Intraocular lens implantation in the absence of capsular support: a report by the American Academy of Ophthalmology

Wagoner M D, Cox T A, Ariyasu R G, Jacobs D S, Karp C L

CRD summary
This review assessed intraocular lens implantation in eyes with inadequate capsular support. The authors concluded that open-loop anterior chamber, scleral-sutured posterior chamber (PC), and iris-sutured PC intraocular lenses are safe and effective techniques, but there was insufficient evidence to compare the three techniques. Since the review only identified case series, the strength of the evidence is therefore weak.

Authors' objectives
To assess the safety and efficacy of open-loop anterior chamber (AC), scleral-sutured posterior chamber (PC), and iris-sutured PC intraocular lenses (IOLs) in eyes with inadequate support for PC implantation in the capsular bag or ciliary sulcus. A further objective was to compare these surgical techniques.

Searching
MEDLINE was searched from 1980 to 2001 for studies published in the English language and the search was updated in March 2002; the MeSH terms were listed. Use of the Cochrane Controlled Trials Register was also mentioned. Proceedings of meetings were not searched.

Study selection
Study designs of evaluations included in the review
Only studies rated III or higher for study design were included. The included studies were randomised controlled trials (RCTs), non-randomised controlled trials and case series.

Specific interventions included in the review
The inclusion criteria were not specified in terms of the interventions, but it was clear that studies of open-loop AC and scleral- and iris-sutured PC IOLs were included. The included studies used a variety of surgical procedures: primary and secondary open-loop AC IOLs; scleral- and iris-sutured PC IOLs after complicated and uncomplicated cataract surgery, including insertion on open-loop AC IOL after extracapsular cataract extraction (ECCE); and secondary open-loop AC IOL and scleral- and iris-sutured PC IOLs at the time of penetrating keratoplasty for pseudophakic or aphakic corneal oedema.

Participants included in the review
The inclusion criteria were not specified in terms of the participants, but it was clear that studies of patients who had eyes with inadequate support for PC implantation in the capsular bag or ciliary sulcus were included.

Outcomes assessed in the review
The inclusion criteria were not specified in terms of the outcomes. The outcomes in the review were the final best-corrected visual acuity (BCVA), post-operative BCVA within one or two lines of Snellen acuity, and adverse effects. The adverse effects considered were corneal oedema, graft failure, glaucoma escalation, cystoid macular oedema (CME), lens tilt, retinal detachment and endophthalmitis. Glaucoma escalation was defined as the development of new onset glaucoma, or the need for more aggressive control of pre-existing glaucoma with one or more additional medications or surgical intervention. Lens tilt was defined as decentration along the horizontal or vertical meridian, or actual displacement into the vitreous. Where studies did not use the review definition for glaucoma escalation, the authors translated the reported data to fit this definition.

The studies varied in the definition, reporting and methods of ascertaining surgical complications. The duration of follow-up, where stated, ranged from 1 to 144 months for individual patients.
How were decisions on the relevance of primary studies made?
The Ophthalmic Technology Assessment Committee Anterior Segment Panel selected the studies.

Assessment of study quality
The studies were graded using a hierarchy of study design. Level 1 studies were properly conducted, well-designed randomised controlled trials; level II studies were well-designed cohort and case-control studies; and level III studies were cases series. The quality of the statistical methods used in studies comparing the safety and efficacy of flexible open-loop AC IOLs and scleral- and iris-sutured PC IOLs was rated from A to F, where A and B were considered satisfactory, C borderline, and D and F unacceptable. No details of the criteria used for this rating system were presented. The panel methodologist rated study validity.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. The extracted data included study design, sample size, length of follow-up and percentage followed up.

Methods of synthesis
How were the studies combined?
The studies were grouped according to the intervention and clinical situation and a narrative synthesis was undertaken. The results were summarised separately for cataract surgery and penetrating keratoplasty, for primary and secondary IOL insertion, and for complicated and uncomplicated cases. The results were also reported separately for studies in which PC complications precluded the placement of a PC IOL in the capsular bag or ciliary sulcus, and for studies with different complications (removal of a dislocated crystalline lens by pars plan lensectomy). The percentage of patients achieving a specified visual outcome was averaged across relevant case series.

How were differences between studies investigated?
Differences between the study results were not discussed.

Results of the review
Forty-three studies were included: two RCTs (n=2,178), one longitudinal cohort study (n=79) and 40 case series. The number of units analysed for each outcome was reported in the 'Results' section.

Open-loop AC IOLs.
Cataract surgery.

Primary open-loop AC IOLs at the time of uncomplicated intrascapular surgery: one large RCT (n=2,002) found no significant difference between primary open-loop AC IOL and no IOL insertion for BCVA less than 20/200 (2.2% versus 1.7%) or most complications (corneal oedema, CME, retinal detachment, or endophthalmitis). It found that AC IOL significantly increased glaucoma escalation compared with no insertion (1.3% versus 0.2%, P=0.05).

Primary open-loop AC IOLs at the end of complicated intrascapular surgery (7 case series): five case series of open-loop AC IOL after ECCE in which PC IOL could not be implanted in the capsular bag or ciliary sulcus because of PC complications found 68.3% (123 of 180 eyes) achieved BCVA of 20/40 or better, while 4.2% (6 of 143 eyes) had BCVA of 20/200 or worse. Causes of reduced vision included CME (5 cases) and corneal oedema (1 case). Two case series in which a dislocated lens was removed using pars plan lensectomy found 75% (36 of 48 eyes) achieved BCVA of 20/40 or better, while 2.1% (1 eye) had BCVA of 20/200 or worse because of retinal detachment.

Secondary open-loop AC IOLs after uncomplicated intrascapular cataract surgery: four case series found 90.1% (136 of 151 eyes) achieved BCVA within one Snellen line or better than pre-operatively.

Secondary open-loop AC IOLs after ECCE in complicated intrascapular cataract surgery: two case series with PC complications preventing primary placement found 80% (20 of 25 eyes) achieved BCVA within one Snellen line or
better than pre-operatively. Two cases series with different complications preventing primary insertion found 84.6% (11 of 13 eyes) achieved BCVA within one Snellen line or better than pre-operatively.

Penetrating keratoplasty.

Secondary open-loop AC IOLs at the time of penetrating keratoplasty: seven case series found that 35.2% (124 of 352 eyes) achieved BCVA of 20/40 or better, while 35.2% (124 of 352 eyes) had BCVA of 20/200 or worse. Graft failure occurred in 12.5%, glaucoma escalation in 28.4%, CME in 19% and retinal detachment in 1.7%.

Scleral-sutured PC IOL.

Cataract surgery.

Primary scleral-sutured PC IOL at the end of complicated cataract surgery: three case series with PC complications preventing PC IOL placement found that 80.5% (33 of 41 eyes) achieved BCVA of 20/40 or better, while 4.9% (2 of 41 eyes) had BCVA of 20/200 or worse. In two cases series, different complications prevented primary PC IOL insertion. These series found 100% (10 of 10 eyes) achieved BCVA of 20/40 or better after pars plana lensectomy, compared with 54% (7 of 13 eyes) after intracapsular cataract extraction. Secondary scleral-sutured PC IOL after uncomplicated cataract surgery: four case series found 97.6% (82 of 84 eyes) achieved BCVA within one Snellen line or better than pre-operatively.

Penetrating keratoplasty.

Secondary scleral-sutured PC IOL at the time of penetrating keratoplasty: nine case series found that 40% of eyes achieved BCVA of 20/40 or better, while 35% of eyes had BCVA of 20/200 or worse.

The two largest case series found that 46.1% (100 of 217 eyes) achieved BCVA of 20/40 or better, while 31.3% (68 of 217 eyes) had BCVA of 20/200 or worse. In these two case series, graft failure occurred in 7.8%, glaucoma escalation in 36.9%, CME in 13.8%, erosion of the suture through the conjunctiva in 17.5% and retinal detachment in 3.2%.

Iris-sutured PC IOL.

Cataract surgery.

Secondary iris-sutured PC IOL at the end of uncomplicated cataract surgery: two case series found that 96.1% (25 of 26 eyes) achieved BCVA within one Snellen line or better than pre-operatively.

Secondary iris-sutured PC IOL at the end of complicated cataract surgery: two case series found that 100% (23 of 23 eyes) achieved BCVA within one Snellen line or better than pre-operatively.

Penetrating keratoplasty.

Secondary iris-sutured PC IOL at the time of penetrating keratoplasty (5 case series): the largest two case series found that 47.2% (154 of 326 eyes) achieved BCVA of 20/40 or better, while 30.7% (100 of 326 eyes) had BCVA of 20/200 or worse. The most common causes of poor vision were graft failure, macular oedema and degeneration, and glaucoma escalation (4 case series reported an overall rate of 31.2%).

Open-loop AC IOLs versus scleral- or iris-sutured PC IOLs (6 studies with a statistical methods rating of A, B or C).

Cataract surgery.

Secondary open-loop AC IOLs versus scleral-sutured PC IOLs after cataract surgery: two case series (evidence level III) found little difference between these treatments in visual outcomes or complications. For patients with no pre-existing pathology, BCVA of 20/40 was achieved by 92.5% after open-loop AC IOL versus 91.4% after scleral-sutured surgery. For patients with pre-existing pathology, BCVA of 20/40 was achieved by 67.4% after open-loop AC IOL versus 66% after scleral-sutured surgery. The complication rates for open-loop compared with scleral-sutured surgery were as follows: corneal oedema, 3.4% versus 0.9%; glaucoma escalation, 1.7% versus 0.9%; CME, 5.9% versus 6.1%;
retinal detachment, 0.9% versus 3.5%; and endophthalmitis, 0% versus 0.9%.

Penetrating keratoplasty.

Secondary open-loop AC IOLs versus scleral-sutured PC IOLs versus iris-sutured surgery: one RCT (evidence level IB) found that iris-sutured PC IOL reduced the proportion with poor vision compared with scleral-sutured or open-loop surgery but the reduction was not statistically significant (BCVA of 20/200 or worse in 35.5%, 45.4% and 46.9%, respectively).

One smaller non-randomised study (evidence rating 11B) found higher rates of glaucoma escalation with scleral- and iris- sutured surgery compared with open-loop AC IOL. One cohort study found no significant difference in corneal endothelial attrition between open-loop AC IOL and iris-sutured PC IOL.

Authors' conclusions
Open-loop AC, and scleral- and iris-sutured PC IOLs are safe and effective in aphakic eyes with inadequate support for PC implantation in the capsular bag or ciliary sulcus. The authors also concluded that there was insufficient evidence to compare the three techniques.

CRD commentary
The review question was clear in terms of the study design, intervention and participants, although the inclusion criteria were not specified in these terms. By limiting the included studies to those in English, the authors might have omitted some relevant studies. In addition, no attempt was made to locate unpublished studies, thus raising the possibility of publication bias. A panel selected the studies, but it was not stated whether the panel members selected the studies independently. The validity assessment was limited to study design and appears to have been undertaken by only one reviewer. This lack of duplication may lead to errors and bias. The methods used to extract the data were not described; hence, any efforts made to reduce errors and bias cannot be judged.

Some relevant information on the included studies was tabulated but, since the methods used to select patients for inclusion in the case series were not described, it was unclear how representative of the relevant population the study samples were. The studies were appropriately grouped by characteristics of the interventions and the results were discussed separately for controlled trials and case series. The authors did not adequately discuss the limitations of evidence from case series. Given the limited search and the dependence of the review on case series, the results of the review may not be representative of the population undergoing these surgical procedures. Hence, the authors' conclusions should be treated with caution.

Implications of the review for practice and research
Practice: The authors stated that there is support in the literature for open-loop AC, scleral-sutured PC and iris-sutured PC IOLs for eyes with no anatomical contraindications.

Research: The authors stated that a large prospective RCT is required to compare the visual outcome and complication rates among these three IOL techniques (open-loop AC, scleral-sutured PC and iris-sutured PC).

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