operation; and we, therefore, have no hesitation in recommending, with the utmost confidence, simple sub-conjunctival extraction as being the simplest and safest operation for the relief of senile cataract we know of at present. It is the operation we would desire for ourselves should such be necessary.

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HOLTH'S EXTRALIMBAL TANGENTIAL PUNCH FORCEPS SCLERECTOMY FOR CHRONIC GLAUCOMA*

BY

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HOLTH's new operation for glaucoma, extralimbal tangential sclerectomy, has been performed in 52 cases at the University Eye Clinic at Christiania. In connection with Dr. Holth's paper, I here give the experience we have had with regard to this operation and its results.

In forty of the fifty-two cases the operation was performed for *glaucoma simplex*, in twelve cases only for other forms of glaucoma, viz., in six cases of buphthalmus, four cases of secondary glaucoma, one case of acute inflammatory glaucoma (the prodromal stage) and one case of chronic inflammatory glaucoma.

The first six operations (incisions with the Graefe knife, a broad needle or with the keratome) were performed in June, 1920 by Holth himself, the remainder, up to the present time, partly by my predecessor Professor Hj. Schiötz, and partly by myself. There has not been any selection of cases for this operation; during the above period the operation has been employed in nearly all cases where previously we should have performed Elliot's trephining. There was no case of glaucoma absolutum among our cases.

*Read at the Fifth Scandinavian Ophthalmological Congress at Stockholm, August 29, 1921.

As regards *technique* we have mostly followed the procedure described by Holth in this journal, 1921, pp 547-549. I will merely observe, that in cases of a very shallow anterior chamber, we prefer to make the incision with the Graefe knife, because in such cases by this means the incision can be made more safely, without wounding the iris or the ciliary body. The incision should not be too short; when using a 1.5 mm. punch forceps the incision must be at least 4 mm.; if a 1 mm. punch forceps is used a 3 mm. long incision is sufficient. We have used the 1.5 mm. punch forceps as well as one of 1 mm. The defect obtained by the 1 mm. punch forceps in glaucoma simplex is, according to our experience, quite large enough, and is therefore to be preferred. For buphthalmus, on the contrary, I believe a 1.5 mm. punch forceps should be used, and excision be made *from both angles of the keratome incision* so that double sclerectomy is obtained. We generally make a small peripheral iridectomy corresponding to the sclerectomy opening. Occasionally we have also made a complete iridectomy, but whether the latter or the peripheral is chosen does not seem to make any difference to the result. In two cases we have omitted the iridectomy altogether without the result being any the worse for it, but it is advisable always to perform iridectomy, for otherwise there is a risk of closing the sclerectomy opening by an iris prolapse.

I will first detail the results of the operation for *glaucoma simplex*. As stated above, we have performed the operation on forty eyes, none of which had been operated upon before. There was glaucoma in all stages, but as mentioned before, no case of *glaucoma absolutum*.

Complications during the operation have occurred once only. This was in a case of advanced glaucoma with a very shallow anterior chamber. When the incision was made with a keratome, there was at once a somewhat profuse *haemorrhage* from the iris, possibly also from the ciliary body, which may have been injured by the point of the keratome; the blood lasted for a long time in the anterior chamber. Later on, *occlusio pupillae* followed, but at last the eye became quiet with a somewhat increased tension.

Amongst *complications after the operation* must be mentioned one case of *cataract* appearing in connection with the operation on an eye where no iridectomy was performed. A direct injury to the lens capsule is out of the question, most likely there had been a bursting of the lens capsule by the rapid emptying of the anterior chamber.

In three cases there appeared a protracted *haemorrhage* in the anterior chamber *after* the operation, but the final result was good.

The question of the frequency of *iritis* after sclerectomies is of great interest. As is well known, very frequently, after

Elliot's trephining, a slight or quiet iritis sets in. The more closely these cases are examined the more frequently some *posterior synechiae* are found. Holth's operation does not differ in this respect from Elliot's sclero-corneal trephining. After careful examination of our forty cases I have found ten cases only which were completely free from any trace of a posterior synechia; for diagnostic purpose I recommend an application of homatropin 1 per cent. It appears, however, that this slight or quiet iritis is of no great significance; but early applications of atropin 1 per cent. are advisable. In two cases there appeared a more pronounced *iridocyclitis*, with precipitates in one case, and *occlusio pupillae* in the other (the latter is the case before mentioned where a severe haemorrhage set in during the operation). Enucleation was not found necessary in any of the cases.

Complications, other than the above mentioned, did not appear unless the *transitory* post-operative *detachment of the choroid* is to be considered as a complication; this symptom is very frequently seen after trephining. Without any systematic examination such a transitory detachment was recorded in several of our cases where the anterior chamber remained shallow or effaced longer than usual.

I will now deal with the *tension regulating effects of the operation*. On leaving the hospital (generally a fortnight after the operation) the tension was good (viz., below 5.5/3 Schiötz) in all cases but one; this case showed a tension of 5.5/2, but the tension later on became normal.

In thirty-three cases the patients have been subjected to subsequent examination from five weeks to thirteen months after the operation. I have divided the cases into four groups according to the time of observation:—

I 11½ - 13 months		...	...	6 cases.
II 5 - 7 "		...	...	7 "
III 3 - 4½ "		...	...	11 "
IV 1½ - 2½ "		...	...	9 "

GROUP I.		GROUP II.	
Time of observation 11½-13 months.		Time of observation 5-7 months.	
(Punch forceps 1.5 mm.)		(Punch forceps 1 mm.)	
TENSION.	SCAR.	TENSION.	SCAR.
1. 5.5/7	Smooth glassy cushion.	1. 5.5/5	Flat, not glassy cushion.
2. 5.5/7	Small flat glassy cushion.	2. 5.5/5	Flat, not glassy cushion.
3. 5.5/8	Flat cushion with bubble 2 mm. from limbus.	3. 5.5/11	Diffuse oedema of conjunctiva over and above the scar.
4. 5.5/20	Flat cushion with bubble 2.5 mm. from limbus.	4. 5.5/5	Diffuse oedema of conjunctiva over and above the scar.
5. 5.5/6.5	Somewhat prominent glassy cushion.	5. 5.5/3.5	Smooth scar.
6. 5.5/4.5	Smooth, not glassy cushion.	6. 5.5/3	Smooth scar.
		7. 5.5/7	Smooth scar.

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GROUP III.

Time of observation 3-4½ months.

TENSION.	SCAR.	PUNCH FORCEPS.
1. 5.5/7	Glassy, somewhat prominent cushion	1 mm.
2. 5.5/5	Smooth, glassy cushion ...	1 „
3. 5.5/7	Smooth glassy cushion ...	1 „
4. 5.5/8	Flat, not glassy cushion ...	1 „
5. 5.5/5	Flat, not glassy cushion ...	1 „
6. 5.5/5	Smooth scar	1 „
7. 5.5/7	Smooth glassy cushion ...	1.5,,
8. 5.5/20	Diffuse oedema over and above the scar ...	1.5,,
9. 5.5/6	Smooth scar	1.5,,
10. 5.5/5	Smooth scar	1.5,,
11. 5.5/5	Small flat, not glassy cushion ...	1.5,,

GROUP IV.

Time of observation 1½-2½ months.

(Punch forceps 1.5 mm. in all cases, the last one excepted.)

TENSION.	SCAR.
1. 5.5/4	Flat glassy cushion.
2. 5.5/10	Flat glassy cushion.
3. 5.5/5	Flat glassy cushion.
4. 5.5/10	Smooth, not glassy cushion.
5. 5.5/13.5	Smooth scar.
6. 5.5/3	Smooth scar.
7. 5.5/1	Smooth scar (iridocyclitis).
8. 5.5/2	Smooth scar (haemorrhage and iritis).
9. 5.5/5	Smooth scar.

All cases of the first three groups (viz., time of observation from three to thirteen months) showed at the last examination a good tension without myotics. In one case only there was found a tension of 5.5/3; the rest showed a lower tension.

In Group IV (time of observation 1½-2½ months) there are two cases with a somewhat increased tension. These are precisely the two cases where iridocyclitis set in after operation.

At the last examination the *function* of the eye operated upon, both with regard to vision and visual field, was found on the whole unchanged. An exception is the case above mentioned where there developed a cataract after the operation.

Thus the last examination shows a *very favourable result* with regard to functional and tension-regulating effect in *glaucoma simplex*. I am, of course, aware that the number of cases is too small and, above all, the time of observation too short to justify definite conclusions regarding the lasting results of the operations. It seems, however, apparent from our observations that as to efficacy in *glaucoma simplex* this operation is by no means inferior to the other modern operations for glaucoma, e.g., Elliot's trephining.

Holth's aim in his new sclerectomy is, as we know, to *reduce the risk of late infection*, the danger common to all operations producing a sub-conjunctival fistula from the anterior chamber. We have the experience that this danger is not the least in eyes operated upon after Elliot's method. Holth believes that by making the sclerectomy more peripherally, farther from limbus than possible with a trephining operation which opens the anterior chamber, he

will obtain a more solid conjunctiva over the opening; by this means the fistula will have a thicker cover and be better protected against the entrance of microbes. Can we, from our cases, say whether this aim has been achieved? It is of no consequence that until now* no case of late infection has been observed, the cases being too few and the time of observation too short to draw any conclusion from this fact.

However, in this respect *the appearance of the scar* is no doubt of great importance. The thin-walled bubble-shaped scar is justly feared as disposing to late infection, especially if situated close to the limbus; it is easily injured by the rubbing of the edge of the eyelid, and thus facilitates the entrance of microbes. For this reason I have examined our cases, especially with regard to these conditions.

The *ideal condition* must be considered to be the *smooth scar combined with normal tension*; such a scar I have found in no fewer than *nine cases*. The most common is a flat, more or less glassy cushion, through which the sclerectomy opening can be distinguished as a dark blot. Sometimes a diffuse oedema of the conjunctiva over and above the scar is found without formation of any cushion.

In two of the cases which have been longest under observation there was seen a glassy distinctly limited cushion with a faint trace of bubble formation (both eyes of the same patient). It must, however, be observed regarding these bubbles that they were 2 or 2.5 mm. removed from the limbus. By their peripheral position these bubbles are better protected than if they had been close to the limbus, where they very often appear after the sclero-corneal trephining.

There is one condition which I believe is of importance for the appearance of the scar, viz., the size of the scleral defect, in other words the size of the blades of the punch forceps. A comparison between Group I, where the sclerectomy is made with a punch forceps of 1.5 mm. and Group II with a punch forceps of 1 mm. is to the advantage of the latter. On the whole I am of opinion that these *scars*, after Holth's operation, have a *favourable appearance*.

Finally I will shortly mention the experience we have had with this operation for *other forms of glaucoma*.

We have performed the operation for *buphthalmus* six times on two children, on one child twice on each eye, on the other child once on each eye. Three times double sclerectomy was performed. The result with both patients was reduced tension, but after they left the hospital pilocarpin had still to be applied.

*Until July, 1922, no case of late infection has been seen.—THE AUTHOR.

The operation was performed once for *acute inflammatory glaucoma* (after a prodromal attack) with a good result; smooth scar with good tension six months after operation; and once for *chronic inflammatory glaucoma* with a less good result: T. 5.5/2 Schiötz.

Finally, we have performed the operation four times for *secondary glaucoma*. On one patient the same eye was operated upon twice for staphyloma corneae with transitory effect only. On the other two patients the operations were performed quite recently.

The number of patients is, as shown, too small to make a definite statement regarding the results in these forms of glaucoma. On the whole, however, the efficacy of all fistula-forming operations is more doubtful in cases other than glaucoma simplex.

ENTOPTIC APPEARANCES OF SENILE CATARACT

BY

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TRURO

THESE sketches representing the entoptic images of senile cataract as observed over a period of more than six years were kindly sent to me by one of my patients, and seem to me to be of rather

FIG. 1.

LEFT EYE.

RIGHT EYE.

Images in Reverse of Crystalline Lenses.

unusual interest, as it is not often that one comes across people with the ability to represent accurately, in the manner shown, the pathological changes occurring in their own lenses.

The sketches were made with the aid of a pin-hole in a black card, held between the window and the eye.