

COMPARISON OF INTRACAPSULAR AND EXTRACAPSULAR TECHNIQUES WITH INTRAOCULAR LENSES

HENRY HIRSCHMAN

Long Beach, U.S.A.

It is a great pleasure to be in Bogotá again. I came once before to visit the Instituto Barraquer only, and was pleasantly surprised to see what a lovely city was, but the Institute and its incredible director, José Barraquer, would have been more than enough to justify the visit. We have come together, ophthalmologists from all over the world, to present our work, to exchange ideas, and to study with each other, but we are here because of the towering genius and incredible energies of José Barraquer, and I am honored to be on this program. I salute doctor Barraquer. We are in debt to him for more than you may realize, in addition to the advances he has made to the microsurgery of the anterior segment with his microscope, instruments, and techniques. His tireless, dedicated, continuous animal surgery has single handedly kept the rabbit population under control.

In this brief presentation, one cannot outline the history of intraocular lenses; much will have to be assumed, but at least one major point can be brought about. LENS implant surgeons are strongly moving towards extra-capsular cataract extractions. I think that those who do not do lens implantations will soon recognize the reason for this trend. The first intra-ocular lens required a meticulous planned extra-capsular cataract extraction when it was done by Harold Ridley in 1949. That 200 miligram lens was much too large to be supported by the posterior capsule and minor dislocations allowed it to rest on the ciliary body, therefore causing a chronic cycnitis, or to close off the angle by resting on the iris root, or to cause a secondary glaucoma, or to cause iris atrophy or corneal dystrophy, but worst of all,

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when the posterior capsule gave way and dislocations occurred into the vitreous the result was usually a lost eye. When capsular fixation did take place, and it did in the majority of cases, these lenses proved to be most useful. Many are still giving their bearers good vision after 20 years and more. The lens is significant in that it initiated the concept of pseudophakia and it proved the long term tolerance of pure methyl methacrylate. Dislocations were so feared that the next lenses were designed so as to make dislocations impossible. Rigid one-piece methyl methacrylate angle-supported lenses were developed by Strampelli, Choyce, Ridley, and others. Anterior chamber lenses with flexible supports in the chamber angle were developed by Danheim, Leib, and Joaquín Barraquer. It was possible to insert a lens either as a primary procedure at the time of the cataract extraction, as Ridely prefers to do, or secondary implantation after the eye has recovered from the cataract extraction and the refraction is known, as is preferred by Choyce. There were a great number of these lenses and all of us I'm sure are familiar with disasters that occurred with their use. Particularly tragic is the experience of Joaquín Barraquer, whose great gifts as a surgeon were not enough to overcome the inherent defects in these early lenses. He fell victim to his early enthusiasm and used several hundreds of the angle supported lenses in the 50's and early 60's, only to realize to his dismay that most of them were going to have to be removed and many of the eyes were lost. That so great a surgical calamity should befall a man whose surgical skills have few peers compounded the disaster. It was indeed the experience of Joaquín Barraquer that cooled the enthusiasm of most ophthalmologists around the world for a decade.

A few persisted with the intriguing idea. The concept of iris support for the lens was first advanced by Edward Epstein of Johannesburg with this modified Ridley lens. It was in the shape of a pulley wheel with a slot designed to accommodate the iris. The demanding role of the iris was to support this monster but the weight of the lens was overpowering. Very few used, it perhaps less than a dozen, for it was abandoned in favor of the Maltese Cross Lens also designed by Edward Epstein. This lens was introduced in the U.S. under the name of the Copeland lens in 1967. It received an extensive clinical trial which was marvelously well documented in a cooperative study headed by Norman Jaffe & the Bascom Palmer Eye Institute. I have used very few of these lenses and will defer a comment on them to those who have greater experience. My objections to this iris-plane lens are: it causes a relative pupillary block; it has a wide area of iris contact and therefore, a very low-grade iritis; there is pressure and ultimately

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pressure atrophy of the iris, and macular edema occurs in approximately 10% of cases.

The iris clip lens of Binkhorst was developed in 1957 and used in 1958. The results reported by Binkhorst with this lens were so encouraging that I began to use it in 1967. I am not by nature a patient man, yet I waited and watched the development of intra-ocular lenses 8 years before doing my first case. Hardly a reckless plunge. This lens is intended for use with intra-capsular cataract extractions. It can be used with extra-capsular cases but in extra-capsular cases the anterior loops are superfluous and Binkhorst designed the 2-loop lens for that purpose. The problems associated with the Binkhorst Iris Clip lens were dislocation and corneal touch leading to dystrohy. Rare but disturbing cases. In order to avoid the possibility of loop touch it was desirable to design a lens that had no loops in the anterior chamber. This followed Jan Worst's concept of suturing the lens in place. Mackensen had been using Tübingen nylon for the repair of sphincterotomys and sutured the iris' with that material a decade before it was used to suture lenses in place. At first, the 4-loop lens itself was sutured to the iris which made it unnecessary to use Pilocarpine and this avoided the occasional iritis from mechanical irritation that Pilocarpine caused. Another problem with the use of Pilocarpine is sphincter erosion. Once the lens was sutured to the iris no miotics were necessary. But neither were the anterior loops. The posterior loops were to prevent anterior dislocation and the anterior loops were to prevent posterior dislocation but once the lens was sutured there was no need for anterior loops. Since anterior loops were capable of touch with its serious consequence it was a great step forward to modify the lens design in this way. Here are a few preliminary steps in this development. I suture the body of the lens to the iris through 0.1 mm. holes. All I can say for this concept is that it is possible to do so but it is very much like catherizing a cockroach and I gave it up. The lens that utilizes this concept efficiently and effectively is the Medallion Lens of Jan Worst manufactured by Medical Workshop. It is one of the most popular lenses ever devised and has received extensive use. I have used several hundred of these lenses and Jan Worst has used close to 1,000. One defect in the concept with this lens is that one is dependent on a fine nylon suture. I never trusted 23 micron nylon and have been using 9-0 supramid which I believe will last many years. I have had one suture failure which I believe was from suturing the lens too tightly and I believe the suture failed because of chaffing and not because of some inherent flaw in the suture itself.

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In 1963 Binkhorst started to do lens implants after extra-capsular procedures. He designed a 2-loop lens that was called the irido-capsular lens because it was designed to be held in place by adhesions between the iris and the lens and between the iris and the capsule and the lens loops and the capsule. These did occur and kept the lens from dislocating but it was not a very elegant appearing eye, and the pupil would not fully dilate.

With the development of phakoemulsification in the United States, the extra-capsular procedure came into its own. It had long been recognized that the extra-capsular was a very useful procedure to avoid retinal detachments in myopes, and to protect corneas from vitreous touch. In addition to these advantages, preserving the posterior capsule and remnants of the anterior capsule provide the firmest possible support for an intra-ocular lens. Under microsurgical techniques with either a planned extra-capsular or a phakoemulsification, remnants of the anterior capsular are preserved and the lens loops are inserted in the cleft between the anterior capsule and the posterior capsule. Adhesion occurs between these capsule remnants, trapping the lens. This fixation occurs usually in 3 or 4 days. I have a series of slides here illustrating the dilatation that has taken place on the 5th post-operative day. This allows for a lens that is permanently centered, that has no dependence on pupil size, that permits full dilatation of the pupil and examination of the posterior pole. Pilocarpine is used only for 4 days post-operatively.

The major advantages of extra-capsular procedures center around the better control of the vitreous. When detachments occur, after an extra-capsular cataract extraction, they are rarely if ever, of the typical aphakic type with multiple small holes in the periphery. Unfortunately sometimes the peripheral capsule loses its transparency and examination of the far peripheral retina may be difficult. Some retinal surgeons would prefer us not to do extra-capsular for this reason.

I well remember the debate that raged in the early 60's about round pupil cataract extraction vs sector iridectomies. At that time the retinal detachment surgeons were begging us to return to the wide sector iridectomy approach so that if a retinal detachment did occur it could be more readily treated. Castroviejo answered that most succinctly by saying that the kind of cataract extraction you do is determined by the complications you wish to treat. If you wish to protect the cornea then you do a round pupil extraction, if you wish to protect the retina then you do a sector iridectomy. The logic of doing 100% of your cases one way to avoid a complication that

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occurs in 2% of cases is difficult to accept. Besides, our retinal detachment men seem to have learned how to work with round pupils and the results of retinal surgery today is far better than even the most optimistic predictions of a decade ago. Similarly I would say that while overwhelming statistical evidence is not available to support this contention, it is a firm clinical conviction on the part of many lens implant surgeons that retinal detachments occur with significantly less frequency after extra-capsular cataract extraction than they do after intra-capsular extraction. Furthermore, even with an undilatable pupil the majority of retinal detachments can be successfully treated. We are therefore asked to modify our technique for the potential benefit of one patient in perhaps 500.

A very real problem in cataract surgery is the occurrence of macular edema. After intra-capsular extraction, macular edema occurs in a highly significant number of cases. Studies involving routine fluorescein angiography of all cases shows at least a transient macular edema in as high as 70% of cases. Preliminary studies by Jaffe would indicate that the presence or the absence of an intra-ocular lens of the Binkhorst type does not significantly affect the incidence of macular edema. It is however, sharply reduced where extra-capsular cataract extractions have been performed.

In my overall series of intracapsular extractions with lens implants, clinically significant macular edema occurred in 3.5% of cases; with extra-capsulars it is barely 1%.

Retinal detachments occurred in just over 2% of intracapsulars and again 1% of extracapsulars.

SUMMARY

One major point about intra-ocular lenses is that lens implant surgeons are strongly moving towards extra-capsular cataract extractions.

In 1949 Ridley's first intra-ocular lens required a meticulous planned extra-capsular cataract extraction. The 200 miligram lens could not be supported by the posterior capsule. Minor dislocations allowed it to rest on the ciliary body, causing chronic cyclitis, or to rest on iris roots, causing closure of the angle secondary glaucoma, iris atrophy, or corneal dystrophy.

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When the posterior capsule gave way, causing dislocations in the vitreous, the result was usually a lost eye.

However, in the majority of cases, capsular fixation did take place resulting in good vision for their bearers, 20 years and more later. This proves the long time tolerance of methylmethacrylate.

Fearing dislocations, Strampelli, Choyce and others, produced rigid one-piece angled support lenses, while Joaquín Barraquer and others introduced lenses with flexible supports in the chamber angle.

Ridley preferred insertion of the lens at the time of the cataract extraction, and Choyce's preference was to do the implantation after recovery from the cataract extraction, and the refraction was known.

Joaquín Barraquer, a gifted surgeon, after using several angle-support lenses in the 50's and early 60's, was led to dismay by the defects in these early lenses. Due to his tragic experience, many of the ophthalmologists around the world lost enthusiasm for a decade. A few persisted, and a modified Ridley lens was introduced by E. Epstein. Few were used due to the demanding role of the iris in supporting the heavy lens, and was abandoned for the Maltese Cross lens, also a design of Epstein.

In 1967 it was introduced in the U.S. as the Copeland lens. Doctor Hirschmann's objections to this lens are: It causes a relative pupillary block, it has a wide area of iris contact, and there is pressure atrophy of the iris and a macular edema in approximately 10% of cases.

In 1951 the iris clip lens was developed by Binkhorst. It is intended for use with intra-capsular cataract extractions but it can be used with extra-capsular cases. Dislocation and corneal touch leading to dystrophy, occurred. To avoid loop touch it was necessary to design a lens with no anterior loops. Tubingen-Nylon was then used to suture the lenses in place. At first the 4-loop lens was sutured to the iris. With this, Pilocarpine was not necessary, avoiding iritis and sphincter erosion; miotics were not necessary and neither were anterior loops.

In 1963 Binkhorst began doing lens implants after extra-capsular procedures. The 2 loop lens, called the iris capsular lens, kept from dislocating, but the eye was not very elegant, and the pupil did not fully dilate.

Phakoemulsification has been recognized as a procedure to avoid retinal detachment, in myopes, and to protect corneas from vitreous touch.

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Major advantages of extra-capsular extraction are prevention of retinal detachments and better vitreous control. Sometimes the peripheral capsule opaquens and fundus examination becomes difficult. To avoid complications the logical way to operate is to perform 100% of the cases in the same way, with a resulting 2% complication. A problem in cataract surgery is the occurrences of macular edema, which is sharply reduced in the performance of extra-capsular extraction.

With lens implantation, retinal detachment occurred in 2% of intracapsulars and in 1% of extra-capsular.

J. M.