ANTERIOR FLAP SCLEROTOMY WITH BASAL IRIDENCELEISIS*

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A PRELIMINARY report on an operation for glaucoma, combining a scleral flap hinged on the limbus with a small cyclodialysis and the inclusion, between the lips of the scleral flap, of a tongue of iris based upon its root leaving the sphincter pupillae intact, was published about 5 years ago (Stallard, 1948). Such an operation possesses the merits of several of the accepted surgical procedures for glaucoma which indeed it combines, and it has the following advantages:

(1) The anterior chamber is reformed in 24 hours and in no instance has it been subsequently lost;

(2) There is no need for post-operative massage as is the case in Holth's iridencleisis;

(3) In 7 days a bleb is formed which has a thicker covering than is the case with a trephine and which may be as large as 10×8 mm.

(4) The operation has successfully reduced the intra-ocular pressure to within 25 mm. Hg in 97.7 per cent. of a series of 142 patients (162 eyes) reported below.

On 118 eyes the operation was performed for chronic simple glaucoma uncontrolled by miotics, and on 48 eyes for acute congestive glaucoma. I thought that it might be undesirable to include a tongue of iris in a wound over the ciliary body for complicated glaucoma due to iridocyclitis, and have not therefore used it in cases of this kind.

OPERATION

In order to cut a satisfactory iris flap, maximum miosis is desirable; one hour before operation the pupil is constricted by three applications of gutt. pilocarpine 2 per cent., for eserine ceases to be effective when the ciliary ganglion reflexes are "blocked", whereas pilocarpine continues its miotic effect.

Anaesthesia is achieved by local instillation of xylocaine 2 per cent., and haemostasis is helped by privity 1:2,000 (not by adrenaline which dilates the pupil). A retro-ocular injection of 1 ml. xylocaine 2 per cent. is given and another 1 ml. is injected into the belly of the superior rectus muscle. For nervous patients and for those whose intra-ocular pressure is over 40 mm. Hg pentothal sodium is given into a vein, and it is essential to supplement this with local anaesthesia as described above. Pentothal sodium has the advantage of lowering the intra-ocular pressure by 8 to 10 mm. Hg.

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The lids are retracted by Lang's speculum and a traction suture of No. 1 white silk is passed through the belly of the superior rectus muscle 2 or 3 mm. behind its insertion. When the eye is in its appropriate position looking slightly down this suture is clamped to the head towel.

About 5 minims of saline is injected through an intradermal needle under the conjunctiva 3 mm. above the limbus from 11 to 1 o'clock. The conjunctiva is now grasped with plane forceps 7 or 8 mm. above the limbus in the 12 o'clock meridian and is incised for 5 mm. with blunt-ended spring scissors (Fig. 1). Tenon's capsule is opened, and the closed blunt tips of the scissors are passed through it until they lie on the sclera; the blades are then spread to effect a line of cleavage down to the limbus. In like manner the closed blades are passed between the sclera and Tenon's capsule to the temporal side for 10 mm., then to the nasal side for the same distance, and then spread. The incision is then completed 7 mm. above and concentric with the limbus for 10 mm. on either side of the original opening in the conjunctiva and Tenon's capsule. The flap of conjunctiva is then turned down over the cornea and with a few downward strokes from a tightly-wound muslin swab the limbus is cleanly exposed. Any tags of episcleral tissue are cleared from the 3 mm. around the limbus by Tooke's angled splitter.

FIG. 1.—Incision with blunt-ended scissors.

Scleral Incision.—When the sclera has been exposed cleanly over a zone 3 mm. in vertical depth and 7 mm. long concentric with the limbus, any episcleral vessels within this area are touched with a heated probe. A fine scleral hook (Stallard's) is now inserted 2 mm. above the limbus in the 12 o'clock meridian, and slight downward traction is exerted upon it. This serves both to fix the eye and to retract the lower edge of the scleral incision.

The incision, which is made vertically down to the supra-choroidal lymph space

with the belly of a Gillette blade in a No. 3. Bard-Parker handle, is 5 mm. long, 2 mm. above, and concentric with the limbus. The incision through the deeper layers of the sclera is completed with a few light strokes from the point of a ground-down cataract knife (Fig. 2). Histological examinations of various kinds of scleral incisions show that the healing of a vertical incision is imperfect and less secure than that of an oblique incision, an important point in making a surgical fistula.

FIG. 2.—Scleral incision.

Cyclodialysis.—The scleral hook is now swung at right angles to the sclera and is lifted slightly forwards to raise the lower lip of the scleral incision and ease the passage of an iris repositor into the supra-choroidal lymph space. The tip of the repositor is passed through the centre of the incision (Fig. 3) towards the scleral spur, where it is dipped slightly backwards to separate the attachment of the ciliary body at this site and avoid stripping Descemet's membrane. It enters the anterior chamber for about 3 mm. and is held there for 2 or 3 seconds to allow the gradual leakage of aqueous through the scleral incision. The blade of the repositor is now moved laterally first to the temporal and then to the nasal limit of the scleral incision, thus effecting a cyclodialysis 5 mm. wide. The repositor is then withdrawn and the scleral hook is left in place.

The lateral incisions which complete the scleral flap are then made, either with Westcott's scissors or with Herbert's angled sclerotomy knife. Either the blade of the knife or one blade of the scissors is introduced on the flat for 2 mm. into the scleral incision and is then turned so that the cutting edge is directed towards the surface and the point converges about 1 mm. towards the limbus (Fig. 4). In

order to obtain a hinged scleral flap, these lateral incisions must reach the limbus and must converge so that the limbal hinge is 3 mm. long. The mobility of this scleral flap is now tested. The flap fails to move on its hinge if the lateral incisions are made parallel.

FIG. 3.—Cyclodialysis.

FIG. 4.—Scleral flap.

Basal Iridencleisis.—With his right hand the surgeon seizes the centre of the conjunctival flap with plane forceps, whilst with his left he passes a closed pair of Lang's iris forceps into the centre of the scleral incision; then keeping close to the sclera, the forceps enter the anterior chamber. Whilst this manoeuvre is taking place, the conjunctival flap is brought forwards and then upwards so that the progress of the iris forceps in the anterior chamber may be seen. About 2·5 to 3 mm. above the pupil margin the forceps is opened for 2 mm., the teeth are dipped slightly backwards so as to engage the iris stroma, and the iris is drawn up into the scleral incision whilst the conjunctival flap is turned down over the cornea and its forceps grasp is released. This upward movement of the iris is halted when the pupil appears in the scleral incision. The surgeon takes in his right hand either Castroviejo's corneal scissors or a fine pair of de Wecker's scissors, and with them makes a snip in the iris 1·5 to 2 mm. long immediately in front of the forceps (Fig. 5).

FIG. 5.—Iridencleisis—snip in the iris.

FIG. 6.—Iridencleisis—cutting towards the iris root with scissors.

FIG. 7.—Iridencleisis—cutting the iris flap with cataract knife.

One blade of the scissors is passed through this snip towards the iris root at the nasal end of the scleral incision and a cut, usually about 3 mm. long, is made (Fig. 6). A like procedure is then carried out on the temporal side. The folded tongue of iris based on its root is then laid on the sclera, so that about 2 mm. projects above the upper lip of the scleral incision. Its edges curl towards its posterior surface and it lies, or is arranged to lie, so that its endothelial surface is anterior and the pigmented epithelium makes a gutter or tunnel posteriorly.

Dobree (1950) found that this iris tongue may be cut by passing a narrow cataract knife to transfix its root from the temporal to the nasal side and sweeping the blade forward to emerge immediately in front of the forceps (Fig. 7).

The iris forceps are now released, and in doing this it may be necessary to lift the iris clear of the forceps teeth with the tip of an iris repositor. It may be necessary in some cases to replace the pupil by passing an iris repositor into each end of the scleral incision to the side of the basal tongue of iris included in the wound and with a gentle downward stroke towards the centre of the pupil to restore its circular contour. Often it is sufficient to apply an iris repositor to the upper part of the cornea and to make a downward stroke over its surface.

Penicillin is instilled on to the exposed sclera and the conjunctival flap is stroked back into place. The conjunctival incision is closed by a continuous key-pattern suture of 00 black silk (Fig. 8).

FIG. 8.—Closure of conjunctival incision.

A drop of atropine is instilled; tulle gras, an eye-pad, and a cartella shield are held in place by strips of Sellotape.

POST-OPERATIVE TREATMENT AND COURSE

There is no need for digital massage. Atropine is used for 4 days and omitted after this. The pad and bandage are left off 48 hrs after operation, and the eye is protected by a Cartella shield. The patient is allowed into a chair on the 4th day after operation and leaves hospital on the 8th day. The scleral flap remains open and drainage of aqueous along the tongue of iris seems to be effective, as judged by the reduction of intra-ocular pressure to within normal limits and the presence of a bleb which appears 8 to 10 days after operation. The anterior chamber is reformed on the day after operation.

RESULTS IN RECENT CASES

MATERIAL.—From 1947 to 1952 I performed this operation on 142 patients (162 eyes—both eyes in forty patients), 24 with acute congestive glaucoma, and the remainder with chronic simple glaucoma.

Age Incidence.—20 to 40 years, 5 per cent.; 41 to 60 years, 34·9 per cent.; 61 to 70 years, 27·9 per cent.; over 70 years, 32·2 per cent.

INTRA-OCULAR PRESSURE

Pre-operative.—20–30 mm. Hg, 16·9 per cent.; 31–40 mm. Hg, 33·3 per cent.; 41–50 mm. Hg, 17·7 per cent.; 51–60 mm. Hg, 9·6 per cent.; over 60 mm. Hg, 22·5 per cent.

Post-operative.—Under 10 mm. Hg, 13·5 per cent.; 10–20 mm. Hg, 70·9 per cent.; 21–25 mm. Hg, 13·5 per cent. That is, 97·9 per cent. still have the intra-ocular pressure controlled within physiological limits in this series operated on during the 5 years 1947–52.

THE BLEB.—Fig. 9 shows the type of bleb which forms after this operation. The shape is commonly that of a cocked hat, the lower border conforming with the limbus and the upper roughly convex upwards and irregular in outline. The transverse diameter is generally more than the vertical and the average measurements are 8×6 mm. The bleb begins to form on either the 4th or 5th day after operation and is quite large and distinct on the 7th day. Its covering is thicker than the bleb after a trephine operation and it does not extend into the cornea as sometimes occurs after the latter operation. The transverse diameter was as much as 13 mm. in two cases; 12 mm. in two; 11 mm. in ten, and 10 mm. in ten. In 94 eyes the diameters were 7 mm. transversely by 5 mm. vertically or more than this; in 28 the diameters were 6×4 mm.; and in six 3×3 mm.; and in six it became either very shallow or flattened. A flat bleb occurred ultimately in two patients who had had this operation for acute congestive glaucoma, but the intra-ocular pressure has remained within physiological limits, 9–15 mm. Hg for 2 years, and there has so far been no recurrence of glaucoma. In two patients with chronic glaucoma, a flattened bleb has not been associated with a recurrent rise of intra-ocular pressure, which has remained at from 7 to 22 mm. Hg, but in one obese middle-aged woman with vascular hypertension, in whom this anterior flap sclerotomy with basal iridencleisis operation was done after failure with

FIG. 9.—Bleb, 3 months after operation. (From Stallard, 1948).

a trephine operation, flattening of the bleb 2 years after operation was followed by a rise in intra-ocular pressure.

There seems to be no definite relationship between the size of the bleb and the height at which the intra-ocular pressure becomes stabilized. In fact, in some instances of small blebs of 3×3 mm., the intra-ocular pressure was only 8 mm. Hg, whereas in eyes with large blebs the transverse diameter of which was 10×13 mm. and in one where the transverse and vertical diameters were 10×10 mm., the intra-ocular pressures were from 10 to 15 mm. Hg.

The blebs were measured at intervals of 1 to 2 months to note any changes in size, and to correlate any such change with alterations in the intra-ocular pressure. In many instances there was a contraction of the transverse diameter by 1 mm. but the vertical diameter remained the same, whilst in others there was an increase of 1 mm. in the transverse diameter. In three patients this enlargement amounted to 2 mm. and in one it was as much as 3.5 mm. In one patient the bleb increased transversely by 1 mm. to a diameter of 10 mm. during the 3 weeks after operation and ultimately contracted by 4 mm. to a diameter of 6 mm. without any change in the intra-ocular pressure which has remained at 13 mm. Hg. The vertical diameter in this case was unchanged. In another patient, the bleb contracted transversely by 3.5 mm. 7 months after operation, and 9 months later increased by 2 mm. Another patient had a decrease of 2 mm. in the transverse diameter of the bleb 3 months after operation and an increase of 2 mm. in the vertical diameter; 3 months later the vertical diameter had decreased by 2.5 mm. The largest decrease in transverse diameter of the bleb was from 12 to 7 mm.

Three weeks after operation one patient suddenly lost the anterior chamber in the operated eye, and the bleb became flattened, but it was restored to 8×6 mm. when the anterior chamber refilled.

COMPLICATIONS

(1) *Choroidal Detachment*.—This occurred in nineteen patients. The choroid became replaced within 3 weeks of operation in all except one patient in whom its persistence 4 months after operation necessitated scleral puncture and aspiration of the fluid from the supra-choroidal lymph space.

It is probably caused by the seepage of aqueous around the tongue-shaped iris flap into the supra-choroidal lymph space, in fact, along the channels of the small cyclodialysis. In five patients the choroid was detached in three quadrants in front of the equator, in three in two quadrants, and in eleven in one quadrant. The lower nasal quadrant was the most commonly detached. In none did the detachment extend to the posterior part of the globe. Its presence did not seem to affect the size of the bleb, but the anterior chamber became shallower in most cases.

(2) *Iridocyclitis*.—Mild iritis was noted in four patients, one of whom had a 1-mm. hyphaema 2 days after operation. Iridocyclitis occurred a year after operation in two females and it is difficult to assess whether this arose as a late sequel to the operation or through some other cause. In one of the patients, replace-

ment of the iris adjacent to the iris flap was difficult at the time of operation and subsequently the pupil became drawn upwards.

(3) *Late Infection of the Bleb*.—This occurred in a man aged 70, 2 years after operation on the 3rd day after the onset of severe muco-purulent conjunctivitis due to *B. pyocyaneus* for which he had received no treatment. The infection of the bleb cleared up under treatment with polymixin.

(4) *Cataract*.—Three patients showed vacuoles in the upper part of the lens after operation. Lens opacities which were noted before operation in six patients have progressed, and on three of these cataract extraction has been done without any adverse event.

(5) *Partial Detachment of Descemet's Membrane*.—Three patients had a thin curled-up shaving of Descemet's membrane about 1.5 mm. long by 0.75 mm. wide, which lay obliquely across the upper margin of the pupil in two cases and on the middle of the iris in the 11 o'clock meridian in the other. No deep opacification of the cornea nor keratitis occurred in these patients (one had some diffuse superficial opacification of the cornea which was present before operation).

FAILURES

In three patients (2.1 per cent.) this operation failed to keep the intra-ocular pressure within physiological limits; in one failure was evident 5 weeks after operation and in the other two (one with both eyes operated on) the intra-ocular pressure rose one year after anterior flap sclerotomy and basal iridencleisis. One of the latter was an obese middle-aged woman with vascular hypertension (see p. 000) upon whom a trephine operation had failed. In two of these patients a modified Lagrange's operation has kept the intra-ocular pressure within physiological limits for 4 years.

Two patients have had late iridocyclitis the origin of which is obscure. One had infection of the bleb 2 years after operation and the eye was saved by polymixin, the intra-ocular pressure remaining at 25 mm. Hg.

SUMMARY

An operation for glaucoma is described which combines the features of several others:

- (1) A hinged scleral flap 5 mm. in length at its free edge.
- (2) A small cyclodialysis.
- (3) The inclusion between the lips of the scleral flap of a tongue of iris attached at its root and leaving the sphincter iridis intact.

This study is based on 142 patients (162 eyes) operated on from 1947 to 1952, 24 of whom had acute congestive glaucoma, and the remainder chronic simple glaucoma.

In 97.9 per cent. the intra-ocular pressure was reduced to within physiological limits. (Under 10 mm. Hg in 13.5 per cent; 10–20 mm. Hg in 70.9 per cent., and 21–25 mm. Hg in 13.5 per cent). So far the failures have amounted to 2.1 per cent.

RÉFERENCES

- DOBREE, J. (1950). Personal communication.
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