Combined Pars Plana Vitrectomy and Sutured Posterior Chamber Implant

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Objective: To describe the surgical technique, visual acuity results, and complications of sutured posterior chamber intraocular lenses with complete pars plana vitrectomy.

Method: A retrospective review of 63 eyes was combined with a telephone survey of the patients and their ophthalmologists.

Results: The preoperative diagnoses were trauma, 25 eyes; ectopia lentis, 24 eyes; aphakia following retinal detachment surgery, 7 eyes; cataract surgery, 6 eyes; and endophthalmitis, 1 eye. Mean follow-up was 20 months. Preoperative best-corrected visual acuity was 20/40 or better in 36% (23 of 63 eyes), 20/60 to 20/120 in 33% (21 of 63 eyes), and 20/200 or worse in 31% (19 of 63 eyes) improving to 20/40 or better in 76% (48 of 63 eyes), 20/60 to 20/120 in 18% (11 of 63 eyes), and 20/200 or worse in 6% (4 of 63 eyes) at final follow-up. Preoperative complications included iatrogenic retinal breaks in 3 cases, difficulty with a fixation suture in 1 case, and mild vitreous hemorrhage in 1 case. Postoperative complications included retinal detachment in 2 cases, choroidal hemorrhage in 1 case, intermittent pupil capture in 9 cases, self-limiting vitreous hemorrhage in 3 cases, and late intraocular lenses dislocation in 1 case.

Conclusions: Suturing a posterior chamber implant concurrently, or following, a complete pars plana vitrectomy is a safe procedure. Complete vitrectomy may reduce the rate of long-term complications. Optimal visual rehabilitation can be achieved without the need for contact lens wear with an acceptable additional risk of surgical complications.


INTRAOCULAR LENSES (IOLs) are almost universally preferred over aphakic spectacles and contact lenses as a method of visual rehabilitation in aphakic patients. In the absence of sufficient lens capsule support, an anterior chamber (AC) lens, an iris fixated lens, or a sutured posterior chamber (PC) lens may be used. Anterior chamber lenses have been reported to have a high incidence of complications including glaucoma, hyphema, uveitis, cystoid macular edema, and corneal decompensation, although modern flexible open-loop designs are associated with fewer problems. Their use is also contraindicated in patients with preexisting glaucoma, peripheral anterior synechiae, shallow ACs, or iris defects. Since Malbran et al described the technique of suturing an IOL in the PC in 1986, numerous authors have suggested variations in surgical technique to minimize the risk of complications. Burying the external part of the suture under a partial-thickness scleral flap, or rotating the suture to place the knot inside the eye should minimize the risk of the suture eroding through the conjunctiva. The optimum pattern of securing the suture to the suturing eyelet on the lens haptic to minimize IOL torque and tilt has also been debated by several authors. The importance of vitreous clearance prior to inserting the IOL has, by contrast, received little attention. In almost all reports relating to sutured PC IOLs only an anterior vitrectomy has been performed through a limbal incision. A study by Tsunoda et al in pigs’ eyes demonstrated that anterior vitrectomy alone does not remove residual vitreous and capsular remnants from the ciliary sulcus. Suturing a PC IOL under these conditions leads to vitreous entwined around the IOL haptics that would be expected to increase the postoperative incidence of cystoid macular edema and retinal detachment. In contrast they demonstrated that if a complete pars plana vitrectomy was performed, an IOL

From the Moorfields Eye Hospital, London, England. None of the authors has any commercial or proprietary interest in the intraocular lens used in this study.
**POPULATIONS, MATERIALS, AND METHODS**

A retrospective review was performed of all patients who had a complete pars plana vitrectomy and combined or subsequent suturing of a PC IOL implantation over the last 5 years. All surgery was performed by the Vitreoretinal Surgical Unit at Moorfields Eye Hospital. The Alcon CZ 70 BD lens with a 7-mm-diameter optic and suturing eyelets on the haptics was used in all cases.

**SURGICAL TECHNIQUE**

All eyes had undergone a complete pars plana vitrectomy, including wherever necessary, induction of posterior vitreous detachment before the IOL was sutured in place.

The surgical technique of IOL fixation was similar in all cases involving 2-point fixation with 10/0 polypropylene (Prolene) sutures with the knot buried beneath half-thickness triangular scleral flaps. The scleral flaps were usually close to the 12- and 6-o’clock positions, but whenever circumstances dictated, such as previous filtration surgery, the sutures were passed near the 3- and 9-o’clock positions (3 eyes). The exact technique of achieving this fixation varied between surgeons, although all used an external approach. Most passed a double-ended, 10/0 polypropylene suture on a straight needle perpendicularly through the sclera beneath the scleral flap, 1 mm behind the limbus, and into the lumen of a 27-gauge needle passed in a similar fashion beneath the opposite scleral flap. The 27-gauge needle was then withdrawn leaving the 10/0 polypropylene suture stretched across the eye. The suture was hooked out of the eye through a corneal section, cut, and tied to each IOL haptic eyelet. Others favored delivering a loop of suture through each entry site and attaching the suture to each haptic eyelet using a girth hitch. Whichever method was used 1 end, or loop, of suture is attached to the eyelet on the IOL haptic and the other emerges from the sclera under the scleral flap. The IOL is then drawn into the eye aiming to place the haptic in the ciliary sulcus. A bite of sclera was then taken in the bed of the scleral flap and the suture tied to itself without undue tension. The scleral flap was sutured flat with 10/0 nylon prior to conjunctival closure.

The additional surgical procedures performed concurrently as suturing the PC IOL depended on the nature of the surgery each patient had previously undergone as listed in the Table.

**TELEPHONE SURVEY**

In cases where the postoperative follow-up period was short (<3 months), the patient and their ophthalmologist were telephoned. When telephoned, patients were asked what they perceived was the indication for IOL implantation, whether they used contact lenses, their level of satisfaction with the operation (ie, very satisfied, satisfied, dissatisfied, or very dissatisfied), and whether they had any postoperative problems for which they had sought help at other hospitals. When an ophthalmologist was contacted, it was possible to obtain more records of best-corrected visual acuity and refractive outcomes than were available in the hospital case notes.

**SURGICAL INDICATIONS**

The indications for surgery, when stated, were reduced visual acuity in 33 eyes, contact lens intolerance in 12 eyes, variable refraction or visual acuity in 10 eyes, patient preference in 3 cases, and uveitis with pain secondary to an AC IOL in 1 eye.

**PREOPERATIVE PATIENT CHARACTERISTICS**

There were 25 eyes in 25 patients following trauma (17 penetrating, 8 blunt trauma). Four of the blunt trauma cases had pars plana vitrectomy with fragmatome lensectomy and PC sutured IOL as a primary procedure. Two of these cases were combined with repair of an iridodialysis. Of the remaining trauma cases, 13 had primary repair of a penetrating injury as the first operative intervention. Fifteen had a pars plana vitrectomy (6 with removal of intraocular foreign bodies and 13 combined with lensectomy), either as a primary procedure or following primary globe repair, before having a sutured PC lens as a subsequent procedure.

Ectopia lentis was the underlying clinical problem in 24 eyes of 16 patients (20 eyes in 12 patients with Marfan syndrome, 3 eyes in 3 patients with simple ectopia lentis, and 1 eye in a patient with Weill-Marchesani syndrome). Nineteen of the 24 ectopia lentis eyes had a complete pars plana vitrectomy, fragmatome could be sutured in the ciliary sulcus without vitreous traction.

This study reviews the experience of the Vitreoretinal Surgical Unit at Moorfields Eye Hospital, London, England, over the last 5 years in which the suturing of a PC IOL lens was undertaken in eyes that were having or had previously undergone a complete pars plana vitrectomy. The specific aim of the study was to determine the visual acuity results and complication rates of such surgery. Many of the eyes in this series were at particular risk of retinal detachment, such as patients who had Marfan syndrome with ectopia lentis and axial myopia, and it was hypothesized that a complete pars plana vitrectomy prior to suturing the PC IOL would minimize this risk.

**RESULTS**

Sixty-three eyes in 55 patients were analyzed in this study. Males outnumbered females (39:16) owing to the disproportionate number of males among the trauma cases (25 males, 5 females). The mean age of the patients was 43 years (age range, 6-80 years). The mean follow-up was 20 months (follow-up range, 2-57 months).

The indications for surgery, the underlying cause, and the surgery performed prior to suturing the PC IOL are summarized in the Table. The details of further surgical interventions are also included.
lensectomy, and PC sutured IOL as a primary procedure. The remaining 5 eyes had the PC sutured IOL as a secondary procedure after being intolerant of contact lens wear following initial pars plana vitrectomy.

The remaining 14 eyes in 14 patients had a sutured PC IOL to correct aphakia for the following indications: complex retinal detachment surgery, 7 cases; complicated cataract surgery, 6 cases; and following endophthalmitis, 1 case.

**VISUAL ACUITY RESULTS**

The visual acuity results (Figure) were largely determined by the underlying ocular pathological condition prior to suturing the PC IOL. The preoperative best-corrected visual acuity was 20/40 or better in 36% (23 of 63 eyes), 20/60 to 20/120 in 33% (21 of 63 eyes), and 20/200 or worse in 31% (19 of 63 eyes) improving to 20/40 or better in 76% (48 of 63 eyes), 20/60 to 20/120 in 18% (11 of 63 eyes), and 20/200 or worse in 6% (4 of 63 eyes) at final follow-up. Only 1 eye had a final best-corrected visual acuity more than 1 line worse on the Snellen letters chart than preoperatively as the direct result of a surgical complication. This eye suffered a perioperative choroidal hemorrhage followed later by a retinal detachment reducing the visual acuity from 20/120 preoperatively to hand movements at the final follow-up.

**TELEPHONE SURVEY RESULTS**

Thirty patients (34 eyes) were contacted by telephone and 29 of the 30 reported being satisfied or very satisfied with the surgical procedure. The 1 dissatisfied patient had suffered a superotemporal branch retinal vein occlusion many years earlier causing poor visual acuity, although his visual acuity actually improved from count-fingers to 20/200 after surgery. All 8 patients (13 eyes) with ectopia lentis who were contacted were very satisfied. Of the 11 trauma patients contacted by telephone, 7 worked in occupations, such as dusty building construction, for which routine contact lens wear was impractical. Contact lenses were still worn intermittently in the affected eye by 4 of these patients postoperatively. In 2 patients this was for cosmetic reasons to hide large iris defects and in 1 to reduce glare. One patient wore a contact lens to correct a high degree of corneal astigmatism caused by a corneal scar. None of those contacted by telephone had consulted other eye units for any postoperative complications.

**COMPLICATIONS**

Preoperative complications at the time of suturing of a PC IOL were noted in 5 (7.9%) of the 63 eyes. Iatrogenic retinal breaks were detected during the vitrectomy in 3 eyes

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* PC indicates posterior chamber; IOL, intraocular lens; ERM, epiretinal membrane; PPV, pars plana vitrectomy; IOFB, intracocular foreign body; AC IOL, anterior chamber intraocular lens; and Phaco, phacoemulsification.
and were treated with cryotherapy or laser retinopexy and tamponaded with sulfahexafluoride gas. A preexisting retinal dialysis with a pigmented demarcation line was also treated in 1 eye. In 1 case the inferior IOL haptic was not secured and on the first postoperative day was noted to be swinging in the vitreous cavity. After resutting the haptic the patient achieved 20/30 best-corrected visual acuity. One patient suffered a mild vitreous hemorrhage that resolved spontaneously.

Significant postoperative complications were noted in 3 eyes (4.7%). One eye was noted to have a choroidal hemorrhage on the first postoperative day. These were drained 8 days later and silicone oil exchange was performed. Two months later a retinal detachment was successfully repaired but the visual acuity deteriorated from 20/120 preoperatively to hand movements 2 years later. One patient with ectopia lentis, who had a retinal tear treated with cryotherapy at the time of surgery, developed a retinal detachment not involving the macula 6 days postoperatively owing to a new break at the edge of the cryotherapy scar. This was successfully treated and, at last follow-up visit, she had a visual acuity of 20/20. A polypropylene suture broke in another case 31 months after the initial surgery. Minor postoperative complications were more frequent, and most commonly were optic capture by the pupil (2 of which occurred suture through the conjunctiva with the risk of suture track endophthalmitis and late IOL dislocation owing to breakage of the polypropylene suture). In our series of 63 eyes only 1 patient at final follow-up had visual acuity more than 1 line worse in the Snellen letters chart than preoperatively as a result of a surgical complication. Two patients required further surgical intervention for retinal detachment and 1 for a broken suture 31 months after the initial surgery. Minor postoperative complications were more frequent, and most commonly were optic capture by the pupil (2 of which required surgical intervention), temporary hypotony, and vitreous hemorrhage, all of which were self-clearing.

In most reports on suturing PC IOLs, the indication for surgery is insufficient capsular support following complicated cataract surgery. This series is unusual in reporting the experience of suturing PC IOLs in a large series of eyes with a complete pars plana vitrectomy. It is useful to consider these patients in 2 separate groups: (1) management of ectopia lentis and (2) other indications for sutured PC IOLs.

Correction of aphakia in the absence of sufficient lens capsule support remains a difficult management problem. This series demonstrates that good visual acuity results, and high rates of patient satisfaction, can be achieved with PC sutured IOL in eyes following a complete pars plana vitrectomy. Patients with ectopia lentis who have often suffered years of variable refraction and visual acuity achieve particularly good results and were all highly satisfied with the procedure.

Posterior chamber IOLs have several advantages over AC IOLs or contact lenses. The IOL is near the focal point of the eye, minimizing the effects of magnification, anisocoria, and pseudophakodones. There is no contact of the eye, minimizing the effects of magnification, anisocoria, and pseudophakodones. There is no contact of the eye, minimizing the effects of magnification, anisocoria, and pseudophakodones. There is no contact of the eye, minimizing the effects of magnification, anisocoria, and pseudophakodones.

The benefits of achieving a PC fixation for an IOL must always be weighed against the risks. Without capsular support PC IOL fixation is best achieved by transcleral suturing which makes the surgery longer, more complex, and introduces the potentially sight-threatening risk of intracocular hemorrhage during passage of the needles through the ciliary body (an AC IOL may be indicated where the risk of hemorrhage is high). Postoperatively additional risks of this technique include erosion of sutures through the conjunctiva with the risk of suture track endophthalmitis and late IOL dislocation owing to breakage of the polypropylene sutures. In our series of 63 eyes only 1 patient at final follow-up had visual acuity more than 1 line worse in the Snellen letters chart than preoperatively as a result of a surgical complication. Two patients required further surgical intervention for retinal detachment and 1 for a broken suture 31 months after the initial surgery. Minor postoperative complications were more frequent, and most commonly were optic capture by the pupil (2 of which required surgical intervention), temporary hypotony, and vitreous hemorrhage, all of which were self-clearing.

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Patients with ectopia lentis and axial myopia have a significant risk of glaucoma and retinal detachment without any surgical intervention (9%-19%). In the past, the surgical management of subluxed lenses by intracapsular or extracapsular lens extraction techniques was associated with a high incidence of complications, particularly vitreous loss and retinal detachment. The advent of closed-system pars plana lensectomy techniques combined with anterior vitrectomy improved the safety of surgery in these patients by preventing hypotony and vitreous loss into the anterior segment. Contemporary management of patients with ectopia lentis centers on when and what surgical intervention is appropriate and how best to visually rehabilitate the patient. Progressive subluxation of the crystalline lens induces frequent changes and great variability in refraction, high astigmatism, and variable visual acuity. The best-corrected Snellen visual acuity frequently does not reflect the degree of visual handicap that these patients suffer. Early surgical intervention to avoid amblyopia in children and to improve visual acuity at all ages may now be offered. Performing a complete pars plana vitrectomy concurrently with fragmatome lensectomy may further reduce the long-term risk of retinal detachment in these at-risk eyes. Vitreous traction forces on the retina are largely eliminated, the peripheral retina can be inspected and prophylactic treatment applied to areas of peripheral retinal degeneration or tractional retinal tears. In the study of Hubbard et al. prophylactic treatment was applied to 27% of eyes and the postoperative retinal detachment rate was reduced to 6%. None of the detachments occurred in patients who had received prophylactic treatment to areas of lattice degeneration.

A complete vitrectomy may be particularly important when a sutured PC IOL is implanted to prevent vitreous being entwined around the haptics causing subsequent vitreoretinal traction, especially in eyes already predisposed to retinal detachment. Visual rehabilitation with contact lenses has been successfully used to correct aphakia following vitreolensectomy although, if the fellow eye remains phakic, the patient may still experience difficulties owing to anisometropia, as well as having the inconvenience of contact lens use and poor unaided visual acuity. The increased incidence of glaucoma and AC angle abnormalities in patients with ectopia lentis is a relative contraindication to the use of AC IOLs. One report claimed they can be used successfully following complete pars plana vitreolensectomy in patients with Marfan syndrome, although follow-up only averaged 6 months, and 2 of the 4 patients developed pseudophakic pupil block glaucoma. To date there has been no randomized, controlled trial to compare the long-term risks of sutured PC IOL with modern AC IOLs in these patients. We believe this study indicates that early surgical intervention using a complete pars plana vitreolensectomy technique combined with suturing a PC IOL offers optimal visual rehabilitation and high rates of patient satisfaction with an acceptably low complication rate. The best-corrected visual acuity at final follow-up was stable (within 1 line on the Snellen letters chart) or improved in all cases. All 8 patients (13 eyes) with ectopia lentis who were contacted by telephone were delighted with the surgery and reported having excellent visual acuity with a stable refraction. Iatrogenic retinal tears were noted and treated at surgery in 2 patients (8.3%) with ectopia lentis and 1 (4.2%) of these patients suffered a retinal detachment in the early postoperative period, which was successfully treated. The risk of retinal detachment in our series of patients with ectopia lentis who were followed up for a mean of 18 months is similar to that reported by other groups following pars plana lensectomy alone and has the theoretical advantage of protecting the eye against future retinal detachments resulting from ongoing vitreoretinal traction.

**SUTURED PC IOL IN EYES AFTER TRAUMA, RETINAL DETACHMENT SURGERY, OR COMPLICATED CATARACT SURGERY**

Twenty of the 25 patients in our series who had a sutured PC IOL following trauma were young men. Many worked in dusty environments, such as building construction, which are incompatible with regular contact lens wear. All but 4 of the trauma cases and all patients with aphakia after retinal detachment surgery had undergone previous surgical procedures and many had scarred irregular conjunctival or corneal surfaces that make contact lens wear difficult. The safety of modern flexible open-loop AC IOL in these groups has not been proven and their use is likely to remain contraindicated in eyes that are at risk of glaucoma as a result of damage to the AC angle or iris. In eyes with good visual potential, we believe our results demonstrate that the additional risks and surgical complexity of suturing a PC IOL are justifiable. At final follow-up all the eyes in the trauma group had stable (within 1 line on the Snellen letters chart) or improved best-corrected visual acuity. No operative complications were noted at suturing the PC IOL in the trauma group and only 1 sight-threatening complication was encountered postoperatively. One polypropylene suture broke 31 months after surgery and required further surgical intervention to restore good visual acuity. One eye in the retinal detachment group had a decline in best-corrected visual acuity. This was secondary to a perioperative choroidal hemorrhage probably secondary to an overtightened suture cheese wiring through the tissues.

**CONCLUSIONS**

This is the largest published series of suturing a PC IOL in eyes that have had a complete pars plana vitrectomy. It demonstrates that excellent visual acuity results and high levels of patient satisfaction can be achieved. Only a randomized controlled trial with prolonged follow-up would resolve whether this method of visual rehabilitation is superior to modern flexible open-loop AC IOL. The risk of postoperative retinal detachment in our series after an average follow-up of 20 months was 3.2% (2 eyes) with both occurring in the early postoperative period. This suggests that performing a complete pars plana vitrectomy prior to suturing a PC IOL may protect against future retinal detachment in eyes known to be at high risk of retinal de-
attachment. Suturing a PC IOL does, however, expose the patient to additional intraoperative and postoperative risks, which must be explained to the patient.

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REFERENCES


From the Archives of the ARCHIVES

A look at the past . . .

While akinesia is important in every form of cataract operation, it has demonstrated its worth particularly in the intracapsular procedure, as control of the eyelids is essential to the safety of the operation. Smith made an important contribution to the intracapsular technic by devising a method of retracting and controlling the lids with the aid of a specially trained assistant, which was described as follows: On completion of the section, the speculum was removed; the upper lid was drawn forward from the eyeball with a large, blunt-tipped tenotomy hook, and with the fourth and fifth fingers of the same hand, the eyebrow was pushed up, so that the orbicularis was controlled. The lower lid was pulled down with the index finger of the other hand. This maneuver was then simplified with the use of the Fisher retractors.


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