

## EXPERIENCE WITH THE HARRINGTON ERISOPHAKE IN FIFTY CATARACT EXTRACTIONS\*

BY

A. J. CAMERON

*Royal Eye Hospital, London*

IN 1951, Dr. David Harrington of the Division of Ophthalmology, University of California, San Francisco, sent me one of his erisophakes. Since then I have used the instrument sporadically, by which I mean that in an operating list of two, three, or four cataract extractions, an occasional one was done with the erisophake, the rest in the ordinary way. Fifty such extractions have now been performed and a note of my experience may be of some interest to others who may contemplate using this instrument.

The phakoerisis of Barraquer Barraquer and Barraquer Moner in Barcelona is very impressive to watch, and the results obtained at their hands seem excellent, but the space-and-time-machine-like meter on one of the operating theatre walls which has to be watched and consulted, and on which the amount of suction seems to depend, is rather awe-inspiring.

The Harrington erisophake is a modification of that of Bell (1948), which in its turn is a simplification of the sucking-disc type of instrument evolved by Dimitry (1939). It has the advantage over the instruments of Hulen (1911) and Barraquer (1922) in that it is simple in construction and requires no central suction-producing apparatus. As Dimitry himself stated:

the only vacuum required to provoke a grasp in a sucking disc is that measured in the bore of the needle and the concavity of the cup.

Dimitry's sucking disc, however, was found to be cumbersome in use and required unaccustomed positions of the hand. Bell's simplification consisted in fastening a small rubber contact glass sucking bulb to a Dimitry tip, and when this was squeezed between the thumb and the forefinger it produced enough suction to attach the sucking cup strongly to the anterior lens capsule.

Harrington felt, perhaps correctly, that with only the support of the rubber bulb the needle was apt to wobble when introduced into the anterior chamber, and his modification involved incorporating the bulb into an elongated metal case, rigidly fastened to the needle holding the suction cup. The instrument, as it stands, consists of a metal tube 13 cm. long and rather less in diameter than an ordinary lead pencil. At the lower end two windows opposite to each other permit pressure to be applied by the thumb and forefinger to a rubber suction bulb contained in the case; the bulb is attached to the handle, at the tip of which is the suction cup.

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The effect is essentially that of a cross-action-forceps, in that once the instrument has been applied to the lens capsule no further pressure is needed. The rigidity of the container allows complete control of both the vacuum cup and the lens attached to it. The whole is easily assembled and disassembled and can be sterilized in the ordinary way by boiling after filling the bulb with water, or by immersion for 15 minutes in borax and formaldehyde solution (B.P.) followed by 2 minutes in the boiler. Before using the instrument after sterilization, it is better to make certain that all fluid is expressed out of it by rigid pressure on the rubber with thumb and forefinger.

In recent years other modifications of Bell's original erisophake have been made (e.g. Esposito, 1952), but an examination of the literature shows that the principle remains unchanged. A similar instrument described by Veirs (1952) has four small round apertures in the cup instead of a single-opening tip and this is designed to prevent rupture of the capsule.

**Dynamics of Phakoerisis.**—Harrington (1951), by studies of animal and cadaver eyes and by highly magnified moving pictures of erisophake extractions on the living human eye, with microscopic and photographic studies of the extracted lenses, endeavoured to show that the dynamic principle in phakoerisis is wholly dissimilar from the mechanics of zonular rupture, lens dislocation, and intracapsular lens extraction by the method of combined external pressure and forceps traction. It is believed that the modern sucking disc exerts a powerful and evenly-distributed pull on the anterior lens capsule, and through it on the zonular lamella which is actually drawn forward on to the anterior lens surface and forms the "button" of anterior capsule to be described later.

### Operative Experience

In this series the cases were entirely unselected, being a cross section of those normally encountered in the out-patient department. The eldest was about 87 and the youngest 44 years of age. The series included nuclear sclerosis, generalized cortical hardening, and one or two cases of hypermature lenticular degeneration. Three cases of "secondary" cataract, following upon iritis and with total synechiae, are included and will be dealt with later.

After the removal of the lens there appears to be no difference in the post-operative behaviour between cases operated with the erisophake, and those dealt with by the usual method of lens removal. No unusual features of any kind were noticed. The early ones have now been watched for over 2 years and have gone on as any successful cataract extraction may do.

**Corneal Section.**—In the majority of cases the corneal section was made with the Graefe knife cutting a conjunctival flap. A few of the later ones have had a pre-prepared flap and a section with keratome and scissors. In each case one or two conjunctival stitches were laid. As is my normal practice, a full iridectomy was done in the case of elderly patients to obviate if possible a second visit to the theatre

for iris prolapse. In the younger patients, a round pupil with, or without, a peripheral iridectomy or iridotomy was attempted. Care was taken in each case to ensure that the corneal section was at least a hemi-section—this is very important—and if necessary it was enlarged to this extent with scissors. In all cases where it was assessed by previous slit-lamp examination that the lens was both large and hard, a full iridectomy was done before the extraction irrespective of age.

**Technique.**—To apply the erisophake, the instrument is held like a pencil and gripped with the thumb and forefinger of the operating hand. Pressure is applied by both on the suction tube through the windows in the metal case. The instrument is slowly inserted into the anterior chamber, and the pressure is maintained while the suction disc is carefully placed in the centre of the anterior capsule of the lens. A very little downward pressure is then exerted on the suction cup, and the thumb and forefinger are slowly released to take a fresh grip on the metal case on each side of the windows but near enough to the openings to break the suction immediately should that be called for. This manoeuvre of releasing the pressure of the two fingers on the rubber tube, after its insertion into the anterior chamber, immediately initiates the required suction. It takes a second or two to accomplish this and this time is utilized by the suction in drawing the capsule into the vacuum cup. The operator feels at once that there is a union between the instrument, his hand, and the lens.

In the first case tried, the suction was easily obtained, but the combined bulk of the suction disc and a fairly thick lens made one feel that the entire mass could not be got safely out of the wound without risk to the vitreous; largely on account of inexperience and perhaps timidity, therefore, the suction was broken by pressing on the rubber tube and the instrument was removed, the lens being extracted with Arruga's forceps in the ordinary way. It was found that the suction had produced a nice little "button" of capsule in the centre of the anterior surface of the lens which made for easy grasping with the intracapsular forceps. This discovery has subsequently been made use of in a number of cases, chiefly for intumescent lenses on which the intracapsular forceps slip and take no grip; the method is to apply the erisophake to the anterior lens capsule for a second or two and then, having removed it, to grasp with the forceps the little raised "button" of capsule. With a little experience, however, the combined thickness of the disc and the lens, produced no terrors, and it was found that lenses could be removed with surprising ease.

In early cases the instrument was inserted vertically in the 12 o'clock position, but it was found a little difficult to exercise the rotation called for in order to rupture the zonule. Later it was found better (and this I believe is the technique Harrington uses) to insert the instrument at either end of the corneal section—that is roughly speaking in either the 10 or the 2 o'clock position—and then, when the suction has been obtained, gently to bring the handle, together with the suction cup and the lens, slowly into the 12 o'clock position. This manoeuvre, with a few rocking movements, is usually sufficient to free the lens. I formed the opinion that in some cases the suction alone seemed adequate to rupture the zonule.

It has been recommended to apply the instrument to the lower pole of the lens when "tumbling" is required and to the upper pole when the sliding straight withdrawal technique is desired, but in this series it was found much better to apply the suction cup fairly and squarely to the centre of the lens in each case,

because it could not be foretold which part of the zonule would rupture first, and the central grip seemed the most advantageous. In a personal communication from Harrington on this matter I am informed that he now also adopts this procedure.

In the early stages it not infrequently happened that the suction broke before the lens was removed. The instrument, however, could easily be replaced and a fresh suction hold taken. This occurs less frequently now, and I think it was due to excessive concentration on what was being done, accompanied by inadvertent pressure on the rubber tube, which broke the hold of the sucking disc on the capsule. Sometimes the suction has broken when the lens was almost ready to come through the wound, perhaps because the lens was unusually large or the section inadequate. In several such cases, the erisophake has been replaced, and the lenses steadied by a squint hook outside the cornea and safely removed. In others, the erisophake has been discarded and the lens gently expelled by pressure from outside the cornea with the Sinclair lens guard, assisted by the tip of the cystitome when the lens appears at the lips of the wound. Great care has to be exercised in using the cystitome in this way in case the point catches in the iris.

In cases where the suction hold had broken, even several times, there did not appear to be any risk of either iris or vitreous becoming drawn into the cup, as has occurred in the machine operated types, because once the hold on the lens capsule is broken it would require the usual manual pressure through the metal windows once more to produce further suction.

One case is of particular interest in that rapid and easy suction appeared to be obtained on the lens capsule and the lens appeared to be freed, but when an attempt was made to begin the extraction of the lens it appeared that the vitreous was coming with it as if there was some attachment between the two in the form of a capsulo-hyaloid ligament in the patellar fossa, or a post-inflammatory adhesion. The suction was broken immediately, the erisophake removed, the anterior face of the capsule torn away with the capsulectomy forceps and the lens expressed.

With reference to "tumbling" the writer does not feel satisfied that the true "bascule" of the forceps method, so ably demonstrated in the Edinburgh School over a quarter of a century ago, takes place with the erisophake. What has happened, however, in four cases, is that the lens has "tumbled" inside the capsule ending up in a crosswise position antero-posteriorly in the anterior chamber. This has been difficult to deal with. Some of the lenses have been pushed out, others have been lifted out with the cystitome or by any other method which the exigency of the moment seemed to call for. It would seem that these lenses were too hard to be moulded through the pupil as an immature nuclear sclerosed cataract can be moulded. Undoubtedly, as is the case with the intracapsular forceps, the most successful cases are just those cases of immature nuclear sclerosis. Other hard lenses without this intracapsular rotation have been safely removed without any "tumbling". It is difficult to see how a hard lens, which has a suction cup placed squarely on its surface, can possibly "tumble" in the accepted sense.

In cases of complicated post-iridic cataract, the usual procedure of passing a repositor through a peripheral iridectomy to break down the adhesions was followed, and the lens was removed by suction without any difficulty, but, as has happened not infrequently to the writer in this type of case, no matter how the lens was extracted, the tags which were removed from the lens capsule but re-

mained attached to the iris, appeared to adhere together in the centre of the pupil. These are very difficult to deal with and end in a very indifferent visual result.

It is now thought better in such cases to do a wide and full iridectomy.

### Conclusions

The opinion is formed that this is a simple and safe method of doing intracapsular extractions, provided it is remembered that the delivery of the lens takes, perhaps, a little longer with the erisophake than with the forceps. This is not a plea for its use to replace a well-performed extracapsular operation which leaves an intact posterior capsule and hyaloid membrane between the vitreous and the anterior chamber. If, however, such an extracapsular extraction requires a needling then I think the position is as before. The complications encountered are listed in Table I.

TABLE I  
COMPLICATIONS

Complications	Number of Cases		Percentage
Lens rotated inside capsule	4		8
Capsule ruptured (one intentional and described)	2		4
Erisophake applied more than once, otherwise straightforward	12		24
Cases finished by forceps	Intracapsularly	Extra-capsularly	16
	5	2	
Post-operative vitreous hernia into anterior chamber*	Large Saccular Hernia in Anterior Chamber	Bulging of Hyaloid in Pupil	16
	nil	1†	

\* Only 35 of the 50 cases were examined, all within 3 to 4 weeks of operation.

**Rupture of the Capsule.**—This occasionally occurs in everybody's hands with the forceps, but did not occur in those cases which were removed straightaway with the initial suction. In two of the cases where the lens shifted within the capsule and lay crosswise in the anterior chamber, an attempt was made to remove it by suction, and the capsule ruptured, appearing so to do posteriorly. The cataract and the capsule were easily removed.

**Vitreous Loss.**—This was not encountered in any case, but one patient, a woman with relatively high myopia, showed fluid vitreous in the anterior chamber the moment it was attempted to place the suction disc on to the anterior lens capsule. That technique was abandoned and the lens removed in the ordinary way. It is felt that this contretemps was not due to the erisophake, as it has occurred both in intracapsular and extracapsular extractions by the more usual methods.

**Herniation of the Vitreous.**—A point of considerable interest to the writer and one not so far encountered in the literature, is the question whether erisophake extractions, with and without iridectomy, are less prone to hernia of the vitreous into the anterior chamber, which so frequently occurs after forceps intracapsular extractions either soon afterwards or as a late manifestation, and which after a time causes deterioration of visual acuity by rupture.

Table II has been taken from an excellent paper by Irvine (1953), in which, however, erisophake extractions are not specially mentioned.

TABLE II  
FREQUENCY OF OCCURRENCE OF COMPONENTS  
OF SYNDROME (after Irving, 1953)

	No.	Percentage
Intracapsular Cataract Extractions	894	100
No post-operative complications attributable to any abnormality of the position or the state of the vitreous	483	54
Marked prolapse of the vitreous into the anterior chamber without rupture	16	2
Late post-operative rupture of the vitreous face	206	23
No evidence of adhesions	133	15
Adhesions seen subsequently	73	8

It is hoped to continue the study of the comparative frequency and severity of vitreous hernia in intracapsular extractions and those performed with the erisophake and with the forceps.

### Summary

The Harrington erisophake is described together with a technique for its use and the experiences encountered in 50 cases of cataract extraction by this method.

A note is made of the importance of vitreous herniation in intracapsular extractions.

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