Modified technique of Scleral Fixation Intraocular lens implantation

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Abstract: Background: The 1ry indication for scleral fixation of intraocular lenses (IOL) is dislocation as a principal complication of cataract surgery. Inadequate capsular support is the most common cause of IOL dislocation. Other indications include traumatic phakic lens dislocation (cataractous or clear), surgically aphakic eyes or anterior chamber IOL with complications (persistent hyphema, uveitis). Methods: 20 eyes of 20 patients were done, surgery was done only when the IOL was dislocated peripheral to the visual axis and was causing symptoms of visual loss sufficient to interfere with the patient's activities of daily living, or patients who were left aphakic for a 2ry implantation procedure. A modification of the technique was done which made the procedure faster and preserved the surrounding conjunctiva. Results: Best corrected visual acuity (BCVA) preoperatively ranged from 1/60 -6/60 and postoperatively between 6/60 – 6/6. Statistical analysis of the logarithm of the minimum angle of resolution (LogMAR) between the preoperative and postoperative visual acuity revealed significant improvement ($p \leq 0.05$). Intraoperative complications included one case of accidental iris injury, two cases of mild vitreous hemorrhage, two cases of moderate vitreous hemorrhage. Early postoperative complications included pupillary block. Midterm post operative complications occurred in one case with the occurrence of cystoid macular edema. Conclusion: Scleral fixation of IOL is a safe procedure with minimal complications, but needs surgical skills to be managed optimally. [Journal of American Science 2010;6(10):852-859]. (ISSN: 1545-1003).

Key words: Scleral fixation, Intraocular lenses, Aphakia, IOL dislocation.

1. Introduction:

The indication for intraocular lens (IOL) scleral fixation is widely variable. The 1ry indication is IOL dislocation as a principal complication of cataract surgery, with early reports of 13% rate of IOL dislocation [(1)] . Inadequate capsular support is the most common cause of IOL dislocation and most commonly manifests in the early postoperative period [(2)]. Fixation of intraocular lenses in cases of insufficient or no capsular support is challenging and requires a large armamentarium of techniques to resolve different situations [(3-24)]. Other indications include traumatic phakic lens dislocation (cataractous or clear), surgically aphakic eyes or anterior chamber IOL with complications (persistent hyphema, uveitis). The reported incidence of dislocation of rigid posterior chamber IOLs (PCIOLs) is from 0.2% to 2% [(25,26)] . Management decisions are based on the clinical features of every individual case and surgeon preference. Management options described for dislocated PCIOLs include IOL repositioning with or without scleral fixation sutures (depending on residual capsular support) and IOL removal (with or without reimplantation of the same or alternative IOL) [(19,27,28)]. IOL repositioning without scleral fixation suture is generally preferred technique if there is adequate capsular support. In the absence of adequate capsular support, the dislocated PCIOL may be sutured to the sclera or exchanged. The scleral suture fixation technique requires undamaged open-loop haptics. A PCIOL may be exchanged for a sutured PCIOL or an anterior chamber IOL (ACIOL [(29,30)]. Dislocation of the phakic human lens is uncommon but serious complication, as it requires sophisticated techniques to remove safely, especially if it is dislocated in the vitreous cavity. Dislocation of a PCIOL into the vitreous cavity is another uncommon but serious complication with numerous techniques for its management [(3,5,6,13,14,17,18,31-41)]. During surgical intervention, an important consideration is whether to remove, reposition, or exchange the dislocated PCIOL after performing a pars plana vitrectomy. If adequate capsular support is found to be present, the same intraocular lens may be positioned into the ciliary sulcus. Alternatively, the dislocated PCIOL may be sutured to the sclera if capsular support seems inadequate. If the PCIOL is removed, the patient may be left aphakic if intraocular lens implantation is contraindicated for any reason. However, when there is no contraindication to lens insertion, the patient may receive either a sutured PCIOL or an anterior chamber intraocular lens (ACIOL). Historically, ACIOLs, especially rigid and closed-loop lenses, have been associated with a higher rate of complications compared with PCIOLs [(42)]. These complications can lead to poor visual results and include bullous keratopathy, glaucoma, uveitis, hyphema, and cystoid macular edema. Newer, open-loop ACIOL designs, however, seem to have a lower

rate of complications [43]. In case of ACIOL complications, exchange of the anterior chamber IOL to a scleraly fixated PCIOL is done. Previous studies describing the visual results in subjects who underwent intraocular lens exchange have reached conflicting conclusions. Some studies have found similar final visual results between eyes that received an ACIOL and those that received a PCIOL [44]. whereas other studies have found better postoperative visual results in eyes that received a PCIOL [45].

2. Patients and Methods

The study cohort included 20 eyes of 20 patients. Preoperative data included age, gender, type & duration of dislocation (surgery , trauma) or aphakia , coexisting ocular diseases, preoperative best-corrected visual acuity (BCVA), preoperative type of IOL, category of IOL dislocation (in the bag), and previous surgery including pars plana vitrectomy, sclera buckling procedure, or neodyminium:yttrium-aluminium-garnet (Nd:YAG) capsulotomy. Surgery is recommended only when the IOL was dislocated peripheral to the visual axis and was causing symptoms of visual loss sufficient to interfere with the patient's activities of daily living, or patients who were left aphakic for a 2ry implantation procedure. The scleral suture fixation technique for acrylic IOLs was previously reported [18, 46] A modofication of the technique was done which made the procedure faster and preserved the surrounding conjunctiva (fig. 1). All surgeries were done by one surgeon (1st author A.S.)

Scleral fixation technique:

We followed the technique reported by Richard Hoffmann (fig 1) where, Two limbal vertical incisions half corneal thickness 2.5 mm in length were done at 1:30 and 7:30 meridians. A 2.6 mm crescent knife was used to create a reversed sclera pocket 2.5mm backwards across the limbus into the sclera subconjunctivally. Polypropylene sutures (10-0) on a straight needle were introduced 1 mm posterior to the limbus through the wall of the scleral pocket traversing the conjunctiva, sclera pocket and into the eye. The needle is passed across the eye behind the iris and delivered from the opposite side 1 mm behind the limbus through guidance by a 25 G needle introduced through the sclera pocket of the other side 180 degrees away. This needle is again introduced into the eye 1mm adjacent to its exit to pass to the opposite side in the same manner previously described. Finally, we have two 10/0 threads passing across the eye and 2 separate ends on either side of the limbus. A two step corneal incision 7mm is done. The two 10/0 threads are retrieved through the wound by a sinsky hook. Every two ends are tied to the hole on the haptic of sclera fixation PMMA 6.50 optic IOL, whenever the diopteric power was available or on the haptics if not. The two ends were pulled to centralize the IOL. The corneal wound in closed with 3 interrupted 10/0 nylon stitches. The 2 10/0 prolene threads on either side were retrieved from the corneal side of the scleral pocket and tied to one another on either side separately and buried in the sclera pocket.

In vitreous dislocated IOLs; 3 port 20 Gauge pars plana vitrectomy was done in the usual manner with perflurodecalin floatation of the dislocated IOL and retrieval with serrated vitrectomy forceps and into the anterior chamber above the iris, where it is removed through corneal incision. In cases where there was traumatic dislocation of the cataractous lens, the same former technique was done with removal of the lens by phacofragmatome. In cases where total vitrectomy was performed, peripheral retinal indentation was done with intraocular laser treatment to any suspicious peripheral tears and fluid air exchange was done with the eye left with air tamponade with no traction on the retina. In case of surgical aphakia, conjunctiva was not opened and anterior chamber vitrectomy was done either through two corneal side ports or through the main corneal wound. In cases of anterior chamber IOL sublaxation, anterior vitrectomy was done through 2 corneal side ports and IOL was fixated with an anteriorly opened needle introducing the 10/0 prolene through the sclera pocket and retrieving it in the manner described earlier. The anterior chamber iris captured IOL was removed through corneal incision with anterior vitrectomy, All were followed by sclera fixation of a 6.5 optic Polymethylmethaacrylate (PMMA) IOL. Visual acuity was converted to the logarithm of minimum angle of resolution for statistical analysis.

Statistical analysis:

The mean differences in paired designs were applied using paired t-test to analyze the differences in logMAR of visual acuity in the collected sample of this study at a confidence interval 95% and significance level 0.05 quality.

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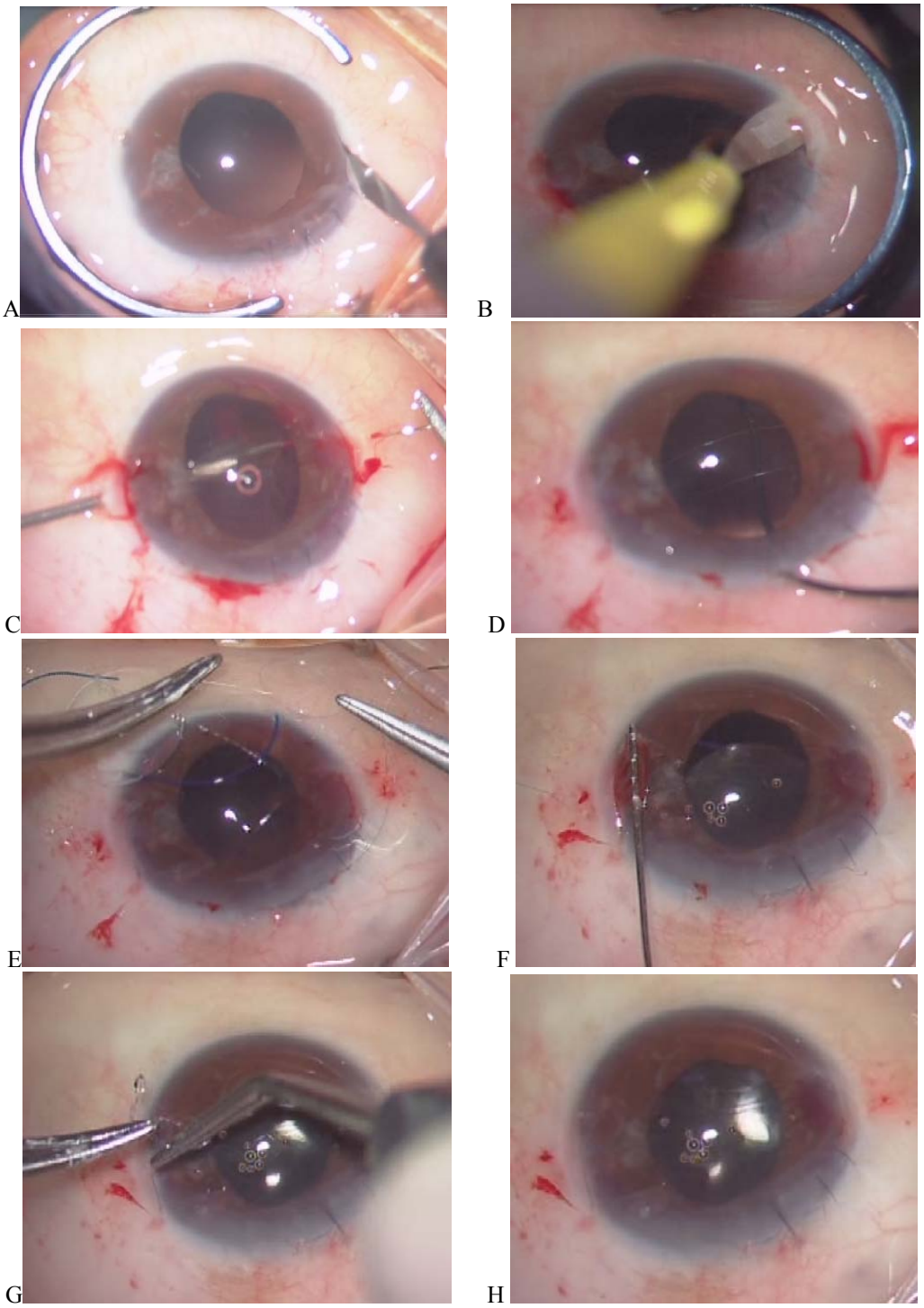

Figure1: Steps of scleral fixation: A- Limbal incision. B- Tunnel dissection. C- 10/0 prolene introduction and retrieval. D- 10/ 0 prolene thread retrieval. E-Haptic tying. F- 10/0 prolene pocket retrieval. G- 10/0 prolene tying and embedding in the sclera pocket. H- Final picture with no conjunctival opening.

3. Results:

Preoperative Characteristics

The study cohort included 20 eyes of 20 patients (8 males, 12 females), with mean age of the patients was 52.9 years (range, 25-70 years; (Table 1). There were 11 (55%) right eyes. The median interval from 1ry procedure to the present procedure is 66 days (range, 14–120 days).The indications for scleral fixation were vitreous IOL dislocation during the 1ry procedure in 3(15%) eyes; surgical aphakia without enough capsular support for 1ry IOL implantation in 9 (45%) eyes; Traumatic cataractous phakic lens vitreal dislocation in 5 (25%) eyes; IOL sublaxation with the optic bisecting the pupil and peripheral anterior synechea and residual cortical matter in 2 (10%) eyes; Anterior chamber captured IOL suffering from chronic iritis in one (5%) eye. The preoperative mean BCVA logarithm of minimum angle of resolution was 1.67 (range of Snellen visual acuity, 1/60 – 6/60). There were 2 (10 %) polymethyl methacrylate (PMMA) IOLs, 3 (15%) one piece acrylic IOLs, and 1 (5%) ACIOLs (Table 1).

Table 1. Baseline Characteristics

No. of patients	20
Eyes	20
Gender (%)	Female 12 eyes 60 %
Age (yrs)	Mean 52.9 Range 25–70
Right	11eyes 55 %
Types of dislocated IOL (n-6)	
PMMA 1-piece	2 (10 %)
1-Piece acrylic IOL	3 (15 %)
ACIOL	1 (5 %)
Preoperative BCVA	
Mean logMAR	1.67
Range (Snellen)	1/60 – 6/60
Interval from IOL implantation to dislocation	Range 14 day to 120 days

ACIOL anterior chamber intraocular lens; BCVA best corrected visual acuity; IOL intraocular lens; logMAR logarithm of minimal angle resolution; PMMA polymethylmethacrylate.

The median follow-up after dislocated IOL management or implantation was 18 months (range, 11monts-24months). The postoperative mean BCVA logarithm of minimum angle of resolution was 0.24 (range of Snellen visual acuity, 6/60 – 6/6). Intraoperative complications included one case of accidental iris injury during anterior vitrectomy (Table 2). Two cases of mild vitreous hg which resolved after 2 weeks of bed rest (Fowler position). Two cases of moderate vitreous hg which mandated doing total vitrectomy during the procedure. Early postoperative complications included pupillary block with elevation of the IOP which resolved completely after a course of mydriatics. Mid term post operative complications occurred in one case with the occurrence of cystoid macular oedema (Irvine gass syndrome).

Table 2: complications.

Complications	
Intraoperative	accidental iris injury (n:1)
	Mild vitreous hemorrhage (n:2)
	Moderate vitreous hemorrhage (n:2)
	Retinal tears (n:2)
Postoperative	
Early	Papillary block (n:1)
Midterm	Cystoid macular oedema (n:1)

Best corrected visual acuity (BCVA) preoperatively ranged from 1/60 -6/60 and postoperatively between 6/60 – 6/6 (Figure 2, 3). Statistical analysis of the logarithm of the minimum angle of resolution (LogMAR) between the preoperative and postoperative visual acuity revealed significant improvement ($p \leq 0.05$).

4. Discussion:

Previous studies have not definitively set surgical indications and optimal timing for management of dislocated IOLs; neither did this study. The management approach depends on surgeon preferences and individual case specifics, including integrity of capsule remnants, type of IOLs, and coexisting ocular pathology [47-50]. The surgical approach in this series was influenced by the specialty (vitreoretinal) and the preferences of the operating surgeon (AS), but standardization was established regarding the scleral fixation itself, while the remainder of the procedure was determined by the case pathology and operative circumstances. The stability and centralization of the scleraly fixated IOLs in this study were excellent during the follow up period with no rotation or sublaxation. The visual acuity significantly improved postoperatively. Postoperative retinal detachment has been reported in 3%21 to 14%10 of cases. In the current study, postoperative retinal detachment didn't develop in

any case postoperatively. In cases where total vitrectomy was performed, peripheral retinal indentation was done with intraocular laser treatment to any suspicious peripheral tears and fluid air exchange was done with the eye left with air tamponade with no traction on the retina. Knot exposure, intraocular hemorrhage, trans-scleral suture fistulas, and endophthalmitis have been reported with transscleral sutures, but none with the present technique. The scleral pocket technique done minimized this incidence. Intraoperative and postoperative intraocular hemorrhage is usually self-limited, with two cases resolved after 2 weeks but 2 (10%) patients received vitrectomy during the scleral fixation owing to moderate nature of the hemorrhage, which was related to the transscleral suture passes. Cystoid macular edema occurred in one case and was treated accordingly. Recent case studies of in-the-bag IOL dislocation have suggested predisposing factors of pseudoexofoliation, uveitis, trauma, status after vitrectomy, and long axial length [27,33,48,51-59]. Postoperative retinal detachment occurred more commonly with in-the-bag IOL dislocation compared with extracapsular dislocation, but none in this study. Intraoperative retinal breaks were encountered in 2 eyes; 10%) in this study during the course of vitrectomy and were treated with intraocular laser. Suturing of a dislocated PCIOL to the sclera could be technically demanding, potentially resulting in an increased number of intraoperative and postoperative complications such as intraocular hemorrhage, retinal tears, and retinal detachment, with a long-term risk of lens rotation, as well as endophthalmitis [36,48,60,61]. Repositioning a dislocated PCIOL into the ciliary sulcus is easier and less traumatic than suturing a lens into the sclera, however, there is the possibility of postoperative lens dislocation because of inadequate capsular support [35]. Finally, although technically easier to place, ACIOLs may be associated with a higher long term risk of corneal decompensation, glaucoma, and uveitis [42,43,62]. In contrast, PCIOLs have a long-term safety record in eyes with other ocular diseases such as glaucoma, uveitis, and diabetic retinopathy [63,64]. This series is rather few, but it adds to the belief of the safety and stability of scleraly fixated IOLs.

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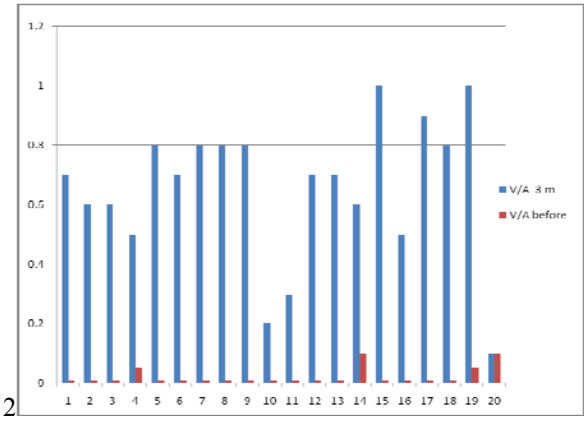

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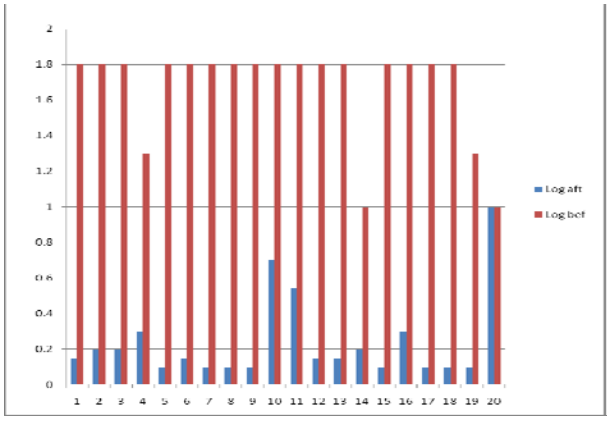

Figure2: graph of visual acuity pre and postoperative by 3 months, Figure3: graph of visual acuity LogMar conversion pre and postoperative by 3 months.

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5. References:

1- Ridley H. Intra-ocular acrylic lenses—past, present and future. Trans Ophthalmol Soc UK 1964;84:5–14.
2- Smith SG, Lindstrom RL. Malpositioned posterior chamber lenses: etiology, prevention, and management. J Am Intraocular Implant Soc 1985;11:584 –91
3- 3-Anand R, Bowman RW. Simplified technique for suturing dislocated posterior chamber intraocular lens to the ciliary sulcus(letter). Arch Ophthalmol.1990;108:1205-1206.
4- Azar DT, Wiley WF.Double-Knot transscleral suture fixation technique for displaced intraocular lenses. Am J Ophthalmol.1990;128:644-646.
5- -Bloom SM, Wyszynski RE, Brucker AJ. Scleral fixation suture for dislocated posterior chamber lens.Ophthalmic Surg.1990;21:851-854.
6- Chan CK. An improved technique for management of dislocated posteror chamber implants. Ophthalmology. 1992; 99:51-57.

7- Chang S. perflurocarbon liquids in vitreoretinal surgery. Int Ophthalmol clin. 1992; 32:153:163.
8- Chang S, Coll GE. Surgical techniques for repositioning a dislocated intraocular lens, repair of iridodialysis, and secondary intraocular lens implantayion using innovative 25-gauge forceps. Am J Ophthalmol.1995; 119:165-174.
9- Fanous MM, Friedman SM. Ciliary sulcus fixation of a dislocated posterior chamber intraocular lens using liquid perfluorophenanthrene. Ophthalmic Surg. 1992; 23:551-552.
10- Friedberg MA, Plikerton AR. Anew technique for repositioning and fixating a dislocated intraocular lens. Arch Ophthalmol. 1992;110:413-415.
11- Kokame GT, Yamamoto I, Mandel H, Scleral fixation of dislocated posterior chamber intraocular lenses; temporary haptic externalization through a clear corneal incision. J cataract Refract Surg.2004; 30:1049-1056.
12- Little BC, Rosen PH, Orr G, Aylward GW.trans-scleral fixation of dislocated posterior chamber intraocular lenses using a 9/0 microsurgical polypropylene snare. Eye.1993; 7:740-743.
13- Maguire AM, Blumenkranz MS, Ward TG, Winkelman JZ. Scleral loop fixation for posteriorly dislocated intraocular lenses, operative technique and long-term results. Arch Ophthalmol.1991; 109:1754-1758.
14- Nabors G, Varley MP, Charles S. Ciliary sulcus suturing of a posterior chamber intraocular lens. Ophthalmic Surg. 1990; 21:263-265.
15- -Schneiderman TE, Johnson MW, Smiddy WE, et al. Surgical management of posteriorly dislocated silicone plate haptic intraocular lenses. Am J Ophthalmol. 1997;123:629-635.
16- Shin DH, Hu BV, Hong YJ, Gibbs KA. Posterior Chamber lens implantation in the absence of posterior capsular support (letter and reply by WJ Stark, GL Goodman, JD Gottsch)ophthalmic Surg.1988;19: 606=607.
17- Smiddy WE. Dislocated posterior chamber intraocular lens; a new technique of management. Arch Ophthalmol.1989; 107: 1678-1680.
18- Smiddy WE, Flynn HW Jr, Needle assisted scleral fixation suture technique for relocating posteriorly dislocated IOLs(letter) Arch Ophthalmol.1993;111:161-162.
19- Smiddy WE, Ibanez GV, Alfonso E, Flynn HW Jr. Surgical management of dislocated intraocular lenses. J Cataract Refract Surg. 1995; 21:64-66.
20- Thach AB, Dugel PU, Sipperley JO, et al. Outcome of sulcus fixation of dislocated posterior chamber intraocular lenses using temporary externalization of the haptics. Ophthalmology.2000;107:480-484; discussion by WF Mieler, 485.
21- Koch HJ, Kim CY, Lim SJ, Kwon OW. Scleral fixation technique using 2 corneal tunnels for a dislocated intraocular lens. J Cataract Refract Surg. 2000; 26: 1439-1441.
22- Lewis JS .Ab externo sulcus fixation. Ophthalmic surgery. 1991; 22: 692-695.
23- Mohr A, Hengerer F, Eckardt C. Retropupillare fixation der irisklauenlinse bei aphakie; Einjahresergebnisse einer neuen implantationstechnik. (Retropupillary fixation of the iris claw lens in aphakia; 1 year outcome of a new implantation technique.) Ophthalmologe. 2002;99: 580-583.
24- Teichmann KD, Teichmann IAM. The torque and tilt gamble. J Cataract refract Surg. 1997;23: 413-418.
25- Stark WJ Jr, Maumenee AE, Datiles M, et al. Intraocular lenses: complications and visual results. Trans Am Ophthalmol Soc 1983;81:280 –309.
26- Smith SG, Lindstrom RL. Malpositioned posterior chamber lenses: etiology, prevention, and management. J Am Intraocular Implant Soc 1985;11:584 –91.
27- Sarrafizadeh R, Ruby AJ, Hassan TS, et al. A comparison of visual results and complications in eyes with posterior chamber intraocular lens dislocation treated with pars plana vitrectomy and lens repositioning or lens exchange. Ophthalmology 2001;108:82–9.
28- Mittra RA, Connor TB, Han DP, et al. Removal of dislocated intraocular lenses using pars plana vitrectomy with placement of an open-loop, flexible anterior chamber lens. Ophthalmology 1998;105:1011– 4.
29- Gonzalez GA, Irvine AR. Posterior dislocation of plate haptic silicone lenses [letter]. Arch Ophthalmol 1996;114:775– 6.
30- Whiteside SB, Apple DJ, Peng Q, et al. Fixation elements on plate intraocular lens: large positioning holes to improve security of capsular fixation. Ophthalmology 1998;105:837– 42.
31- Stark WJ, Michels RG, Bruner WE. Management of posteriorly dislocated intraocular lenses. Ophthalmic Surg 1980;11: 495–7.
32- Sternberg P Jr, Michels RG. Treatment of dislocated posterior chamber intraocular lenses [case report]. Arch Ophthalmol 1986;104:1391– 3.
33- McCluskey P, Harrisberg B. Long-term results using scleralfixated posterior chamber

intraocular lenses. J Cataract Refract Surg 1994;20:34 –9.
34- Smiddy WE, Flynn HW Jr. Management of dislocated posterior chamber intraocular lenses. Ophthalmology 1991;98: 889–94.
35- Panton RW, Sulewski ME, Parker JS, et al. Surgical management of subluxed posterior-chamber intraocular lenses. Arch Ophthalmol 1993;111:919 –26.
36- Insler MS, Mani H, Peyman GA. A new surgical technique for dislocated posterior chamber intraocular lenses [case report]. Ophthalmic Surg 1988;19:480 –1.
37- Campo RV, Chung KD, Oyakawa RT. Pars plana vitrectomy in the management of dislocated posterior chamber lenses. Am J Ophthalmol 1989;108:529 –34.
38- Bowman CB, Hansen SO, Olson RJ. Noninvasive repositioning of a posterior chamber intraocular lens following papillary capture. J Cataract Refract Surg 1991;17:843–7.
39- Hu BV, Shin DH, Gibbs KA, Hong YJ. Implantation of posterior chamber lens in the absence of capsular and zonular support. Arch Ophthalmol 1988;106:416 –20.
40- Stark WJ, Gottsch JD, Goodman DF, et al. Posterior chamber intraocular lens implantation in the absence of capsular support. Arch Ophthalmol 1989;107:1078–83.
41- Ruiz-Moreno JM. Repositioning dislocated posterior chamber intraocular lenses. Retina 1998;18:330–4.
42- Smith PW, Wong SK, Stark WJ, et al. Complications of semiflexible, closed-loop anterior chamber intraocular lenses. Arch Ophthalmol 1987;105:52–7.
43- Lim ES, Apple DJ, Tsai JC, et al. An analysis of flexible anterior chamber lenses with special reference to the normalized rate of lens explantation. Ophthalmology 1991;98: 243– 6.
44- Mamalis N, Crandall AS, Pulsipher MW, et al. Intraocular lens explantation and exchange: a review of lens styles, clin- ical indications, clinical results, and visual outcome. J Cataract Refract Surg 1991;17:811– 8.
45- Lyle WA, Jin JC. An analysis of intraocular lens exchange. Ophthalmic Surg 1992;23:453– 8.
46- Smiddy WE. Modification of scleral suture fixation technique for dislocated posterior chamber intraocular lens implants [letter]. Arch Ophthalmol 1998;116:967.
47- Chan CK, Agarwal A, Agarwal S, Agarwal A. Management of dislocated intraocular implants. Ophthalmol Clin North Am 2001;14:681–93.
48- *Sung Soo Kim, MD, PhD,2 William E. Smiddy, MD,1 William Feuer, MS,1 Wei Shi, MS1* Management of Dislocated Intraocular Lenses. *Ophthalmology 2008;115:1699–1704.*
49- Kazemi S, Wirostko WJ, Sinha S, et al. Combined pars plana lensectomy-vitrectomy with open-loop flexible anterior chamber intraocular lens (AC IOL) implantation for subluxated lenses. Trans Am Ophthalmol Soc 2000;98:247–51.
50- Mello MO Jr, Scott IU, Smiddy WE, et al. Surgical management and outcomes of dislocated intraocular lenses. Ophthalmology 2000;107:62–7.
51- Smiddy WE, Flynn HW Jr, Kim JE. Retinal detachment in patients with retained lens fragments or dislocated posterior chamber intraocular lenses. Ophthalmic Surg Lasers 1996;27: 856 – 61.
52- Epstein E. Suture problems [letter]. J Cataract Refract Surg 1989;15:116.
53- Lanzettta P, Menchini U, Virgili G, et al. Scleral fixated intraocular lenses: an angiographic study. Retina 1998;18: 515–20.
54- Hayashi K, Hayashi H, Nakao F, Hayashi F. Intraocular lens tilt and decentration, anterior chamber depth, and refractive error after trans-scleral suture fixation surgery. Ophthalmology 1999;106:878 – 82.
55- Masket S, Osher RH. Late complications with intraocular lens dislocation after capsulorhexis in pseudoexfoliation syndrome. J Cataract Refract Surg 2002;28:1481– 4.
56- Brilakis HS, Lustbader JM. Bilateral dislocation of in-the-bag posterior chamber intraocular lenses in a patient with intermediate uveitis. J Cataract Refract Surg 2003;29:2013– 4.
57- Zech JC, Tanniere P, Denis P, Trepsat C. Posterior chamber intraocular lens dislocation with the bag. J Cataract Refract Surg 1999;25:1168 –9.
58- Yasuda A, Ohkoshi K, Orihara Y, et al. Spontaneous luxation of encapsulated intraocular lens onto the retina after a triple procedure of vitrectomy, phacoemulsification, and intraocular lens implantation. Am J Ophthalmol 2000;130: 836 –7.
59- -Shigeeda T, Nagahara M, Kato S, et al. Spontaneous posterior dislocation of intraocular lenses fixated in the capsular bag. J Cataract Refract Surg 2002;28:1689 –93.
60- Rao GN, Stevens RE, Harris JK, Aquavella JV. Long-term changes in corneal endothelium following intraocular lens implantation. Ophthalmology 1981;88:386 –97.
61- Cousins S, Boniuk I, Okun E, et al. Pseudophakic retinal detachments in the

presence of various IOL types. Ophthalmology 1986;93:1198 –208.
62- Champion R, McDonnell PJ, Green WR. Intraocular lenses. Histopathologic characteristics of a large series of autopsy eyes [review]. Surv Ophthalmol 1985;30:1–32.
63- Lewis H, Sanchez G. The use of perfluorocarbon liquids in the repositioning of posteriorly dislocated intraocular lenses. Ophthalmology 1993;100:1055–9.
64- -Heilskov T, Joondeph BC, Olsen KR, Blankenship GW. Late endophthalmitis after transscleral fixation of a posterior chamber intraocular lens [case report]. Arch Ophthalmol 1989;107:1427.

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