IRIS-CLIP AND IRIDO-CAPSULAR LENS IMPLANTS (PSEUDOPHAKOI)*†

PERSONAL TECHNIQUES OF PSEUDOPHAKIA

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THE iris-clip lens implant or pseudophakos is already well known (Binkhorst, 1959, 1962)‡ and the results of over 200 implantations in the past 8 years have confirmed its practical value (Binkhorst and Leonard, 1967).

The irido-capsular lens implant, described here for the first time, does not replace the iris-clip lens but has proved especially valuable in children (Binkhorst and Gobin, 1967).

The two types together make lens implantation possible at all ages and after any type of cataract surgery.§

Iris-Clip Pseudophakos

Though these can be manufactured to individual specifications, a standard type is usually used by the author. Its optical part is designed as a simple convexo-plano acrylic lens, according to the suggestion of R. D. Binkhorst (1965), with a diameter of 4 to 5 mm., a centre thickness of 0.5 mm., and a radius of curvature of the anterior surface of 7.6 mm. Its equivalent power in aqueous is 20.26 dioptries. It is entirely located in the anterior chamber, immediately in front of the pupil, without touching the iris. It carries one pair of 0.1 mm. Supramid wire loops level with the lens that lie in front of the iris diaphragm, and one pair of 0.2 mm. loops at a slightly posterior level lying behind the iris diaphragm (Fig. 1).

FIG. 1.—The iris-clip pseudophakos and its mechanism of fixation. There is one pair of loops at the level of the optical portion and one pair at a posterior level. These loops lie above and below the iris.

The clearance between the loops on each side is 0.5 to 0.75 mm., allowing just enough room for the iris to lie between them. The distance between the tips is 9 mm. The wire loops act as safeguards against forward or backward displacement, but the

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‡ The iris-clip pseudophakos has also been described incorrectly as a "pupillary lens" (Binkhorst, 1962). In fact, the optical portion is located not in the pupillary area but in the anterior chamber.

§ Both types of pseudophakoi are manufactured by K. Morcher, Daimlerstrasse 11, Stuttgart-Cannstatt, Western-Germany.

actual fixation and centering are performed by the iris sphincter muscles at the four posterior loop attachments, and 2 per cent. pilocarpine eye drops have to be used continuously twice daily. Only in rare cases, in which adhesions develop between the iris and the posterior loop attachments, is this not necessary. The fact that contact between the lens and the eye is confined to the contact of the four posterior loop attachments with the pupillary border of the iris may well be the secret of its perfect tolerance.

Surgery

The operation is usually performed with the patient under general anaesthesia, though there are no objections to local anaesthesia. The usual measures for cataract surgery are taken. The only special precautions in implantation surgery are the pre-operative administration of a broad-spectrum antibiotic and the 3-hourly instillation of a 0.1 per cent. solution of dexamethasone 21-phosphate (Decadron). Vasoconstriction and the systemic administration of corticosteroids have proved unnecessary and have been discarded. Pre-operative mydriasis is produced by instillation of homatropine or retrobulbar injection of epinephrine.

One-stage surgical technique (primary implantation) has become the method of choice (Binkhorst, 1966), and the insertion of the pseudophakos can be decided upon after delivery of the cataractous lens. Implantation is not advisable in cases of vitreous presentation. The best method is intracapsular round-pupil extraction, but with modern irrigation and suction techniques implantation is also possible after extracapsular extraction.

Although the "irrigating forceps" has been simplified, irrigation during and after insertion is not always necessary. As a rule the pseudophakos is grasped in a tangential direction and is manoeuvred into position by zig-zag movements; the forceps is then removed and the anterior chamber is irrigated with a 1 : 100 acetylcholine solution or with 1 per cent. pilocarpine.¹ Only in the case of a very wide pupil is the anterior chamber irrigated with acetylcholine before removing the forceps. If the pupil is very small, the external instillation of epinephrine will probably dilate it after a few minutes. The pseudophakos is inserted into a small pupil in a radial direction and finally the 12-o'clock iris sector is carefully placed between the two pairs of loops with a blunt iris hook while the corneal flap is lifted.

Before the wound is closed, the anterior chamber is completely filled with air to prevent the implant rubbing the corneal endothelium during suturing. There is no risk of migration of air behind the iris. If aqueous is lost the anterior chamber should immediately be refilled. The wound is closed with at least nine virgin silk end-to-end sutures and is covered by a limbal-based conjunctival flap. The eye is not padded, but is protected by an eye-shield, and if lid-closure is insufficient the cornea is protected by pilocarpine 2 per cent. ointment. The eye can be observed and treated through the 1.5 to 2 cm. central hole in the shield.

Post-operative treatment consists of 3-hourly instillations of a 0.1 per cent. solution of dexamethasone 21-phosphate (Decadron) for the first week, gradually diminishing

¹ A safe 1 per cent. pilocarpine solution for use in the anterior chamber produced by Barnes-Hind is available in so-called "minims".

to four times daily for 6 to 8 weeks, and 2 per cent. pilocarpine eye-drops twice daily. Only occasionally does a suture have to be removed.

The selection of cases for two-stage surgery has been described by Binkhorst (1962), but the surgical technique could be improved by making an *ab externo* incision with a knife and scissors, in order not to touch the prolapsed vitreous in the anterior chamber. This incision should not be too short. Vitreous presentation and consequent complications should be watched for in secondary implantations (Binkhorst and Leonard, 1967). In these cases the incision should be closed with at least five virgin silk end-to-end sutures.

Irido-capsular Pseudophakos

Again a standard implant is usually used by the author. The optical part is the same as in the iris-clip pseudophakos, and it is also located entirely in the anterior chamber immediately in front of the pupil without touching the iris. The fixation mechanism, however, is quite different, and requires a strong capsular membrane behind the iris for its stability. It can therefore be used only after extracapsular extraction, cases with a Soemmerring's ring being especially suitable. Capsular and cortical remnants should be washed out, thus leaving enough capsular support behind the iris with a clear central area. The posterior capsule must not be broken.

The irido-capsular implant has only one pair of wire loops, and these lie posterior to the lens (Fig. 2) and are buried in the irido-capsular cleft. Irido-capsular adhesions embedding the loops guarantee excellent stability, and even prevent inadequate mydriasis. The loops should be made of fine 0.1 mm. wire of a metal such as platina-iridium. The usual distance between the tips of the loops is 9 mm., but this can be slightly modified by the surgeon if necessary. Again, contact between the implant and the eye is minimal.

FIG. 2.—The irido-capsular pseudophakos and its mechanism of fixation. Only one pair of loops is used at a level posterior to the optical part. These loops are buried in the irido-capsular cleft.

Surgery

General surgical technique is the same as for the iris-clip lens, the one-stage operation being the method of choice. Immediately after insertion the pupil should be made to fit firmly around the four posterior loop attachments, producing ideal centering and giving extra support to the pseudophakos. This pupillary action, which plays such an important and permanent role in the success of iris-clip implants need only be maintained for one or two post-operative days while the irido-capsular adhesions form. Careful administration of topical atropine is then started to give

the aqueous as much access to the lens remnants as possible in order to clear the pupil without affecting the stability of the lens. The effectiveness of the irido-capsular adhesions can be tested under maximal mydriasis.

In the two-stage operation, to ensure that efficient irido-capsular adhesions embed the wire loops, the latter should be placed exactly where adhesions had to be cut. If no such adhesions are present, one may decide to use the iris-clip implant instead.

The irido-capsular pseudophakos can safely be inserted into the eyes of very young children, even infants whose eyes are not fully grown. It can also be used in cases of colobomatous iris. In any eye the posterior capsule should be intact at time of implantation since complications may result from the presence of vitreous in the anterior chamber. If necessary, posterior capsulotomy and even posterior capsulectomy can safely be done at a later stage without bringing vitreous into the anterior chamber.

The special irido-capsular pseudophakos has the advantage of lessening the risk of touching the cornea if the capsular membrane seems to push the pseudophakos a little more forwards, especially in eyes with a shallow anterior chamber, eyes that are not fully grown, and those with eccentric pupils. As the loops are embedded in the irido-capsular cleft, Supramid might be subject to absorption, and it is safer to use an inert metal wire, especially as weight is less important in the presence of a capsular membrane.

Modifications of Present Designs

Since the iris-clip pseudophakos has been in use, its stability has been carefully observed. The overall length has been increased to 9 mm., the maximum for comfortable insertion and for sufficient clearance of the cornea. In a double-loop type the shape of the loops and their insertions may be modified to give a little more stability, and it might also be possible to use triple or quadruple loops, and hexagonal or octagonal pupil shapes. Satisfactory prototypes have not yet been produced by the manufacturers, however, and they would make the surgical techniques more complicated and hazardous. Dislocation can be prevented by the use of 2 per cent. pilocarpine eye-drops twice daily. Pupillary size and shape can easily be modified by placing the posterior loop attachments closer together. In this way pupils with round or stenopoeic apertures can be produced. The stenopoeic apertures, by the way, are reversible, which is important for purposes of examination. Because it has to be fixed in the elastic iris diaphragm, the weight of the iris-clip pseudophakos is critical. Even the use of metal instead of Supramid wire loops makes it too heavy and the same applies to glass as opposed to acrylic material for the optical lens. As the irido-capsular pseudophakos is attached to a rigid capsular membrane, its weight is not so important.

Summary

The use of the iris-clip pseudophakos is reviewed after 8 years, and the irido-capsular pseudophakos is described for the first time. With these two lens implants safe pseudophakia is possible at all ages and after any type of cataract extraction.

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