

**COMPERATIVE STUDY BETWEEN THE USE OF
ANTERIOR CHAMBER & POSTERIOR CHAMBER
INTRAOCULAR LENSES IN APHAKIA**

T H E S I S

**Submitted For Partial Fulfilment Of The
Master Degree In
OPHTHALMOLOGY**

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INTRODUCTION

INTRODUCTION

During the past few years one of the most controversial issues in ophthalmology has been the trend among a significant group of leading surgeons about the use of Intraocular lenses after cataract extraction.

What specific types of Intraocular lenses and cataract extraction techniques are the new trend now?, and why...?

What measures can be taken to obtain the best results and minimum complications?

This study is a trial to present the answers of these questions.

HISTORY OF
INTRAOCULAR LENSES

HISTORY OF INTRAOCULAR LENSES

The concept of replacing the crystalline lens of the eye with an optical device perhaps dates back to the eighteenth century. (Taleb, 1955).

Cassanova (1725 - 98) mentioned in his memoirs that Tadini, an Italian oculist suggested implanting an artificial lens after a cataract operation in 1764. Around 1795 Schiferli witnessed Casaamata of Dresden attempt to introduce a glass lens into the eye after a cataract operation. That glass lens immediately slipped back toward the fundus of the eye. (Ridley, 1962).

On November 1949 Harold Ridley reintroduced the intraocular lens (IOL). During World War II he recognised that Pilots in the Royal Air Force who had sustained penetrating injuries to the eye from the plastic windshields of their aircraft suffered no reactions to the immobile plastic material within the eye after the initial trauma had quieted. (Ridley, 1951).

On November 29, 1949, the dream of ophthalmic surgeons to restore normal functional vision to patients afflicted with cataracts grew a giant stride closer to realization. Ridley inserted the first IOL in the left eye of a 45-year-old female after an extracapsular cataract extraction (ECCE) at St. Thomas Hospital in London. (Ridley, 1952 a).

Ridley was performing an ECCE leaving the posterior capsule intact and the plastic lens was inserted into the fossa between the capsule and the iris. (Ridley, 1951).

The most important complications from these lenses were, posterior dislocation, iritis, secondary membrane and secondary glaucoma. (Ridley, 1952 b).

The early 1950's were the begining of a controversial era between proponents of intra- and extra-capsular surgeries and the optical correction with aphakic glasses, contact lenses and IOLs. (Ridley, 1951).

On May 23, 1952, the first Anterior Chamber Lens (ACL) was implanted by Boron of France. (Choyce, 1973).

Strampelli was the first to succeed in ACL. In December 1953, the original Strampelli lens was an (angle fixation) lens. (Strampelli, 1954)

It was also in 1953 that Dannheim in Germany, centered the ACL by elastic-supported loops of 0.1 mm. Supramid thread. (Dannheim, 1956).

Professor Zakaria Taher of Ain Shams University was one of the Egyptian Ophthalmic Pioneers who inserted IOLs (Ridley and Strampelli) which were also manufactured by himself in the early 1950's. He also designed a special forceps for handling Ridley's lens in 1955. (Munir and Charleux, 1980).

In 1956 the concept was that ACLs would likely prove to be the safest, most reliable and most versatile of the artificial IOL implants in existence. At the same year Choyce presented a modification of the Strampelli ACL, by increasing the radius of curvature from 12 to 14 mm. (Choyce, 1958)

Barraquer designed an ACL with flexible angle supported loops made with nylon 66 or Supramid. (Barraquer, 1956).

Binkhorst developed and introduced the iris-clip lens in Holland 1957 (Binkhorst, 1959).

In September 1958. Choyce presented the idea of colored and opaque ACLs to be used in cases of aniridia or traumatic iris loss. (Choyce, 1966).

In 1959 the term Pseudophakia was used by Binkhorst at the Oxford meeting to describe an artificial lens implanted into the eye. (Olmos and Roy, 1981 a).

By 1962 Barraquer has removed 55 implants of the 493 ACL cases he had done. Their main complication was endothelial corneal dystrophy. (Barraquer, 1962)

Fyodorov, in Russia designed several forms of lenses. He used a modification of the iris clip lens in 1964, with the anterior and posterior loops oriented 90 degrees to each other. Since 1968 he has used another modification with three posterior loops and three antenna like extensions having a small round knob at each end

placed anterior to the iris. It has been termed the Sputnik lens. (Fyodorov, 1965 @ 1972).

In January 1968, the first Copeland IOL implantation was completed in the United States by Binkhorst. Also Jaffe began lens implantation in Miami with an iris supported lens the same year (Olmos and Hoy, 1981 a).

Worst designed the Medallion lens in 1970. (Worst, 1971).

In 1974 it was Binkhorst opinion that although IOLs have been used more than 25 years there was still a general lack of understanding of the pertinent optical principles. A critical comparison was made between this new method and conventional methods of correcting Anhakia, from this it appeared that the usual needs of the patients are a decisive factor in the selection of the method. (Binkhorst, 1975).

Pearce first implanted his posterior chamber lens (PCL) in September, 1975. (Pearce, 1977).

In March 1977, Shearing began to use compressible; non-sutured lenses which stretched out completely to what is now called the ciliary sulcus. One year later Kratz also introduced the concept of slightly angling the loops forward to reduce the possibility of pupil capture (Shearing, 1984).

The procedure of ECCE was introduced by Daviel in 1745. (Binkhorst, 1984).

C L A S S I F I C A T I O N

CLASSIFICATION OF INTRAOCULAR LENSES

In order for an IOL to be implanted in an eye safely and remain there for many years, it is important that it be totally inert. The types of plastics that are used include polymethylmethacrylate (PMMA), polyethylene and polyamide. (Olmos and Roy, 1981 a).

The IOL generally is composed of two portions, an optical portion and a haptic one as described by Miller (1977).

I. The optical portion: -----

It can be biconvex or plano convex in shape, with diameter varying from 4 to 6 mm. Powers of these optical portions of the lenses vary from 10 to 25 diopters in aqueous. (Miller, 1977) .

Nowadays almost all IOLs are formed of PMMA which has a specific gravity 1.19, refractive index 1.49, light transmittance 90-92%, effectively transmits 100% of the argon emission wavelength of 418 and 514 nm. used for laser therapy, PMMA is also hydrophobic and may absorb up to 1.5% water. It is thermoplastic and has the ability to become viscous fluid at 160-190°C, below this it is solid. (Olmos and Roy, 1981 b).

II. The haptic portion: -----

Choyce (1975) considered the haptic portion as composed of the haptic part proper surrounding the optical

portion and the supporting feet, loops or clips if present. The haptic portion can be made either clear or colored opaque to match the contralateral iris.

The material from which the haptic portion is made differs in nature according to the type of implant, and it may be either:

- 1- Polyamide, Nylon 6 (or Supramid): has the advantage of being light and easily manufactured but with the disadvantage of being hygroscopic hence it is a source of weakness.
- 2- Polypropylene (Prolene): which has more advantages due to its increased stability and lessened hygroscopic properties.
- 3- Metal loops of platinum, platinum iridium, titanium or gold alloy. These metals are considered as inert ones. Their major disadvantage is causing iris sphincter erosion due to heaviness of these metals more than plastic.
- 4- Both the haptic and optical portions can be made from the same material.

*- Parameters of current loop lenses:

A study done by Fender (1977) showed that the diameter of the optical portion of the lens varies from 4.58 to 4.6 mm, the total diameter of the lens including the loops is between 7.75 and 9.05 mm., the central optical thickness of the lens between 0.50 and 0.80 mm. Finally the weight in air of the lens varies from 10.0

to 18.35 mg. the weight in aqueous from 1.73 to 9.87 mg. (Binkhorst, 1976).

The suitable definition of lens implants has been and still is confused because of variety and combination of locations for both the optical portion and the supporting structures of the lens implant. According to Rosen (1984) the suitable definitions may be as follows:

- 1- Anterior chamber lens (ACL): optic in the anterior chamber (AC) haptic supported by the angle of the AC.
- 2- Pseudophakic lens: optic in the AC and haptic clipped through the pupil.
- 3.A. Postpupillary lens: optic in the posterior chamber (PC), haptic supported through the pupil.
- 3.B. Postpupillary lens: optic in the PC, haptic clipped through the pupil but supported by the angle of the AC.
4. Posterior chamber lens (PCL): optic in the PC, haptic in the capsular bag or the ciliary sulcus. This study considers an ACL only that in which all portions are solely in the AC, similarly the PCL refers to one in which all components are in the PC and hence the study is confined only to these two groups of lenses.

The structures which support the optical portion of the lens may be rigid or flexible in constructions.