

## SOME ASPECTS OF GLAUCOMA

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### A. DIFFICULTIES IN APPLANATION TONOMETRY

The theory of the workings of the Goldmann applanation tonometer,<sup>1</sup> and its superiority over the Schiotz tonometer in eyes with low scleral rigidity or in myopes is well known.

Suffice it to say, that the greatest and main importance of the Goldmann applanation tonometer lies in its ability to read accurately the intraocular pressure ( $P_o$ ) without being affected by variations in scleral rigidity. With the

Schiotz tonometer the reading in an eye with *low* scleral rigidity will be *lower* than that which actually exists, and so a glaucoma may be missed. Conversely, with a *high* scleral rigidity, a *higher* reading is obtained, which in turn may lead to unnecessary treatment for a non-existent glaucoma.

However, certain difficulties were experienced in some cases where the intraocular pressure was measured with the applanation tonometer, and the aim of this paper is to make known our findings.



Smith<sup>3</sup> lists the difficulties of the Schiøtz tonometer, while he warns the operator about the correct use of the applanation tonometer, pointing out clearly how incorrect management will give inaccurate readings. However, apart from mentioning correct use of the instrument, pressure of the eyelids, and corneal irregularity, he does not mention any other difficulties with the applanation tonometer.

#### METHOD

In this series, 280 eyes were examined, first by the Goldmann applanation tonometer on a Haag-Streit slit-lamp, and immediately thereafter by a Schiøtz (weighted) tonometer. The applanation reading was taken sitting, while the Schiøtz measurement was taken in the supine position.

The patients examined were an unselected group taken from those visiting the Glaucoma Clinic over a period of 3 years between May 1962 and May 1965 and were therefore mostly proven glaucomas or suspected glaucomas. Many of the readings were taken when the machine was new and some of the observers were also new to the technique.

#### Findings

The results of the 280 eyes measured were as follows:

Applanation reading higher .....	118
Schiøtz reading higher .....	123
Readings equal .....	39
Total	280

Allowing for the fact mentioned above that the applanation readings are taken in the sitting position, and the Schiøtz ones with the patient supine, we should deduct 3 mm.Hg from the Schiøtz reading to have a really true comparison.<sup>2</sup> The amended figures would then read:

Applanation higher .....	205
Schiøtz higher .....	51
Equal readings .....	24
Total	280

Using the first set of readings, i.e., without reduction of the Schiøtz readings, we find the following breakdown of the figures:

Less than 3 mm.Hg difference between applanation and Schiøtz tonometers .....	165
More than 3 mm.Hg difference .....	115
Total	280
6 mm.Hg difference and more .....	47

This last figure increases to 79 if we take the amended figures, i.e. 28.6% of the eyes tested showed a variation greater than 6 mm.Hg. Such a big difference in the readings means that the accuracy of the readings (either Schiøtz or applanation) is at fault. Examination of the series shows that frequently these high differences followed one another in groups, i.e. probably the applanation tonometer needed adjustment. It can be accepted that the Schiøtz readings were nearer the true readings and the applanation ones were wrong, as the Schiøtz instrument was tested before each measurement.

#### Analysis of False Readings

The reasons for inaccurate readings may be grouped under the following headings:

1. Machine at fault,
2. Observer at fault,
3. Patient difficult to examine.

In this last group we found 17 patients in whom an accurate reading was not possible with the applanation tonometer, and these are therefore not included in this series of 280 eyes studied. Of these 17 patients, all but 4 could be measured with a fair degree of certainty on the Schiøtz tonometer.

Some of the reasons for not being able to obtain an accurate applanation reading are:

Nystagmus, oscillation of the eyeball .....	3
Tight lids, very narrow palpebral apertures in deep-set eyes, squeezers, ptosis .....	3
Corneal scarring or irregular corneal surface .....	1
Monocular—unable to fix and keep eyeball still .....	1
Difficulties for other reasons (mainly uncooperative patient) .....	9
Total	17

It seems that in this group we have little or limited control. There will always be a small percentage of patients who will prove particularly difficult to examine and measure by the applanation tonometer, though repeated attempts over a period may help to get better patient cooperation.

#### Some ways of eliminating these difficulties as far as possible:

1. It is essential that the observer must have had a fair degree of experience in taking applanation tonometer readings before these can be accepted as accurate, and he must follow the instructions with regard to the use of the instrument to the letter.
2. It is most important that the applanation tonometer be checked at least once a week with the special tools provided with the instrument.
3. All readings should be repeated 3 times and the mean taken. This is recommended by Goldmann and Schmidt,<sup>4</sup> but I believe the advice is seldom followed. In nervous or uncooperative patients, readings should be repeated on another day.
4. The difference in measurement with patients sitting or lying may be eliminated with the new special applanation tonometer devised by Goldmann for use on patients in the supine position.

#### B. AN EXAMINATION OF OPERATIONS PERFORMED FOR THE GLAUCOMAS

An attempt has been made to assess the results of operations for the reduction of intraocular pressure.

The number of operations reported on in this series is only a small proportion of those actually operated upon at the Groote Schuur Hospital, as they are confined to those patients who have passed through the Glaucoma Clinic, from where operative treatment was recommended. The recommendation of the Glaucoma Clinic is passed on to the surgeon under whose care the patient is, but it is left to the surgeon to decide finally what line of treatment he will adopt.

Each operation in this series has been carried out by one or other of 16 surgeons, including registrars and house surgeons, so that there is a cross-section of experience among the operators.

#### Operations

This series covers 100 patients and 121 operations. The period under survey is from July 1960 to December 1964, so that there has been a minimum of 6 months' follow-up in those patients who attended for a follow-up, and a maximum of almost 5 years.

Twenty-eight eyes were not operated upon, because the patients failed to appear on the appointed day. Of these 18 were non-White and 10 were White.

It is interesting to note that of the 121 operations performed, 89 were iris inclusions, 9 were trephines and 9 peripheral iridectomies (Table I).

#### RESULTS

Again, of 121 eyes operated upon, 50 were controlled, 27 were not controlled and 41 were unknown. This needs further explanation.



By controlled, we mean those whose tension was still 18 mm.Hg and under, after 3 months and after *one* operation. Patients who after operation were controlled by medical means are classified as 'non-controlled'. If they had to have a second or further operation and were then controlled, they are still classified as 'non-controlled'. This will serve to explain the apparently high figure of so-called 'failures'.

TABLE I. ANALYSIS OF OPERATIONS PERFORMED

	Whites	Non-Whites	
No. of patients	29	Coloured 59	} 71
No. of males	21	Bantu 12	
No. of females	8		
No. of eyes	43		23
No. recommended for operation (eyes)	40	142	109
Total operations done	28	93	71
Iridenceleisis	18	71	3
Scheie	1	3	3
Trephine	6	3	2
Iridectomy	—	2	7
Peripheral iridectomy	2	4	4
Cyclodialysis	—	—	3
Cyclodiathermy	1	—	—
Air in AC	—	—	3
Failed to attend for operation recommended	10	Coloured 15	Bantu 3
<b>Results:</b>			
Controlled	16 (58%)	26	8
Non-controlled	5	16	6
Unknown	7	30	4

The 'unknowns' are those who failed to re-attend for a period of 3 months after operation, or who did not have an intraocular tension recorded on their notes. This latter number of 41 seems unduly high, but it must be remembered that many patients come to Cape Town from far away and once they have had their operation, they do not return for a post-operative check. Also, for one reason or another, the intra-ocular tension is frequently not recorded after the operation.

When one considers that glaucoma is the third commonest cause of blindness, it is particularly distressing to see the high number of patients who failed to attend hospital again, despite having been advised to have an operation. Today in

South Africa, of those on the Blind Register 1,177 of all races are blind from glaucoma.<sup>5</sup>

#### Race Comparison

Our numbers are too few to give any indication of the results of the operations.

Among the Whites we see there are 16 controlled out of 28, i.e. 58%, the Bantu 44% and the Coloured 36%. Because of the 'unknown' factor mentioned before, these figures are clearly not a true reflection of the results.

#### CONCLUSIONS

It seems that in Cape Town iridenceleisis is the operation most commonly performed for both open-angle and angle-closure glaucoma at the time of this investigation.

Perhaps the immediate postoperative complications of delayed AC formation are less than in C-S trephines, and while Zita's figures<sup>6</sup> of 81% - 82% success in 608 eyes with trephinations are encouraging, it is dampened by the 53.6% of cataract development after 5 years.

Cassady<sup>7</sup> compared the results of iridenceleisis in Negroes and Whites in OA glaucoma. His results showed 52% success in the Whites and 44% in the Negroes. This is statistically insignificant. We had hoped to make a similar comparative study, but our Bantu numbers were far too small. In addition the problem of the poor follow-up also makes such a study difficult.

I hope that this short paper will show the importance of follow-up in hospital practice, and will emphasize that so frequently more than one operation is required and that patients dare not be given the promise that if an operation is performed, they will be able to dispense with further medical treatment.

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