From the Pages of History

History of Intra Ocular Lens

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History

Human crystalline lens is a transparent structure in eye, which along with cornea helps in focusing of light on retina. As ageing occurs this transparency is lost leading to formation of cataract. Even though cataract surgery was practiced 2000 years ago, modern cataract surgery started only 50 years back. In the past opaque cataractous lens was removed leaving the patient with compro mised vision after surgery. Italian scientist Tadni in 18th century first considered intra ocular lens implantation. In 1795 Casamata implanted an glass intraocular lens with poor outcome.

In 1949, Sir Harold Ridley[1] first implanted the successful intra ocular lens in London. This was due to the curiosity of his student who commented to Ridley that he did not replace anything after removing the cataract. At the same time Ridley was treating many World War II fighter pilots who had shattered windshield of cockpit in eyes, which did not cause reaction as a foreign body. This made him use this material called polyethyl methacrylate(PMMA) for intra ocular lens which was found to be accepted well by the eye. This started the journey of IOL.

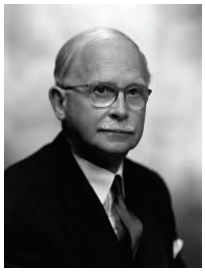
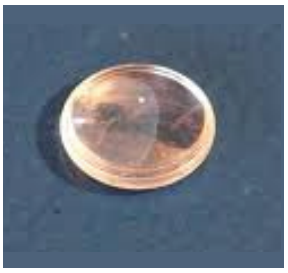


Fig1: Sir Harold Ridley



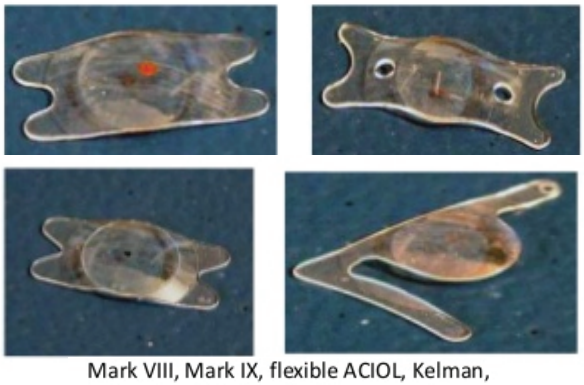
Ridley Posterior ChamberLens 1949

Development

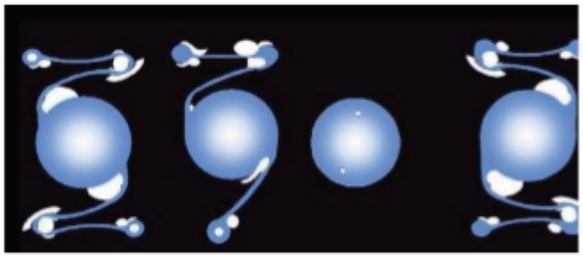
Development of IOL was with great success and disasters. Major development took place during seventies by Dr.Binkhorst, Dr. Worst in Europe and Dr.Shearings in America. They removed cataract leaving behind the lens capsule and implanting the IOL in the bag which improved the outcome dramatically. At the same Dr. Charles Kelman was developing phacoemulsification, a new method of removing cataract through a small incision which paved way for development of foldable lens which when implanted unfolds within the eye giving better visual outcome.

Improved surgical techniques led to the development of IOL. The generation in which it occurred is described as

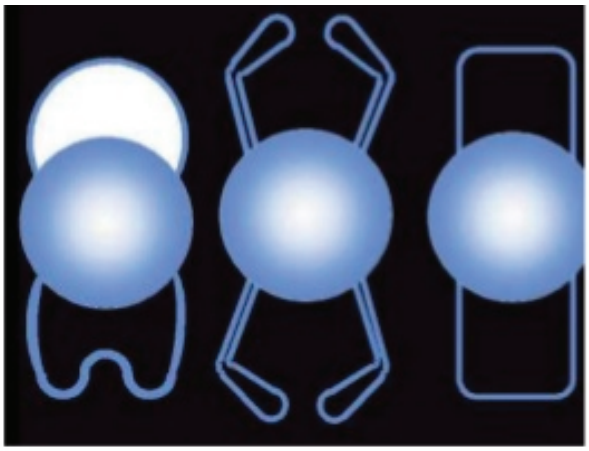
1st generation – Posterior chamber IOL
2nd generation – Anterior chamber IOL
3rd generation – Iris supported IOL2
4th generation – Anterior chamber Kelman IOL
5th generation - again Posterior chamber IOL
6th generation – from 1990 till date the newer IOL



Mark VIII, Mark IX, flexible ACIOL, Kelman, Kelman flexible tripod, Kelman quadraflex, Kelman multiplex 4 point fixation



Kelman multiflex AC-IOL (1982)
Kelman flexible Tripod AC-IOL (1981),
Intermedics Inc Dubroff AC-IOL (1981),
Modern, one-piece, flexible PMMA AC-IOL (Kelman design) with Choyce foot plates (various manufacturers).



Azar 91Z AC-IOL (1982)
ORC Inc Stableflex AC-IOL (1983)
Surgidev Inc Style 10 Leiske ACIOL (1978)

Fig 2: 2nd Generation IOLs

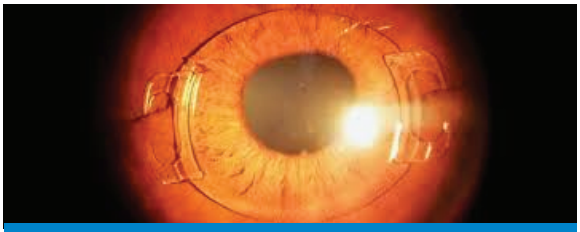


Fig 3: Kelman IOL

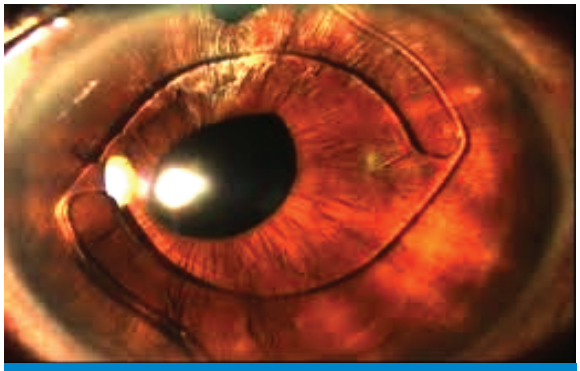


Fig 4: AC IOL

The search for ideal IOL is still on. IOL has evolved from replacement for cataractous lens to cosmetic refractive surgery. The outcome of surgery is determined by the pre and post operative astigmatism, and loss of accommodation due to the procedure. The patient after surgery has only proper distant vision with compromised near vision due to loss of accommodation.

Premium IOL

Newer premium IOL have redefined the way patient sees after surgery. The change from simple rigid PMMA lens which has to be implanted through a large incision to foldable lens being implanted through small incisions. These lenses are made of hydrophilic, hydrophobic acrylic material and silicone which can be folded or rolled.

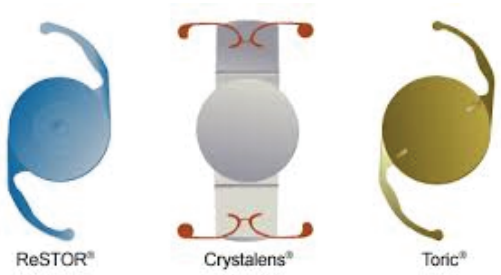


Fig 5: Premium IOLs

Aspheric lenses where the edges of lens are flattened to reduce the aberration induced by regular lenses, to lenses with yellow chromophores which prevents damage to eye by ultra-violet light. Toric[3] lenses are available which can overcome astigmatism and give clear vision with good contrast sensitivity. Multifocal lenses (Restor, Crystalens[4]) have redefined surgery leading to better distance, intermediate and near vision (fig5). Myopic patients with high refractive error can be corrected with Phakic[5] IOL which can be implanted over the normal clear lens leading to better vision (fig6). This has made IOL has refractive surgery counterpart.

Fig 6: Phakic IOL

Patients with low vision due to retinal problems can have telescopic IOL6 implanted which improve distant vision and used as low visual aids. This lens was first discovered by Dr. Lipshitz. He later modified this with mirrors to improve peripheral field and called it as Telescopic macular implant (fig7).

Fig 7: Telescostic IOL

Future

Light adjustable IOL have also rapid strides in improvement. After IOL has been implanted the curvature of the IOL can be altered by application of laser. The search for better IOL with youthful vision is still leading the charge.

References

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