

Endocapsular Cataract Extraction

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Summary

Endocapsular (intercapsular) cataract surgery has recently gained popularity, particularly in Europe.

We describe our technique of endocapsular cataract extraction and insertion of an intraocular lens and prospectively compare 93 eyes which underwent endocapsular cataract extraction with 83 which underwent a standard extracapsular procedure. There was no apparent difference between the two groups in visual outcome. Pre-operative and post-operative complications were more common in the endocapsular group: posterior synechiae formation in the latter occurred in 19%. In 90% of the endocapsular cataract extractions, the lens was placed 'in the bag' at the time of surgery but at three months only 53% remained 'in the bag'. Displacement of one haptic from the capsular bag was associated with symptomatic lens decentration requiring repositioning in four eyes in the endocapsular group and two eyes in the extracapsular group.

Extracapsular cataract extraction has become established in the last ten years as the method of choice for the management of cataract and posterior chamber intraocular lenses as the method of aphakic correction.

In 1981 Baikoff¹ first suggested, and Anis² and Galland³ popularised the technique of endocapsular cataract extraction, in which the anterior capsule remains *in situ* until after the lens is inserted into the capsular bag.

The introduction and adoption of a new technique of cataract extraction should demonstrate advantages and not be associated with disadvantages or an increased complication rate compared with the present method. The advantages claimed for endocapsular extraction are definitive 'in the bag' lens implantation and protection to the corneal endothelium during surgery. A possible disadvantage is the increase in surgical manipulation. To our knowledge, no study has com-

pared directly the endocapsular and standard extracapsular methods of cataract extraction. We compare the pre- and post-operative complications, post-operative lens fixation and posterior synechiae formation in endocapsular and standard extracapsular cataract extraction.

Materials and methods

All patients included in this study were operated upon and followed up at Moorfields Eye Hospital. None had had previous intraocular surgery or anterior segment disease. One hundred and seventy eight eyes, 178 patients, were randomly allocated, either to endocapsular cataract extraction, 93 eyes, or standard extracapsular cataract extraction, 85 eyes: all participating surgeons performed both procedures.

The age range of the patients was 52-92

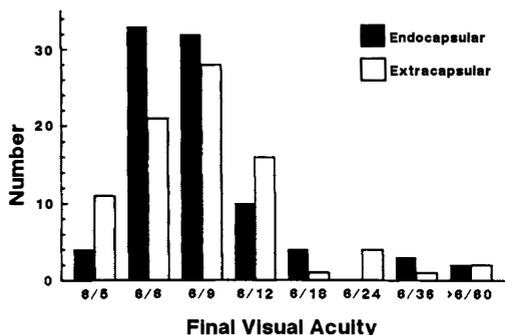


Fig. 1. Final visual acuity for endocapsular and extracapsular groups.

years (mean 69.5) for the endocapsular group and 30–90 years (mean 71) for the extracapsular group. The follow-up was three to 14 months (mean 9.9) for the endocapsular and three to 15 months (mean 8.4) for the extracapsular group.

The central corneal thickness was measured in a subgroup of 23 eyes in the endocapsular group and 21 in the extracapsular group. This was performed at approximately the same time of day pre-operatively, one day, two weeks and three months post-operatively. Measurements were made with same Haag-Streit optical pachymeter on the same slit-lamp and an average of three readings recorded.

The relevant features of the endocapsular cataract extraction technique were a corneal section and transverse anterior capsulotomy at the junction of the upper one third and lower two thirds of the anterior capsule followed by hydrodissection with balanced salt solution. The nucleus was expressed and irrigation/aspiration performed with either a McIntyre (Steriseal) or Simcoe (Storz) cannula.

A visco-elastic substance (Healon, Pharmacia, or Hydroxypropyl-methylcellulose, Moorfields Eye Hospital) was injected into the capsular bag and anterior chamber. The intraocular lens was then inserted into the capsular bag and dialled, if necessary to centralise the lens. A Rayner Pearce Vaulted Y loop lens (PMMA optic and prolene haptic) was used in 73 eyes and a Coburn 72 UV (all PMMA) in 15 eyes. The anterior capsule was then removed with Vannas or vitreous scissors (Keelers) and side-curved (Micra) or butterfly

(Weiss) forceps. The viscoelastic substance was removed, if necessary the lens was centred by dialling, and the position of the intraocular lens noted. The cornea was sutured with interrupted 10/0 monofilament nylon sutures.

The standard extracapsular cataract extraction differed from the above in that a 5–6 mm circular anterior capsulectomy was performed prior to expression of the nucleus. A Rayner Pearce Vaulted Y loop intraocular lens was used in 71 eyes and a Coburn 72 UV in 13 eyes. We were unable to confirm ‘in the bag’ placement of the lens in this group as the peripheral rim of anterior capsule was not always visible.

In both groups, the initial post-operative medication was guttae Dexamethasone 0.1% *qds*, guttae Chloramphenicol *qds*, and guttae Cyclopentolate 1% *od*, continued for up to eight weeks. Pre- and post-operative complications were recorded and at the final examination the position of the intraocular lens was assessed in the endocapsular group by three mirror examination: capsular fixation was defined as the fixation of both haptics alone or including the optic, between the anterior and posterior capsule leaves.

Results

Vitreous loss occurred in five eyes in the planned endocapsular group and one in the planned extracapsular group: all achieved a visual acuity of 6/12 or better with appropriate aphakic correction but were excluded from further study.

There was no apparent difference in the visual outcome between the two groups (Fig. 1). There was no significant difference in corneal thickness between the two groups at any time. In both groups the first day post-operative thickness was significantly greater ($p < 0.01$) than the pre- and three month post-operative result (Fig. 2).

Including vitreous loss, the per-operative complications (Table 1) were more frequent in the endocapsular group ($0.05 > p > 0.02$, X^2). The anterior capsule ripped peripherally in one and removal was incomplete in three endocapsular cataract extractions and in one extracapsular cataract extraction the posterior capsule ruptured without vitreous loss.

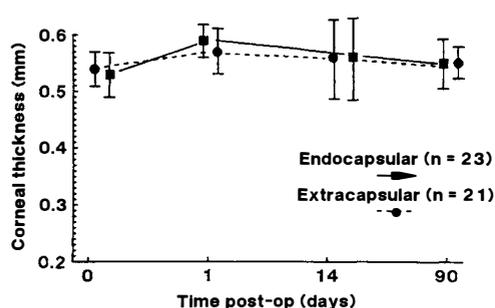


Fig. 2. Central corneal thickness, measured pre-operatively, at one day, two weeks and three months post-operatively.

In two cases in the endocapsular group the anterior lens epithelium remnants proliferated, requiring surgical removal in one (Fig. 3). This appeared to originate from the area where the iris and anterior capsule were adherent.

Symptomatic lens decentration occurred in four eyes in which an endocapsular cataract extraction and in two in which an extracapsular cataract extraction had been performed. All required surgical repositioning.

Synechia formation occurred in 17 eyes (19%) in the endocapsular group and in ten eyes (12%) in the extracapsular group ($p < 0.001$, X^2). The synechia in the former group consistently occurred at the three and nine o'clock positions, where iris and anterior capsule remnant crossed (Fig. 4). In one case in the endocapsular group iris capture occurred requiring surgical lens repositioning.

The post-operative lens fixation was

assessed only in the endocapsular group as 'in the bag' fixation could not always be accurately assessed pre-operatively in the extracapsular group. In 79 eyes (90%) in the endocapsular group there was capsular fixation of the lens at the end of surgery: at the final follow-up this had reduced to 36 of the 68 eyes (53%) in which this was reassessed. In 25 cases (37%) one loop was in the capsular bag and one in the sulcus whilst due to inadequate pupil dilation we were unable to determine lens fixation in seven eyes (10%).

YAG laser capsulotomy has been performed in three eyes from the endocapsular and five from the extracapsular group.

Discussion

Endocapsular, intercapsular or praetercapsular cataract extraction has recently gained popularity with claimed advantages over the standard extracapsular cataract extraction of positive in the bag placement of the intraocular lens and protection of the corneal endothelium. The introduction of a new technique of cataract extraction should offer no disadvantages or increased complication rate compared with the present method and preferably should provide advantages.

Vitreous loss was more common in the endocapsular group (five eyes) than in the extracapsular (one eye). In none of the eyes in the former group was this due to posterior capsule rupture, but related to the removal of material from the anterior capsule resulting in a zonular dehiscence. Although this complication could be considered a result of the

Table I Preoperative and postoperative complications

Endocapsular		Extracapsular
5	Vitreous Loss	1
0	Zonular dehiscence without vitreous loss	1
0	Posterior Capsule Rupture without vitreous loss	1
3	Incomplete Anterior Capsule Removal	0
1	Anterior Capsule Rip	0
2	Anterior Lens Epithelium Proliferation	0
17	Synechia Formation	10
4	Symptomatic Lens Decentration	2

Table II Causes of post-operative visual acuity less than 6/22

<i>Endocapsular</i>		<i>Extracapsular</i>
6	Senile Macular Degeneration	3
2	Cystoid Macular Oedema	2
3	Amblyopia	0
2	Anterior Capsule Remnants	0
0	Unknown	4

'learning curve' the occurrence was at regular intervals throughout the study. Galand reported an incidence of up to 2%.⁴

Synechiae between the posterior aspect of the iris and the anterior capsule remnants was more common in the endocapsular group possibly due to the larger area of anterior lens capsule remaining in this procedure. The adhesions were typically at three and nine o'clock where the pupil margin and the anterior capsule cross, limiting pupil dilation. In one eye pupil capture resulted requiring lens repositioning and in two eyes the anterior lens capsule epithelial cells proliferated to cover the visual axis: this was removed surgically in one case.

Such complications might be reduced by

the use of ultrasound to remove these epithelial cells⁵ although adhesion between the capsular leaves and implant may be reduced, resulting in poor lens fixation.

In 90% of eyes in the endocapsular group 'in the bag' (ITB) fixation was achieved at the time of surgery, but at final follow-up only 53% of the lenses were capsularly fixated. Those in which both loops were ITB at the end of the procedure may have become displaced due to an inadequate anterior capsular rim remaining, contraction of the capsular leaves displacing a loop into sulcus fixation or capsular splitting or tearing. Symptomatic lens decentration, requiring repositioning, was twice as common in the endocapsular group, although the difference did not reach

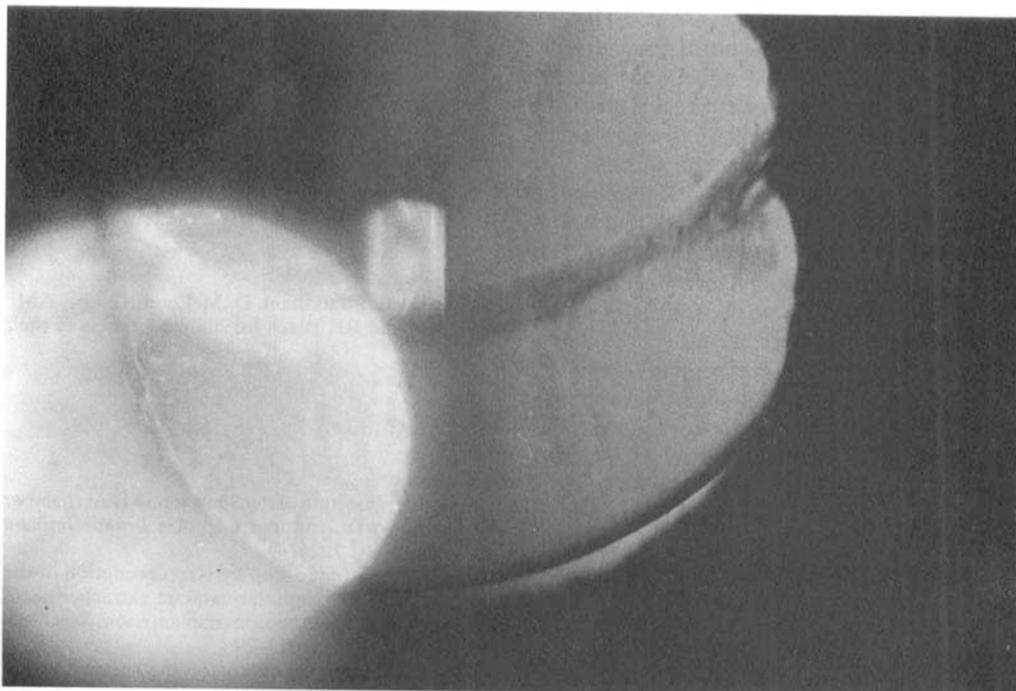


Fig. 3. Post-operative anterior lens epithelium proliferation.

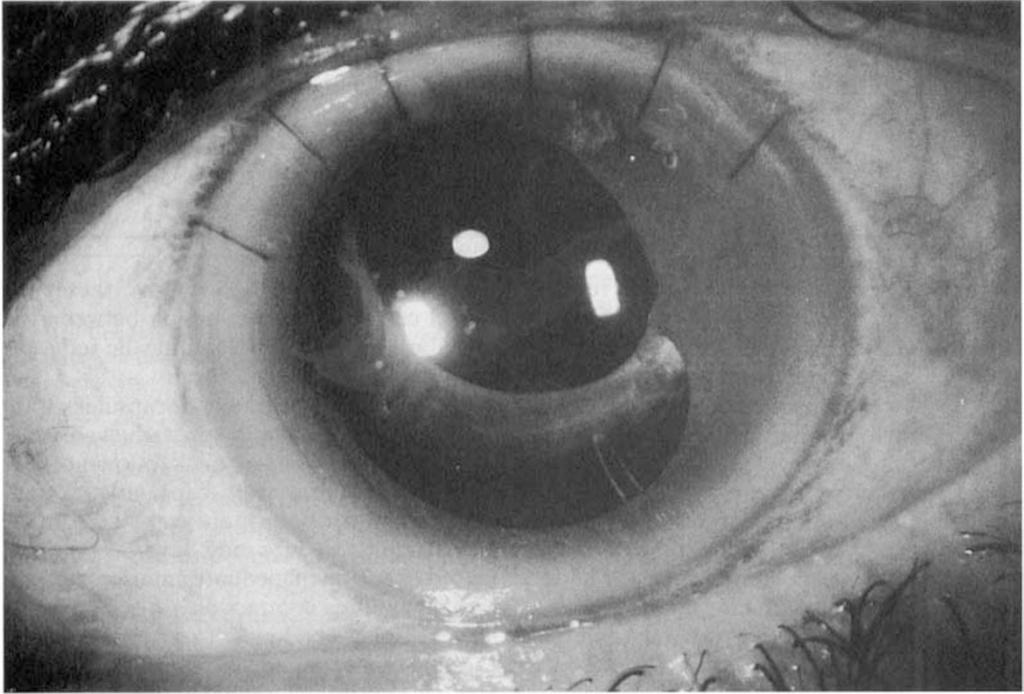


Fig. 4. *Synechia between iris and anterior capsular remnants, characteristically at nine and three o'clock.*

statistical significance. The cause in each case was one loop in and one out of the capsular bag: it is interesting that none were due to asymmetrical compression of the prolene loops. Lens position has been shown to be the most important factor in decentration.⁶

We believe that the relatively small optic diameter and position of the dialling holes in some of the implants used in this study, are likely to cause symptoms even with slight decentration. There is no consensus as to the ideal lens for capsular fixation.

The endocapsular technique involves greater surgical manipulation with more entries of instrumentation into the eye; the final anterior capsulectomy can be particularly difficult and requires fine bladed scissors on a curved handle.

Corneal endothelial trauma was assessed by observing changes in corneal thickness, which is directly related to its physiological function.⁷ That there was no significant difference between the two groups, suggests that the endocapsular technique does not offer any greater protection to the endothelium but

conversely is not associated with any greater endothelial trauma.

Therefore, we feel endocapsular cataract extraction requiring greater surgical manipulation does not offer any advantages over the more familiar extracapsular technique with the intraocular lenses that were used in this study.

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