

Classification and Evaluation of Secondary Posterior Chamber IOL Implantation Scleral Fixation of IOL

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Purpose: Aim of the study was to evaluate secondary PC IOL implantation in terms of: Variation of surgical procedure required to manage different situations, visual outcome and postoperative complications.

Methods: Fifty eyes of 45 patients having traumatic or surgical aphakia were included in the study over the period of 5 years from Oct. 95 to Nov. 2000. The status of posterior capsule varied from intact, partially deficient or totally absent. Similarly the technique varied from simple synechiolysis to anterior vitrectomy combined with simple implantation to single or double haptic trans-scleral fixation. Single piece PC IOL was used in most of the patients while multi piece PC IOL was used very occasionally. No AC IOL was implanted or included for exchange in this series.

Postoperative follow up ranged from 6 to 60 months, average being 26.5 months.

Results: Surgical technique needed to be varied according to the situation. It ranged from simple implantation on an intact PC (6 eyes), synechiolysis and implantation in 3 eyes, Capsulotomy with anterior vitrectomy and implantation (11 eyes), trans-scleral IOL fixation in 26 eyes and retrieval with fixation of dislocated IOL in 4 eyes. Average visual acuity was in the range of 6/9-6/12. The most common complication was glaucoma (8 cases) followed by vitreous hemorrhage (4 cases with trans-scleral fixation) and hyphaema (2 cases), which resolved in all the patients with no residual complication.

Conclusion: Secondary PC IOL implantation is an effective and safe technique for visual rehabilitation of aphakic patients. One should be ready and well versed with the variations of surgical technique required while carrying out such procedures.

The preferred lens for aphakic rehabilitation is a posterior chamber lens. Major therapeutic advantage of a posterior chamber IOL over anterior chamber IOL is its position away from delicate anterior chamber structures especially the corneal endothelium and aqueous out flow channels. Moreover the posterior chamber IOL is positioned in the focal point of the eye and is close to the rotational axis of the eye. This ensures good refraction and minimal pseudophacodonesis^{1,2}.

Secondary PC IOL implantation in aphakics is an established procedure. The most suitable candidate for this procedure is a patient who had had uncomplicated extra capsular cataract extraction in the past. The posterior capsule is intact and pupil is mobile with no anterior or posterior synechiae. However most of the patients, going to have secondary intraocular lens implantation, are far from this ideal situation. The eyes are usually already compromised secondary to inadvertent surgical

trauma in the past. The scenario may be complicated by borderline endothelial cell counts, lack of iris tissue and iridocapsular adhesions. Vitreous touch and vitreous wick along with all associated problems like CME is not an uncommon finding³⁻⁶.

IOL exchange is another indication for secondary IOL implantation. Dislocation or subluxation of the posterior chamber lenses may occur secondary to postoperative trauma to the eye or zonular dehiscence not recognized at the time of primary lens implantation. Repositioning or retrieval and fixation of the same lens transsclerally or IOL exchange, can be a procedure of choice in these situations⁷⁻¹³.

The status of posterior capsule may vary from intact to partially deficient or totally absent. Similarly the technique has to be varied from simple implantation to synechiolysis to anterior vitrectomy combined with single or double haptic trans-scleral fixation of PC IOL.

This study is focused on evaluation of variations of surgical procedure required to manage different situations encountered in secondary IOL implantation. It also reviews the visual outcome and postoperative complications.

MATERIAL AND METHODS

Fifty eyes needing secondary PC IOL implantation were included regardless of age or sex. We tabulated the following data for each patient. Age, sex, type of antecedent surgery, interval between antecedent surgery and presentation and surgical procedure used. Pre and postoperative visual acuity was also recorded along with postoperative complications. Follow up ranged from 6 to 60 months, average being 26.5 months.

Preoperative evaluation included history taking in detail, recording of best-corrected V/A, anterior segment slit lamp biomicroscopy, fundus examination and applanation tonometry. B-scan was performed where media did not permit direct fundus examination to rule out retinal pathology. Anterior segment photographs were taken wherever possible.

Various techniques used can be generalized under following headings:

1. Simple Secondary PC IOL (Sec- PC IOL): Routine implantation of Intra Ocular Lens in eyes with intact posterior capsule and no anterior or posterior synechiae along with clear visual axis (Fig-1).

2. Sulcus Dissection/Synechiolysis and PC IOL implantation (SD & PC IOL): in eyes with intact posterior capsule but with anterior or posterior synechiae and clear/opaque visual axis (Fig-2).
3. Intra shelf PC IOL implantation (IS PC IOL) with anterior vitrectomy in eyes with central rent in posterior capsule or densely opaque visual axis (Fig-3).
4. Single Haptic Scleral Fixation (SHSF PC IOL) in eyes with partially deficient posterior capsule with peripheral rent extending for less than 180 (Fig-4).
5. Double haptic scleral fixation (DHSF PC IOL) in eyes missing posterior capsule completely. (Fig-5)
6. Retrieval & Fixation of dislocated IOL (R&SF PC IOL) in eyes with rented posterior capsule and subluxated / dislocated pseudophacos (IOL).

In postoperative evaluation special stress was given to recording the, condition of the wound, endothelial status with specular reflection and grading of anterior chamber activity, IOL status and condition of the vitreous. IOP assessment was performed and documented as a routine. Follow up schedule was at first post operative day, weekly for two weeks, fortnightly for two months and then monthly at least for 6 months.

RESULTS

50 eyes of 45 patients needing secondary intraocular lens implantation were included in the study and evaluated for visual outcome and complications. Average age was 51 years ranging from 5 to 78 years. The follow up ranged from 6-60 months and average follow up was 26.5 months. The characteristics of the patients are listed in (Table 1).

Out of 50 eyes operated 34 were of males and 16 were of females. Indications wise the patients were divided into six major groups.

1. Aphakics with Intact PC, 6 eyes (No anterior or posterior synechiae and clear visual axis)
2. Complicated Aphakia with Intact PC, 3 eyes (With anterior or posterior synechiae but clear visual axis).
3. Aphakic Eyes with central rent in PC, 11 eyes or densely opaque visual axis.
4. Partially deficient posterior capsule, with peripheral rent extending less than 180 degrees, 2 eyes.
5. Totally missing posterior capsule 24 eyes
6. Posterior capsular rent subluxated pseudophacos 4 eyes

Most of eyes presented with rented or totally absent posterior capsule (41 eyes) and PC was intact only in 9 eyes. Surgical procedures required also varied similarly and were again divided into six major groups (Table 2).

- a. Simple Secondary implantation of PC IOL 6 (12%) (Sec- PC IOL).
- b. Synechiolysis/sulcus dissection 3 (6%) and PC IOL implantation (SD&PC IOL)
- c. Intrashelf implantation with anterior vitrectomy (IS PC IOL) 11(22%)
- d. Single haptic fixation (SHSF PC IOL) 2 (4%)
- e. Double haptic scleral fixation 24(48%) (DHSF PC IOL)
- f. Retrieval & Scleral fixation of dislocated PC IOL (R&SF PC IOL) 4 (8%)

The postoperative visual acuity was dependent on the eye's pre operative visual potential. In our study 5 patients had pre-existing macular problems. Secondary Intra Ocular Lens implantation was considered in these patients to improve the quality of vision and to manage the vitreous wick and vitreous touch syndromes. Table 3 (Graph1) shows the preoperative and postoperative visual acuity. Forty (80%) eyes were 6/36 or better preoperatively while 47 eyes (94%) were in the same range postoperatively. The eyes in the range of 6/60 or less were 10 (20%) preoperatively, while only three (6%) eyes were in that range postoperatively. Only one eye had postoperative visual loss secondary to retinal detachment.

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. 6/9). 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.

The most common complication was glaucoma in 8 eyes (16%) followed by vitreous hemorrhage in 4 eyes (8 %) and hyphaema in 2 eyes (4%). Vitreous hemorrhage cleared in all the patients within 1-3 weeks with no residual complications while

hyphaema resolved within 3-7 days in all the cases. Clinically significant IOL tilt occurred one case (2%) and the IOL had to be repositioned. The gross IOL tilt in one patient was related to history of trauma accompanied by vitreous hemorrhage. (Table 4 and Graph 2).

Table 1: Patients' characteristics

Patients' characteristics	
Age Range	5-78 years
Males	32
Females	13
Avg. Follow Up	26.5 months

Table 2. Surgical Procedures

Simple Sec- Implantation of IOL (Sec- PC IOL)	6(12%)
Sulcus dissection & Implantation (SD &PC IOL)	3(6%)
Intra Shelf Implantation With Ant.Vit. (IS PC IOL)	11(22%)
Single Haptic scleral Fixation (SHSF PC IOL)	2(4%)
Double Haptic scleral Fixation (DHSF PC IOL)	24(48%)
Retrieval & Fixation/Exchange of Dislocated IOL (R&SF/X PC IOL)	4(8%)

Table 3. Comparison of Pre and Post op Visual A

	6/6-6/9	6/12-6/18	6/24-6/36	6/60
Preop VA	16 (32%)	14 (28%)	10 (20%)	10 (20%)
Postop VA	25 (50%)	16 (32%)	6 (12%)	3 (6%)

DISCUSSION

Aphakic patients may opt for secondary IOL insertion because of objective or subjective intolerance of contact lenses and/or spectacle correction.¹⁴ Management of aphakic patients with intact posterior capsule is quite simple and straightforward. However secondary IOL implantation in eyes lacking enough capsular support remains challenging and controversial.

Table 4. Postoperative Complications

Glaucoma	8 (16%)
Vit. He	4 (8%)
Hyphaema	2 (4%)
IOL tilt (Visually Insignificant)	1 (2%)
Traumatic Subluxation	1 (2%)

Preoperative characteristics	Intended surgical Plan	
Intact clear PC with mobile dilated pupil	Simple Secondary PC IOL Implantation	Sec- PC IOL
Poorly dilating pupil secondary to Synechia	Sulcus dissection PC Polishing and PC IOL Implantation	SD & PC IOL
Scenario 2+ central rent in Posterior capsule	Sulcus dissection, PC Polishing, anterior vitrectomy and Intrashelf PC IOL Implantation	IS PC IOL
Partially deficient posterior capsule with peripheral rent extending for less than 180	Sulcus dissection, Anterior Vitrectomy and Single Haptic Sclera Fixation of PC IOL	SHSF PC IOL
Subluxated / dislocated PC IOL with rent posterior capsule	Retrieval & Scleral Fixation/ Exchange of IOL with Anterior Vitrectomy/ PPV	R&SF/X PC IOL

SIMPLE 2⁺ IMPLANTATION OF IOL

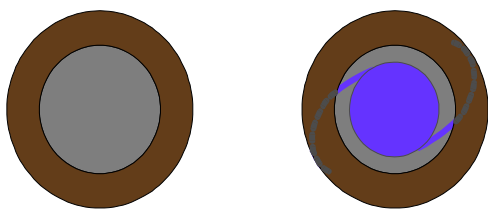


Fig. 1. Simple Secondary PC IOL (Sec- PC IOL)

Both posterior chamber (traditionally sulcus supported and scleral fixated) and anterior chamber

SYNECHIOLYSIS AND IMPLANTATION

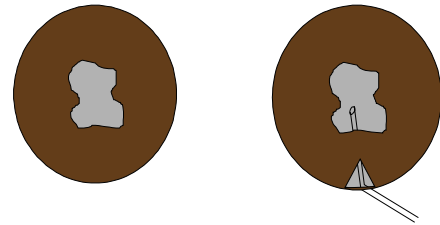


Fig-2. Sulcus Dissection Synechiolysis and PC IOL implantation (SD & PC IOL)

INTRASHELF IMPLANTATION WITH ANTERIOR VITRECTOMY

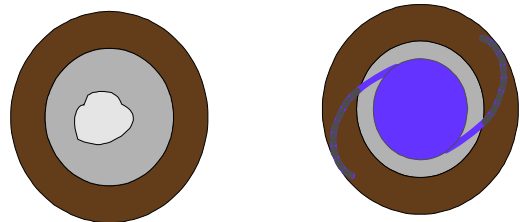


Fig. 3. Intra shelf PC IOL implantation (IS PC IOL)

SINGLE HAPTIC FIXATION

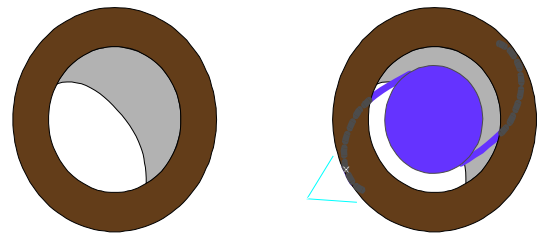


Fig-4. Single Haptic Sclera Fixation (SHSF PC IOL)

DOUBLE HAPTIC FIXATION

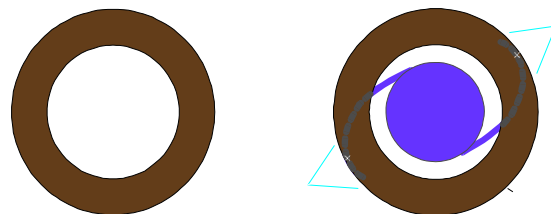


Fig 5. Double haptic scleral fixation (DHSF PC IOL)

(angle-supported and iris clip) IOLs have been implanted secondarily.¹⁵ Secondary IOLs are difficult to place in the capsular bag because of anterior and

posterior capsular fusion secondary to fibrosis. Although sulcus-supported posterior chamber IOLs need adequate capsular support, they have a reduced complication rate in comparison with scleral fixated or anterior chamber IOLs. The capsular remnant provides an excellent support scaffold, even in the absence of a 360-degree ring; although it may remain adherent to the posterior surface of the iris, the remnant may be used to reconstruct the ciliary sulcus and provide adequate support for a posterior chamber IOL¹⁶.

Preoperative evaluation of patients having secondary IOL implantation is important to enable accurate surgical planning, including choice of the IOL and informed patient consent.^{17,18,19} In patients in whom inadequate dilation precludes the detection of capsular support, our study suggests that ciliary sulcus-supported secondary IOL implantation should be considered preoperatively, with the final decision lying with the surgeon with direct visualization of the sulcus²⁰⁻²².

In our study, we used the following classification for surgical planning and evaluation:

1. Simple Secondary PC IOL (Sec- PC IOL): Routine implantation of Intra Ocular Lens in eyes with intact posterior capsule and no anterior or posterior synechiae along with clear visual axis).
2. Synechiolysis/Sulcus Dissection and IOL implantation (SD & PC IOL) in eyes having intact posterior capsule but with anterior or posterior synechiae and clear visual axis).
3. Intra shelf PC IOL implantation (IS PC IOL) with anterior vitrectomy in eyes with central rent in posterior capsule or densely opaque visual axis (See Photograph-1).
4. Single Haptic Sclera Fixation (SHSF PC IOL) in eyes with partially deficient posterior capsule with peripheral rent extending for less than 180.
5. Double haptic scleral fixation (DHSF PC IOL). In eyes missing posterior capsule completely. (See Photograph-2).
6. Retrieval & Scleral Fixation/exchange of dislocated IOL (R&SF/X PC IOL) in eyes with rent posterior capsule and subluxated/dislocated pseudophacos (IOL).

Uthoff and Teichmann (1998) have concluded secondary intraocular lens implantation with scleral fixation was a safe procedure. More than 90% of their patients regained or improved their pre-operated visual acuity.²³ Another study reports mean visual

acuity (VA) improved from 6/18 to 6/9.²⁵ In our study 40 (80%) eyes were 6/36 or better preoperatively while 47 eyes (94%) were in the same range postoperatively. The eyes in the range of 6/60 or less were 10 (20%) preoperatively while only three (6%) eyes were in that range postoperatively. Only one eye had postoperative visual loss secondary to retinal detachment.

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 IOL implantation.

Postoperative complications associated with secondary IOL implantation include glaucoma, vitreous hemorrhage, hyphaema, macular edema and IOL decentration or tilt and endophthalmitis etc¹⁹⁻²⁴.

Daus W, Tetz M, Buschendorff P reported the following complications during their mean postoperative follow-up of 15 (range 3-45) months. There were 6-limited anterior chamber and 1 vitreous hemorrhage that resolved spontaneously. Two IOLs required surgical repositioning with scleral suturing because of postoperative IOL subluxation. A delayed but reversible fibrin reaction was seen in 1 eye, while 1 eye developed a cystoid macular edema with reduction of VA from 20/30 to 20/60²⁵.

The most common complication observed in our study was glaucoma in 8 eyes (16%) followed by vitreous hemorrhage in 4 eyes (8 %) and hyphaema in 2 eyes (4%). Vitreous hemorrhage appeared more frequently in our study though it cleared inconsequentially in all the patients. The probable reason was trans-scleral fixation in almost half of the patients. Clinically significant IOL tilt occurred one case (2%) and the IOL had to be repositioned. The gross IOL tilt in one patient was related to history of trauma accompanied by vitreous hemorrhage.

CONCLUSION

The choice of the surgical procedure depends on the degree of involvement, of the bag-zonular system. Preoperative evaluation of patients having secondary PC IOL implantation is important to enable accurate surgical planning. In patients where inadequate dilation precludes the detection of capsular support,

our study suggests that ciliary sulcus-supported secondary IOL implantation should be considered preoperatively, with the final decision lying with the surgeon with direct visualization of the sulcus.

We suggest the following approach for secondary PC IOL implantation:

Secondary PC IOL implantation is an effective and safe technique for visual rehabilitation of aphakic patients. One should be ready and well versed with the variations of surgical technique required while carrying out such procedures.

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REFERENCE

- 1 **Apple DJ, Rabb MF.** Ocular Pathology; Clinical Applications and Self-Assessment. 4th ed. St. Louis: Mosby Year Book Inc. 1991: 1-11, 112-65.
- 2 **Bleckmann H, Kaczmarek U.** Functional results of posterior chamber lens implantation with scleral fixation. *J. Cataract Refract Surg.* 1994; 20: 321-6.
- 3 **Hussein M, Mehmood H, Durrani J, et al.** Secondary implantation of IOL. *Pak J Ophthalmol.* 1995; 11: 26-31
- 4 **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. 1992: 125-44.
- 5 **Lane SS, Agapitos PJ, Lindquist TD.** Secondary intraocular lens implantation. In: Lindquist T.D., Lindstrom R.L. Ed. *Ophthalmic Surgery; Loose Leaf and Update Service.* St. Louis: Mosby. 1994: G-0 to G-14.
- 6 **Wong SK, Koch DD, Emery JM.** Secondary intraocular lens implantation. *J Cataract Refract Surg.* 1987; 13: 17-20.
- 7 **Osher RH, Cionni RJ.** What to do when: Intraocular lenses misbehave. *Review of Ophthalmology.* 1994; 1: 42-7.
- 8 **Arkin MS, Steinert RF.** Sutured posterior chamber intraocular lenses. In: Jacobiec FA, Adamis AP, Volpe NJ. Eds *International Ophthalmology Clinics. Controversies in Ophthalmology: Current Therapies & Emerging Technologies.* Boston: Little, Brown and Company. 1994; 34: 67-86.
- 9 **Chan CK.** An improved technique for management of dislocated posterior chamber intraocular lens implants. *Ophthalmology.* 1992; 99: 51-7.
- 10 **Fanous MM, Friedman SM.** Ciliary sulcus fixation of a dislocated posterior chamber intraocular lens using liquid perfluorophenanthrene. *Ophthalmic Surg.* 1992; 23: 551-2.
- 11 **Maguire AM, Blumenkranz MS, Ward TG, et al.** Scleral loop fixation for posteriorly dislocated intraocular lenses: operative technique and long term results. *Arch Ophthalmol.* 1991; 109: 1754-8.
- 12 **Panton RW, Sulewski ME, Parker JS, et al.** Surgical management of subluxated posterior chamber intraocular lenses. *Arch Ophthalmol.* 1993; 111: 919-26.
- 13 **Smiddy WE.** Dislocated posterior chamber intraocular lens: A new technique of management. *Arch Ophthalmol.* 1989; 107: 1678-80.
- 14 **Galentine PG, Cohen EJ, Laibson PR, et al.** Corneal ulcers associated with contact lens wear. *Arch Ophthalmol.* 1984; 102: 891-4.
- 15 **Evereklioglu C, Er H, Bekir NA, et al.** Comparison of secondary implantation of flexible open-loop anterior chamber and scleral-fixated posterior chamber intraocular lenses. *J Cataract Refract Surg.* 2003; 29:301-308.
- 16 **Dahan E, Salmenson BD, Levin J.** Ciliary sulcus reconstruction for posterior implantation in the absence of an intact posterior capsule. *Ophthalmic Surg.* 1989; 20: 776-80.
- 17 **Dick HB, Augustine AJ.** Lens implant selection with absence of capsular support. *Curr Opin Ophthalmol.* 2001; 12: 47-57.
- 18 **Hahn TW, Kim MS., Kim JH.** Secondary intraocular lens implantation n aphakia. *J Cataract Refract Surg.* 1992; 18: 174-9.
- 19 **Hussein M, Mehmood H, Durrani J, et al.** secondary implantation of IOL. *Pak. J Ophthalmol.* 1995; 11: 26-31.
- 20 **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, Mosby Year Book Inc. 99: 125-44.
- 21 **Lane SS, Agapitos PJ, Lindquist TD.** Secondary intraocular lens implantation. In: Lindquist T.D., Lindstrom R.L. Eds. *Ophthalmic Surgery; Loose Leaf and Update Service.* St. Louis: Mosby. 1994: G-0 to G-14.
- 22 **Wong SK, Koch DD, Emery JM.** Secondary intraocular lens implantation. *J Cataract Refract Surg.* 1987; 13: 17-20.
- 23 **Uthoff D, Teichmann KD.** Secondary implantation of scleral-fixated intra Ocular Lenses. *J Catatact Refract Surg.* 1998; 24: 945-50.
- 24 **Scott IU, Flyman HW.** Endophthalmitis after secondary Intraocular Lens implantation. A case control study. *Ophthalmology.* 1995; 102: 1925-31.
- 25 **Daus W, Tetz M.** Buschendorff P Secondary posterior chamber lenses. Implantation in intact, partially intact and missing posterior lens capsule *Ophthalmology.* 1994; 91: 498-502.