

HISTOPATHOLOGICAL STUDIES OF EYES ENUCLEATED AFTER FAILURE OF INTRA-OCULAR ACRYLIC LENS OPERATIONS*

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SINCE Ridley (1951) described his operation, there has been considerable interest and speculation about the possible reaction of the human eye to the presence of an acrylic lenticulus. The clinical impression has been that a certain amount of irritation occurs, as evidenced by frequent iridocyclitis and almost invariable pigment disturbance, but a difference of opinion appears to exist as to the seriousness of these features and as to whether they are caused by trauma at operation, by the irritating mechanical effect of the presence of an intra-ocular foreign body, by the plastic material itself, or by the liberation from the plastic material of previously absorbed antiseptics.

Despite a wealth of clinical contributions (Arruga, 1951; Charamis, 1952; Anton, 1953; Arruga and Arruga, 1953; Cavara and Ciotola, 1953; Jonkers, 1953; Silván Lopez, 1953; McLean, 1953; and many other authors), descriptions of histopathological material are scanty. Theobald (1953) described a slide she had seen of one of our specimens and gave her opinion that the inflammatory response was most marked around the site of the lenticulus and was "an answer to the insult of the irritating acrylic lens". This view, however, remains speculative, and many workers in the field of orthopaedic surgery report excellent tolerance of acrylic material by the tissues (Judet and Judet, 1952; Cherry, 1953; Bingold, 1954; Heck and Chandler, 1954). Henrichsen, Jansen, and Krogh-Poulsen (1952) found that acrylic monomer was highly toxic to animal tissues, but that methyl methacrylate (Metex) was tolerated with no inflammatory response. Finlay and Romaine (1954) described two small pieces of iris removed from eyes containing acrylic lenses and reported a non-specific round cell infiltration, slight in degree and accompanied by fibrosis.

Nine eyes enucleated following the acrylic lens operation have now been examined in this department. One was received in 1952, two in 1953, three in 1954, and three in 1955. Eight of the specimens originated from sources outside London and the remaining one from the London area. None was received from the Moorfields group of hospitals. It is not possible, therefore, on the basis of these cases, to give a statistical estimate of the failure rate as compared to that in conventional cataract extraction, since the number of satisfactory cases, which is probably considerable, is not known;

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nor is this the purpose of the present work, the aim of which is merely to describe the histo-pathological appearances of the specimens together with brief comments in conclusion.

Case Reports

Case 1.—The lens was inserted after extracapsular extraction of a traumatic cataract. The eye was enucleated 2 months later following iritis, seclusio pupillae, and an hypopyon.

The lens could not be removed from the specimen since it was firmly embedded and had to be dissolved in chloroform. Sections showed the space bounding the lens to be occupied by a pseudo-capsule of fibrous tissue in which many inflammatory cells including eosinophils and giant cells were present. This fibrous mass was adherent to the iris anteriorly and to the remnants of the cataractous lens posteriorly. The iris showed a well-marked disturbance of its pigment layer, a mild focal reaction was present in the choroid, and there was perivasculitis retinae and oedema of the optic disc (Fig. 1).

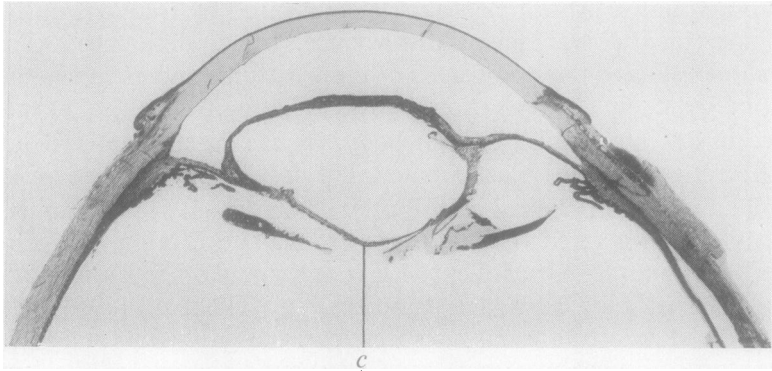


FIG. 1.—Anterior segment of eye of Case 1. Note fibrous pseudo-capsule (c) for the lenticulus which has been removed. ($\times 4$.)

Case 2.—An iris prolapse was abscised 6 days after an extracapsular extraction with lenticulus implant; a large haemorrhage occurred and enucleation was carried out 6 weeks later.

Sections showed marked infiltration of the region of the corneal wound with eosinophils, epithelioid cells, and round cells, and much fibrous tissue was present on both sides of the iris, across the pupil, and in the form of a pseudo-capsule for the lenticulus. This tissue was markedly infiltrated with inflammatory cells including eosinophils and contained numerous macrophages filled with pigment from the disrupted posterior pigmented layer of the iris. Perivasculitis retinae with a peripapillary retinal detachment was also present and a moderate inflammatory cell infiltration was present in the uveal tract (Fig. 2, opposite).

Case 3.—Panophthalmitis was diagnosed 36 hours after an extracapsular extraction with implant; a haemolytic streptococcus was recovered from the conjunctival sac. The eye was enucleated a month after operation, the acrylic lens having been extruded spontaneously shortly before.

Sections showed an unhealed limbal wound. The anterior chamber was filled with blood, pigment-laden macrophages, inflammatory cells including polymorphonuclears, eosinophils, and giant cells. A dense cyclitic membrane was present in which there were incorporated remnants of the cataractous lens, the iris was almost totally destroyed, inflammatory cell infiltration was evident in the remainder of the uveal tract, being most marked anteriorly, and the retina showed perivasculitis (Figs 3 and 4, opposite).

FIG. 2.—Equatorial portion of lenticulus “bed” of Case 2. Note dense mass of fibro-inflammatory tissue (*f*), disturbance of posterior pigmented-cell layer of iris (*p*), and imperfect healing of inner aspect of cataract section (*s*). ($\times 58$.)

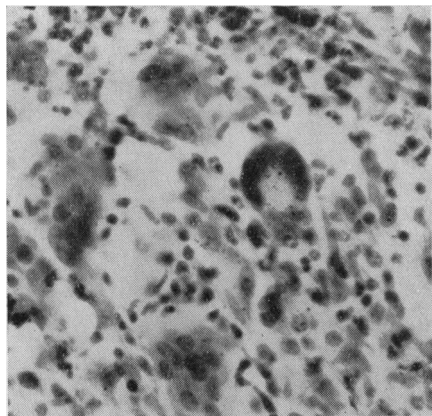
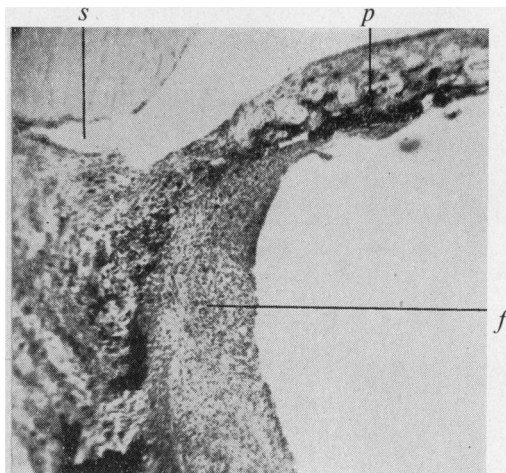


FIG. 3.—Giant cells in inflammatory exudate in anterior chamber of Case 3. ($\times 480$.)

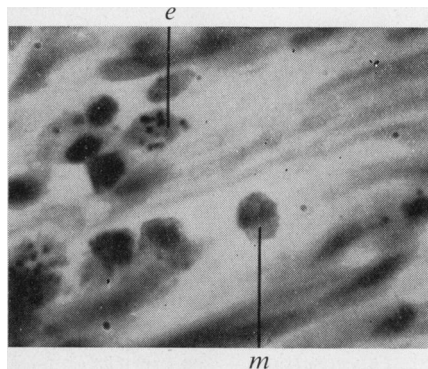


FIG. 4.—Eosinophil (*e*) and pigment-laden macrophages (*m*) in inflammatory exudate in anterior chamber of Case 3. ($\times 795$.)

Case 4.—Approximately 3 months after cataract extraction and lenticulus implant, the lenticulus was removed because of intractable cyclitis. This persisted and the eye was enucleated a month later.

Sections showed a mild inflammatory reaction of a non-specific character, disruption and migration of the pigment layer of the iris, keratic precipitates, iritis, and a cyclitic membrane. Eosinophils were present in small numbers near the base of the iris and in retinal perivascular infiltrates. The retina also showed moderate oedema.

Case 5.—The eye was enucleated for intractable iridocyclitis $3\frac{1}{2}$ months after extracapsular extraction and lenticulus implant.

Sections showed the anterior chamber to be almost obliterated and the filtration angle to be closed. A thin layer of fibrous tissue covered the anterior and posterior surfaces of the iris, occluded the pupil, and formed a pseudo-capsule for the acrylic lens. Disruption and migration of the posterior pigment of the iris was well marked, and dense deposits of the pigment were present in the pupillary membrane. Eosinophils and giant cells

were present but not very numerous near the remnants of the cataract lying behind the site of the acrylic lens. Retinal oedema and perivasculitis were present (Fig. 5).

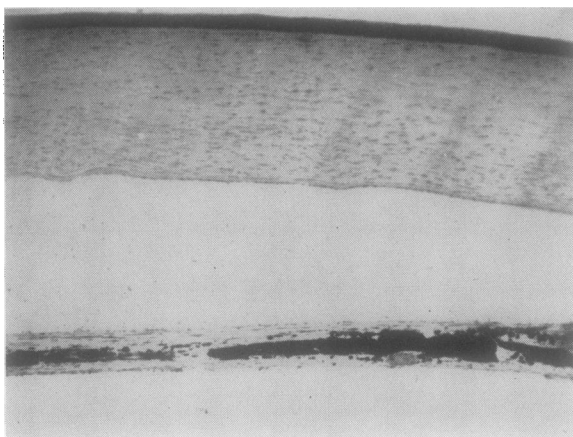


FIG. 5.—Photomicrograph showing densely pigmented membrane occluding pupil in Case 5. ($\times 35$)

Case 6.—One month after extracapsular extraction and lenticulus implant for traumatic cataract, iris bombé developed and the lenticulus was removed. This was followed by an appearance of epithelial downgrowth, and radiotherapy was given, but flare and keratic precipitates persisted and the eye was enucleated 5 months after the original operation. Sections showed fibrous tissue in the filtration angle and anterior chamber, and on the anterior and posterior surfaces of the iris, but no intra-ocular conjunctival epithelium was seen. The posterior pigment layer of the iris showed disruption and migration, many eosinophils were present in the fibrous membranes, and a retinal perivasculitis in which plasma cells predominated was also evident (Fig. 6, opposite).

Case 7.—The acrylic lens was removed from this eye because of glaucoma 19 months after its insertion. The eye was enucleated soon afterwards.

Sections showed considerable fibrous tissue formation in the anterior segment of the globe with *occlusio pupillae* and *iris bombé*. Plasmacytoid cells and polymorphonuclear eosinophils were numerous in a widespread uveitis, pigment from the posterior layer of the iris was scattered over its anterior surface and in the region of the occluded filtration angle, the retina was degenerate, and the optic disc was cupped.

Case 8.—An iridectomy was performed because of glaucoma 5 months after an extracapsular extraction and acrylic lens implant. The condition was not relieved and the blind painful eye was enucleated 20 months after the original operation.

Sections showed the usual dense fibrous pseudo-capsule, which was partially displaced towards and adherent to the distorted ciliary processes on one side. No reaction was present in the vicinity of the quite bulky cataractous remnants. The anterior chamber was largely obliterated by proliferating fibrous tissue containing many inflammatory cells, and a mild diffuse uveitis was present in which a few eosinophils were evident.

Case 9.—After the insertion of an acrylic lens this eye developed secondary glaucoma and iritis. A dense membrane necessitated retrolenticular capsulotomy and the lenticulus was eventually removed 7 months after its insertion. The eye remained irritable and was enucleated 18 months later, that is 2 years and one month after the insertion of the acrylic lens.

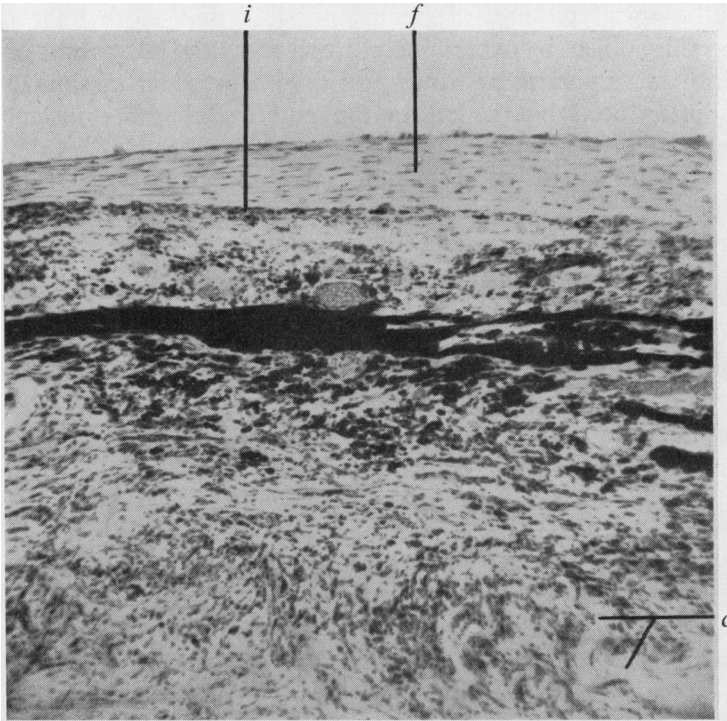


FIG. 6.—Case 6, dense fibrosis (*f*) on anterior surface of iris (*i*), disturbance and migration of posterior pigmented cell layer, and posterior to this a solid mass of fibro-inflammatory tissue in which lens capsule remnants are embedded (*c*). ($\times 86$.)

Sections showed scarring of the cornea and obliteration at one side of the filtration angle. A dense fibrous membrane incorporating clumps of pigment and lens remnants occluded the pupil, but inflammatory cells were not numerous and foreign-body giant cells were not seen. The retina showed ganglion cell atrophy and the optic disc was cupped.

Comment

The most prominent feature in this series is the invariable presence of a large amount of fibrous tissue in the anterior segment of the eye which is usually visible macroscopically as a pseudo-capsule for the lenticulus. Microscopically its anterior layer is adherent to the disorganized posterior aspect of the iris, in which pigment disturbance is a marked feature, and its posterior layer is usually but not always adherent to the remnants of the cataract.

Giant cells were seen in three specimens only, but eosinophils were found in all but one case, sometimes in enormous numbers.

The picture is frequently complicated by mechanical factors such as incarceration of iris remnants in the operation wound, or, as in one case, by frank infection, or, as in four other cases, by the prior removal of the lenticulus, so that it is difficult to establish the precise role played by the implant

in the pathological picture. It seems possible that more light might be thrown on this subject by experimental work or by the late results of another type of implant reported by Strampelli (1953) in which a similar type of plastic is introduced but is left in the anterior chamber instead of the posterior chamber of the eye.

It seems true to say at the moment, on the basis of this report, that proof of the irritating nature of the material of which the lens is made (fully polymerized polymethyl methacrylate; Transpex 1) is not yet available, since the factors of mechanical irritation or antiseptic irritation have not been excluded. It is notable, however, that one pathological change which is present in all the specimens, namely the deposition of fibrous tissue in the immediate vicinity of the acrylic lens, does not seem to be influenced by the time during which the lens remains in the eye. In the three last cases in which the implant had been retained for longer than 6 months there was no increase in fibrous tissue, as compared with the previous six cases in which the lens had been retained for shorter periods. It is tempting, therefore, to speculate that the noxious stimulus causing the fibrotic reaction may not be the lens itself, for, if it were, an increase of fibrous tissue formation would be expected in the longer-term cases. The findings suggest rather that the stimulus is possibly some substance adherent to or part of the acrylic lens, which having been liberated and having caused an inflammatory response, becomes expended. In this connexion it is of particular interest to know to what degree the acrylic material absorbs cetrimide 1 per cent., the anti-septic recommended by Ridley (1953) for sterilizing the acrylic.

There is no doubt that the fibrosis of the anterior segment of the globe is the specific pathological change in these cases, and if it could be avoided by the use of alternative methods of sterilizing the lenticulus, a considerable advance would have been achieved.

The question also arises whether the appearance would be similar in a successful case, since it must be remembered that the present series consists of unsuccessful cases only and therefore tends to give an unduly gloomy picture. Dr. G. Saubermann of Basel has very kindly given me information about such a case, in which the eye became available for examination through the death of the patient (Rintelen and Saubermann, 1956).

In this successful case there was, as in the present series, a fibrous membrane, containing pigment particles, adherent to the posterior surface of the iris and to the anterior aspect of the lens remnants.

Summary

The literature concerning Ridley's acrylic lenticulus operation is mainly confined to descriptions of surgical results and clinical impressions with few histological contributions. The present paper contains histo-pathological descriptions of nine eyes enucleated after the implantation of an acrylic lenticulus. Fibrosis in the vicinity of the lenticulus is the most prominent

pathological change and a suggestion as to the possible mode of its causation is put forward.

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