Original Article

Iris reconstruction combined with iris-claw intraocular lens implantation for the management of iris-lens injured patients

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Aim: To study the efficiency and safety of iris reconstruction combined with iris-claw intraocular lens (IOL) implantation in the patients with iris-lens injuries. **Settings and Design:** Retrospective, noncomparable consecutive case series study. **Materials and Methods:** Eleven patients (11 eyes) following iris-lens injuries underwent iris reconstructions combined with iris-claw IOL implantations. Clinical data, such as cause and time of injury, visual acuity (VA), iris and lens injuries, surgical intervention, follow-up period, corneal endothelial cell count, and optical coherence tomography, were collected. **Results:** Uncorrected VA (UCVA) in all injured eyes before combined surgery was equal to or <20/1000. Within a 1.1–4.2-year follow-up period, a significant increase, equal to or better than 20/66, in UCVA was observed in six (55%) cases, and in best-corrected VA (BCVA) was observed in nine (82%) cases. Postoperative BCVA was 20/40 or better in seven cases (64%). After combined surgery, the iris returned to its natural round shape or smaller pupil, and the iris-claw IOLs in the 11 eyes were well-positioned on the anterior surface of reconstructed iris. No complications occurred in those patients. **Conclusions:** Iris reconstruction combined with iris-claw IOL implantation is a safe and efficient procedure for an eye with iris-lens injury in the absence of capsular support.

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Ocular trauma is the leading cause of monocular blindness in the world.[1,2] Iris-lens injuries are the most common type of anterior segment injuries, primarily presenting as sphincter tear, iridodialysis, iris defect, mydriasis, lens opacity or luxation, and lens capsular rupture. Aphakic eyes with iris injuries in the absence of capsular support are difficult situations to address.[3,4] Appropriate management is critical for those injured eyes to achieve the best anatomical and functional recovery. Iris reconstruction combined with intraocular lens (IOL) implantation is the most efficient used procedure.

Reconstruction of an injured iris is the first step not only to reach the goal of relieving uncomfortable symptoms such as photophobia, diplopia, or glare but also to achieve a cosmetic effect. A 10-0 prolene suture is used to reposition the ruptured or dialyzed iris to restore the integrity of the iris and pupil. There have been multiple IOL implantation procedures proposed for the treatment of aphakic eyes in the absence of capsular support, such as angle-supported anterior chamber IOL (ACIOL), and transscleral sutured posterior chamber IOL (PCIOL).[3-5] Each surgical intervention has its own advantages and disadvantages. Preference is dependent upon an IOL's characteristics and a surgeon's experience. In the last three decades, iris-claw IOL has been introduced to the clinic.[6-8] This IOL was primarily designed for aphakic patients but was later recognized as a useful tool for the correction of phakic eyes with high myopia and eye trauma.[8-12] Iris-claw IOLs are meant to be used in the eyes with a healthy iris or a normal pupil because the claws require an opposite, mid-peripheral iris as support.

Recently, in clinical practice, we performed a combined iris reconstruction with iris-claw IOL implantation surgery to treat aphakic eyes with iris injuries and achieved successful outcomes. These surgeries were performed from May 2010 to August 2013, with an average of 3-year follow-up.

Materials and Methods

Eleven traumatic, aphakic eyes with an accompanying sphincter tear/iris defect, or iridodialysis, or pupil dilation were chosen for this case series review. This study was approved by the Institutional Ethics Committee, and informed consent was obtained from all patients. The patients were aged 6–66 years including 10 males and 1 female. In five patients, trauma was caused by a blunt injury, and six patients had a penetrating injury. Iris injuries included five sphincter tears, one iridodialysis, and six partial iris defects within a quadrant; all patients had varied pupil dilation. Primary lens injuries presented as lens luxation in three cases, lens opacities/capsular rupture in seven cases, and the absence of

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a lens in one case. Initial surgery consisted of corneal/scleral wound repair, lensectomy or lens extraction, and anterior or pars plana vitrectomy. After the primary surgery, all cases became aphakic without sufficient capsular support. The secondary surgery permitted the reconstruction of the injured iris and the implantation of an iris-claw IOL. The interval between the two surgeries was from 5 days to 3 years with a mean of 3 months. Corneal endothelial cell count (CECC), IOL master calculation, and optical coherence tomography (OCT) examination data were collected before and after surgery. The clinical characteristics of those patients are presented in Table 1.

Surgical procedures were based on the individual patient and iris status. Two children underwent general anesthesia, and nine adults received a retrobulbar block. Iris reconstruction consisted of iridodialysis repair/sphincter tear repair (or iris defect repair) and pupil reconstruction. If an iridodialysis coexisted with a sphincter tear (or iris defect), iridodialysis repair should be processed first and later followed by sphincter tear repair (or iris defect repair).

Iridodialysis was first repaired by starting a scleral tunnel incision at 2–3 mm posterior to the limbus around the site of the iridodialysis [Fig. 1a and b]. The AC was maintained by inserting a 20-gauge infusion cannula in the inferior temporal quadrant. A 10-prolene suture within a 25-gauge needle was introduced from a small corneal incision through the dialyzed iris root and out to the scleral tunnel [Fig. 1c]. Next, the thread was pulled out, and the needle was drawn into the AC to place additional sutures at 1–2-mm intervals (running mattress suture). The extraocular thread was passed through the mattress suture loops one by one until the entire iridodialysis was closed [Fig. 1c]. Finally, the two threads were tied together, and the knot was buried under the scleral tunnel [Fig. 1d]. Ruptured sphincter or partial defected iris was then reconstructed by passing a curved needle with a 10-0 prolene suture through the ruptured iris from a limbal incision out to the opposite limbus [Fig. 1e]; one thread was hooked out from AC [Fig. 1f]; and the two threads were tied externally with a Siepser slipknot [Fig. 1g and h].[13] An iris-claw IOL was implanted through a 5.5-mm superior scleral tunnel incision. The iris-claw IOL (Ophtec BV, Groningen, The Netherlands), held by specially designed forceps, was slowly inserted into the AC and was horizontally fixed at mid-periphery of the iris with an enclavation needle (or 25-gauge needle) through a side limbal incision [Fig. 1i].

About 0.5% levofloxacin and TobraDex eye drops were given postoperatively. The follow-up period was scheduled at 1 and 2 weeks; 1, 3, and 6 months; and once a year. Final examinations included visual acuity (VA), IOP, iris and pupil status, IOL position, CECC, and OCT.

Results

Uncorrected VA (UCVA) in all of the injured eyes before combined surgery was ≤ 20/1000. Postoperatively, a significant increase in UCVA and best-corrected VA (BCVA) of 20/66 or more was obtained in six (6/11, 55%) cases and nine (9/11, 82%) cases, respectively [Table 2]. Postoperative BCVA was 20/40 or better in seven cases (64%). There was only one case (Case #6) with BCVA of 20/200, most likely due to the presence of a 7-mm scar on the cornea.

Anatomical recovery following iris reconstruction and iris-claw IOL implantation was also significant [Fig. 2]. After combined surgeries, the irises were reshaped, and the pupils became smaller (irregular in five cases, round in six cases). However, light reflex was dull. All pupil sizes were smaller than the IOL optical zones. The center of the pupil was consistent with the IOL's optical center. Iris atrophy and depigmentation around the claw enclavation sites or iris suture sites were noted in several cases [Fig. 2].

Pre- and post-operative CECCs during follow-up periods varied in cases. Except for an increased postoperative CECC in the injured eye of Case #2, the remaining injured eyes exhibited a decreased postoperative CECCs compared to the preoperative CECCs. All 11 control eyes exhibited a higher CECCs compared with the injured eyes. Table 3 presents the pre- and post-operative CECC results.

OCT images of the posterior segment in 10 cases exhibited no remarkable changes pre- and post-operatively. In one case, the cystoid macular edema (CME) disappeared spontaneously after combined surgery (Case #2).

Table 1: Clinical data in 11 patients with iris-lens injuries

Sex/ years	Eyes	Cause	IVA	Iris	Pupil (mm)	Lens	Primary surgery	Intervals
Male/28	OD	Ruler	FC	Sphincter tear/iridodialysis at 5 o'clock	7	Dislocation/opacity	Lec + PPV	6.5 months
Male/64	OD	Fist	FC	Sphincter tear at 10 o'clock	8	Dislocation/opacity	Lec + AV	3.2 months
Male/6	OS	Welding rod	LP	Sphincter tear at 3 o'clock	5	Rupture/opacity	CR + Lec + AV	3.4 months
Male/66	OD	Plastic	FC	Sphincter tear at12 o'clock	7	Dislocation/opacity	Lec + AV	2.8 months
Male/66	OS	Scrap iron	FC	Sphincter tear at 4 o'clock	5	Rupture/opacity	CR + Phaco + AV	4.0 months
Male/30	OD	Iron	LP	Defect within a quadrant	6	Absent	CR	20 days
Female/9	OS	Scissors	HM	Defect within a quadrant	8	Rupture/opacity	CR	5 days
Male/43	OS	Board	FC	Defect within a quadrant	5	Rupture/opacity	CR + Phaco + AV	5 months
M/33	OS	Iron	HM	Defect within a quadrant	7	Rupture/opacity	IOrFB + PPV + SOT	6 months
Male/29	OS	Nail	HM	Defect within a quadrant	7	Rupture/opacity	CR + Phaco + AV	3 months
Male/36	OD	Iron	HM	Defect within a quadrant	6	Rupture/opacity	CR + PPV + SOT	3 years

IVA: Initial visual acuity, Lec: Lensectomy, PPV: Pars plana vitrectomy, AV: Anterior vitrectomy, CR: Corneal repair, Phaco: Phacoemulsification, IOrFB: Intraorbital foreign body, SOT: Silicone oil tamponade, HM: Hand motion, FC: Finger count, LP: Light perception, OD: Oculus dexter, OS: Oculus sinister

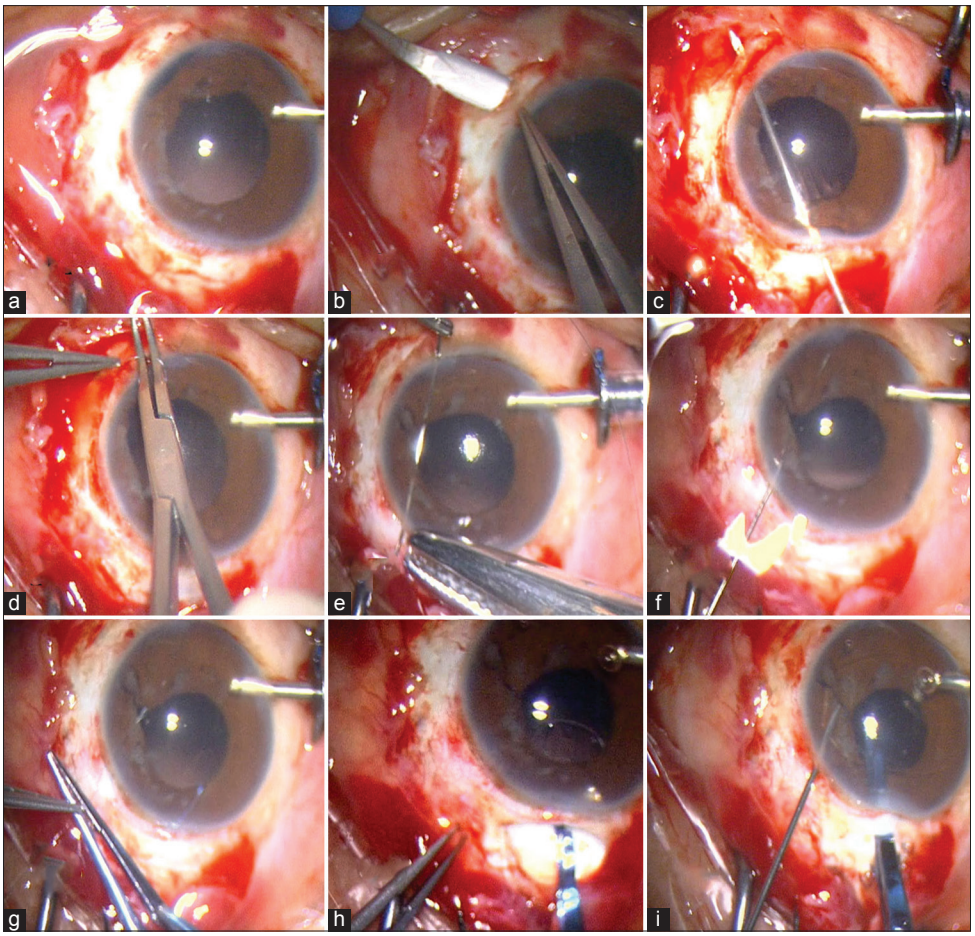

Figure 1: Iris reconstruction combined with iris-claw intraocular lens implantation in Case #1. A 28-year-old male patient was injured by a ruler and resulted in pupil dilation, iridodialysis, and sphincter tear (a). Iridodialysis was repaired first (b-d), followed by sphincter tear repair (e-h) and iris-claw intraocular lens implantation (i)

Table 2: Visual outcomes in 11 patients with combined surgery

Preoperative*		Postoperative		Follow-up period (years)
UCVA	BCVA	UCVA	BCVA	
20/1000	20/20	20/33	20/20	4.0
HM	20/50	20/66	20/22	4.2
FC	20/66	20/66	20/66	3.8
FC	20/50	20/66	20/25	3.3
FC	20/33	20/80	20/33	3.1
HM	-	HM	20/200	3.0
HM	-	20/40	20/20	3.1
FC	20/40	20/25	20/20	3.2
HM	20/50	20/400	20/40	2.0
20/1000	20/100	20/200	20/100	1.1
FC	20/66	20/125	20/66	2.2

*After primary surgery and before secondary ICIOL implantation. UCVA: Uncorrected visual acuity, BCVA: Best corrected visual acuity, -: Unable to measure, ICIOL: Iris-claw intraocular lens, HM: Hand motion, FC: Finger count

IOP in all of the cases was within normal range. No glare, photophobia, diplopia, infection, or IOL dislocation was noted. Only one patient, a 6-year-old boy, had a loose knot with a slightly dilated pupil, but his iris-claw IOL was well-positioned (Case #3).

Discussion

There are many procedures to reconstruct injured irises. The two most popular and efficient methods for iris repair are most likely the Siepser slipknot to repair sphincter tear (or iris defect) and the mattress suture to repair iridodialysis.[13-15] The Siepser slipknot technique was introduced by Dr. Siepser in 1994.[13] This method's outstanding advantage is that the knot can be tied extraocularly by sliding two opposite sutures in a way that results in minimal disturbance to the ruptured iris. This technique now has been used to suture injured iris and iris fixated IOL.[13,16] The modified running mattress suture method that we described here for iridodialysis repair simply used a 25-gauge needle with a 10-0 prolene suture [Fig. 1c]. The needle tip can grasp as little iris root as possible, fixing to the sclera, and thus helps to restore the natural, round structure of a pupil. Scleral tunnel incisions can protect knots from exposure or erosion. Moreover, a running mattress suture can save surgical time with only one knot left. In our series, successful anatomical results were achieved after iris reconstruction including 11 cases with Siepser slipknots and

one case with a running mattress suture. With varied periods of follow-up, only a 6-year-old boy had a loose knot with a slightly dilated pupil; however, his iris-claw IOL was still at a stable position (Case #3). Surgical experience demonstrated that the two iris reconstruction procedures both obtain excellent anatomical and cosmetic outcomes [Fig. 2].

Implantation of an IOL in an aphakic eye without capsular support is technically complicated and varies based on patient age, iris and pupil statuses, as well as surgeons' preferences. Suspension of a scleral or sulcus-fixated PCIOL is most likely the most frequently used surgical technique, particularly since modified novel procedures have been introduced.[17] The advantages of this type of procedure are a natural position, lack of corneal endothelial cell decompensation, and lack of pressure, which could rupture the iris or pupil. Dick and Augustin suggested that sulcus-fixated PCIOLs remained the preferred procedure to correct aphakia in eyes without capsular support that had a significant loss of iris tissue from surgery or trauma.[3] However, transscleral fixated IOL is a time-consuming operation, and short- or long-term complications, such as tilting or decentering of the IOL, suture erosion, or IOL dislocation may happen in certain cases.[18,19]

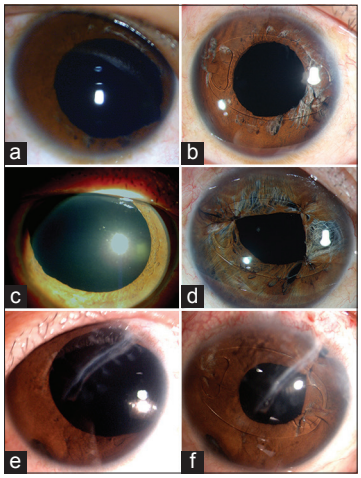

Figure 2: Pre- and post-operative anterior segment photographs (Case #1, #2, and #9). A dilated pupil with a sphincter tear (a and c) and an iris defect (e) were noted preoperatively. (b, d, and f) A well-positioned iris-claw intraocular lens fixated on the anterior surface of the repaired iris, with a round or smaller pupil postoperatively. Figure a and b, c and d, and e and f represent Case #1, #2, and #9, respectively

An alternative to a PCIOL is an ACIOL, which is simpler and more convenient and is recommended for the treatment of those with aphakic eyes. An ACIOL needs the angle of the AC as support and is easy to insert; however, there is the possibility of endothelial cell loss and pupil deformation. Because ocular trauma mostly occurs in young patients, long-term ACIOL placement in this group of patients may not be favored.[3-5]

Many reports have shown the implantation of an iris-claw IOL is simple, safe, and efficient for short-term or long-term use.[20-24] The advantages of the iris-claw IOL are that insertion is easy, no suture is needed for fixation, it is reversible, and there is little corneal endothelial cell loss. This technique has been considered as a good option in the absence of capsular support, for example, as an alternative method for IOL implantation with a complicated posterior capsule ruptured during cataract surgery or for traumatic aphakic eyes.[11,12,25]

In our literature search, we have not found reports about iris reconstruction combined with iris-claw IOL implantation applied to traumatic aphakic eyes. Sminia *et al*. reported a long-term outcome of Artisan iris-claw IOL implantations in five aphakic eyes without capsular support following a penetrating ocular trauma. The BCVA at the last follow-up was 20/40 or better in four eyes.[11] A report from Neuhann *et al*. described a 3-year-old boy who presented with a perforating corneal injury and an extensive iris dialysis in his right eye. The child had a lensectomy, iridectomy, and vitrectomy with an implantation of an Artisan IOL fixed to some iris remnants, but the child developed an extensive noninflammatory fibrous membrane in the AC, which subsequently needed explantation.[12] Those cases did not combine iris-claw IOL implantation with iris

Table 3: Pre- and post-operative corneal endothelial cell counts in 11 patients (cells/mm²)

Preoperative CECC injured eye	Postoperative CECC injured eye	Preoperative CECC controlled eye	Cell loss postoperative versus preoperative of injured eye (%)*	Cell loss operated eye versus fellow eye (%)†	Follow-up (years)
2809	2660	2950	−5.34	−9.83	4.0
1903.1	2203	2994	+15.76	−26.42	4.2
Unavailable	1706	2950	-	−42.17	3.8
2562	2299	2849	−10.27	−19.30	3.3
1449	899	1949	−37.96	−53.87	3.1
Unavailable	1808	2866	-	−36.92	3.0
Unavailable	2817	3135	-	−10.14	3.1
2618	2358	2770	−9.93	−14.87	3.2
2755	2533	2924	−8.06	−13.37	2.0
2463	2159	3135	−12.34	−31.19	1.1
2445	2265	2804	−7.36	−19.22	2.2

Unavailable: Unable to make the measurement. CECCs: Corneal endothelial cell counts. *Cell loss in postoperative versus preoperative injured eye = $\frac{\text{Postoperative CECC of injured eye} - \text{Preoperative CECC of injured eye}}{\text{Preoperative CECC of injured eye}}$,

†Cell loss in operated eye versus fellow eye = $\frac{\text{Postoperative CECC of injured eye} - \text{Preoperative CECC of controlled eye}}{\text{Preoperative CECC of controlled eye}}$

reconstruction. Theoretically, iris-claw IOL was meant to be used in patients with a normal pupil or a normal iris because they could experience inconvenient symptoms when the pupil size exceeds the diameter of the iris-claw IOL, such as halos, blurred vision, or further laceration, or unknotting of a suture could happen when inappropriately applied to a ruptured iris. However, our clinical data showed that iris-claw IOL implantation combined with iris reconstruction in traumatic aphakic eyes had significant results. This combined surgery required less time compared to a transscleral fixated IOL implantation surgery. The iris-claw IOLs in all of the cases were well-fixed on the anterior surface of the repaired iris. None of the patients developed such complications as tilting or decentering of the IOL, corneal endothelial cell decomposition, or a dislocation of the iris-claw IOL. VA increased greatly, although variably, from 20/200 to 20/20 in cases. The BCVA was 20/40 or better in seven patients (64%).

Whether the sutured iris is sufficiently strong to support an iris-claw IOL is our consideration, for example, unknotting of the suture or dislocation of the iris-claw IOL. Our 1.1–4.2 years of follow-up demonstrated the sutured iris remained well-shaped, except in one child who had a loose knot, but his IOL remained in the proper position without dislocation. The 11 patients, both children and adults, maintained their regular daily activities after surgery. We assume the iris-claw IOL may not interfered with the sutured iris; nevertheless, this proper positioned IOL may strengthen the sutured iris against mechanical force.

Although the result showed a decreased postoperative CECCs compared to preoperative ones in injured eyes, and a decreased CECCs in injured eyes compared to control eyes, neither decompensation nor postoperative corneal edema was observed in any of the cases after an average of 3 years follow-up period. A corneal scar and the measuring technique may have contributed to the CECC drop from preoperative 1449 cells/mm^2 to postoperative 899 cells/mm^2 in a 66-year-old male (Case #5). Comparing with Dr. Budo' criteria for CECC in an iris-claw IOL implantation,[20] there was another case (Case #2) in our series with preoperative CECC below 2100 cells/mm^2; however, it increased to 2203 cells/mm^2 after surgery. Therefore, for traumatic IOL implantation, preoperative CECC should be evaluated along with other conditions, such as corneal edema or corneal scarring. Because we do not know whether the CECCs will increase or further decrease in the future or whether the reduced CECCs are due to the trauma or surgery, long-term follow-up is needed. Evidence from other reports indicates that iris-claw IOL implantation was safe for corneal endothelial cells. Pop *et al*. concluded that this IOL did not result in a significant loss of endothelial cell density after observing 765 eyes implanted with an Artisan iris-claw phakic IOL.[26] Sminia *et al*. performed an 11-year follow-up study of five children with penetrating eye injuries who received an iris-claw IOL implantation, in which preoperative CECCs in three cases varied from 1349 to 1972 cells/mm^2, and none of the patients developed corneal edema or decompensation after the long-term follow-up.[11] The reason that iris-claw IOLs implantation in traumatic aphakic eyes is quite safe for corneal endothelial cells is most likely related to a deeper AC or a safe distance from the corneal endothelial cells to the surface of the iris-claw IOL after cataract removal. Moreover, a viscoelastic intraoperatively injected agent may also contribute to the protection of the corneal endothelial cells.

There were no remarkable changes found on macular OCTs in 10 of the 11 cases before or after combined surgery. Only one CME, in Case #2, occurred after a primary lensectomy and anterior vitrectomy, but it spontaneously disappeared after the secondary combined surgery. None of the 11 cases with CME demonstrated that the combined surgery did not disturb the macula. Hirashima *et al*. studied iris-claw ACIOL for the treatment of subluxated lenses in 15 patients with Marfan syndrome and found that none of them developed CME.[6] Sminia *et al*. also had a similar result after an 11-year follow-up study of five children with penetrating eye injuries with an iris-claw IOL implantation.[11]

Overall, our results demonstrate iris reconstruction combined with iris-claw IOL implantation is a safe and efficient procedure due to the good visual outcomes, well-reconstructed iris and pupil, well-positioned iris-claw IOLs, and minimal complications. It may be a good option for the iris injury in an aphakic eye without capsular support. Because of the relatively small sample size and relatively short follow-up period, the long-term efficiency and safety of the combined surgery need to be further evaluated. CECC, suture knot, iris and pupil characteristics, and iris-claw IOL position should be the major focus of the follow-up study.

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Conflicts of interest

There are no conflicts of interest.

References

1. Roodhooft JM. Leading causes of blindness worldwide. Bull Soc Belge Ophtalmol 2002;283:19-25.
2. Memon MN, Narsani AK, Nizamani NB. Visual outcome of unilateral traumatic cataract. J Coll Physicians Surg Pak 2012;22:497-500.
3. Dick HB, Augustin AJ. Lens implant selection with absence of capsular support. Curr Opin Ophthalmol 2001;12:47-57.
4. Wagoner MD, Cox TA, Ariyasu RG, Jacobs DS, Karp CL; American Academy of Ophthalmology. Intraocular lens implantation in the absence of capsular support: A report by the American Academy of Ophthalmology. Ophthalmology 2003;110:840-59.
5. Evereklioglu C, Er H, Bekir NA, Borazan M, Zorlu F. Comparison of secondary implantation of flexible open-loop anterior chamber and scleral-fixated posterior chamber intraocular lenses. J Cataract Refract Surg 2003;29:301-8.
6. Hirashima DE, Soriano ES, Meirelles RL, Alberti GN, Nosé W. Outcomes of iris-claw anterior chamber versus iris-fixated foldable intraocular lens in subluxated lens secondary to marfan syndrome. Ophthalmology 2010;117:1479-85.
7. 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.
8. Benedetti S, Casamenti V, Marcaccio L, Brogioni C, Assetto V. Correction of myopia of 7 to 24 diopters with the Artisan phakic intraocular lens: Two-year follow-up. J Refract Surg 2005;21:116-26.
9. Pop M, Mansour M, Payette Y. Ultrasound biomicroscopy of the iris-claw phakic intraocular lens for high myopia. J Refract Surg 1999;15:632-5.

10. de Vries NE, Tahzib NG, Budo CJ, Webers CA, de Boer R, Hendrikse F, *et al*. Results of cataract surgery after implantation of an iris-fixated phakic intraocular lens. J Cataract Refract Surg 2009;35:121-6.
11. Sminia ML, Odenthal MT, Wenniger-Prick LJ, Gortzak-Moorstein N, Völker-Dieben HJ. Traumatic pediatric cataract: A decade of follow-up after Artisan aphakia intraocular lens implantation. J AAPOS 2007;11:555-8.
12. Neuhann IM, Kleinmann G, Apple DJ, Pandey SK, Neuhann TF. Cocooning of an iris-fixated intraocular lens in a 3-year-old child after perforating injury: Clinicopathologic correlation. J Cataract Refract Surg 2005;31:1826-8.
13. Siepser SB. The closed chamber slipping suture technique for iris repair. Ann Ophthalmol 1994;26:71-2.
14. Kaufman SC, Insler MS. Surgical repair of a traumatic iridodialysis. Ophthalmic Surg Lasers 1996;27:963-6.
15. Snyder ME, Lindsell LB. Nonappositional repair of iridodialysis. J Cataract Refract Surg 2011;37:625-8.
16. Chang DF. Siepser slipknot for McCannel iris-suture fixation of subluxated intraocular lenses. J Cataract Refract Surg 2004;30:1170-6.
17. Hoffman RS, Fine IH, Packer M. Scleral fixation without conjunctival dissection. J Cataract Refract Surg 2006;32:1907-12.
18. Bellamy JP, Queguiner F, Salamé N, Montard M. Secondary intraocular lens implantation: Methods and complications. J Fr Ophtalmol 2000;23:73-80.
19. Carlson AN, Stewart WC, Tso PC. Intraocular lens complications requiring removal or exchange. Surv Ophthalmol 1998;42:417-40.
20. Budo C. Another view of iris-claw IOL implantation. J Cataract Refract Surg 2010;36:1801-2.
21. Tahzib NG, Nuijts RM, Wu WY, Budo CJ. Long-term study of Artisan phakic intraocular lens implantation for the correction of moderate to high myopia: Ten-year follow-up results. Ophthalmology 2007;114:1133-42.
22. Budo C, Hessloehl JC, Izak M, Luyten GP, Menezo JL, Sener BA, *et al*. Multicenter study of the Artisan phakic intraocular lens. J Cataract Refract Surg 2000;26:1163-71.
23. Maloney RK, Nguyen LH, John ME. Artisan phakic intraocular lens for myopia: Short-term results of a prospective, multicenter study. Ophthalmology 2002;109:1631-41.
24. Tahzib NG, Eggink FA, Frederik PM, Nuijts RM. Recurrent intraocular inflammation after implantation of the Artiflex phakic intraocular lens for the correction of high myopia. J Cataract Refract Surg 2006;32:1388-91.
25. van der Meulen IJ, Gunning FP, Vermeulen MG, de Smet MD. Artisan lens implantation to correct aphakia after vitrectomy for retained nuclear lens fragments. J Cataract Refract Surg 2004;30:2585-9.
26. Pop M, Payette Y. Initial results of endothelial cell counts after Artisan lens for phakic eyes: An evaluation of the United States food and drug administration ophtec study. Ophthalmology 2004;111:309-17.