

Scleral Fixation of Intraocular Lens

Zia ul Mazhri, Wasif M Qadri

Pak J Ophthalmol 2008, Vol. 24 No. 4

.....
See end of article for
authors affiliations

.....
Correspondence to:
Zia ul Mazhry
511- E 1
Wapda Town Lahore

Purpose: Evaluation of a simplified technique of scleral fixation of posterior chamber IOL in terms of visual outcome and complications.

Material and Methods: Fifty eyes of 48 patients with sclerally fixated IOL were included in the study. In general these eyes were lacking adequate posterior capsular (PC) support for routine posterior chamber intraocular lens implantation. 9/0 Nylon (Ethicon), 10/0 polypropylene(Proline) and occasionally 10/0 Nylon were the sutures used for transscleral fixation of the lens heptics. Transscleral suture passage was performed with Ab Externo Cum Ab Interno Technique in 21 patients and modified Ab Externo Technique in 29 patients. Anterior core vitrectomy was performed as a routine accompaniment.

The follow up ranged from 8-36 months and average follow up was 21.4 months.

Results: Visual outcome was quite good. Average visual acuity was in the range of 6/9-6/12, which is quite comparable to other kinds of implantations. The most common complication was vitreous hemorrhage and hyphaema, which resolved in all the patients with no residual complications.

Conclusion: Scleral fixation of IOL is an effective but surgically demanding technique. There is no reason to become somewhat over conscious about the slightly higher risk of complications with scleral-sutured PC IOL. Most of these complications can be avoided or minimized by proper selections of materials used and adopting the proper technique.

Received for publication
January' 2008
.....

For routine PC IOL implantation an intact posterior capsule is mandatory. Anterior chamber intraocular lenses are commonly placed into the eyes lacking adequate capsular or zonular support. These lenses have been noted to carry high risk of post operative complications like corneal endothelial damage, uveitis, glaucoma, hyphaema (UGH), and cystoid macular edema¹⁻⁵.

In response to the real and potential problems associated with anterior chamber lenses, alternative techniques for implanting the more successful posterior chamber in the absence of posterior capsular support were sought. Some have suggested suturing a posterior chamber lens to the iris, but this may result in iris chafing, uveitis, and pupillary constriction^{4,6}. To avoid these complications and still achieve a posteriorly placed lens position, methods to transsclerally fixate posterior chamber lenses to the ciliary sulcus have been developed. Malbran and co-authors were the first to report transscleral sulcus fixation of posterior chamber lenses in aphakic patients who had had previous intra capsular cataract extraction^{1,2,4}.

Although scleral fixation techniques are still evolving, early results have been encouraging and these techniques are becoming more widespread. Posterior chamber intraocular lenses directly fixated to sclera have been used in a variety of situations such as planned secondary IOL insertion and surgical complications at the time of primary cataract surgery. Fixation of IOL may also be considered safe while managing subluxated or dislocated crystalline lens or in IOL exchange procedure^{2,7-9}.

Technique of scleral fixation of IOL has not been widely practiced in Pakistan. This study was aimed at evaluation of simplified locally practicable technique in terms of visual outcome and complications. We have found it quite useful and effective alternative to secure a posterior chamber IOL in eyes lacking posterior capsule partially or totally.

MATERIAL AND METHODS

A prospective study was planned and carried out between July 1994 to June 1997. Fifty eyes of forty-eight patients were included in the study with the following criteria. Age sixteen (empirical) years and above with as no sex limitation were considered.

The patients were divided into following groups according to the clinical presentation and the nature of the procedure required:

1. Primary scleral fixation of IOL

- A) Patients who had capsular rupture during planned extra capsular cataract extraction.
- B) The patients presenting with dislocated or subluxated crystalline lenses. (11 eyes=22%)

2. Secondary IOL implantation

Patients wanting secondary implantation in aphakic eyes lacking adequate posterior capsular support.

3. Miscellaneous

- Penetrating keratoplasty combined with scleral fixation of IOL. The patients needing keratoplasty for aphakic or pseudophakic bullous keratopathy where an implant was desired.
- Retrieval and scleral fixation of a dislocated or subluxated posterior chamber IOL.
- Intraocular lens exchange procedures patient having pseudophakia with a high refractive error leading to anisometropia that was not manageable with routine measures.

The patients with chronic uveitis, diabetic retinopathy, bleeding disorder and high axial myopia were excluded.

A complete ocular examination was carried out stressing on: corneal endothelial status (guttata), presence of synechiae, remnants of the posterior capsule and anterior vitreous cavity. Taking all the features into account, the surgical plan was clearly mentioned. Anterior segment photographs were taken where ever possible.

SRK-I formula was used to calculate the power of the lens implant. In most of the cases Rayner 752 U Single Piece IOL was used with 7 mm optical diameter and 13.5 mm over all diameter. Occasionally multipiece lens with 6.5 mm optic 13-13.5 mm over all diameter was also used, where single piece lens was not available. +0.50-1.0 D was added to the calculated emmetropic IOL power to compensate for the slightly posterior placement of sclerally-fixed IOL^{6,10}.

In the present study, 9/0 Nylon (Ethicon), 10/0 polypropylene (Proline) were the sutures used for transscleral fixation of the lens heptics. 10/0 Nylon was used for wound closure and conjunctival stitches. However 10/0 Nylon was also used occasionally

where no other suture was available especially in cases of scleral fixation after posterior capsular rent during routine ECCE.

The surgical procedure differed slightly from patient to patient. The initial steps were the same as for a routine ECCE through a scleral tunnel incision. Depending upon the situation membranectomy, lensectomy or cryo extraction of the subluxated lens was done. Anterior vitrectomy is mandatory in all cases.

The most important step in this procedure is the transscleral suture passage. This was achieved using one of the two methods.

• **Ab externo cum ab interno technique**

In this case one entry was made outside in whereas the other was inside out. 23 G needle was used for this purpose which passed through the eye. Straightened needle of the nylon suture was passed through it, needle withdrawn, suture cut into two and tied to the IOL.

• **Modified ab externo technique**

In this technique which is a modified version of the above mentioned method the nylon suture is cut into two before passing through the eye. 1 cc disposable needle with 26-30 G needle is used; the cut suture ends threaded into the needle and pulled out under vision. Thus in this method both entries were made from outside in.

After tying the lens the implant was rotated into position by gentle traction on the sutures. The suture tied to itself and knots buried under the already raised scleral flaps. Wound was closed, AC formed and conjunctiva approximated

Routine post operative medication was continued for four to six weeks postoperatively depending upon the situation. Conjunctival sutures were removed one week post operatively.

Follow up examinations were generally undertaken on postoperative day 1, 3,7,15 and every month there on, for at least six months post operatively.

RESULTS

Fifty eyes of 48 patients with sclerally fixated IOLs were included in the study and evaluated for visual outcome and complications. Average age was 51 years ranging from 17 to 76 years. The follow up ranged from 8-36 months and average follow up was 21.4 months. The preoperative characteristics of the patients are listed in Table 1.

Table 1: Preoperative Characteristics

Characteristic	No. of patients n (%)
Females	15 (30)
Males	35 (70)
Right eyes	29 (58)
Left eyes	21 (42)
Average age (Years)	51
Age range (Years)	17-76
Pre-existing glaucoma	3 (3)
Pre-existing CME or Macular scar	4 (8)
Retinal breaks or dialysis	2 (4)
Adherent leukoma	2 (4)
Iridodialysis	2 (4)
Basal iridectomy	2(4)
Marphanoid features	2(4)
PPV and Injected silicon oil	1 (2)
Amblyopia	1(2)
Pale optic disc	1(2)

Out of 50 eyes operated 35 were of males and 15 were of females. Three patients had pre-existing glaucoma while 4 patients had pre-existing CME/ macular scar. Two patients each had retinal breaks/ dialysis, adherent leukoma, iridodialysis, basal iridectomy and Marphanoid type of dislocation. One eye each was there with PPV with silicon oil injection, amblyopia and pale optic disc. Indications wise the patients were divided into three major groups. (Table 2, Graph.1)

Table 2: Indications for scleral fixation

Indication	No. of patients n (%)
Primary scleral fixation	21 (42)
A) PC rent during routine ECCE	10 (20)
B) Management of subluxated or dislocated crystalline lenses.	11 (22)
Secondary scleral fixation of IOL	22 (44)

Miscellaneous:	7 (14)
A) Aphakic bullous keratopathy	2 (4)
B) IOL exchange	1 (2)
C) Dislocated or subluxated IOL	4 (8)

Table 3: Pre operative and post operative visual acuity

Range of visual acuity	Pre op. n (%)	Post op. n (%)
6/6 to 6/12	13(26)	36(72)
6/18 to 6/36	10(20)	8(16)
6/60 to 1/60	15(30)	5(10)
CF, HM, PL	12(24)	----
NPL	----	1(2)

The post operative visual acuity was dependent on the eye's pre operative visual potential. In our study 4 patients had pre-existing macular problem. Scleral fixation of IOL was considered in these patients to improve the quality of vision and to provide all important peripheral vision. Table 3 shows the preoperative and post operative visual acuity. Twenty three (46%) eyes were 6/36 or better preoperatively while 44 eyes (88%) were in the same range postoperatively. The eyes in the range of 6/60 or beyond were 27(54%) preoperatively while only six (12%) eyes were in that range postoperatively. Only two eyes had postoperative visual loss, one secondary to retinal detachment and the other secondary to graft rejection.

Table 4: Post operative complications

Complications	No. of patients n (%)
Hyphema	5(10)
Vitreous haemorrhage	8(16)
Glaucoma	3(6)
Retinal detachment	2(4)
CME	2(4)

Nonseptic vitritis	2(4)
IOL tilt +	3(6)
IOL dislocation	1(2)
IOL tilt ++	1(2)
Suture erosion	3(6)
Limbal suture abscess	1(2)
High post op refraction	1(2)
Graft rejection	1(2)
Transient striate keratopathy	2(4)
Endophthalmitis	—

Graph 2 shows the pre and postoperative median visual acuity in general and in various groups. The median acuity, in general was 0.1 (6/60) preoperatively and 0.5 (6/12) postoperatively. The preoperative median VA was again 0.1 (6/60) in all the groups except the group of patients who had planned secondary scleral fixation of IOL that was 0.5 (6/12). The obvious reason was that the most of them were aphakic patients with full aphakic correction. Average VA in general was 0.25 preoperatively and 0.54 postoperatively. Median postoperative VA was comparable in cases of primary vs secondary IOL fixation i.e. (6/12 vs 6/10) and it was on poorer side in miscellaneous group (6/18). This fact was related to number and amount of surgical handling involved in these already compromised eyes.

Table 4 shows the post operative complications associated with transscleral fixation of IOL (graph 3). The most common complication was vitreous haemorrhage in 8 eyes (16%) followed by hyphaema in five eyes (10%). Vitreous haemorrhage cleared in all the patients within 1-3 weeks with no residual complications while hyphaema resolved within 3-7 days in all the cases.

IOL tilt occurred in 4 cases (8%) but it was significant clinically only in one case (2%) and it induced no astigmatic error in the remaining three patients. The gross IOL tilt in one patient was related

to history of trauma accompanied by vitreous haemorrhage.

Delayed subluxation of IOL occurred in one patient (2%). He was one and a half year post operative when he received some kind of blunt trauma. On examination inferior heptic was found to be fallen back into vitreous cavity and IOL was hanging along the superior heptic.

Post operative glaucoma, striate keratopathy, retinal detachment, CME and aseptic vitritis occurred in two eyes each (4%). Fixation suture erosion was seen in three patients. In these patients no scleral flap was raised to bury the fixation sutures. Other infrequent complications included limbal suture abscess and high post operative refractive error in one eye each. One of the patients who received corneal graft combined with scleral fixation of IOL, had graft rejection 5 months postoperatively. The corneal graft perforated later on and the patients got NPL from that eye secondary to intractable glaucoma.

DISCUSSION

Designs, fixation sites and indications for IOL implantation have changed a lot since their introduction by Harold Ridley in late 1940s. Posterior chamber IOL has become clearly the treatment of choice these days. For routine posterior chamber IOL implantation an intact posterior capsule is mandatory. Anterior Chamber IOLs tried in cases lacking enough posterior capsular support have been noted to carry high risk of post operative complications¹⁻⁵. To avoid these complications, methods to transsclerally fixate, posterior chamber lenses to the ciliary sulcus, have been developed. Malbran and co-authors were the first to report transscleral sulcus fixation of posterior chamber lenses in aphakic patients who had had previous intracapsular cataract extraction^{2,4,7}. After that many surgeons around the world have suggested various alternatives using different kinds of sutures, needles and IOL designs. Mostly these special devices are not available locally. Idea behind my study was evaluation of a simplified technique of scleral fixation of IOL in terms of visual outcome and postoperative complications.

Almost all types of situations mentioned in the literature for scleral fixation of IOL were considered in this study. Most of the eyes in this study were there with previous history of aphakia planned as secondary IOL, (22 eyes), the fact, probably related to

still widely practiced ICCE in Pakistan. The eyes having subluxated or dislocated crystalline lenses (11 eyes) along with eyes having posterior capsular rent during routine ECCE comprised the second major group (planned as primary scleral fixation 10 eyes).

The original surgical technique used in this study was modified after Lewis^{11,12}. We used a locally available 10/0 Nylon or 9/0 or 10/0 Prolene suture carried by a manually straightened needle. A 23 gauge hollow needle passed across the eye was used to retrieve the suture across the eye. In this technique a bigger gauge needle was used and one entry was made from inside out.

Another modification was made after Basti et al¹³. (from patient no 21-50) to minimize the risk of decentration and damage to ciliary vasculature. In this technique 26-30 gauge hollow needles were used and both the entries were made from outside in. This technique is found to be very simple and reproducible any where because nothing special is required.

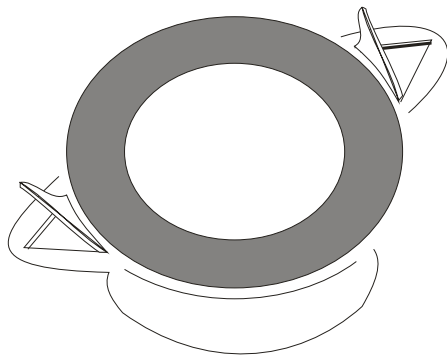
Fixation sutures were placed under conjunctiva in 17 patient and suture erosion was noted in 3/17 patients. No suture erosion was noted in remaining 33 patients in whom scleral flaps were fashioned and fixation suture knots were buried underneath it.

In 30 patients sutures were tied 1.5 mm posterior to the limbus. Post operative AC depth was found to be on higher side in these cases. Duffey¹⁴, Apple¹⁵, Lubniewski¹⁶, R.L. Bergren¹⁷ and many others have suggested ideal fixation site for this procedure is ciliary sulcus that lies about 1.00 mm posterior to limbus. Lee and et al¹⁸. have reported no significant difference in post operative AC depth and refraction with varying degrees of suture to limbal distances. Horiguchi and Hiros¹⁹ have suggested a little complicated way to localize ciliary sulcus by transillumination. Our clinical assessment of AC depth and postoperative refraction has convinced us that ideal site for fixation suture is 1.00 mm posterior to the limbus. This does affect the post operative refraction. So +1.00D was added to the emmetropic IOL power in group A and +0.5D in group B to compensate for slightly posterior placement of IOL in the sclerally fixated eyes as compared to routine PC IOL implantation.

9/0 nylon or 10/0 prolene sutures were used in most of the cases. In few patients, however 10/0 Nylon was used where the preferred sutures were not available. Considering long term dependency of the

stability of IOL on fixation sutures, ideal suture for fixation remains Prolene.

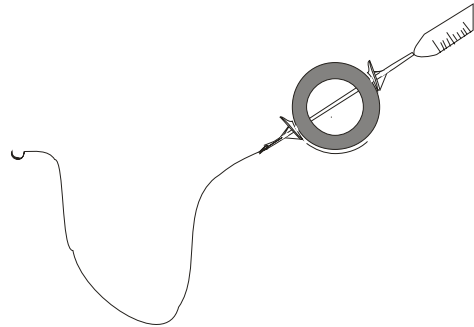
Our study provides useful data about the long term follow up after scleral fixation of IOL. Our follow up ranged from 8 to 36 months with average of 21.4 months. Only 1 patient had a follow up of less than 8 months who actually died 4 months after the surgery. The post operative visual acuity was dependent on the eye's pre operative visual potential. In our study 4 patients had pre existing macular problem and 1 patient had amblyopia. Scleral fixation of IOL was considered in these patients to improve the quality of vision and to provide all important peripheral vision. 2 patients were there with adherent leukoma and corneal opacity sparing the visual axis, but post operative visual acuity could not be improved due to scar induced astigmatism.



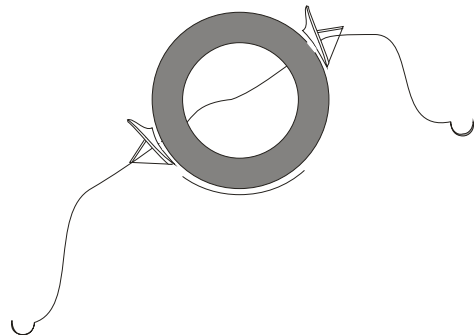
Conjunctival peritomy, 7-12 mm partial thickness scleral incision, partial thickness scleral flaps at 2 & 8 O'clock for fixation sutures deep anterior core vitrectomy

Visual outcome in our study was still comparable to and even better than reported in various studies. Post operative visual acuity was better or equal to pre operative visual acuity in 48/50 (96%) patients in our study. Considering the number of patients, it seems to be quite comparable and even better as reported in various other series². Stark and et al. have reported 23/24 (95.8%)¹⁴. While Agapitos and Lindstrom²⁰ have reported a little poor result i.e. 12/17 (70.58%) in their study.

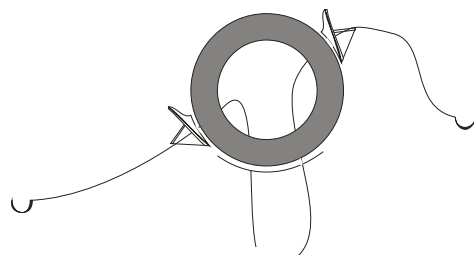
Kreshner RM²¹ has reported 21/30 eyes in the range of 6/12 or better post operatively, while in our study 36/50 (72%) were in the same range post operatively.



No.1:

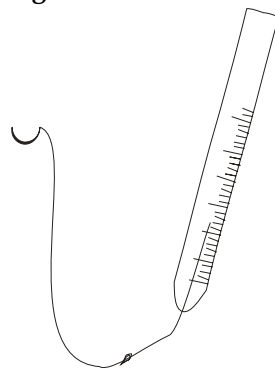


No.2:

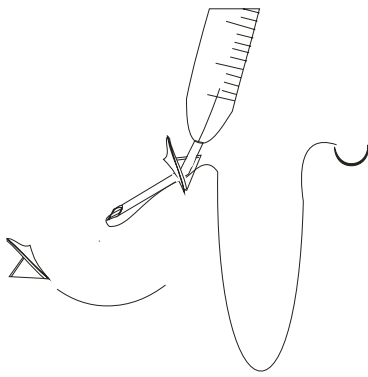


No.3:

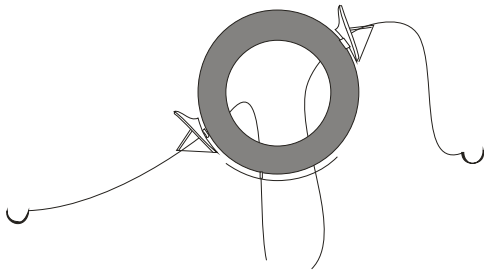
Fig. a: Ab externo ab cum interno fixation suture pass



No.1:



No.2:

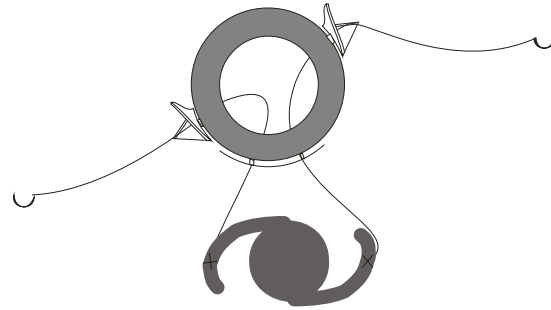


No.3:

Fig. b: Modified externo ab fixation suture pass

Spherical equivalent of post operative refraction was in the range of + 2.00D to -6.00D. Average refraction was -0.70 D of myopia. One patient with IOL exchange had post operative refraction of -6.00 D. Refractive surgery was suggested to correct anisometropia but the patient refused.

Vitreous haemorrhage (16%) and hyphema (10%) was the most frequent complication in our study which is slightly on higher side if compared to other studies. The incidence decreased from 20% to 13.3 % after modification of the technique after Basti et al¹³. Hidemann and Dunn reported 11% incidence of vitreous haemorrhage and hyphaema²². Qazi reported 8.3% incidence of vitreous haemorrhage in his study²³. Holland and colleagues²⁴ reported no vitreous bleeding in their 115 cases. Arkins and Steinert²² have discussed the incidence of post operative bleeding in scleral fixation of IOL to be varying from 0-22% in various studies. In our study vitreous haemorrhage cleared within three to four weeks with no residual complications.



Free Suture ends tied to the site of maximum convexity on IOL haptics

Incidence of glaucoma was on lower side (4%) as compared to other studies by Arkins and Steinert²² and Holland and co-workers²⁴. This decrease may be related to better selection of the patients as most of the patients were planned as primary or secondary scleral fixation combined with anterior vitrectomy only. Only 7 patients were there with complicated nature of surgery like IOL exchange or penetrating keratoplasty with IOL etc. One out of four patients in our study needed trabeculectomy later on while glaucoma was of transient nature in remaining three patients.

Incidence of CME is reported to be quiet high in some of the studies as reported by Arkins and Steinert²² (9-36%). It was only 2% in our study while 6% has been reported by McCluskey and Harrisburg² in their 32 patients. Qazi mentioned 1.66% in his study²³. Ours was in agreement with him and interestingly it was comparable to even routine PC IOL implantation (2%)².

5-10% incidence of IOL tilt or decentration has been reported in the literature²². In our study it was 8% and it was clinically significant only in one eye. This decentration occurred 2 weeks post operatively and was related to trauma and accompanied by vitreous haemorrhage.

Delayed subluxation of IOL occurred in one patient (2%). He was one and a half years post operative when he received some kind of blunt trauma. On examination inferior heptic was found to be fallen back into vitreous cavity and IOL was hanging along the superior heptic.

Initially fixation suture knots were buried just under conjunctiva. 3 out of 17 patients had suture erosion. In rest of the patients sutures were buried under scleral flaps and no suture erosion was noted in this group. In our study we had no patient with suture

track endophthalmitis, which is one of the most fear-some complications after suture erosion as reported in other studies^{2,25,26}. The incidence of suture erosion and suture track endophthalmitis can be minimized to almost nil by securing the knots properly under scleral flaps. Further more this also helps in avoiding the accidental cutting of the fixation suture.

In spite of the fact that quite a few eyes had compromised endothelial status preoperatively (Specular reflection), but no corneal decompensation was noted. This is one of the major advantages of sclerally fixated IOL over an IOL placed in anterior chamber. Although introduction of modern flexible open loop anterior chamber IOL has reduced this problem, still the anterior chamber angle and corneal endothelium mind a lot about any thing placed in their vicinity.

Incidence of retinal detachment was 4%. It has been reported to vary from 2.7 to 5.4% in various studies^{22,24}. The fact that whether detachment was related to scleral fixation itself, could not be established. Too posterior placement of fixation suture may increase the risk of retinal detachment^{16,22}.

Choroidal effusion was noted in 2 patients (4%) which resolved by itself with no serious sequelae. We were lucky enough to have no suprachoroidal haemorrhage.

Aseptic vitritis was observed in 2 patients which was easily controlled with intensive topical steroids. We had no case of post operative endophthalmitis in our study, although many studies are suggestive of higher incidence of endophthalmitis in relation to scleral fixation or secondary IOL implant than otherwise²⁵.

One of the patients who received corneal graft combined with scleral fixation of IOL, had graft rejection 5 months postoperatively. The corneal graft perforated later on and the patient was NPL from that eye secondary to intractable glaucoma. For comparison of the complications with other studies.

CONCLUSION

It is impossible with the available information, to reach a firm conclusion regarding sclerally fixated PC lenses. The visual result for most patients with scleral-sutured lenses is comparable to that with other lens types. Moreover, there is no reason to become somewhat over conscious about the slightly higher risk of complications with scleral-sutured PC IOL. These possible complications include an apparently higher risk of vitreous haemorrhage, hyphaema, glau-

coma, lens tilt and decentration, retinal detachment, suture exposure and endophthalmitis, and persistent cystoid macular edema. As we have discussed earlier most of these complications can be avoided or minimized by adopting the proper technique.

Many variables might be changed that could possibly result in a better method for suturing posterior chamber lenses. For example, a change in suture type may help avoid suture breakage and lens dislocation. It may be possible to localize the ciliary sulcus more precisely to ensure that the heptics are positioned in this location; if the heptics are in the sulcus and away from the pars plana, retinal detachment rates may decrease. It may also be possible to improve the coverage of the polypropylene suture knot, thereby preventing exposed suture and suture tract endophthalmitis. Refinement in surgical technique may decrease the incidence of lens decentration. A study of routine postoperative use of anti-inflammatory drugs such as Fluorbiprofen (Ocufen) or Diclofenac (Voltaren) may show a decrease in the incidence of persistent cystoid macular oedema. Changes in the extent or method of vitrectomy also may lessen the incidence of cystoid macular oedema and possible retinal complications.

Author's affiliation

Dr. Zia ul Mazhry
511- E 1, Wapda Town
Lahore

Prof. Wasif M. Kadri
Eye Unit 1 Services Hospital
Lahore

REFERENCE

1. Hahn TW, Kim MS, Kim JH. Secondary intraocular lens implantation in aphakia. *J Cataract Refract Surg.* 1992; 18: 174-9.
2. McCluskey P, Harrisberg B. Long term results using scleral-fixated posterior chamber intraocular lenses. *J Cataract Refract Surg.* 1994; 20: 34-9.
3. Shock JP Lens, In: Vaughan DG, Asbury T, et al. *General Ophthalmology.* 13th ed. East Norwalk: Appleton and Lange. 1992: 176.
4. Shapiro A, Leen MM. External transscleral posterior chamber lens fixation. *Arch Ophthalmol.* 1991; 109: 1759-60.
5. Hussain M, Mehmood H, Durrani J, et al. Secondary implantation of IOL. *Pak. J Ophthalmol.* 1995; 11: 26-31.
6. Solomon K, Gussler JR, Gussler C, et al. Incidence and management of complication of transsclerally sutured posterior chamber lenses. *J Cataract Refract Surgery.* 1993; 19: 488-93.
7. Bleckmann H, Kaczmarek U. Functional results of posterior chamber lens implantation with scleral fixation. *J Cataract Refract Surg.* 1994; 20: 321-6.

8. **Girard LJ, Nino N, Wasson N, et al.** Scleral fixation of a subluxated posterior chamber intraocular lens. *J Cataract Refract Surg.* 1989; 14: 326-7.
9. **Smiddy WE, Sawusch MR, OBrien TP, et al.** Implantation of scleral-fixed posterior chamber intraocular lenses. *J Cataract Refract Surg.* 1990; 16: 691-6.
10. **Sulewski ME, Gottsch JD, Haller JA, et al.** Posterior chamber intraocular lens implantation without capsular support. In: Schachat A.P. ed. *Current Practice in Ophthalmology.* St. Louis, Missouri. Mosby Year Book Inc. 992: 125-144.
11. **Panton RW, Sulewski ME, Parker JS, et al.** Surgical management of subluxated posterior chamber intraocular lenses. *Arch Ophthalmol.* 1993; 111: 919-26.
12. **Smiddy WE.** Dislocated posterior chamber intraocular lens: A new technique of management. *Arch Ophthalmol.* 1989; 107: 1678-80.
13. **Basti S, Tejaswi PC, Sing SK, et al.** Outside-In transscleral fixation for Ciliary sulcus intraocular lens placement. *J. Cataract Refract Surg.* 1994; 20: 89-92.
14. **Duffey RJ, Holland EJ, Agapitos PT, et al.** Anatomic study of transscleral sutured intraocular lens implantation. *AM J Ophthalmol.* 1989; 108: 300-9.
15. **Apple DJ, Rabb MF.** *Ocular Pathology; Clinical Applications And Self Assessment.* 4th ed. St. Louis: Mosby Year Book Inc. 1991: 1-11, 112-65.
16. **Lubniewski AJ, Holland EG, Van Meter WS, et al.** Histological studies of the eyes with transsclerally sutured posterior chamber intraocular lenses. *Am J Ophthalmol.* 1990; 110: 237-43.
17. **Bergren RL.** Four point fixation technique for sutured posterior chamber intraocular lenses. *Arch Ophthalmol.* 1994; 12: 1485-87.
18. **Lee JH, Chang JH.** Suture to limbal distances in eyes with posterior chamber intraocular lens implanted by scleral fixation. *J Cataract Refract Surg.* 1993; 19: 278-83.
19. **Horiguchi M, Hirotsu H, Koura T, et al.** Identifying the ciliary sulcus for suturing a posterior chamber intraocular lens by transillumination. *Arch Ophthalmol.* 1993; 111: 1693-5.
20. **Agapitos RJ, Lindstrom RL.** Transscleral ciliary sulcus fixation of posterior chamber intraocular lens implants. *Aust NZJ Ophthalmol.* 1989; 17: 169-72.
21. **Kreshner RM.** Simple method of transscleral fixation of a posterior chamber intraocular lens in the absence of lens capsule. *J Cataract Refract Surg.* 1994; 10: 647-51.
22. **Arkin MS, Steinert RF.** Sutured posterior chamber intraocular lenses. In: Jakobiec FA, Adamis AP, Volpe NJ. Eds *International Ophthalmology Clinics. Controversies in Ophthalmology: Current Therapies and Emerging Technologies.* Boston: Little, Brown and Company. 1994; 34: 67-86.
23. **Qazi ZA.** Retrospective study of 62 patients with transscleral fixation of IOL. (Paper presented at Lahore Ophthalmology 95 held by Ophthalmological Society of Pakistan in December 1995).
24. **Holland EJ, Daya SM, Evenglista A, et al.** Penetrating keratoplasty and transscleral fixation of posterior chamber lens. *Am J Ophthalmol.* 1992; 114: 182-7.
25. **Scott IU, Flyman HW, Feuer W.** Endophthalmitis after secondary IOL implantation. A case control study. *Ophthalmology.* 1995; 102: 1925-31.
26. **Heilskov T, Joondeph RC, OLson KR, et al.** Late endophthalmitis after transscleral fixation of a posterior chamber intraocular lens. *Arch Ophthalmol.* 1989; 107: 1427.