THE CORNEO-SCLERAL SUTURE*

A TECHNICAL MODIFICATION

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THE corneo-scleral suture is to-day widely recognized as important in the prevention of serious complications at the time of cataract operation and during convalescence. Properly placed corneo-scleral sutures assist in the healing and firm closure of the section.

Nevertheless, Dunnington and Regan (1951) have shown histologically the dangers of over-enthusiasm and faulty technique in the use of corneo-scleral sutures. It is evident that when these sutures are placed deeper than half the thickness of the cornea, and are tied too tightly, and that when many sutures are used, such complications as epithelialization of the corneal edges and the anterior chamber, deep necrosis, cystoid cicatrix, cicatricial ectasia, peripheral synechia, and late iris prolapse may occur.

It is desirable, therefore, that only one or two sutures be used, and that these should pass no deeper than half the thickness of the cornea, should not be tightly tied, and must be removed between the 10th and 12th day after operation.

Controversy still exists about the advantages and disadvantages of inserting the corneo-scleral suture before or after the section is made. It is likely that greater accuracy in obtaining exact apposition is achieved by the so-called "preplaced" suture. The alleged disadvantage that this pre-placed suture makes the section more difficult is negligible in the hands of a skilled operator. On the very rare occasions when the stitch is cut by the cataract knife it may be readily passed again through its former track.

Surgeons who use the so-called "post-placed" suture claim the advantage of a clear field for the section. The precise anatomical alignment of the suture meridionally in depth is difficult to obtain in a soft eye and in some cases the passing of a suture after the section is made may be dangerous and even impossible if vitreous presents in the anterior chamber on completion of the section.

There are many types of corneo-scleral suture. Any suture inserted through the cornea and sclera adjacent to the section but not directly through it, such as the mattress suture of Liegard, Kalt, and Harrington, and the suture I described in 1938, may cause inversion of the wound edges and gaping on its deeper surface with the liability to peripheral synechia, cystoid cicatrix, and iris inclusion in the wound.

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So I prefer a modification of MacLean's pre-placed corneo-scleral suture with a stay-knot on the corneal end when one suture is used, the final passage of the suture through the conjunctival flap being postponed until after the extraction of the lens.

Technique

A small tongue-shaped conjunctival flap based on the limbus is cut and turned down over the upper part of the cornea. The area for the insertion of the suture and for the section is cleanly exposed with one or two strokes of a small muslin swab and a few strokes with the edge of an angled Tooke's corneal splitter held at right angles to the corneo-scleral surface. A scleral hook (Stallard's) is now engaged in the limbus and held forwards and downwards in the 12-6 o'clock meridian. This helps to fix the eye and exerts slight traction on the anterior lip of the 2.5-mm. corneo-scleral incision made at and concentric with the limbus at 12 o'clock through slightly more than half its thickness (Fig. 1).

FIG. 1.—Lids retracted by sutures and Castroviejo's suture retractors. A white suture is passed through the superior rectus belly. A small conjunctival flap has been turned down over the cornea. A scleral hook (Stallard's) is engaged in the limbus at 12 o'clock. The corneo-scleral incision, 2.5 mm. long at and concentric with the limbus, is made with a small cataract knife.

FIG. 2.—Corneo-scleral suture. Needle engaged in scleral lip of incision.

The scleral hook retracts the anterior lip of this incision forwards and downwards. There is seldom any bleeding, but when this may mask the passage of the suture it is checked by the fine tip of a heated probe. The point of the needle (Vogt's corneo-scleral) bearing Kalt's 6/0 black silk engages the sclera almost vertically 1 mm. behind the centre of the posterior lip of the incision, and when about 0.3 mm. deep it is turned to emerge in the bottom of the incision having traversed half the thickness and no more of the limbus (Fig. 2). The needle is passed on in the same line to engage the anterior lip of the incision and is then turned forward to emerge on the surface of the cornea about 1 mm. below the incision. At this point the surgeon uses Michaelson's counter presser to stroke the conjunctival flap upwards over the wound so that it lies in its normal position covering the wound; this same instrument may be used, if necessary, to assist the passage of the needle through the cornea. With a good corneo-scleral needle

and Kalt's 6/0 silk, counter-pressure around the needle point is unnecessary.

When about 4 mm. of silk has emerged, the needle is removed from this end of the suture (which is double-armed) and a substantial knot consisting of at least four loops is tied 1 cm. from the end of the suture. The suture is now seized with plane forceps as it traverses the depths of the corneo-scleral wound and is drawn out into a loop. The lower corneal arm is pulled upward until the substantial knot lies on the cornea at the site of the needle exit through the lower lip of the incision. The purpose of this knot is to act as a stay against which the suture may be drawn and the section thus closed quickly and firmly immediately on delivery of the lens.

The corneal arm of the suture loop is now passed over and round the screw of Castroviejo's lid retractor in the centre of the lower lid, it is then carried round the screw of the upper lid retractor (Castroviejo's) which is in the centre of the lid and so in the line of the suture. The loop is drawn taut between the two retractors with epilation forceps applied to the scleral arm of the suture. When the desired tautness is effected the scleral arm of the suture is firmly clamped to the head towel slightly to the nasal side of the mid-line (Fig. 3). This scleral arm of the suture wears a needle which is laid on the towel and covered with a small swab soaked in normal saline to mark its position and to prevent it from being swept off the thread.

FIG. 3.—Loop of corneo-scleral suture drawn out of incision and passed over and round Castroviejo's screw lid retractors. It is drawn taut between the retractors and is held thus by clamping the scleral arm of the suture to the head towel. The lips of the corneo-scleral incision are thus retracted.

FIG. 4.—Section nearly complete. Fixation forceps have been released. Plane forceps hold scleral arm of suture.

The retracted and taut arms of this suture serve to retract the edges of the incision and so obviate the risk of cutting the suture as the cataract knife emerges to complete the section (Fig. 4). The suture is also lifted forward away from the wound by Castroviejo's screw retractor and its position is always in view throughout the section. Its effect in assisting fixation of the eye is slight.

I have tried a number of ways of securing this suture and to-date I think that the method described above suits my technique. The alternatives are:

- (1) For the assistant to hold the corneal and scleral arms of the suture and to exert on

these just the right degree of traction during the progress of the section. This method is safe and good with an assistant of superb manual dexterity who is able to keep his hands well clear of the surgeon's manoeuvres. In clinics where the assistants change frequently the practice period is painful to both the surgeon and assistant and perfection is never enjoyed for long. Another disadvantage of this manual retraction is that both the assistant's hands are immobilized.

(2) The opened arms of Lang's speculum laid across the nose will retract and raise the arms of the suture, but the speculum is not fixed and so there is the danger of its slipping and dragging on the corneo-scleral suture and the lips of the section.

(3) I have tried Sinclair's and Arruga's speculum with bosses added to the upper and lower blades, but I find that the upper blade of any speculum is sometimes in the way, and I think that the operation is more safely done without a speculum and by suture retraction of the eyelids.

When the section is nearly complete and the cataract knife lies below the limbal incision for the suture, the surgeon releases fixation of the eye and into his hand thus freed the assistant places a pair of plane forceps for the purpose of making any small adjustments in the position of the conjunctival flap and for holding the scleral arm of the suture if necessary (Fig. 4).

When the section is complete, the clamp on the scleral arm of the suture is released and this arm is seized between its entrance into the scleral lip of the incision and the Castroviejo screw retractor on the upper lid. The suture is drawn slightly upwards so as to slacken the taut loop hitched round the Castroviejo retractors from which it is now reflected, and laid on the bulbar conjunctiva on the temporal side of the eye. By drawing the scleral arm upwards, the size of the loop is diminished to a dimension large enough to allow the lens to pass without hindrance. The suture is moistened in saline to keep it in position and to facilitate and expedite its passage through the section when it is drawn taut immediately on delivery of the lens.

The corneal arms of this suture, held in plane forceps, are used to lift the cornea so as to obtain a direct view of the iris and lens capsule

- (i) when doing peripheral iridotomy,
- (ii) when seizing the capsule with forceps.

By lifting the corneal flap, injury to the corneal endothelium is avoided for the iris and the capsule forceps thus do not enter the anterior chamber in contact with the corneal endothelium.

Immediately before application of the forceps to the capsule the assistant applies a bull-dog clip to the free end of the scleral arm of the corneo-scleral suture, and he holds this between his finger and thumb with the rest of his hand flattened against the fronto-vertical region of the skull. As the lens is passing through the section the assistant draws gently on the suture, and as the lower part of the lens equator emerges from the section the suture is quickly tightened to close the section securely. The assistant applies his finger to the suture as it crosses the towel over the supra-orbital margin, and holds it thus for a few seconds to allow the vitreous face to settle.

It may sometimes be necessary to slacken the suture to allow the separation of the section by 1 mm. or so in order to disentangle the iris root and so ensure accurate reposition of the iris. In the case of extra-capsular extraction slight slackening may be necessary to allow the larger flakes of soft lens matter to leave the eye when the anterior chamber is irrigated.

When the toilet of the anterior chamber and iris is complete, the conjunctival

FIG. 5.—Needle on scleral arm of suture passed through conjunctiva from its deep surface 1 mm. above limbus.

FIG. 6.—Section closed by corneo-scleral suture and conjunctival flap by three sutures.

flap is held in plane forceps and drawn upwards to a plane at an angle of about 30° with the sclera sufficient to allow the passage of the needle on the scleral arm of the suture from the deep surface of the conjunctiva to its superficial 1 mm. above the limbus in the meridian of the suture as it traverses the limbus (Fig. 5). The free corneal arm of the suture with its knot is now drawn forward for 1 cm. so that the knot is clear of the cornea; at the same time the wound is held closed by very gentle posterior traction with the plane forceps applied to the conjunctival flap. The knot is then cut off the corneal arm of the suture and with suture-tying forceps (Stallard's) a surgical knot is tied with sufficient firmness to coapt the edges of the section without tension.

The edges of the conjunctival incision are closed by three to five interrupted sutures (Fig. 6) tied with the first double loop of a surgical knot.

Two Corneo-Scleral Sutures

Recently I have practised this technique with the sutures passed meridianly at two sites, 11 o'clock and 1 o'clock (Fig. 7). The course of the suture is first through the scleral lip of the 2-mm. long half-thickness limbal incision at 11 o'clock, then through the corneal lip. Thence it is carried over the surface of the cornea to enter the corneal lip of the 1 o'clock half-thickness limbal incision, and afterwards through the scleral lip. The scleral arms of the suture are then laid on the head drape on either side of the 12 o'clock meridian.

That part of the suture which passes over the surface of the cornea between the corneal lip of each incision is now pulled downwards and looped over the screw of the lid retractor in the centre of the lower lid (Fig. 8). The loop in the depth of the 11 o'clock incision is pulled out and the corneal arm is looped over the screw of the lid screw retractor of the lower lid, and the scleral arm of the loop is carried round the screw of the lid screw retractor on the upper lid margin in the same meridian. The loop over the screws is tautened so that the silk is lifted clear of the cornea and sclera, and the free scleral end of the suture is drawn taut across the head towel

FIG. 7.—Passage of corneo-scleral suture through two half-thickness limbal incisions at 11 o'clock and 1 o'clock respectively (Conjunctival flap omitted from diagram for the sake of clarity).

to which it is clamped with a bull-dog clip. In this way the lips of the limbal incision are separated to facilitate the exit of the corneal knife in the right plane and clear of the suture.

A similar procedure is done with the 1 o'clock suture which is looped over the screws of the lid screw retractor in the lower lid and in the 1 o'clock meridian of the upper lid. The loops are tautened and the free scleral end of the suture is clamped to the head towel parallel with the 11 o'clock meridian suture. Fig. 8 shows the arrangement of the loops around and between three Castroviejo lid screw retractors.

During delivery of the lens the assistant holds both scleral arms clamped in a bull-dog clip, and after delivery of the lens, when this suture is tightened, the wound is more firmly closed than when one suture is used. After the needles on the scleral arms of the suture are passed through the conjunctival flap, the corneal loop of suture which unites the corneal arms and traverses the cornea between 11 and 1 o'clock is gently drawn forward for 1 cm. and cut in its middle, thus leaving two free ends for tying, the one at the 11 o'clock meridian and the other at the 1 o'clock meridian.

This procedure is not complicated and I have not found it embarrass the section. To-date there has been no incidence of iris prolapse and it seems that two sutures are more effective than one in checking post-operative hyphaema.

Results

In 331 consecutive cases in which I have used one suture there has been no iris prolapse. The anterior chamber was absent for 7 days after the removal of one suture, but it reformed, peripheral synechia at 12 o'clock has occurred in one patient, and hyphaema of 1–2 mm. in eight patients.

Removal of the Corneo-Scleral Suture

The corneo-scleral suture should be removed between the 10th and 12th

FIG. 8.—Loops of corneo-scleral suture passed around screws on lid clamps, made taut, and secured by clamping free scleral ends to head-towel with bull-dog clips (Superior rectus suture omitted from drawing for the sake of clarity).

day after operation, and it is safer to do this in the operating theatre. Pethidine is given 45 min. before the removal of the suture. Adequate surface anaesthesia is obtained by pantocaine and adrenaline drops. The upper lid is held forwards and upwards by the assistant, and the patient is directed to look down. Any mucus which has collected around the suture is gently removed with a marten brush moistened in saline. The knot of the suture is carefully lifted and a fine pair of de Wecker's iris scissors is placed tangentially on the eye so that the blades may straddle one end of the suture between the knot and the limbus. The forceps grip is now released and the scissors are closed. The knot is gripped again with fine plane forceps and the suture is withdrawn.

Provided that the suture is not dragged forward and is not too deep, it is unlikely that the anterior chamber will be opened and aqueous lost.

Summary

The value of the corneo-scleral suture is discussed. The so-called "pre-placed" interrupted suture, a modification of MacLean's, is preferred. The technique of arranging the suture so as to separate the edges of the corneo-scleral wound and facilitate the completion of the section with a cataract knife is described.

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