

COMMUNICATIONS

INTRA-OCULAR ACRYLIC LENSES*

**A RECENT DEVELOPMENT IN THE
SURGERY OF CATARACT**

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EXTRACTION of the human lens for cataract has been performed with various improvements and increasing success for just 200 years. Daviel (1748) reported the first planned extraction but, as is frequently the experience of pioneers, his operation did not at first prove popular and most surgeons continued to couch cataracts, dislocating the opaque lens within the eye as had been practised in various countries with some measure of success since 1000 B.C. The discovery of cocaine as a local anaesthetic in 1884 rendered intra-ocular operations on elderly people less hazardous as well as painless, and from that time cataract ceased to lead almost inevitably to blindness. The extracapsular extraction which left in place the posterior lens capsule seemed for many years the only practicable operation and to this day, with its many improvements in technique, still has an honoured place in surgery.

At first the surgeon would not operate until the cataract was mature, when it could be completely expressed, but this entailed the patient waiting perhaps years in almost complete blindness until courage was found to operate. Later, with improvements in asepsis, it was found that if any soft cortex remained after expression of the nucleus it could safely be removed by irrigation with normal saline. Earlier operation could therefore be undertaken without great risk of post-operative iridocyclitis and with a reasonable chance of a clear pupil. Later still, anterior capsulectomy further improved technique and diminished the need for capsulotomy of "after cataract"; for the posterior capsule is extremely thin and, in the absence of the anterior capsule and remaining lens cortex, seldom requires division. The modern extracapsular extraction gives very good results, and the intact posterior capsule is a useful bulkhead in the eye, preventing forward bulging or prolapse of the vitreous and reducing the risk of detachment of the retina.

Early in the 20th century intracapsular extraction was introduced by Smith, Elschnig, and others, but for many years this operation, which permits removal of very immature cataracts, was regarded by many as unjustifiably dangerous, and it is only recently that it has become more popular than the well-tried and generally satisfactory extracapsular extraction. This procedure, though accompanied by considerably increased risk in the hands of inexperienced operators, is, within its limitations, practically the ideal, and

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with the development of modern technique perfection of cataract extraction has been attained. The defective part is completely removed in one stage through a wound which heals with an invisible scar.

Extraction is, however, but halfway to a cure, which is complete only when the important portion of a highly specialized organ is replaced.

DISADVANTAGES OF APHAKIA

There are many disadvantages of aphakia. Accommodation is inevitably lost, but this is normal and physiological in most patients of cataract age. Ordinary cataract glasses, generally of the order of + 11 D are unsightly and heavy, and without them, as for instance when washing or bathing, the patient is practically blind. Moreover, serious optical disadvantages ensue, even with the latest "best form" patterns, for they only function at their best when the eye looks directly through the centre of the lens. Oblique views produce aberration and apparent displacement of objects which may cause patients to miss their step and to feel unsafe in traffic, so that although 6/6 vision may usually be obtainable the sight is not in practice so satisfactory as this high acuity would suggest. Furthermore, since to avoid touching the eyelashes the spectacle lens has to be beyond the anterior focal point of the eye, the image on the retina is magnified by about 33 per cent. In conjunction with the aberrations this renders binocular vision impossible if the other eye has not undergone cataract extraction, and it is frequently found that patients will persist in using an eye with acuity perhaps as low as 6/24 in preference to the aphakic eye which can read 6/6. Binocular difficulties are to some extent reduced by the use of a contact lens, the image of the aphakic eye being increased by only 15 per cent., but the majority of cataract patients have not the ability to insert these or the perseverance to continue their use on account of their tendency to cause irritation and "veiling".

REPLACEMENT OF LENS

Attempts have been made since 1949 to complete the surgical cure of cataract by replacing the missing lens. A heterogeneous human lens graft seems impracticable though, judging by the comparative success of corneal grafts composed of similarly avascular tissue, this would not appear to be beyond the realm of possibility. The difficulties of inserting a normal lens without damage within the recipient eye appear immense and there can be no certainty that, if inserted, it would be suitably nourished and remain clear. It would seem, however, from our present knowledge of artificial lenticuli that it might well stay in place, unlike a lens traumatically dislocated where the supporting vitreous is always deranged.

At present, therefore, an artificial lenticulus is the only solution. The problems to be solved were three: to select a transparent material which would not set up a tissue reaction in the eye, to determine the size and

refractive power of the artificial lens, and to devise a method of inserting it and retaining it accurately in position within the eye.

COMPOSITION OF THE ARTIFICIAL LENTICULUS.—The choice of material is between glass and “plastic” methacrylate compounds. Both these substances are known to be chemically inert in tissue fluids. It is well recognized that fragments of glass can remain in an eye indefinitely unless a sharp edge rests in contact with a sensitive and mobile part such as the iris, and there are many instances of eyes containing glass particles being examined by competent ophthalmic surgeons without the presence of the transparent foreign body being suspected. Rather less is known about acrylic compounds, though some experience has been gained from war wounds, especially those in which a perspex aircraft cover has been fractured by a bullet. These compounds too have been used successfully for some time for filling gaps in bone, not only in the skull but also in joint cavities where movement and the presence of synovial fluid to some extent resemble conditions within the eye.

Glass and acrylic compounds have much in common in addition to being inert in body fluids. Both are almost perfectly transparent and can be worked to a high degree of accuracy both mechanically and optically. Though less hard and therefore more easily scratched, methacrylate has the overwhelming advantage of light weight, its specific gravity being only half that of glass and not greatly in excess of the aqueous fluid.

Polymethyl methacrylate, generally known as Perspex (or Plexiglass), is now widely used in many industries. There are several varieties, and the manufacturers, Imperial Chemical Industries, have advised that their product Transpex I is the least likely to set up irritation in the body. This is a form of fully polymerized perspex with which the risk of gradual liberation of excess free monomer is eliminated. Moreover its composition and optical properties are more reliable than those of other varieties. Its refractive index is 1.49 and its specific gravity 1.19. It cannot be boiled without risk of distortion, neither is it resistant to certain chemical agents such as alcohol and formaldehyde. 1 per cent. cetrimide however, does not affect the material, and lenses may be sterilized by immersion in this fluid for at least one hour, after which they are thoroughly rinsed in distilled water.

DEVELOPMENT OF THE ARTIFICIAL LENTICULUS.—The object of inserting the artificial lenticulus to date has been to restore the eye to its pre-cataractous state so that, if the other eye is normal or nearly so, the refraction of the two will be approximately equal and will permit the return of single binocular vision. A standard lens has therefore always been employed, though in the future it may be advantageous to design and manufacture lenticuli to individual specification to obtain post-operative emmetropia when both eyes are to receive intra-ocular lenses and where the pre-cataractous refraction is accurately known.

The design of an artificial lens to copy the human might at first appear relatively simple, but such is not the case. The living human lens is a complex structure made up of differing anterior and posterior capsules and various distinct layers in both cortex and nucleus. Since it is not homogeneous it has no constant refractive index, though the approximate calculation is 1.42. Its refractive power is uncertain and has been variously estimated by different authorities as from +16.01

dioptries (Tscherning) to +19.11 (Gullstrand) when accommodation is relaxed. Moreover it is doubtful if an artificial lens would occupy precisely the same situation in the eye as the natural one, and in a compound lens system of short focal length a small difference of position is clearly of considerable refractive moment.

The lenses* have each been individually cut and ground from solid Transpex I to fine limits of accuracy. It was decided, for ease of insertion and to avoid undue pressure on the ciliary region which might tend to cause both cyclitis and obstruction of the filtration angle, to make the lens 8.35 mm. in diameter, approximately 1 mm. less than the normal human lens. The earliest lenticuli were constructed with the anterior and posterior curvatures similar to those attributed to the normal human lens, *i.e.*, anterior curve radius 10 mm., posterior curve radius 6 mm. A peripheral notch was cut with an ampoule file on both sides in one area of the periphery so that the prosthesis could be firmly grasped with toothed forceps. This lens proved to be too strong, and to render the eye myopic. Experience was gained, however, as it could be in no other manner, and at the third attempt the present specification was achieved which is found to provide a close approximation to the effect of the natural lens in the eye.



FIG. 1.—Section of intra-ocular acrylic lens. Anterior surface upwards.

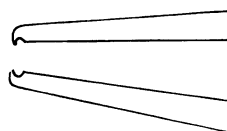


FIG. 2.—Profile of blades of lens-insertion forceps. Slotted tip firmly grasps grooved edge of acrylic lens.

SPECIFICATION OF THE ACRYLIC LENS.—The artificial intra-ocular lenticulus at present in use is made of fully polymerized polymethyl methacrylate, Transpex I (I.C.I.). It measures 8.35 mm. in diameter and 2.40 mm. in thickness. The radius of the anterior curve is 17.8 mm. and of the posterior curve 10.7 mm. (Fig. 1). At the periphery on both sides a circumferential groove is cut before polishing to permit it to be grasped firmly in forceps. The refractive power of this lens in air is +74 D but in a medium of refractive index 1.33, such as the aqueous fluid, it is +24 D. The dimensions are about 1 mm. less than those of the human lens, and it is clear that its anterior and posterior refracting surfaces cannot be in the usual positions within the eye and differ from those of the natural lens in relation to the cornea, the retina, and each other. It is found, however, that the compound system composed of cornea and acrylic lens closely and consistently approximates to the normal, as judged by the refraction of the other eye. The machine-cut peripheral groove is superior in accuracy to the original hand-cut linear slots, and has the great advantage that, if necessary, the lens could be removed from the eye at the time of insertion, or at a later operation necessitated by complications, the prosthesis being grasped with forceps at any region of the periphery instead of at only one. Special forceps† for inserting the lens (Fig 2) cause less obstruction and provide a firmer grip than the 5-toothed fixation-forceps originally used.

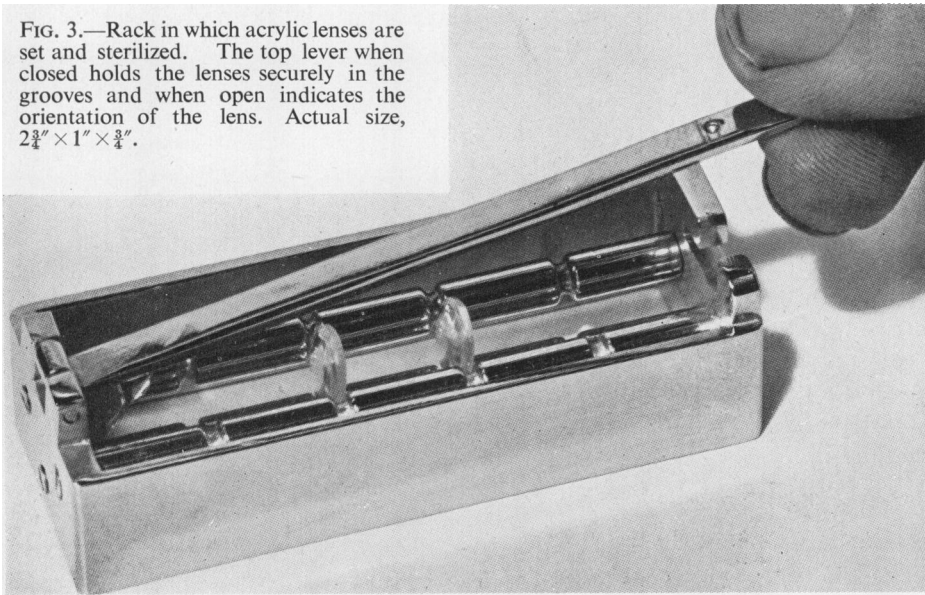
It is important that the lens be inserted with its less curved surface nearest the

* These lenses have been made throughout by Rayner and Keeler, Ltd., 100 New Bond Street, London, W.1.

† These forceps are manufactured by John Weiss and Son, Ltd., 287 Oxford Street, London, W.1.

cornea. This surface can be distinguished in profile if the lens is held in forceps, and a useful check is to observe reflections on it from a source of light such as a window or the operating lamp. Two reflections are seen, one from each surface of the lens ; when these are markedly dissimilar in size the less curved anterior surface is in front, when nearly similar the posterior. A special metal rack* has also been designed, in which the prostheses may be sterilized in 1 per cent. cetrimide, thoroughly rinsed, and held undamaged in position until required (Fig. 3). It is advisable to set two correctly orientated lenses in the rack in case one should be dropped. If the lens is not set beforehand it may be difficult to distinguish the anterior surface rapidly during the operation and a mistake would be serious.

FIG. 3.—Rack in which acrylic lenses are set and sterilized. The top lever when closed holds the lenses securely in the grooves and when open indicates the orientation of the lens. Actual size, $2\frac{3}{4}'' \times 1'' \times \frac{3}{4}''$.



TECHNIQUE OF CATARACT EXTRACTION AND INSERTION OF ACRYLIC LENS

Extracapsular cataract extraction is at present recommended, though the intracapsular technique has been used successfully in two cases. The pupil should be dilated to at least 5 mm. diameter with homatropine only. Full dilatation is by no means essential, for the curved edge of the acrylic lens will widen the iris aperture. Procaine 4 per cent. is injected over the neck of the mandible to block the upper branches of the facial nerve which supply the orbicularis muscle, and a simple lid stitch is inserted to ensure closure of the eye after operation. Anaesthesia is provided by 4 per cent. cocaine drops, no retrobulbar injection being required. Two half-depth corneo-scleral mattress sutures are inserted and an otherwise normal cataract section is cut, including where possible a small conjunctival flap (the writer does not in ordinary extractions find any sutures desirable). Very careful and complete removal of the central anterior lens capsule is effected with toothed capsule-forceps and, after expression of the lens nucleus, all cortical remnants are thoroughly removed by irrigation with normal saline. If it is decided that the posterior capsule has been completely cleared, the acrylic lens may be inserted forthwith ; if not, it is advisable to close the eye and to insert it at a second operation some weeks later. Assuming that the posterior capsule has been cleared, the acrylic lens is grasped by its

* These racks are manufactured by Rayner and Keeler, Ltd.

peripheral groove with the special forceps and removed from the lens holder with its anterior surface upwards. The corneo-scleral section is opened by an iris repositor held in the surgeon's other hand, and the acrylic lens is guided into the eye downwards and backwards with a slight side-to-side movement so that it enters the pupil, and partly lies beneath the lower portion of the iris (Fig. 4). The forceps can then, and only then, be relaxed, and the lens is steadied by the repositor while the sides and upper portion of the iris are manipulated over it with the point of a hook* or cystitome (Figs 5 and 6). Final centring is effected by external pressure on the cornea and sclera by iris repositors. A small peripheral iridectomy is now made, and, after a final irrigation of the anterior chamber, the corneo-scleral sutures are tied. Penicillin is instilled; it is no longer considered generally necessary or advisable to use miotics, and both eyes are padded for 48 hours. The patient is allowed out of bed on the third or fourth day and the sutures are removed on the eighth day. Even pressure by the muscular iris, almost comparable to gravity, keeps the light lens securely upright in the patellar fossa.

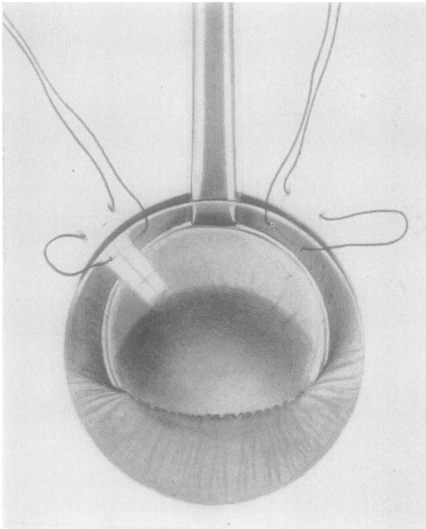


FIG. 4.—Insertion of acrylic lens beneath lower part of iris.

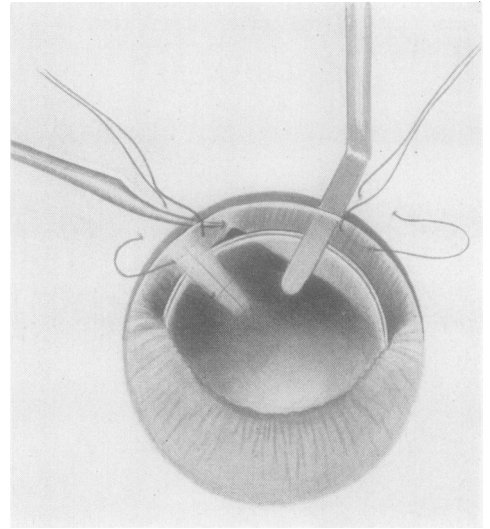


FIG. 5.—Upper part of iris hooked in front of acrylic lens, which is held steady by an iris repositor.

COMPLICATIONS.—The operation is clearly more difficult than plain cataract extraction, but the improved technique described is within the power of an ophthalmic surgeon with good experience. Very little trouble has, so far, been encountered, even with two intracapsular extractions in which vitreous loss might seem not improbable.

The key to success is to insert the lens through the pupil and beneath the lower portion of the iris. If the forceps grip is relaxed when the entire lens is still in the

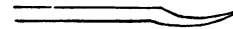


FIG. 6.—Iris hook. This resembles a Moorfields cystitome but has no cutting edge. The platinum stem can, if necessary, be bent to any shape to manipulate inaccessible regions of the iris.

* Obtainable from John Weiss and Son, Ltd.

anterior chamber it is advisable to re-grasp and insert it again, for manipulation of the lower portion of the iris over the lens, though feasible, is very difficult. The special iris hook has a platinum stem which may be readily bent to facilitate this manoeuvre if necessary. Judging by present results, there seems to be no risk that the lens, once properly inserted, will dislocate. It is, in fact, surprising how little the refraction alters once the eye has healed, for even a slight tilt of a powerful lens would inevitably produce marked astigmatism.

There is clearly a danger that the posterior capsule may thicken or wrinkle and require capsulotomy as in simple extracapsular extractions. This is relatively unlikely if a large area of anterior capsule is removed and great care is taken to wash away all cortical remnants. It should be remembered that the middle of the posterior capsule, which unlike the anterior is a simple hyaline membrane, is exceedingly thin—having a thickness of only 4 microns. Furthermore, the presence of the acrylic lens tends to keep it taut and free from wrinkles. In only one case to date has it seemed advisable to divide the posterior capsule. This was in an early case in which the lens employed proved to be too thick and powerful. Capsulotomy was performed by inserting a Ziegler's knife through the sclera well behind the lens, and by cutting from behind forwards under direct observation through the pupil. There is clearly some risk of scratching or dislocating the acrylic lens and fortunately there has so far been no need for this operation on other cases. If posterior capsule thickening is feared, central capsulotomy might be performed before the lens is introduced.

Two surgical misfortunes have to be reported. In Case 1, in which too large a lens was inserted and corneo-scleral sutures were not used, an iris prolapse occurred. By good fortune, however, the eye settled and is capable of seeing 6/18, though only with the aid of a strong concave spectacle lens in addition. In Case 15, a somewhat feeble old man of 75, the corneal section failed to unite in the usual time, and when the sutures were removed the aqueous was lost; this caused the iris to adhere to the wound and led to the formation of a "false filtration angle" and to glaucoma.

As with simple extracapsular extractions, slight serous iritis frequently follows the operation, and there is a tendency for the pupillary margin of the iris to adhere to the lens for a while and for exudate to be deposited on the middle of the anterior lens surface. This mild inflammatory phase is transient, however, and the fibrinous deposits disperse, especially if miotics are avoided and if subconjunctival cortisone is given. It is quite surprising how clear these eyes become and remain, and there has been no instance of persistent or recurrent iritis. Miotics, employed at first to prevent forward dislocation of the lens, are no longer considered necessary, for the presence of the prosthesis seems just sufficient stimulus to maintain iris tone and keep the pupil less than half dilated.

The two intracapsular operations were performed with some misgivings, for there was no membrane to prevent prolapse of vitreous or to line the patellar fossa and form a firm background against which the gentle iris pressure would be exerted. No trouble has, however, been experienced either at the operations or since, though the risk of lens dislocation as a result of minor trauma still causes anxiety.

RESULTS

So far 27 eyes have undergone this operation at St. Thomas's Hospital and Moorfields, Westminster and Central Eye Hospital since November, 1949. The early cases were carefully selected and only those in which the cataract was completely monocular were chosen. It was felt that these had less to lose should failure ensue and much to gain from success, for, in addition to freedom from the need for spectacles, the reward was restoration of binocular vision. The possible dangers of the operation were explained to the patients. As a result acrylic lenses were inserted in only eight eyes in the first 18 months but the encouragement provided by these early cases, observed for a considerable period, justified less stringent selection and the operation has now been performed on patients between the ages of 12 and 84 years. The 27 cases are tabulated on the opposite page.

The first two cases form a separate group, for not only was the operative technique untested but the acrylic lens, as already mentioned, was too thick and of too high refractive power. The first case, in which no corneo-scleral sutures were used, developed iris prolapse, but the other was technically satisfactory. Moderate acuity is now obtainable but only with the aid of a high concave spectacle lens which renders the result no better, though little worse, than that of a simple extraction of monocular cataract.

The remaining 25 eyes all contain an acrylic lens of the present specification, and only one, the old man of 75 (Case 15) whose section was slow to heal, has given trouble. The others are all successful in that binocularly the sight is better than with simple extraction alone. A more exacting criterion of success, however, is to judge the eye individually and not as one of a pair, to judge in fact the performance of the organ rather than the performance of the patient.

These 24 are surgically satisfactory and have central and circular or nearly circular pupils, lenses in good position, normal tension, and no active inflammation. In some, however, the presence of varying amounts of exudate and iris pigment on the lens surface still partly obstructs vision, but in every case improvement is occurring, and it is not beyond hope, though there is no certainty, that all will become clear in due course. So far two eyes can see 6/36 letters, one 6/24, three 6/18, two 6/12, five 6/9, five 6/6, and two 6/5. (One 6/36 eye is technically perfect with an intracapsular extraction but was found to suffer from myopic degeneration.) The four most recent cases have not yet been tested for acuity. Many of these eyes have undergone operation comparatively recently, and further improvement in acuity is confidently anticipated. With three exceptions, cataract extraction and acrylic lens insertion were performed at one operation. Of the two-stage operations, one was on a 12-year-old boy (Case 12) who had had an intra-ocular foreign body. Here an adhesion between the perforating wound of the iris and the underlying lens capsule causes some distortion of the pupil, but acuity of 6/9 is obtained and the eye is free from inflammation.

REPORTS OF 27 CASES OF ACRYLIC LENS INSERTION

Hospital	Case No.	Age and Sex	Date of Operation	Present Refraction and Acuity		Remarks
				Operated Eye	Other Eye	
<i>Series 1</i>						
S.T.H.	1	45 F	29.11.49	Left $\frac{-18.0 \text{ DS}}{-6.0 \text{ dc,}}$ ax 120-6/18	-0.25 DS-6/6	Iris prolapse. Eye now quiet.
M.W.C.E.H.	2	46 F	23.8.50	Right $\frac{-14.0 \text{ DS}}{-2.0 \text{ dc,}}$ ax 60-6/60	1.0 DS-6/5	Pre-operation iridocyclitis. Tension+
<i>Series 2</i>						
M.W.C.E.H.	3	59 F	17.11.50	Right $\frac{-10.0 \text{ DS}}{-1.0 \text{ dc,}}$ ax 90-6/18	-9.0 DS-6/12	Two-stage operation.
M.W.C.E.H.	4	58 F	17.11.50	Right $\frac{+4.0 \text{ DS}}{+1.0 \text{ dc,}}$ ax 135-6/12 part	$\frac{+2.25 \text{ DS}}{+0.5 \text{ dc,}}$ ax 90-6/5	
S.T.H.	5	41 F	1.3.51	Right $\frac{-1.5 \text{ DS}}{-1.5 \text{ dc,}}$ ax 60-6/6	unaided 6/5	
M.W.C.E.H.	6	32 M	6.4.51	Left unaided 6/24	+0.25 DS-6/5	Fundus clearly visible, should see more.
M.W.C.E.H.	7	50 M	20.6.51	Right unaided 6/18	unaided 6/5	Much pigment on lens, clearing.
S.T.H.	8	40 M	10.5.51	Right -0.5 DS-6/5	unaided 6/5	Right eye 6/6 unaided.
M.W.C.E.H.	9	59 M	24.7.51	Left $\frac{-1.5 \text{ DS}}{-1.5 \text{ dc,}}$ ax 90-6/5	+1.0 DS-6/5	
S.T.H.	10	62 F	25.7.51	Right $\frac{+0.5 \text{ DS}}{-1.0 \text{ dc,}}$ ax 180-6/9	$\frac{+0.5 \text{ DS}}{+1.5 \text{ dc,}}$ ax 90-6/9	
S.T.H.	11	63 F	25.7.51	Right $\frac{-1.0 \text{ DS}}{-2.0 \text{ dc,}}$ ax 75-6/6	-0.5 DS-6/6	
S.T.H.	12	12 M	8.8.51	Left $\frac{-1.5 \text{ DS}}{-1.5 \text{ dc,}}$ ax 90-6/9	unaided 6/6	Left traumatic cataract. Intra-ocular foreign body, 1947.
M.W.C.E.H.	13	80 F	10.8.51	Left unaided 6/9 part	+2.0 dc, ax 130-hand movements	Left cataract for acrylic lens.
S.T.H.	14	63 F	10.9.51	Right $\frac{+1.0 \text{ DS}}{+1.5 \text{ dc,}}$ ax 10-6/6	-1.0 DS-6/24	
M.W.C.E.H.	15	75 M	11.9.51	Left less than 6/60	unaided-6/60	Section gaped. Tension+
S.T.H.	16	65 M	17.9.51	Left -1.0 dc, ax 105-6/6 part	$\frac{-1.0 \text{ DS}}{-0.5 \text{ dc,}}$ ax 30-6/9	
S.T.H.	17	73 F	19.9.51	Right $\frac{-9.0 \text{ DS}}{-3.0 \text{ dc,}}$ ax 60-6/36	-1.0 DS-6/12 part	Intracapsular extraction. Monocular myopia.
S.T.H.	18	49 M	20.9.51	Left -4.0 dc, ax 45-6/36	+0.5 dc, ax 90-6/12	Much pigment on lens, clearing.
M.W.C.E.H.	19	51 M	21.9.51	Left unaided 6/9	+0.5 DS-6/12	
S.T.H.	20	71 M	3.10.51	Right $\frac{-4.0 \text{ DS}}{-3.0 \text{ dc,}}$ ax 90-6/12 part	Less than 6/60	Intracapsular extraction. Left eye for acrylic lens.
M.W.C.E.H.	21	63 F	25.9.51	Left $\frac{-6.0 \text{ DS}}{-2.0 \text{ dc,}}$ ax 135-6/9	$\frac{-6.0 \text{ DS}}{-5.0 \text{ dc,}}$ ax 45-6/12 part	
S.T.H.	22	60 F	29.10.51	Right $\frac{-2.5 \text{ DS}}{-1.5 \text{ dc,}}$ ax 100-6/6	$\frac{+0.5 \text{ DS}}{-1.5 \text{ dc,}}$ ax 30-6/9	
M.W.C.E.H.	23	82 F	6.11.51	Left +1.5 dc, ax 90-6/18	$\frac{+3.5 \text{ DS}}{+2.0 \text{ dc,}}$ ax 90-6/12	Much pigment on lens, clearing.
S.T.H.	24	84 F	3.12.51	Right not yet tested	Less than 6/60	
S.T.H.	25	82 M	13.12.51	Right not yet tested	Less than 6/60	Right eye distinguishes faces clearly now.
S.T.H.	26	84 F	17.12.51	Left not yet tested		Acrylic lens in second eye.
M.W.C.E.H.	27	74 F	21.12.51	Left not yet tested		

With the acrylic lens, the refraction is usually within 2 dioptres of the other eye, and often much less, a difference quite compatible with binocular vision. In some cases the spectacles worn before cataract developed can be used again with fair acuity (6/12). There is naturally no post-operative rivalry between the two eyes and patients generally appreciate binocular vision as soon as the acrylic lens eye can be used. The best result obtained, which may not be surpassed, is 6/6 unaided and 6/5 with — 0.5 D sphere.

DISCUSSION

It is now known that it is possible to insert an artificial lens into the human eye and to retain it accurately in position, without giving rise to inflammation or to glaucoma, for at least 2 years. A satisfactory lens specification seems to have been evolved, though this may undergo modifications in the future. It is now possible, where the other eye is normal or relatively normal, for binocular vision to be regained with no external refractive aid or only slight assistance, and ordinary cataract patients need no longer suffer the disabilities inseparable from the use of very strong glasses. It is too soon, however, to claim that this operation, like others before it, renders earlier technique obsolescent, though this would not appear to be impossible. The early experimental stage has passed but over-confidence is certainly unjustified; simpler methods will continue to give adequate results and inevitably, from time to time, serious accidents may occur with the new operation, as in every branch of surgery. The new technique with future modifications may well be the best that can be evolved until biochemical and endocrinological research eventually teaches us how to prevent cataracts developing.

SUMMARY

A new operation is described whereby an artificial lenticulus is inserted in the eye after cataract extraction. Excellent function can be obtained, and a lens has been known to remain in position without causing inflammation for at least two years.

My thanks are due to Mr. J. Pike of Messrs Rayner and Keeler Ltd., for his assistance in the design and manufacture of the acrylic lenticuli and lens rack, to Mr. A. G. Voigt of Messrs John Weiss and Son, Ltd. for constructing the lens-insertion forceps and iris hook, and to Imperial Chemical Industries for providing suitable polymethyl methacrylate. I am also indebted to Col. F. R. B. Skrimshire for carefully determining the refraction and acuity of every case. Miss J. Trotman kindly made drawings of the operation.

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