Original Article

Surgical refixation of posteriorly dislocated intraocular lens with scleral-tuck technique

Pukhraj Rishi, Ekta Rishi, Aditya Maitray

Purpose: To report the outcomes of surgical refixation of posteriorly dislocated intraocular lens (IOL) using scleral-tuck method, and to compare the "scleral groove" and the "scleral flap" techniques used. **Study Design:** Single-center, retrospective, interventional, comparative study. **Methods:** Medical records of patients undergoing closed globe scleral refixation of posteriorly dislocated posterior chamber IOL (PCIOLs) by scleral-tuck method using two different techniques ("scleral groove" vs. "scleral flap" technique) were reviewed. This approach involved retrieving the dislocated PCIOL, externalizing the haptics through 2 sclerotomies created in paralimbal lamellar scleral grooves, or under lamellar scleral flaps and tucking the haptics into limbus-parallel scleral tunnels. No specific haptic architecture, haptic suturing, or large incisions were needed. Main outcome measures included best-corrected visual acuity (BCVA), final mean refractive error, and intra- and post-operative complications. **Results:** Thirteen eyes of 13 patients (scleral groove, $n = 6$; scleral flap, $n = 7$ eyes) with a mean follow-up of 20.6 months were included. BCVA in all eyes was maintained or improved postoperatively, with three eyes (23%) showing ≥2 line improvement. Median astigmatic error at 6-week follow-up was −1.25 D cylinder (range: −0.5 D–−2.0 D) which remained stable till final follow-up. All IOLs remained stable and well centered. None of the eyes had a recurrent dislocation, retinal detachment, endophthalmitis, or glaucoma. Both techniques were comparable in terms of postoperative BCVA, and refraction. **Conclusion:** Intrascleral haptic fixation by scleral-tuck method is reliable and effective for secure IOL refixation of posteriorly dislocated IOLs, providing good IOL centration and stability with minimal surgically-induced astigmatism. Both techniques (scleral groove and scleral flap) appear to have similar outcomes in the short term.

Key words: Dislocated intraocular lens, intraocular lens, intraocular lens refixation, scleral flap, scleral groove, scleral tuck

Access this article online

Website: www.ijo.in

DOI: 10.4103/ijo.IJO_960_16

Quick Response Code:

Dislocation of posterior chamber intraocular lens (PCIOL) into the vitreous cavity is a known complication of cataract surgery with a reported incidence of 0.2%–3%.[1,2] It may occur due to the absence of adequate capsular or zonular support. Risk factors including high myopia, pseudoexfoliation, advanced age, trauma, and prior vitrectomy predispose to IOL dislocation.[1,3] Current management options include intraocular lens (IOL) explanation, exchange, or repositioning.[4,5] The dislocated IOL can be placed in the ciliary sulcus in case of adequate residual capsular support. In the absence of capsular support, the dislocated PCIOL can be repositioned in ciliary sulcus using scleral fixation with or without sutures or explanted through limbal or corneal incisions and/or exchanged with an anterior chamber IOL or Iris fixated IOL.[6-12] However, IOL explanation or exchange can be associated with severe postoperative surgical astigmatism (owing to large incisional wounds), risk of corneal endothelial decompensation, iris pigment dispersion, glaucoma, intraocular inflammation, and cystoid macular edema, iris damage, hyphema, retinal detachment, vitreous prolapse, and intraocular bleeding.[4,13-16] Sutured scleral fixated IOLs (SFIOLS) can be associated with the risk of suture degradation and IOL dislocation.[17,18]

Repositioning of dislocated PCIOLs by a closed globe approach allows retention of the same IOL and eliminates the need for large limbal incisions, thereby reducing postoperative complications related to large incision size or sutures. There are limited studies in literature reporting the management of dislocated IOLs by a sutureless closed globe scleral refixation.[7,8,19-23] This study analyses the treatment outcomes following scleral refixation of dislocated IOLs using the scleral tuck method and compares the outcomes between the two techniques used.

Materials and Methods

This was a retrospective, interventional, comparative study. Prior Institutional Review Board approval was obtained. Informed Consent Form was signed by all study subjects. This study adhered to the tenets of Declaration of Helsinki. Medical records of all patients presenting with posteriorly dislocated IOLs presenting between January 2012 and January 2015 who were managed with scleral refixation of dislocated IOLs using

Department of Vitreoretinal Services, Sankara Nethralaya, Chennai, Tamil Nadu, India

Correspondence to: Dr. Pukhraj Rishi, Shri Bhagwan Mahavir Vitreoretinal Services, Sankara Nethralaya, 18 College Road, Chennai - 600 006, Tamil Nadu, India. E-mail: docrishi@yahoo.co.in

Manuscript received: 23.12.16; Revision accepted: 26.04.17

Cite this article as: Rishi P, Rishi E, Maitray A. Surgical refixation of posteriorly dislocated intraocular lens with scleral-tuck technique. Indian J Ophthalmol 2017;65:365-70.

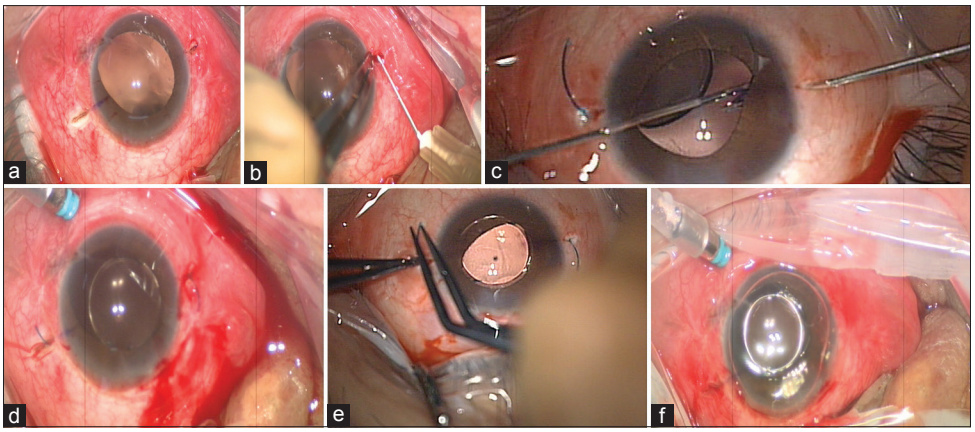

Figure 1: The scleral groove technique of refixation of dislocated intraocular lens. (a) Two, 3 mm long, radially oriented, partial thickness scleral grooves created at 4 and 10 o'clock meridians, perpendicular to limbus. (b) Intrascleral tunnel parallel to the limbus made through each groove using a bent 26-gauge needle. The 2 tunnels are parallel to limbus but oriented in opposite directions on both sides. (c) The intraocular lens haptics externalized through the two sclerotomies using the "hand-shake" technique using two micro incision vitrectomy system forceps. (d) Externalized haptics. (e) The haptics are placed ("tucked") into the circumparallel scleral tunnels. (f) At closure

the scleral tuck method were reviewed. Patients who had a minimum 6-week follow-up were included in the study. Preoperative information recorded for all patients included refraction, best-corrected visual acuity (BCVA), intraocular pressure, and presence of ocular comorbidities. Postoperative data collected at 6 weeks and at final visit included refraction, BCVA, IOL position, and presence of any complications. Main outcome measures included BCVA, final refractive error, and intra- and post-operative complications. The outcomes of the two techniques used for scleral tuck were compared using the Mann–Whitney U-test.

The surgical techniques of "scleral tuck."

Scleral groove technique

The scleral groove technique included the following steps: A 30° localized conjunctival peritomy was made at 4 and 10 o'clock meridians. Two, 3 mm long, radially oriented, partial thickness scleral grooves were created 180° apart at 4 and 10 o'clock meridians, perpendicular to limbus [Fig. 1a]. An intrascleral tunnel was made through each groove using a bent 26-gauge needle. The two tunnels were parallel to limbus but oriented in opposite directions on both sides [Fig. 1b]. Using microincision vitrectomy system (MIVS) cannulae, sclerotomies were made in the bed of the scleral incisions 1 mm away from the limbus. A standard three port 25-gauge pars plicata vitrectomy was performed in previously nonvitrectomized eyes. The IOL haptics were retrieved from the vitreous cavity using intraocular forceps and externalized through the two sclerotomies using the "hand-shake" technique [Fig. 1c and d].[22] The haptics were then tucked counterclockwise in the circumparallel scleral tunnels [Fig. 1e]. Conjunctiva was closed with fibrin glue or 7-0 vicryl sutures [Fig. 1f]. Fig. 2 demonstrates the procedure in a schematic form.

Scleral flap technique

The "Glued IOL technique" involved the following steps. A 30° localized conjunctival peritomy was made at 4 and 10 o'clock meridians. Two paralimbal partial thickness scleral flaps 3 mm × 2 mm were created at 4 and 10 o'clock meridians [Fig. 3a]. Intrascleral tunnel parallel to the limbus was made under each flap using a bent 26-gauge needle.

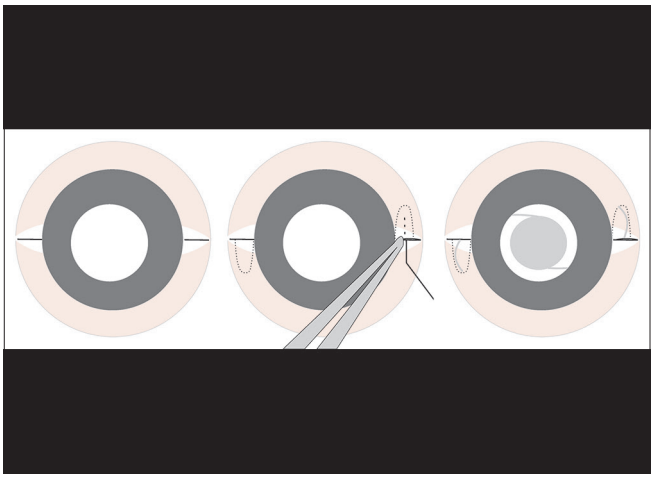

Figure 2: Schematic representation of the scleral groove technique of refixation of dislocated intraocular lens

The two tunnels were parallel to limbus but oriented in opposite directions on both sides [Fig. 3b and c]. Using MIVS cannulae, sclerotomies were made in the bed of the scleral flaps 1 mm away from the limbus. A standard three-port pars plicata 25-gauge vitrectomy was performed in previously nonvitrectomized eyes. The IOL haptics were retrieved from the vitreous cavity using intraocular forceps and externalized through the two sclerotomies using the "hand-shake" technique [Fig. 3d and e]. The haptics were then tucked counterclockwise in the circumparallel scleral tunnels [Fig. 3f] and the flaps were sutured with 7-0 vicryl. Conjunctiva was closed with fibrin glue or 7-0 vicryl sutures [Fig. 3g]. Fig. 4 demonstrates the procedure in a schematic form.

Results

Between January 2012 and January 2015, 13 eyes of 13 patients (6 males, 7 females) that presented with dislocated PCIOLs were successfully operated for IOL repositioning using intrascleral haptic fixation. Five of the 13 eyes had undergone cataract surgery with IOL implantation as the only prior

surgical procedure. A history of blunt trauma was positive in 2 of these 5 eyes. Two eyes had also undergone prior vitrectomy and IOL repositioning in the sulcus following prior cataract surgery, elsewhere. Inadequate capsular support due to intraoperative posterior capsular rent was the probable cause of IOL dislocation in these cases.

Three eyes had undergone prior VR surgery for pseudophakic retinal detachments, while 3 eyes presented with dislocated sutured SFIOLs.

The scleral groove technique was used in 6 of these eyes and the scleral flap technique in 7 eyes. The mean age was 52.4 years (range 38–82 years). The types of IOLs refixed included 3 piece polymethylmethacrylate (PMMA) IOLs (n = 8), single-piece PMMA SFIOLs (n = 3), and 3 piece acrylic PCIOLs (n = 2). The mean preoperative BCVA was LogMAR 0.43, (SD 0.52), with 9 of the 13 eyes having BCVA 6/12 or better. At 6 weeks postoperatively, the mean BCVA was LogMAR 0.23, (SD 0.32), with 11 of the 13 eyes having BCVA 6/12 or better that remained stable over a mean follow-up of 20.6 ± 8.8 months. BCVA in all 13 eyes was maintained or improved postoperatively, with 3 eyes (23%) showing ≥2 line improvement [Table 1]. Mean preoperative and postoperative spherical equivalents were + 9.75 D and −1.6 D, respectively ($P < 0.01$). The median astigmatic error at 6-week follow-up was − 1.25 D cylinder (range: −0.5 D–−2.0 D) which remained stable till final follow-up. None of the cases had a recurrent dislocation. The IOLs in all the cases remained well centered, and no IOL tilting was noted clinically till the final follow-up. No intra- or post-operative complications were encountered in any of the cases. Table 2 shows the comparison

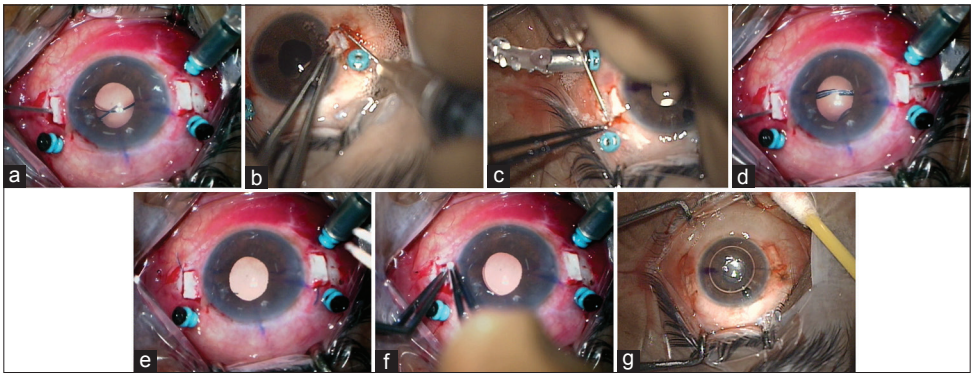

Figure 3: The scleral flap technique of refixation of dislocated intraocular lens. (a) Two paralimbal partial thickness scleral flaps 3 mm × 2 mm. (b) Intrascleral tunnel parallel to limbus made under each flap using a bent 26-gauge needle. (c) The 2 tunnels are parallel to limbus but oriented in opposite directions on both sides. (d) The intraocular lens haptics retrieved from the vitreous cavity and externalized via the two sclerotomies using the "hand-shake" technique. (e) Externalized haptics under scleral flaps (f) The haptics placed ("tucked") into the circumparallel scleral tunnels and the flaps were sutured with 7-0 vicryl (g) At closure

Table 1: Refraction and BCVA outcomes

Parameter	Pre operative	Post Operative*
Spherical equivalent (mean±SD)	+9.8D±3.3	−1.4D±1.72
Mean BCVA (LOGMAR)	0.43±052	0.24±0.30
Astigmatism (mean±SD) (range)	−0.9DC±1.15 (0-−3.25)	−1.30DC±1.69(−0.5-−2.0)
Change in BCVA		
Gained ≥2 lines, *n*(%)	-	3 (23%)
Maintained (±1 line)	-	10 (77%)
Lost ≥2 lines, *n*(%)	-	0

* 6 weeks postoperatively

Table 2: Scleral groove vs scleral flap technique: Comparison

Parameter	Scleral Groove (n=6)	Scleral Flap (n=7)	P
Age (mean ± SD, years)	52.4±13.1	52.6±15.3	1.0
Pre-operative LogMAR BCVA (mean±SD)	0.41±0.63	0.43±0.44	0.9
Post-Operative* LogMAR BCVA (mean±SD)	0.26±0.15	0.22±0.40	0.8
Post-operative* Spherical Equivalent (mean±SD, D)	-1.5 ±2.0	-1.25 ±1.6	0.8
Post operative* Astigmatism (mean±SD, DC)	-1.5±0.5	-1.3±0.5	0.5
Complications			
IOL Decentration/ Tilt	-	-	
Recurrent dislocation	-	-	

SD: Standard deviation, D: Diopter, DC: Diopter cylindrical

Table 3: Comparison of outcomes and complications of different techniques of scleral fixation of IOLs from various published reports

Author	*N* (eyes)	Method of IOL refixation	Mean follow up (months)	Visual outcome		Complications		
				Final BCVA (LogMAR)	SE (D)	IOL dislocation (%)	IOL decentration (%)	Others (%)
Scharioth e*t al,* 2010	63	Scleral tuck	7	0.4	0.98	3.17	3.6%	Temporary corneal edema (8%) Persistent IOP elevation (3%) Transient vitreous hemorrhage (3%) CME (1.6%) Iris Capture (1.6%)
Kumar DA e*t al,* 2010	53	Glued IOL	12	0.13±0.15	-0.46±1.2D	3.6%	5.6%	Macular edema (7.5%) Pigment dispersion (3.7%)
Oh *et al,* 2015	13	Scleral Tuck	6	0.3±0.56	–0.84±1.75	0		Optic Capture (*n*=1) RD (*n*=1) IOP elevation (*n*=1) CSCR (*n*=1)
Kumar and Agarwal, 2013	191	Glued IOL	16.6± 8.8	0.39±0.29	Na	2.6%		Optic capture (5.7%) Haptic displacement (2%) Subconjunctival haptic (1.5%) Haptic tip extrusion (0.5%) Corneal edema (0.5%) Fibrinous reaction (0.5%) Scleral thinning (0.5%)
Johnston *et al,* 2000	63	Sutured SFIOL	20	≤0.4 (76%) 0.5-1(18%)	na	1.6%	-	RD (3%) Choroidal hemorrhage (1.6%) Intermittent pupil capture (14%) Transient vitreous haemorrhage (4.8%)
Kim *et al*,2015	16	Glued IOL	10.1 ± 3.2	0.29±0.36		0	0	Transient vitreous hemorrhage (6.2%) Iris capture (6.2%) Transient ocular hypertension (6.2%)
Current Study	13	Scleral tuck	20.6±8.8	0.24±0.30	-1.4D±1.72	0	0	-

BCVA: Best corrected visual acuity, SE: Spherical equivalent, RD: Retinal detachment, CSCR: Central serous chorioretinopathy, IOL: Intraocular lens, IOP: Intaocular pressure SFIOL: Scleral fixated intraocular lens

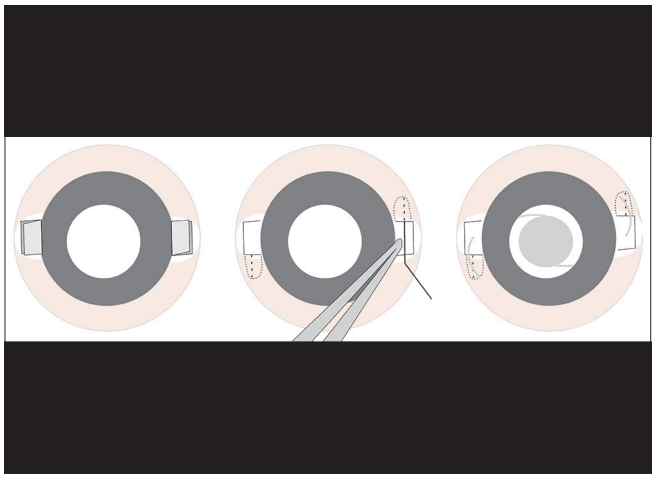

Figure 4: Schematic representation of the scleral flap technique of refixation of dislocated intraocular lens

between the two techniques used. Both groups were matched for baseline BCVA ($P = 0.9$), and age at presentation ($P = 1.0$). The mean postoperative LogMAR BCVA ($P = 0.8$), spherical equivalent ($P = 0.8$), and astigmatism ($P = 0.5$) did not show a statistically significant difference between the two groups and the outcomes remained comparable till the final follow-up.

Discussion

The techniques of scleral fixation of dislocated PCIOLs can be divided into two general categories:

1. Creation of suture loop around the haptic with surgical maneuvers around the dislocated PCIOL inside the eye – "Cow-hitch knot" or the "Lasso" technique[12]
2. Externalization of haptic and fixing it to sclera by the creation of scleral tunnels with or without scleral flaps (scleral tuck).[7,8,21-23]

Recently, sutureless techniques for the scleral fixation of a dislocated PCIOL using MIVS and bimanual manipulation of the IOL have been introduced.[4,7,8,19-25]

Scharioth *et al*. were the first to propose the sutureless intrascleral IOL fixation technique, using scleral pockets for fixation of externalized haptics.[8] Kumar and Agarwal have reported the largest series of this technique with several innovative modifications including the "glued IOL" technique of using fibrin glue to seal the scleral flaps instead of sutures.[23,25]

The main advantages of this sutureless closed globe procedure are that a PCIOL or dislocated SFIOL can be effectively repositioned in a minimally invasive manner, without requiring a large incision for explanting the IOL, and without the need for another IOL implant, scleral fixation sutures, or suturing of the surgical incision. Even though the procedure has a brief learning curve, it is reliable, efficient, and provides reproducible results.

Potential complications of transscleral fixation of PC IOLs include suture erosion, suture-knot exposure, and recurrent dislocation caused by a broken suture, all of which can be avoided by the sutureless technique.[4,7,8,17-25] In our case series, we found no evidence of scleral erosion by IOL haptic, and the IOLs were well centered and stable after fixation. BCVA was maintained or improved in all our cases at mean 20.6-month follow-up. This minimally invasive approach leads to minimal postoperative astigmatism with minimal surgical manipulation. Although theoretically there is a potentially increased risk of endophthalmitis secondary to the scleral track of the exteriorized haptic, we did not encounter any instance of unusual postoperative inflammation. Our results are consistent with those shown by the recent studies describing similar techniques of sutureless scleral refixation of PCIOLS for the management of postoperative or traumatic aphakia [Table 3].[4,7,8,19-25]

On comparing the two techniques used for the intrascleral fixation of PCIOLs, we found that the postoperative IOL stability and the visual and refractive outcomes of the scleral groove technique were comparable to that of the conventional scleral flap technique.

It should be noted that 3-piece foldable IOLs with an overall diameter of 13 mm are ideal for this technique due to their flexible haptics. There remains a concern that rigid haptics of single-piece PMMA IOLs might cause gradual erosion of the IOL haptics through the scleral pocket. Therefore, we recommend careful long-term follow-up of eyes with single-piece PMMA IOLs refixated using this technique. Foldable 1-piece acrylic IOLs and plate-haptic IOLs are not suitable for this procedure.

Limitations of our study include a small sample size and a relatively short duration of follow-up.

Conclusion

Intrascleral haptic fixation technique by scleral tuck method is effective and reliable for secure IOL refixation in cases of posteriorly dislocated IOLs. Both the techniques (scleral groove and scleral flap) show similar outcomes in the short term. Larger studies with longer follow-up are required to validate our results and to study the long-term stability of the IOLs and other late complications.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Pueringer SL, Hodge DO, Erie JC. Risk of late intraocular lens dislocation after cataract surgery, 1980-2009: A population-based study. Am J Ophthalmol 2011;152:618-23.
2. Gimbel HV, Condon GP, Kohnen T, Olson RJ, Halkiadakis I. Late in-the-bag intraocular lens dislocation: Incidence, prevention, and management. J Cataract Refract Surg 2005;31:2193-204.
3. Krepšte L, Kuzmiene L, Miliauskas A, Januleviciene I. Possible predisposing factors for late intraocular lens dislocation after routine cataract surgery. Medicina (Kaunas) 2013;49:229-34.
4. Dajee KP, Abbey AM, Williams GA. Management of dislocated intraocular lenses in eyes with insufficient capsular support. Curr Opin Ophthalmol 2016;27:191-5.
5. Güell JL, Barrera A, Manero F. A review of suturing techniques for posterior chamber lenses. Curr Opin Ophthalmol 2004;15:44-50.
6. Thach AB, Dugel PU, Sipperley JO, Sneed SR, Hollifield RD, Park DW, *et al*. Outcome of sulcus fixation of dislocated posterior

chamber intraocular lenses using temporary externalization of the haptics. Ophthalmology 2000;107:480-4.

7. Wilgucki JD, Wheatley HM, Feiner L, Ferrone MV, Prenner JL. One-year outcomes of eyes treated with a sutureless scleral fixation technique for intraocular lens placement or rescue. Retina 2015;35:1036-40.
8. Scharioth GB, Prasad S, Georgalas I, Tataru C, Pavlidis M. Intermediate results of sutureless intrascleral posterior chamber intraocular lens fixation. J Cataract Refract Surg 2010;36:254-9.
9. Azar DT, Wiley WF. Double-knot transscleral suture fixation technique for displaced intraocular lenses. Am J Ophthalmol 1999;128:644-6.
10. 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;30:1049-56.
11. De Silva SR, Arun K, Anandan M, Glover N, Patel CK, Rosen P. Iris-claw intraocular lenses to correct aphakia in the absence of capsule support. J Cataract Refract Surg 2011;37:1667-72.
12. Nakashizuka H, Shimada H, Iwasaki Y, Matsumoto Y, Sato Y. Pars plana suture fixation for intraocular lenses dislocated into the vitreous cavity using a closed-eye cow-hitch technique. J Cataract Refract Surg 2004;30:302-6.
13. Auffarth GU, Wesendahl TA, Brown SJ, Apple DJ. Are there acceptable anterior chamber intraocular lenses for clinical use in the 1990s? An analysis of 4104 explanted anterior chamber intraocular lenses. Ophthalmology 1994;101:1913-22.
14. Ellerton CR, Rattigan SM, Chapman FM, Chitkara DK, Smerdon DL. Secondary implantation of open-loop, flexible, anterior chamber intraocular lenses. J Cataract Refract Surg 1996;22:951-4.
15. Navia-Aray EA. Suturing a posterior chamber intraocular lens to the iris through limbal incisions: Results in 30 eyes. J Refract Corneal Surg 1994;10:565-70.
16. Yen KG, Reddy AK, Weikert MP, Song Y, Hamill MB. Iris-fixated posterior chamber intraocular lenses in children. Am J Ophthalmol 2009;147:121-6.
17. Asadi R, Kheirkhah A. Long-term results of scleral fixation of posterior chamber intraocular lenses in children. Ophthalmology 2008;115:67-72.
18. Buckley EG. Safety of transscleral-sutured intraocular lenses in children. J AAPOS 2008;12:431-9.
19. Kim M, Lee DH, Koh HJ, Lee SC, Kim SS. Surgical outcome of simultaneous intraocular lens rescue and sutureless intrascleral tunnel fixation of dislocated intraocular lenses. Retina 2015;35:1450-7.
20. Prasad S. Transconjunctival sutureless haptic fixation of posterior chamber IOL: A minimally traumatic approach for IOL rescue or secondary implantation. Retina 2013;33:657-60.
21. Oh SY, Lee SJ, Park JM. Comparision of surgical outcomes of intraocular lens refixation and intraocular lens exchange with perfluorocarbon liquid and fibrin glue-assisted sutureless scleral fixation. Eye (Lond) 2015;29:757-63.
22. Agarwal A, Jacob S, Kumar DA, Agarwal A, Narasimhan S, Agarwal A. Handshake technique for glued intrascleral haptic fixation of a posterior chamber intraocular lens. J Cataract Refract Surg 2013;39:317-22.
23. Kumar DA, Agarwal A, Prakash G, Jacob S, Saravanan Y, Agarwal A. Glued posterior chamber IOL in eyes with deficient capsular support: A retrospective analysis of 1-year post-operative outcomes. Eye (Lond) 2010;24:1143-8.
24. Por YM, Lavin MJ. Techniques of intraocular lens suspension in the absence of capsular/zonular support. Surv Ophthalmol 2005;50:429-62.
25. Kumar DA, Agarwal A. Glued intraocular lens: A major review on surgical technique and results. Curr Opin Ophthalmol 2013;24:21-9.