

VALEDICTION

Sir Harold Ridley's vision

This valediction to the late Sir Harold Ridley commemorates the 50th year of his first publication in the *St Thomas's Hospital Report*, describing his pioneer undertaking to research, design, and implant an intraocular lens to correct aphakia.

Dissatisfied with the poor acuity and loss of binocular single vision following unilateral cataract extraction and the poor outcome, particularly in children, with the contact lenses then available, he had early in his career envisaged using an artificial lenticulus. His research was catalysed by the now famous remark of a medical student, that it was a pity that the cataract he had seen extracted could not be replaced by a clear lens. In his paper Ridley described his threefold problem. Firstly, he had to find an inert material for what would be an intraocular foreign body. In this he was inspired in his choice of poly(methylmethacrylate) which became the gold standard of implant materials. Animal experiments were rejected by Ridley, although they might have added to the surgical techniques proposed, on the grounds of adding little to the known intraocular tolerance of the material. This lack of inflammatory response to glass and plastic intraocular foreign bodies, provided they did not touch the iris, had been observed in the eyes of injured aircrew who survived aerial combat in the second world war. Optical laboratory benchwork was not undertaken. To sterilise the implants he used cetrimide solution which unbeknown to him could be absorbed by and later leached from the poly(methylmethacrylate), causing anterior uveitis, which was attributed wrongly to the implant material itself. Later, sodium hydroxide was used before present day gas sterilisation.

To solve his second problem, of implant design, Ridley copied too closely the radii of curvature of the human lens and his first two prototypes resulted in high myopic pseudophakia. Redesigned, subsequent implants produced remarkably little anisometropia with refractions of about 2 dioptres sphere difference compared with the fellow eye. He was also prophetic of preoperative biometry and of implant banks when he wrote that "In the future it may be desirable to produce lenses to individual specification to attain ametropia." Ridley hoped to present the results of his secret experimental surgery with perhaps a 2 year follow up but as knowledge of the project leaked out it was published first in the little read journal, *St Thomas's Hospital Report*, to establish his priority.

Sir Harold Ridley's epoch making operation was done on 29 November 1949, when for the first time he inserted an artificial acrylic lenticulus into a human eye. This was the left eye of a 45 year old female patient whose cataract was unilateral, and the extracapsular cataract extraction technique was used. However, he was uncertain that the implant was stable and so removed it then and there and re-inserted it definitively, as a secondary procedure on 8 February 1950 when the eye had healed and had become quiet.

Where Sir Harold was most percipient was in deciding that the most physiological place to position an intraocular lens was in the posterior chamber. His third problem—namely, to find the means of providing stable fixation

remained unsolved until 1975 when Shearing introduced polypropylene haptics designed for capsular bag insertion. Ridley recommended extracapsular cataract extraction and hoped the lens would remain secure, sandwiched between the iris and posterior lens capsule. It seems today quite incredible that this implant which weighed 45 times more than a modern one was similarly positioned in a small number of patients' eyes following the then popular technique of intracapsular cataract extraction. Indeed, to place the heavy Ridley lens in the ciliary sulcus, before operating microscopes and without damaging the zonule or lens capsule, must have been very demanding. Eventually the incidence of complications arising from lens decentration and anterior uveitis led to the abandonment of the whole procedure. However, Ridley's vision of pseudophakia was so compelling as to encourage numerous ophthalmologists to design a multitude of anterior chamber angle supported lenses including the Ridley mark II tripod lens several of which I inserted under his guidance as his resident at Moorfields Eye Hospital in 1970.

Ridley had to watch the abandonment too of all these early anterior chamber implants because of the disastrous appearance of lens induced endothelial decompensation and bullous keratopathy, which arose mainly from poor design and substandard manufacture. Even a surgeon as excellent as Barraquer had to explant half the anterior chamber lenses he had inserted.

Ridley shared in the universal condemnation which fell upon lens implantation, the development of which might have ceased save for the resolute inventiveness of Binkhoret, Worst, Choyce, and Fyodorov. That this condemnatory attitude, albeit softening, persisted into the 1980s is unsurprising, when implants were patented, trademarked, and some fatuously labelled as "one size fits all" and "a lens for all seasons," and even as late as 1983 a publication from Moorfields Eye Hospital expressed reservations about implants.

That Ridley chose to initiate his work in secret without any previous experimental research, at St Thomas's Hospital, rather than at Moorfields, may have led to resentment on the part of Sir Stewart Duke-Elder whose immense power of influence and support as director of research at the Institute of Ophthalmology and Moorfields Eye Hospital, was thereafter denied to Ridley. Today it is difficult to imagine to what extent Ridley's idea became professionally scorned and dismissed. Had his concept of pseudophakia originally been openly presented, supported, further researched, and scientifically developed, the collateral loss of sight suffered by patients in those early years might have been avoided with probably little loss of the time it has taken for the safety, efficacy, and validity of the device to become so self evident. Ridley recognised posterior lens capsular opacification and the prevention of this and the correction of pseudophakia presbyopia remain as challenges for the future.

A decade ago Sir Harold underwent successful bilateral lens implantation at St Thomas's Hospital. He thus

became not only one of very few men to benefit from his own operation, but also to have had it done in the same hospital where he pioneered it—a fact which always greatly pleased him.

In this tribute to Sir Harold Ridley, whose vision has been truly vindicated, let us hope that his additional aspiration, written in his first publication—namely, that “this

operation may be the best that is possible until finally biochemical and endocrinological research teaches us how to prevent cataract developing,” will be achieved and acknowledged.

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