APPLIANCES

A NEW OCULAR PROSTHETIC AID THE INTRA-OCULAR IMPLANT*

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OCULAR implants have so transformed the surgery of the blind, degenerate, and badly-damaged globe as to have become a vital cosmetic factor in modern ophthalmic surgery (Allen and Allen, 1950; Guyton, 1949a, b, 1950). For this reason ocular cosmetic inventions and techniques have become important in recent years (Cutler, 1949; Hudson, 1950; McDowell, 1950). I believe that a new device which will preserve the neuro-anatomy of the musculature should be the basis of any future invention (Crawford, 1950; Culler, 1951). I have therefore invented a new prosthetic aid based on this principle.

DESCRIPTION

Briefly this is a plastic implant, peg-shaped, with two holes drilled through its body at right angles in different planes, which is inserted into a prepared and eviscerated globe. It is maintained in position by tantalum wires, which pass through the sclera on both sides well back and are fixed in position so that the implant is retained within the eviscerated globe. The peg (squared point) passes through a hole in the cornea, and acts as an obturator on which the prosthesis rests. Conjugate movement with the other eye is then possible owing to the mobility of the implant with its attached prosthesis.

OPERATIVE TECHNIQUE

The operation is carried out under retrobulbar anaesthesia, using novocaine 2 per cent. It is performed in five stages:

- (1) Preparation of the conjunctival and episcleral covering.
- (2) Incision into and evisceration of the globe.
- (3) Positioning and fixing of the implant with tantalum wires.
- (4) Repair of the globe.
- (5) Covering of the globe with implant in position.

(1) *Preparation of the Conjunctival and Episcleral Covering.*—The conjunctiva is severed at its attachment to the limbus, and the conjunctival and episcleral tissues are separated from the sclera. Great care must be taken to define the position of the extrinsic ocular muscles, since

* Received for publication June 1, 1951.

one must go fairly well back in preparing the conjunctiva and the episclera, as these tissues will be used finally to cover the implant with its protruding peg.

(2) *Incision into and Evisceration of the Globe.*—The nature of the incision will depend on:

- (a) whether it is proposed to use a chronically inflamed or degenerate eye;
- (b) whether the eye has been previously perforated by a foreign body.

(a) If the surgeon proposes to use a chronically inflamed or degenerate eye, the incision should be L-shaped and commence at the limbus on the inner or outer superior quadrants, running parallel to the upper border of the rectus internus or rectus externus respectively. When the incision is sufficiently long, about 15 mm., a right-angled extension of the incision is made towards the borders of the superior rectus. This accomplished, the globe is very carefully eviscerated, particular care being taken with the folds on the more inferior aspects of the globe as uveal tissue can be easily overlooked when the eviscerating incision has been made at an unusual angle.

(b) If the eye has been the seat of a perforating wound, the operation can proceed as above, by an extension of the original wound in one or other of the quadrants mentioned and into the substance of the cornea; if necessary, as in those cases in which the cornea has been perforated, it should be extended radially towards the centre. In this event, an extension of the incision posteriorly can often be limited, as there is readier access for the insertion of the prosthesis, but the cornea must be sewn up very strongly with nylon sutures, putting one as close to the peg as possible. The whole cornea and/or sclera is taken up in suturing the globe.

FIGURE.—Peg type body of acrylic implant, showing conformation with wire holes at different levels.

(3) *Positioning and Fixing of the Implant with Tantalum Wires.*—The implant for this operation is approx. 1" long, with a peg 8 mm. long having a squared tip. (In the early experimental cases two different types of implant were used: (i) a peg-type body, and (ii) a pear-shaped body (see Figure)).

The body of the implant is drilled with two holes in different planes at right angles, so that the tantalum wires can be pushed through without touching one another. A hole is then made in the centre of the

cornea with a Graefe knife. (The use of a 3-mm. trephine would probably prevent any tendency for the cornea to split, and the perforated cornea would fit more snugly around the base of the peg.)

In this particular case the implant was made of a specially heated and hardened plastic and was sterilized and washed thoroughly in distilled water before use.

When the globe has been prepared for the implant, it is most important that the wires be passed through the scleral wall of the globe before the implant itself is actually inserted into the eye, for this greatly facilitates the operation. The tantalum wire is threaded through the prosthesis on to an ordinary Jameson needle. According to the position of the holes in the implant, the wire is made to pierce the sclera well back, in such a way that when the implant is in position it will be fixed firmly in the posterior fundus of the globe and will not tend to move forward to the level of the wire holes in the sclera. This process is then repeated on the other side, the first wire being placed horizontally and the second vertically. When the wires are in position, the implant is inserted into the globe and the peg pushed through the hole in the cornea so that the cornea fits firmly up against the angle between the peg and the body of the implant.

When the implant is in position, the ends of each tantalum wire are brought together, gently twisted, and bent down at right angles posteriorly to lie flush on the sclera.

(4) *Repair of the Globe.*—The scleral wound is then closed, but first the implant and the interior of the globe are insufflated with sulphonamide and penicillin powder. The scleral wound is closed with strong interrupted nylon sutures placed close together for strength and taking a good "bite" of the sclera as each suture is inserted to give added strength to the part.

When this is done, one sees the conjunctival and episcleral tissues laid back, the cornea facing one with the peg of the prosthesis protruding through the centre of the cornea, the scleral incision closed by interrupted sutures and the two wires fixed in position with their twisted ends facing posteriorly.

(5) *Covering of the Globe with Implant in Position.*—The whole of the contents are completely covered by the conjunctival and episcleral tissues in a horizontal plane by means of strong interrupted black silk sutures placed close together. Before inserting these sutures, however, I have been accustomed to insufflate all the raw areas on the underside of the conjunctival and scleral incisions with sulphonamide and penicillin powder, because this limits the amount of reaction of the tissues to operative trauma and keeps secondary infection at bay. The conjunctival and episcleral tissues eventually become thickly matted to the cornea, giving increased strength to this part of the eye.

POST-OPERATIVE COURSE AND AFTER-TREATMENT

The conjunctiva of the socket should be washed out daily with boracic lotion, and oculentum penicillin should be instilled. The

conjunctival stitches are left *in situ* for about 14 days. On the tenth day, however, or perhaps even sooner, the peg of the implant will be seen to be protruding gently through the stitch line and attempting to separate some stitches, very much like a chicken breaking its way out of an egg. When this occurs the protrusion of the peg may be assisted by the removal of the most central stitch.

After about 14 days this process is complete. The remaining stitches can then be removed and the implant is ready for the temporary "shell" which will be kept *in situ* for about 6 weeks until the eye is ready for the first temporary prosthesis. During the early stages it will be seen that the conjunctiva tends to become somewhat chemosed and to protrude between the lids. When this occurs a vaseline pad should be kept over the lid and short-wave diathermy given daily. The swelling soon subsides.

When the peg is finally extruded through the conjunctiva, the conjunctiva fits most snugly around the base of the peg with the result that infection and granulation do not appear to occur. The movement of the globe is full and complete and bears a cosmetic result comparable with that of any of the existing implant technique and infinitely safer. The result is so good that the patient often forgets to remove the prosthesis for days on end.

It is claimed for this technique that it is quick, safe, and reliable, and that it gives rise to fewer complications than any other technique with the same cosmetic result. The operation takes less than half an hour and can be modified to suit globes which have been perforated through the cornea. Apart from this the principal advantages are these:

- (1) The conjugate movement of the implant and prosthesis with the other eye is cosmetically perfect.
- (2) The extrinsic musculature and neuro-muscular end-plate mechanism are preserved by the interposition of the fibrous insulating scleral jacket of the globe between the extrinsic musculature and the intra-ocular implant. With the present implant technique fibrous infiltration of the extrinsic muscles and destruction of the neuro-muscular end-plates occur after some years with gross limitation of movement.
- (3) The implant is solidly held in place by four different agencies :
 - (a) double independent wiring technique,
 - (b) reinforced corneal tissue,
 - (c) solidity and thickness of plastic implant,
 - (d) pressure upon the prosthesis by the musculature of the lids.
- (4) This technique is applicable to the chronic blind, and to chronically inflamed, or perforated globes.
- (5) It is suitable for small children as well as adults, two sizes of implant can be obtained.

- (6) It is easily sterilized, and can be boiled in A.C.10.
- (7) The combined weight of the implant and prosthesis bears a close resemblance to the weight of the globe itself.
- (8) It is unbreakable.
- (9) It is solid, so that there is no empty space to act as a reservoir for serum and infection.
- (10) The peg is remarkably free from infection, and granulation reaction in the conjunctiva does not occur.
- (11) It can be bored accurately to take the wires.
- (12) The plastic peg works within the body of a plastic prosthesis and undue friction is avoided.

DEMONSTRATIONS

Two cases demonstrating this implant were shown at a meeting of the Midland Ophthalmological Society at Nottingham on April 17, 1951.

Case 1, J. T. H., had his operation in July, 1950, with splendid cosmetic and functional results.

Case 2, G. W. B., was more recent, having been operated on in March, 1951; here the peg was seen to be gradually working its way through the conjunctiva. In this particular case a white plastic shell with 4-mm. black pupil was used to demonstrate the mobility of the implant and the prosthesis.

I should like to thank Mr. Steer Wardman for his co-operation in developing this implant.

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