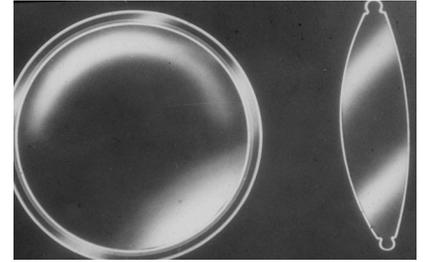


A Short History of the development of early lens implants by Piers Percival

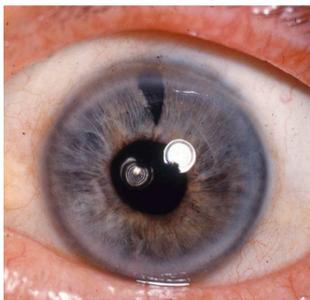


Harold Ridley

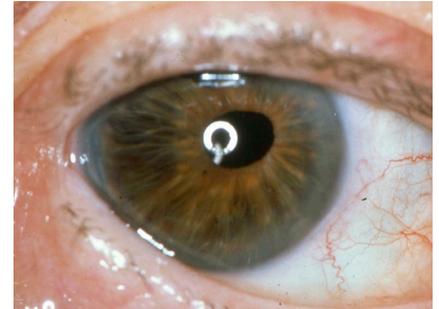
It was in the back of his Rolls Royce in Cavendish Square that Harold Ridley and John Pike of Rayner Opticians, first discussed the formulation of a lens for intra-ocular use. Ridley told me himself that he had used my grandfather's formulae (see A S Percival's *Optics*, 1899). The material was to be 'Clinical Quality' PMMA from Imperial Chemical Industries as it was known from surgery on eyes injured in the war that intraocular splinters from Spitfire and Hurricane windscreens (made by ICI) remained inert. So with John Holt from ICI on board, the first lens implant was made at the Rayner workshop at Brighton, on all three counts an entirely English product.



The Ridley Posterior Chamber Lens, 8.3mm in diameter, 2.4mm thick, RI 1.49, power 24D, slightly heavier than aqueous, first implanted at St Thomas' Hospital 29 November, 1949



(left) Ridley PCL implanted at St Thomas' Hospital, Feb 1951, photographed Nov 1960, CVA 6/6: this was one of the 8 cases to be reported of extracapsular cataract extraction (ECCE) with implantation at the Oxford Ophthalmological Congress in July 1951, the very first paper concerning implants to receive public attention.



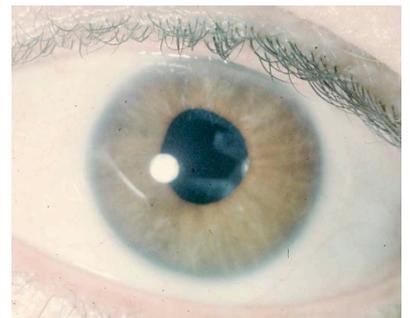
(right) Ridley PCL, the 3rd in the USA, by Turgit Hamdi in 1953, photo 1976 when VA 6/9.

However Harold had not thought it necessary to inform Sir Stewart Duke-Elder head of research at the Institute of Ophthalmology, of his research, and this led to outright opposition from all establishment figures at the Institute and at Moorfields Eye Hospital where he was also a consultant.

Peer opposition to lens implantation would soon become widespread and ostracism of many implanters the world over led to humiliation and bitterness: hostility from colleagues would also be compounded by complications that would inevitably happen.



Eddie Epstein of SA quickly became a disciple of Ridley and here is a Ridley lens implanted by him in 1952: a girl of 12 with traumatic cataract. She underwent capsulotomy in 1955 and was still seeing well half a century later (photo 1979).



Sadly Eddie was dismissed from Witwatersrand University, Johannesburg for continuing his lens implantations.

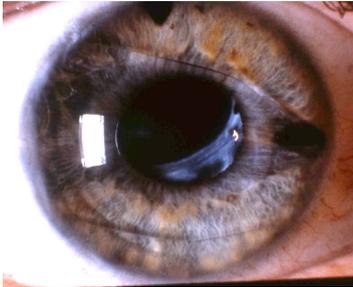
Anterior Chamber Lenses became popular particularly for ease of insertion as a secondary procedure or after intra-capsular cataract extraction (ICCE). Here are three of the pioneers outside the Eden Roc hotel, Miami Beach in 1960: Choyce of England, Strampelli of Italy, Barraquer of Spain.



Peter Choyce had become a Resident at Moorfields, City Road in July 1949 and worked with Ridley. By 1952 he was dearly wishing for a teaching hospital appointment but this was denied him, mainly through behind-the-scenes influence of Sir Stewart Duke-Elder.



Unfortunately there were many disasters, causing most surgeons to abandon implants. Dannheim (Germany) had introduced another ACL that was flexible and this is one example of a result from Finland inserted in 1962, later photographed with shallow chamber and scarred cornea.



Choyce Mark I ACL implanted 1956, photographed in 1981.

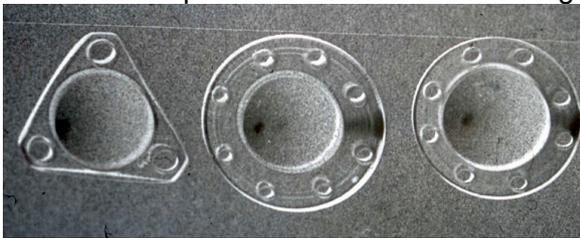
Peter Choyce was one of the few to persevere to keep implants alive in the late 50s and early 60s. Now of Southend, his fixed length ACLs with four feet modified from the Strampelli tripod, provided better stability than flexible lenses but even so some would lead to bullous keratopathy. He formed the International Intra-ocular Implant Club in 1966 with Ridley as President.



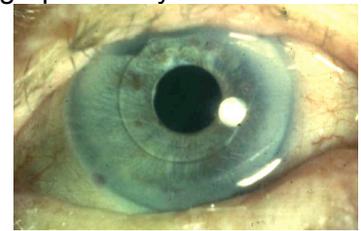
Peter Choyce

Modifications on his own lens continued with ultimately the Mark IX being introduced in 1977.

In 1954 Epstein modified the Ridley into various 'saucers' (below left) that would be much lighter, and in 1955 he developed the 'collar stud'. Below right is one from 1957 photographed 22 years later.



Epstein 'collar stud'



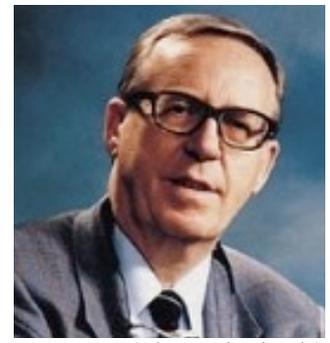
From the 'collar stud' Epstein developed in 1964 a Maltese cross design for ICCE and then came the 'Sputnik' iris supported lens of Slava Fyoderov (Russia).



Cees Binkhorst

In 1957 Cornelius Binkhorst (The Netherlands), invented the Iris clip lens with supramid loops and he implanted his first in August 1958.

Another pioneer was Jan Worst, a great character and ardent supporter of Binkhorst. In 1970 he introduced his iris claw lens initially for aphakia. This was a sutureless ACL, well back from the cornea, whose claws gripped the peripheral iris and provided better stability than the iris clip lens that would sometimes dislocate.



Jan Worst (The Netherlands)

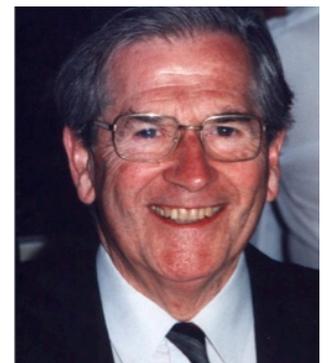
By 1964, with the advent of cryoextraction, the world was dominated by ICCE; implanters would try newly modified ACLs of which there were many, mostly with extravagant claims without sufficient assessment. There were still many disasters.



Charlie Kelman (USA)

In 1967 Charlie Kelman introduced phacoemulsification: cataract surgery could then become a two stage procedure with an ACL being inserted after the primary extraction through a smaller incision.

Michael Roper-Hall a founder member of the IIC and leader of microsurgery in the UK, had kept an open mind concerning implants. Then with a report from John Pearce on a large cohort of Binkhorst's patients with more than 5 years follow-up at Terneuzen, became convinced by 1971 that the iris clip lens was reliable and safe when coupled with ICCE.



Michael Roper-Hall

An iris suture to the upper loop improved stability, and this was later modified by Hung Cheng at Oxford to a peg, which slotted over the anterior loop of the lens through the iridectomy.

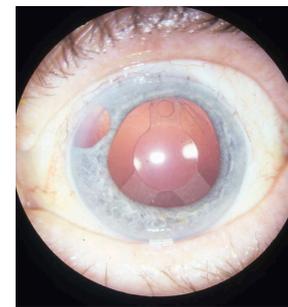
Piers Percival who had started with Ridley in 1962 and was with Roper-Hall 1970-1, moved to Scarborough in November 1971 and commenced Binkhorst implants a few months later. His First Scarborough Symposium took place in June 1975 when John was invited to speak on Binkhorst lenses and Manny Rosen who had little interest in lens implantation in the 70s, came to speak on Fluorescein Angiography.



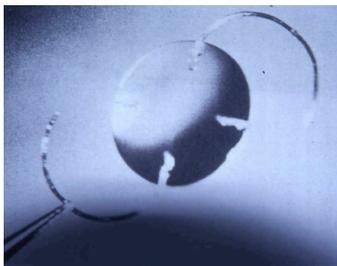
1975: after the Scarborough Symposium, a day by the sea, with Piers Percival, David Bowen, Alan Ridgway, John Pearce and family.

At this time there was a whisper led by Binkhorst, that ECCE was in fact safer than ICCE because of a reduced incidence of macular oedema, retinal detachment and keratopathy.

Also in 1975 John Pearce performed the following experiment: he detached the posterior loops of 15 Binkhorst lenses, reversed them and implanted the lens behind the iris with a suture in front after ECCE. He reported the results at the OSUK congress and developed his single piece posterior chamber tripod.

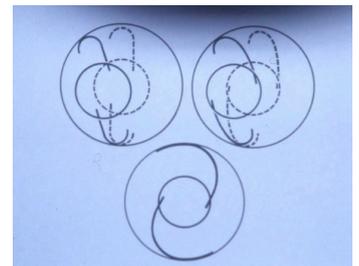


Surgeons were encouraged to switch to ECCE, another advantage being free movement of the pupil. The example shown is a Pearce sutured tripod from Scarborough in 1977.



Disinserted loops

Simultaneously in 1975 Bill Simcoe (USA) also removed the posterior loops of a Binkhorst lens but disinserted one end of each anterior loop for bag implantation in animals and humans. He mentioned this to colleagues in the USA in 1976: Shearing then patented in 1977 a new flexible PCL stating he was the first. An extraordinary legal battle followed, Shearing unfortunately winning as the inventor of the unsutured flexible loop PCL



'Shearing' v 'Simcoe'

Simcoe however won the argument on design showing how his 'C' loops improved stability and preserved the shape of the capsule.

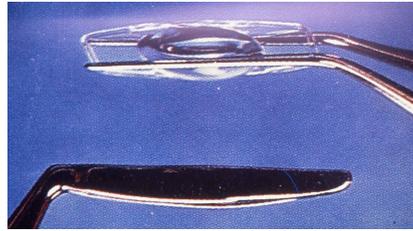
Meanwhile Eric Arnott who had started at Moorfields under Ridley, gained an appointment at Charing Cross Hospital, and when this moved in 1973 to Fulham, set up the ophthalmic services to include phacoemulsification. For a long time he was the only proponent of phako in the UK, mainly because of expense, and in 1976 he designed the Little-Arnott PCL for use after phacoemulsification. He was also the joint instigator of several international meetings where live surgery could be relayed to audiences of several hundred through CCTV.



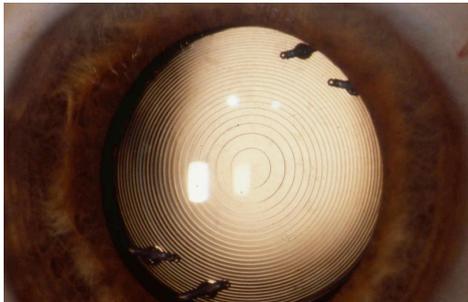
By 1978 although ECCE with a PCL was gaining favour in the UK, only about 5% of US surgeons were using PCLs, 30% ACLs; 65% were using iris or capsule support.

Viscoelastics for the anterior segment were commenced at Scarborough in May 1980, and promoted as Healon at the IIC meeting Singapore, Jan 1981. This gave a big step forward in improving the safety of lens implantation and most propitiously it was then the Chinese year of the rooster, Healon being a high molecular weight viscoelastic developed from the cock's combs of roosters!

Though Epstein had previously experimented with soft lens material using HEMA, in 1982 Tom Mazocco (USA) patented a foldable three piece silicone lens for phaco using this primitive Faulkener folder.

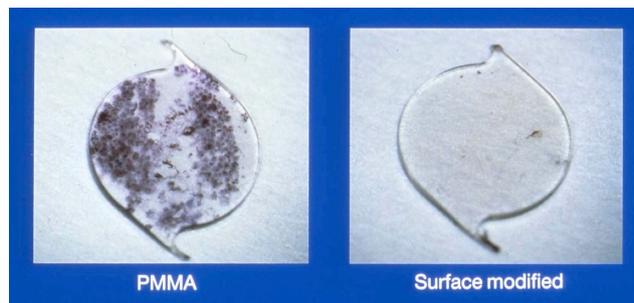


However decentration was still common: David Apple (USA) showed that of the eyes he had been able to examine post mortem in the early 80s, about 50% of PCLs were only half in the bag (as shown). Something had to be done about this and in 1981 Albert Galand (Belgium) showed his envelope technique of opening the lens capsule. This became widely popular in the UK but was superseded in 1987 and the years that followed by the method of Howard Gimbel (Canada) of Continuous Curvilinear Capsulorhexis (or 'continuous tear capsulotomy'). This would not only improve the stability of an implant by ensuring in-the-bag placement, but significantly improve the safety of phacoemulsification.



In 1986 John Pearce was the first in the UK to implant a 2 zone bifocal lens. The first multifocal in Europe (left, of a diffractive type with some 30 discontinuous annular zones), was implanted at Scarborough in March 1988.

Heparin surface modification became available for uveitic cases in 1988.



Finally we should remember John Pearce, pioneer of PCL design and first secretary of UKIOIS, whose enthusiasm and ideas over the years did so much to shape both the society and ophthalmology throughout the United Kingdom.

And so the story of cataract surgery continues. It is hoped that this short account of the early days will provide some of the important dates and sequence of events before they are lost to uncertainty through the mists of time, as well as the faces of those pioneers to whom we are all indebted with extreme gratitude.