EXPERIENCE WITH TWELVE CASES OF INTRA-OCULAR ANTERIOR CHAMBER IMPLANTS FOR APHAKIA*

TWO NEW MODELS OF LENSES ARE DESCRIBED

BY

J. BOBERG-ANS

*From the Finsen Institute Eye Department†
(Chief: O. Blegvad, M.D.) and from private practice, Denmark*

UNIOCCULAR aphakia is a condition of artificial anisometropia which very often causes great annoyance to the sufferer, who finds the aphakic eye of little use if the other eye is normal, and often complains of lack of binocular function and difficulty in judging distances, especially at close range. If contact lenses have been tried with unsatisfactory results, it seems justifiable especially in younger individuals, to alleviate the condition of unioocular aphakia by the insertion of an intra-ocular lens.

The work of H. Ridley (1952, 1957) proved that it was possible for the eye to receive an intra-ocular lens with slight or no reaction. As the Ridley procedure entailed certain dangers, however, improvements have been effected by several successors including Arruga and Arruga (1953), Strampelli (1954), Bietti (1955), Barraquer Moner (1954), Schreck (1955), Apollonio (1956), Epstein (1957), and Lieb and Guerry (1957), using an anterior chamber lens.

The simple rigid and uncomplicated construction of the Strampelli anterior chamber lens (Fig. 1) seemed to make this preferable to other types. In intracapsular lens extraction, the vitreous may prolapse through the pupil and if the vitreous touches the posterior surface of the cornea, the transparency of the latter will be damaged. An anterior chamber implant may therefore be of therapeutic value in preventing or curing this complication of herniated vitreous.

The reports of Strampelli, Bietti, and Barraquer seemed very promising, and the fact that I had watched the introduction of the Strampelli lens by Dr. Joaquin Barraquer led us to choose this for our first cases.

FIG. 1.—Strampelli intra-ocular lens.

STRAMPELLI LENSES

Case 1, a man born in 1896, was a trapeze artist who had had to give up his work because of a cataract in the right eye.

* Received for publication January 11, 1960.

† Closed in April, 1959.

His condition was unchanged by an extracapsular cataract extraction in August, 1956, and a 13-mm. Strampelli lens was inserted in December, 1956. Haemorrhage occurred on the ninth day, with a rise in ocular tension, and a discission of a secondary cataract, with removal of the 13-mm. lens and insertion of a 12.5-mm. lens, was carried out in February, 1957. The patient recovered without complications, and regained a visual acuity of 6/12 and binocular single vision (Fig. 2).

FIG. 2.—Strampelli lens in place (Case 1, right eye).

He was able to resume his trapeze work, and 2½ years later the visual acuity was unchanged and the cornea was clear. This patient's left eye later became affected, and is discussed below (see Case 11).

Case 2, a man born in 1902, had had a posterior polar cataract of the right eye for some years, the visual acuity being reduced to 2/60.

An intracapsular cataract extraction was performed in September, 1957, and the visual acuity was improved to 6/6 with +10.5 D sph., but with slight opacities and a rather large prolapse of the vitreous.

In January, 1958, a 13.5-mm. Strampelli lens was inserted, and he was discharged on the tenth post-operative day with a visual acuity of 6/12, with -1.5 D sph., -1.5 D cyl., axis 80°.

On the 17th day he returned with a collapsed anterior chamber and the iris bulging around the edges of the lens, which covered the pupil and prevented prolapse of the vitreous. The vitreous was visible in the large peripheral iridectomy at 12 o'clock. Three unsuccessful attempts were made to close suspected leakages in the subconjunctival scar. There was pronounced bulging of the iris around the edges of the lens. As soon as a transfixion was done in the lower iris bulge (April, 1958), the anterior chamber reformed and the eye quietened down, but the vitreous was now rather opaque, clearing slowly and permitting vision of only 5/60. The left eye remained normal.

1½ years later, the right eye was white but rather soft, with the iris bulging as before. The patient has been observed for 2 years.

Case 3, a motor mechanic born in 1938, developed a traumatic cataract of the left eye in October, 1956. In September, 1957, synechiolysis and removal of the lens remnants resulted in a visual acuity of 6/6 with +11 D sph.

In January, 1958, a 12-mm. Strampelli lens was inserted. In December, 1958, a secondary cataract was incised, giving a visual acuity of 6/6 with -1.5 D sph. The patient has been observed for 2 years and is thoroughly satisfied with the binocular function essential in his work.

Case 4, a man born in 1933, suffered from Besnier's prurigo. An extracapsular cataract extraction performed in May, 1957, resulted in a visual acuity of 6/6 with +10.5 D sph., +3 D cyl., axis 35°.

In April, 1958, a 12.5-mm. Strampelli lens was inserted, and recovery was uneventful with a visual acuity of 6/9 with -3.5 D sph. In February, 1959, an operation for a pronounced divergent squint resulted in a perfect ocular position with no diplopia and full restoration of binocular function. The patient has been observed for 21 months.

FENESTRATED LENS

Reasoning that the complication in Case 2 was due mainly to blockage of the pupil and interference with the normal intra-ocular circulation, we suggested that as large a perforation as possible should be made in the haptic part*. This modification (Fig. 3) was simultaneously suggested by Mr. John Cogan of Tunbridge Wells.

FIG. 3.—Fenestrated lens.

Case 5, a man born in 1933, developed a traumatic cataract of the left eye in 1952. Several discussions of secondary cataract in 1958 resulted in a visual acuity of 6/6 with $+12$ D sph., and a divergent squint of 25° .

In June, 1958, an iridotomy was performed and a 13-mm. Boberg-Cogan fenestrated lens was inserted. Recovery was uneventful and the visual acuity was 6/6 with -2 D sph., -2 D cyl., axis 20° , in the left eye, and 6/6 with -0.5 D cyl., axis 170° , in the right. An operation for squint gave a perfectly parallel position with no diplopia and normal binocular function for close range with spectacles.

In June, 1959, the ocular tension rose and the iris appeared to be bulging around the lens. A transfixion at 12 o'clock was performed by Dr. E. Sebbler of Copenhagen. Uneventful recovery resulted in a visual acuity of 6/9 in the left eye, the refraction and binocular function being unchanged (Fig. 4), and the cornea clear. The patient has been observed for 18 months.

FIG. 4.—Fenestrated lens in place (Case 5, left eye).

* The lenses were manufactured by Rayner and Keeler Ltd., 100 New Bond Street, London, W.1.

Case 6, a man born in 1900, underwent a cataract extraction of the right eye in 1956, when the final visual acuity was 6/6 with +13 D sph., +1 D cyl., axis 170°.

In September, 1958, a 12-mm. Boberg-Cogan fenestrated lens was inserted into the right eye. Recovery was uneventful and the final visual acuity was 6/6, with -1.75 D cyl., axis 80° in the right eye, and 6/6 with +1.5 D sph. in the left. The patient was thoroughly satisfied, and, with bifocals, was able to continue his work without difficulty.

In September, 1959, after an attack of influenza, he developed iritis of the right eye. The usual treatment with cortisone, etc., resulted in a pale eye but the cornea became hazy, with changes in the sub-epithelial area. The corneal changes were a general affection more likely to have been caused by the iridocyclitis than by the lens touching the posterior surface. The cornea was clearing slowly, but when the visual acuity was about 6/12 the patient got a foreign body in the eye. He developed a very severe hypopyon ulcer, which subsequently cleared on treatment with antibiotics, but left a central corneal scar so that the visual acuity could not be improved beyond 6/60. The anterior chamber lens did not seem to affect the hypopyon or the course of the infection in the least.

Case 7, a man born in 1892, had a dense cataract in the right eye and a normal left eye.

In August, 1950, he underwent an intracapsular cataract extraction of the right eye, and the visual acuity was then 6/6, with +9.5 D sph., +1.5 D cyl., axis 0°.

In October, 1958, a 12-mm. Boberg-Cogan fenestrated lens was inserted. Recovery was uneventful apart from a temporary increase in tension. The visual acuity was 6/6 with -2.5 D cyl., axis 115°. He wears bifocals and is quite satisfied.

SEMI-RIGID FENESTRATED LENS

It was thought that a rigid lens in the anterior chamber might—by reason of pressure, accidental trauma, or operation (*e.g.*, for squint)—cause undesirable damage to the anterior chamber angle and its structures. Therefore, it was thought advisable to alter the haptic part of the lens to obtain some elasticity, as suggested by Dannheim (1957). A nylon elastic sling forming a loop on either side of the lens has certain advantages, but if the length of the sling does not exactly correspond with the width of the anterior chamber it will exert a constant pressure in the angle of the anterior chamber and cause atrophy at this site. Also the position of the lens in the anterior chamber cannot be fixed exactly, and if the lens touches the posterior surface of the cornea, degeneration and opacity of this structure will ensue. Another difficulty is that the required power of the lens cannot be measured exactly because its position in the anterior chamber is not fixed. Because of these disadvantages a better model was sought.

Apart from the slight elasticity the lens should be rigid and easy to handle. The last part to be introduced into the eye should be easily held by a pair of forceps, and the lens should maintain its position in spite of slight trauma or vibrations and should be supported by as little material as possible, not because of the weight nor because of the space that this support will occupy, but because of the importance of a free fluid circulation inside the anterior chamber.

The fenestrated lens was therefore altered; one side of the support of the pointed end was removed, and the remaining leg was thinned down to obtain sufficient elasticity to permit it to bend under slight pressure (Figs 5 and 6).

FIG. 5.—Semi-rigid fenestrated lens (side view).

FIG. 6.—Semi-rigid fenestrated lens (full view).

This semi-rigid fenestrated lens was inserted into five eyes.

Case 8, a man born in 1888, developed a heterochromia of the left eye, and underwent an extracapsular cataract extraction elsewhere in February, 1950.

Dissection of a secondary cataract was carried out in January, 1958, and 5 days later a 12-mm. Boberg semi-rigid fenestrated lens was inserted. The visual acuity was 6/9, with -0.5 D sph., 2.5 D cyl., axis 70° , and binocular function was satisfactory. The patient has been observed for 2 years.

Cases 9 and 10 (two eyes of one patient).—A woman born in 1928 had congenital cataract of both eyes, which were operated on elsewhere at the age of 11 years. The visual acuity was 6/9, with $+14$ D sph., $+1$ D cyl., axis 90° , in the right eye, and 6/9 with $+14$ D sph., $+1$ D cyl., axis 90° , in the left.

In January, 1959, an 11.5-mm. Boberg semi-rigid fenestrated lens was inserted into the right eye and 2 weeks later a similar lens into the left, giving a visual acuity of 6/9, with -1 D sph., -2 D cyl., axis 130° , in the right eye, and 6/9, with -3.5 D sph., in the left. The patient is very happy to have got rid of her heavy glasses, and now has binocular vision, with glasses for distance, and is perfectly content from a cosmetic and working point of view without glasses (Fig. 7). The patient has been observed for 1 year.

FIG. 7.—Semi-rigid fenestrated lens in place (Case 9, right eye).

Case 11.—The second eye of Case 1, developed a cataract in July, 1959, which prevented binocular function.

An intracapsular cataract extraction was performed in August, 1959, and the visual acuity was then 6/6 with +11.5 D sph., +1 D cyl., axis 0°. A 12-mm. Boberg semi-rigid fenestrated lens was introduced into the anterior chamber in December, 1959, and the patient had an uneventful recovery (Fig. 8).

FIG. 8.—Semi-rigid fenestrated lens in place (Case 11, left eye).

The visual acuity was 6/9, with 0.75 D sph., -2.5 D cyl., axis 160°, and perfect binocular function. The patient has been observed for 6 months.

Case, 12, a man born in 1892, had a posterior capsular cataract in the left eye; the right eye was normal. The cataract was removed in September, 1959, and the visual acuity was improved to 6/6, with +12 D sph., +1.5 D cyl., axis 150°. A 13-mm. Boberg semi-rigid fenestrated lens was inserted into the left eye, giving a visual acuity of 6/6, with -2 D sph., -2.5 D cyl., axis 60°. The patient was quite satisfied and wore bifocals with comfort, but he unfortunately developed cancer and died 8 months after the second eye operation. The eye has been preserved for pathological examination, and a full report on it will be given in a later paper.

These last five cases showed a very rapid recovery with practically no reaction from the eyes, and the new semi-rigid model was much more easily introduced into the eye than the previous models.

Technique

At a suitable interval—at least 10 weeks—after a cataract operation, the refraction is measured; the distance from the anterior surface of the cornea to the posterior surface of the corrective lens is measured, together with the transverse diameter of the clear cornea, and an estimation is made of the diameter of the anterior chamber according to the procedure described by Barraquer (1956). Usually the diameter of the anterior chamber exceeds that of the cornea by 1.5 to 2 mm. In all cases except the first, the lenses were supplied by Rayner and Co. in special containers. Sterilization was carried out by the method described by F. Ridley (1957).

Operation

Pilocarpine eye drops are instilled 3 hours pre-operatively, and sedation is induced with barbiturates and phenegan. Retrobulbar analgesia is induced by a solution containing hyaluronidase but no adrenalin. Facial block is effected by the method of Atkinson (1955). An Arruga lid retractor prevents pressure on the globe. A bridle suture is inserted under the superior rectus. A limbal incision is made and enlarged with scissors to 8 or 9 mm. If vitreous fluid is expected air is injected into the anterior chamber before the introduction of the lens.

While being introduced the lens is held as close to the base as possible by means of special forceps. The limbal incision is closed with five to eight virgin silk appositional sutures. Air is injected into the anterior chamber in most cases. Atropine, cortisone, and antibiotics are used as necessary and the bandage is removed on the 4th day.

In five of the cases reported above a limbus-based small conjunctival flap was found to be an advantage. The slight bleeding caused by this technique was easily staunched. Care was taken not to injure the posterior surface of the cornea. The latest model of the lens was especially easy to introduce. In only one instance (Case 1) was it necessary to replace the lens by a shorter model. In all cases it was very easy to rotate the lens so that its ends rested in the angle of the anterior chamber, away from the incision.

Conclusions

As the procedure of intra-ocular lens insertion is relatively easy, and causes little damage to the eye and little or no reaction, it seems justifiable to suggest the insertion of anterior chamber lenses in cases of uniocular aphakia in patients who are dependent, to some extent, upon a binocular function. The risks involved and the advantages to be gained must, of course, be weighed up in each individual case.

Summary

Twelve cases are reported in which anterior chamber lenses were inserted into aphakic eyes. A description is given of two new models, one fenestrated and one semi-rigid fenestrated.

REFERENCES

- ARRUGA, H., and ARRUGA, A. (1953). *Arch. Soc. oftal. hisp.-amer.*, **13**, 731.
 ATKINSON, W. S. (1955). "Anaesthesia in Ophthalmology". Thomas, Springfield, Ill.
 APOLLONIO, A. (1956). *Boll. Oculist.*, **35**, 314.
 BARRAQUER, J. (1956). *Estud. inform. oftal. Barcelona*, vol. 8.
 BARRAQUER MONER, J. (1954). *Ibid.*, vol. 6.
 BIETTI, G. B. (1955). *Acta ophthalm. (Kbh.)*, **33**, 337.
 DANNHEIM, H. (1957). *Ber. disch. ophthalm. Ges. Heidelberg*, **60**, 267.
 EPSTEIN, E. (1957). *Brit. J. Ophthalm.*, **41**, 368.
 LIEB, W. A., and GUERRY, DU PONT, III (1957). *Amer. J. Ophthalm.*, **44**, 579.
 RIDLEY, F. (1957). *Brit. J. Ophthalm.*, **41**, 359.
 RIDLEY, H. (1952). *Ibid.*, **36**, 113.
 — (1957). *Ibid.*, **41**, 355.
 SCHRECK, E. (1956). *Ber. disch. ophthalm. Ges. Heidelberg*, 1955, **59**, 212.
 STRAMPELLI, B. (1954). *Ann. Ottal. clin. Ocul.*, **80**, 75.