.*, 1959), but this mechanism appears to fail when subconjunctival fibrosis round the bleb occurs and the aqueous itself appears to be an irritant (Stanworth, 1958; Epstein, 1959). In particular, Molteno *et al.* (1976) using subconjunctival implants have noted the irritant effect of the aqueous lasting for about 3 months and have achieved suppression of this inflammatory response by using a more intensive anti-inflammatory regimen—corticosteroids and flufenamic acid systemically and local adrenaline drops. They considered this inflammatory effect was most marked in very advanced glaucoma, but there did not seem to be any correlation in this series between the severity of the glaucoma and the severity of the postoperative inflammation. It seems that a clear understanding of the cause and treatment of this postoperative subconjunctival tissue

reaction, which is often so marked in Negroes, will be very significant in improving the results of glaucoma surgery in Africans.

Several authors have commented on the improved results in drainage operations in Negroes from excision of Tenon's capsule (Ben Sira and Ticho, 1969; Welsh, 1972; Kietzman, 1976) because this is the origin of much of the fibrous tissue reaction that causes drainage failure. The results of Kietzmann and Ben Sira and Ticho's series with a 6 and 7% failure rate seem to justify this claim. In this series Tenon's capsule was not excised because of the fear of delayed complications from blebs covered only with a thin conjunctival layer, but in a trabeculectomy operation with a deeper bleb further from the limbus it is probably safe to excise Tenon's capsule. In this series the fibrosis and failure of drainage was probably lessened by the prolonged administration of local corticosteroids.

The average age of the patients in this series was only 38. This could partly be due to social factors—such as young people living in the towns coming to hospital more readily than the older people in the villages, and partly to the rapid population increase in Africa, and shorter life expectancy. The average age of the patients on whom the operation failed was 32. This is probably due to the increased amount of subconjunctival tissue and increased postoperative reaction in young people. Worse results in younger patients have also been noted by Schwarz and Anderson (1974).

Onchocerciasis was fairly common in the area, and 26 of the 123 cases (21%) had microfilariae in a skin snip at the lateral canthus. Six of the 14 cases that failed (43%) had positive skin snips. Very little is known of the relationship between glaucoma and onchocerciasis and whether such a relationship

even exists. Four of the cases that failed (2 patients) were in young people showing heavy intraocular infestation with microfilariae, severe glaucoma, but no signs of uveitis—an association that has also been noted by Anderson *et al.* (1976).

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