

Comparative Analysis of Iris Claw Anterior Chamber Fixation Versus Suture Less Intrasceral Intraocular Lens Implantation in the Management of Aphakia

Dr. Kainaat Queen¹, Dr. Pervaiz Ahmad Handoo²

¹Post Graduate, Department of Ophthalmology, Govt. Medical College, Srinagar

²Associate Professor, Department of Ophthalmology, Govt. Medical College, Srinagar

Abstract:

Purpose: To determine the efficacy of iris claw anterior chamber fixation versus suture less intrasceral intraocular lens implantation in terms of visual recovery and complications during and after surgery.

Method: The present prospective observational study was conducted in the Postgraduate Department of Ophthalmology at SMHS Hospital, Govt. Medical College, Srinagar over a period of one and half year.

Results: A total of 30 patients were studied and divided equally into two groups with patients age ranging between 19-70 years with mean age of 49.5±17.41 years in iris claw anterior chamber IOL group and in suture less intrasceral fixated IOL group with age ranging between 24-70 years with a mean age of 51.9±15.94 years. Primary fixation of IOL was implanted in 8 (26.7%) patients, out of which 5 (33.3%) underwent iris claw anterior chamber IOL fixation and 3 (20%) patients underwent suture less intrasceral fixated IOL while the remaining 22 (73.3%) underwent secondary IOL. Mean preoperative BCVA improved from log MAR 0.78±0.251 in iris claw anterior chamber IOL to log MAR 0.85±0.241 in suture less intrasceral fixated IOL to log MAR {0.23±0.206 & 0.18±0.191} in two study groups respectively. Eyes with iris claw IOL experienced pigment precipitates (73.3%) followed by ovalisation of pupil (26.7%) while intraocular pressure (33.3%) followed by corneal edema (13.3%) and transient hypotony (6.7%) were seen in suture less intrasceral fixation of IOL.

Conclusion: It was concluded that both iris claw anterior chamber IOL fixation and suture less SFIOL using flange are viable options for surgical correction of aphakia.

Keywords: Vision, Aphakia, IOL, Surgical correction and Lens.

Introduction:

Aphakia is defined as absence of crystalline lens from the pupillary area. In addition to having high hypermetropia, patients with aphakia have loss of accommodation¹. Many situations contribute to aphakia such as traumatic lens subluxation/dislocation, cataract in pseudoexfoliative syndrome with zonular dehiscence or systemic and congenital disorders characterized by weakness of zonules (e.g., idiopathic ectopia-lentis, Marfan syndrome, etc.) or intraoperative complications (e.g., large breaks of the posterior capsule, accidental aspiration of the capsular bag, etc.) leaving the patient aphakic². There are several options to correct aphakia in eyes without adequate capsule support such as spectacle lens, contact lens,

refractive surgery and intraocular lens³. The IOL implantation is the most suitable treatment for visual rehabilitation and rectification of aphakia. There are a range of choices for surgical correction of aphakia in the patients without adequate capsular support, such as anterior chamber IOLs (ACIOLs); iris fixated IOLs and scleral fixated IOLs (SFIOL)⁴. Placement of the IOL in the posterior, rather than the anterior chamber reduces the risk of damage to anterior chamber angle structures and corneal endothelium⁵.

Aims and Objectives:

This study aimed to determine the efficacy of iris claw anterior chamber fixation versus sutureless intrascleral intraocular lens implantation in terms of visual recovery and to determine the complications during and after the surgery.

Material and Methods:

The prospective observational study was conducted in the Postgraduate Department of Ophthalmology at SMHS Hospital, Govt. Medical College, Srinagar over a period of one and half year after obtaining the ethical clearance from the Institutional Ethical Committee. In this study 30 Patients fulfilling the selection criteria and after obtaining the proper informed consent were enrolled as per the following inclusion and exclusion criteria.

Inclusion Criteria

Patients with the following indications were included:

- Aphakia with insufficient capsular support.
- Post traumatic dislocation or subluxation.
- Dropped IOL / nucleus or its fragments. AC depth >3.2 mm.
- Endothelial cell count >1500 mm²

Exclusion Criteria

Following patients were excluded from the study:

- Dense Corneal Opacity
- Optic atrophy
- Macular Scar

The patients were subjected to secondary IOL implantation and were followed post-operatively for 6 months for assessment of visual outcome and complications, if any.

In this comparative study, 30 eligible cases of aphakic eyes were assigned in to two groups (iris claw anterior chamber fixation and sutureless intrascleral intraocular lens implantation) using 'chit in box' method. Double blinding was done. Along with socio demographic information, preoperative and post-operative visual acuity, slit lamp and fundus examination, IOP (intraocular pressure) measurement, specular microscopy (TOPCON SP- 1P), optical biometry (Lens star 900LS Haag Streit), B-scan, ocular computed tomography (OCT) was done for extensive evaluation of anterior and posterior segment.

Surgical Techniques:

Iris Claw Anterior chamber:

The surgery was performed under peribulbar anesthesia. Preparation of 5.2 mm sclera-corneal tunnel incision was made at 12' o'clock. Two paracentesis incision were made at the side of surgeon's non-

dominant hand at either the 3 or 9'O, clock position. Anterior vitrectomy was performed to clear the vitreous from anterior chamber either by pars plana approach or limbal approach. In cases with posterior dislocation of lenticular matter or intraocular lens, a 23 G / 25G complete pars plana vitrectomy was performed. Following induction of posterior vitreous detachment, vitrectomy was completed followed by removal of dislocated IOL lenticular matter using a sclera through 20 G port. Pilocarpine 0.1cc was injected intracamerally through the paracentesis for miosis, followed by injection of viscoelastic material. Artisan intraocular lens with a position of convex side up and fixed to anterior surface of iris with claw mechanism using lens stabilization forceps and enclavation needle to tuck the iris into the claw. All viscoelastic was aspirated. Corneoscleral tunnel was sutured with 10-0 nylon. Following surgery, the patient's eye was padded and shifted to recovery room.

Suture less Flanged Intrascleral SFIOL

The conjunctival entry spots were marked 180 degrees apart with atoric marker at 4'O, clock and 10'O, clock, 2mm from limbus. Following adequate vitrectomy, a three-piece Polymethyl methacrylate (Auro Lab, India) intraocular lens was introduced initially in anterior chamber through limbal or sclera-corneal tunnel. A 26G needle was inserted 2mm from the limbus keeping it tangential with iris plane to avoid ciliary body injury. A 23 G end gripping forceps was introduced from the paracentesis to insert the tip of leading haptic into lumen of 26G needle. A 27G A/C maintainer was used. The haptic was externalized and tip heated with thermal cautery to create a flange, which was then fixed intrascleral. Same technique was repeated at 180 degrees opposite meridian to fixate haptics. Following surgery, the patients' eye was padded and shifted to recovery room. The parameters like visual acuity, indirect ophthalmoscopic examination for fundus examination, IOP, slit lamp examination, specular microscopy, pachymetry, OCT (posterior segment) and photographic documentations were recorded at an interval of 01-week, 01 month and 06 months from the time of surgery.

Statistical Analysis:

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean \pm SD and categorical variables were summarized as frequencies and percentages. Graphically the data was presented by bar and pie diagrams. Student's independent t-test or Mann-Whitney U-test, whichever feasible, was employed for comparing continuous variables. Chi-square test or Fisher's exact test, whichever appropriate, was applied for comparing categorical variables. A P-value of less than 0.05 was considered statistically significant.

Observations and Results:

A total of 30 patients were studied and divided equally into two groups with patients age ranging between 19-70 years with mean age of 49.5 \pm 17.41 years in iris Claw an anterior chamber IOL group and in suture less intrascleral fixated IOL group with age ranging between 24-70 years with a mean age of 51.9 \pm 15.94 years. The difference observed was statistically insignificant with P value of 0.697.

Male gender was dominant in both the study groups with 73.3% males in iris claw anterior chamber IOL and 60% in suture less intrascleral fixated IOL.

Table 2: Indications for IOL implantation in two groups							
Cause of aphakia	Iris Claw Anterior chamber IOL		Suture less intrascleral fixated IOL		Total		P value
	No.	%	No	%	No.	%	
PCR	7	46.7	6	40	13	43.3	0.945
Dislocated IOL	4	26.7	3	20	7	23.3	
Nucleus Drop	2	13.3	3	20	5	16.7	
Crystalline lens drop	1	6.7	2	13.3	3	10	
Decentered IOL	1	6.7	1	6.7	2	6.7	
Total	15	100	15	100	30	100	

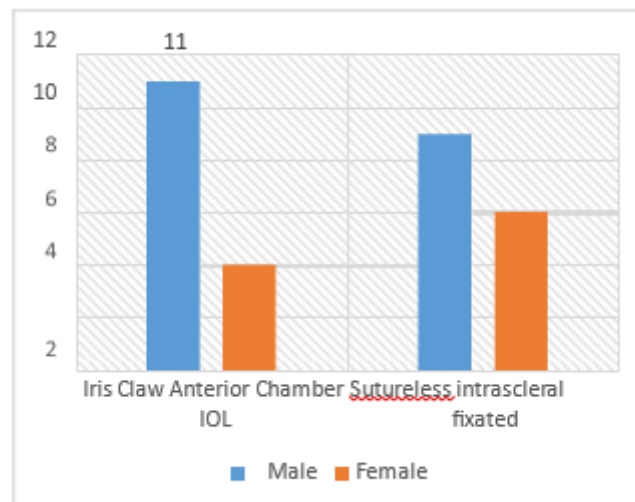


Fig. 1: Gender Distribution

The most common indication was PCR with 46.7% patients in iris claw anterior chamber group and 40% patients in suture less intrascleral fixated IOL group, followed by dislocated IOL in 26.7% and 20% patients in two study groups respectively (iris claw anterior chamber and suture less intrascleral fixation of IOL). Other indications included nucleus drop (13.3% and 20%), crystalline lens drop (6.7% and 13.3%) and decentered IOL (6.7% and 6.7%) in both study groups (iris claw anterior chamber IOL and suture less intrascleral fixated IOL) respectively.

Primary fixation of IOL was implanted in 8 (26.7%) patients while the remaining 22 (73.3%) underwent secondary IOL. Out of 8 patients of primary fixation of IOL, 5 (33.3%) patients underwent iris claw anterior chamber IOL fixation and 3 (20%) patients underwent suture less intrascleral fixated IOL fixation. The remaining 22 patients underwent secondary IOL implantation in which 10 (66.7%) patients underwent iris claw anterior chamber IOL fixation and 12 (80%) underwent suture less intrascleral fixated IOL fixation.

In our study Anterior vitrectomy was performed in 73.3% and 26.7% patients in iris claw anterior chamber IOL group and suture less intrascleral fixated IOL group respectively. Pars plana vitrectomy was performed in 26.7% and 73.3% patients in both study groups (iris claw anterior chamber IOL and suture less intrascleral fixated IOL).

The Mean preoperative UCVA improved from log MAR 1.38+0.652 in iris claw anterior chamber IOL group and log MAR 1.42+0.543 in suture less intrascleral fixated IOL group to postoperative log MAR 0.38+0.419 and log MAR 0.30+0.527 at 6 months respectively. The association between preoperative UCVA and two study groups (iris claw anterior chamber IOL group and suture less intrascleral fixated IOL group) was statistically significant at 1 week, 1 month and 6 months postoperatively. However, the inter-Mean preoperative BCVA improved from group difference was found to be statistically insignificant.

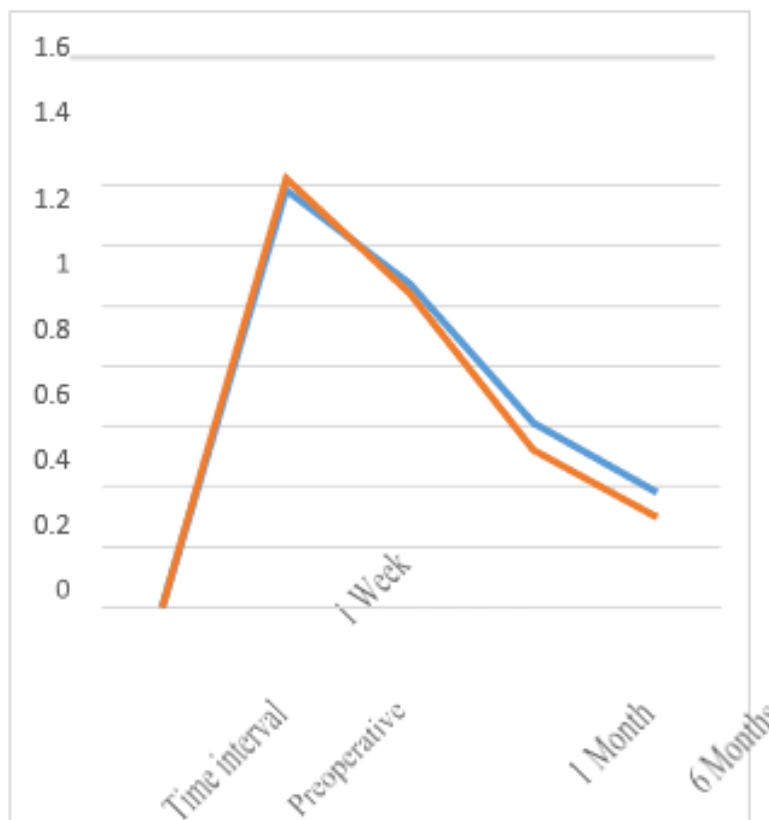


Fig. 2: UCVA (log MAR) before and after IOL implantation

Table 4: BCVA (log MAR) before and after IOL implantation

	Iris Claw Anterior chamber IOL	Suture less intrascleral fixated IOL
--	--------------------------------	--------------------------------------

Time interval	Mean	SD	P-value	Mean	SD	P-value
Preoperative	0.78	0.251	-	0.85	0.241	-
1 Week	0.74	0.341	<0.043*	0.69	0.231	<0.015*
1 Month	0.41	0.345	<0.001*	0.36	0.259	<0.001*
6 Months	0.23	0.206	<0.001*	0.18	0.191	<0.001*

Mean preoperative BCVA improved from log MAR 0.78+0.251 in iris claw anterior chamber IOL and log MAR 0.85+0.241 in suture less intrascleral fixated IOL to log Mar 0.23+0.206 and log MAR 0.18 + 0.191 at 6 months postoperatively respectively. The results were statistically significant but within group difference was statistically insignificant. The mean Spherical Equivalent (SE) decreased from +10.92 D preoperatively to -0.88+0.519 D at 6 months postoperatively in iris claw anterior chamber group while as in suture less intra scleral fixated IOL group it decreased from the preoperative value +11.17D to -0.63+0.728D at 6 months post-operatively. The mean preoperative central corneal thickness in iris claw anterior chamber IOL group was 502.7+44.52 µm and 493.6+31.59 µm in intrascleral fixated IOL group. Which increased at 1 week to 593.4+39.43 µm and 597.0+36.74 µm and came down to 538.1+31.90 µm and 541.9+33.25 µm at 6 months postoperatively in both study groups, respectively.

Mean endothelial cells count decreased preoperatively from 2142.7+347.83 cells / mm² and 2226.5+375.31 cells/mm² iris claw anterior chamber group and suture less intrascleral fixated IOL group to 1897.5+219.13 cells/mm² and 2076.3+252.59 cells/mm² at 6 months respectively in two study groups. There was no significant change in Central Macular Thickness at 6 months postoperatively (248.7+19.37, 251.3+23.71 µm) compared to preoperative values (238.4+15.74, 240.1+18.35 µm) in two study groups (Iris Claw Anterior chamber IOL group and suture less intrascleral fixated IOL) respectively. Mean preoperative Intraocular pressure in Iris Claw Anterior chamber IOL group was 15.71+2.89 mmHg which then decreased to 12.97+3.72 mmHg at 6 month follow up. In Suture less intrascleral fixated IOL group mean intraocular pressure was 14.92+3.78 mmHg and it rose to 23.19+7.83 mmHg at one week but returned to normal levels at 1 month.

Table 14: Late complications in two groups					
Complications	Iris Claw Anterior Chamber IOL		Suture less intrascleral fixated IOL		P-value
	No.	%	No.	%	
Pigment precipitates	11	73.3	0	0	1
IOP elevation	0	0	5	33.3	0.014*
Pupil ovalization	4	26.7	0	0	0.031*
Vitreous hemorrhage	0	0	1	6.7	1
IOL decentration	1	6.7	0	0	0.483
Corneal edema	0	0	2	13.3	1
Transient hypotony	0	0	1	6.7	1
Haptic breakage	0	0	1	6.7	1

Most common complication was pigment precipitates (73.3%) followed by ovalisation of pupil in 26.7% and anterior uveitis (13.3%) in iris claw anterior chamber IOL group. Intraocular pressure (33.3%) followed by corneal edema (13.3%), haptic breakage (6.7%) and transient hypotony (6.7%) were seen in suture less intrascleral fixation of IOL.

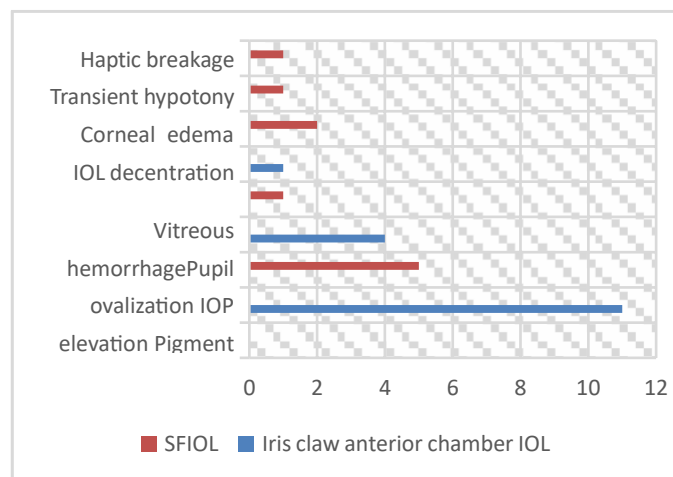


Fig. 3: Complications in two groups

In our comparative study a total of 30 patients were included and divided equally into two groups with patients age ranging between 19-70 years with mean age of 49.5+17.41 years in iris claw anterior chamber IOL group and in suture less intrascleral fixated IOL group with age ranging between 24-70 years with a mean age of 51.9+15.94 years. Further, male gender was dominant in both the study groups with 73.3% males in iris claw anterior chamber IOL and 60% in suture less intrascleral fixated IOL. In a study conducted by **Kelkar AS et al., (2019)**¹⁷ mean age of iris claw group (retro pupillary) was 62.0+23.0 years

and the mean age of the SFIOL group was 57.06+16.9 years. **Yamane S et al., (2014)⁷** also confirmed male dominance with 23 men against 11 women in their study population with a mean age of 67.8+10.9 years.

In our study the most common indication was PCR with 46.7% patients in iris claw anterior chamber group and 40% patients in suture less intrascleral fixated IOL group, followed by dislocated IOL in 26.7% and 20% patients in two study groups respectively (iris claw anterior chamber and suture less intrascleral fixation of IOL). Other indications included nucleus drop (13.3% and 20%), crystalline lens drop (6.7% and 13.3%) and decentered IOL (6.7% and 6.7%) in both study groups (iris claw anterior chamber IOL and suture less intrascleral fixated IOL) respectively. The results of our study are consistent with the study conducted by **Yamane S et al., (2014)⁷ Czajka et al (2020)⁸ and Kelkar AS et al., (2019)¹⁷**

In our study the Primary fixation of IOL was implanted in 8 (26.7%) patients while the remaining 22 (73.3%) underwent secondary IOL. Similar results were observed by **Kelkar AS et al., (2019)⁶ and Agarwal L et al (2016)¹⁶**.

In our study Anterior vitrectomy was performed in 73.3% and 26.7% patients in iris claw anterior chamber IOL group and suture less intra scleral fixated IOL group respectively. Whereas pars plana vitrectomy was performed in 26.7% and 73.3% in two groups respectively. Our results are consistent with the study conducted by **Kelkar AS et al (2017)⁶ and Agarwal L et al (2016)¹⁶**

In our study the mean preoperative UCVA improved from log MAR 1.38+0.652 in iris claw anterior chamber IOL group and log MAR 1.42+0.543 in suture less intrascleral fixated IOL group to postoperative log MAR 0.38+0.419 and log MAR 0.30+0.527 at 6 months respectively. Our results are consistent with the findings of **Riazi M et al., (2008)⁹ and Kelkar AS et al (2017)⁶**.

In our study, mean preoperative BCVA improved from log MAR 0.78+0.251 in iris claw anterior chamber IOL and log MAR 0.85+0.241 in suture less intrascleral fixated IOL to log Mar 0.23+0.206 and log MAR 0.18 + 0.191 at 6 months postoperatively respectively. Our results are consistent with the studies conducted by **Toro MD et al (2019)¹⁰ and Yamane S et al., (2014)⁷**.

The mean spherical equivalent (SE) decreased from +10.92 D preoperatively to -0.88+0.519 D at 6 months postoperatively in Iris Claw Anterior chamber group while as in Suture less intrascleral fixated IOL group it decreased from the preoperative value +11.17D to -0.63+0.728D at 6 months post-operatively. The results of our study are consistent with the studies conducted by **Chen Y et al (2012)¹¹ and Guell L et al (2005)¹²**.

The mean preoperative central corneal thickness in Iris Claw Anterior chamber IOL group was 502.7+44.52 μ m and 493.6+31.59 μ m in intrascleral fixated IOL group. Which increased at 1 week to 593.4+39.43 and 597.0+36.74 and came down to 538.1+31.90 and 541.9+33.25 at 6 months postoperatively in both study groups, respectively. The results of our study are similar to the studies conducted by **Zafar SN et al (2013)¹³ and Toro MD et al (2019)¹⁰**

In our study, mean endothelial cell count (ECC) decreased preoperatively from 2142.7 ± 347.83 cells/mm² and 2226.5 ± 375.31 cells/mm² in Iris Claw Anterior chamber group and suture less intrascleral fixated IOL group to 1897.5 ± 219.13 cells/mm² and 2076.3 ± 252.59 cells/mm² at 6 months respectively in two studygroups. The findings are consistent with the similar studies conducted by **Chen Y et al., (2012)¹¹** and **Anbari A et al., (2015)¹⁴**

There was no significant change in Central Macular Thickness at 6 months postoperatively (248.7 ± 19.37 , 251.3 ± 23.71 mm) compared to preoperative values (238.4 ± 15.74 , 240.1 ± 18.35 mm) in two studygroups (Iris Claw Anterior chamber IOL group and suture less intrascleral fixated IOL) respectively. The results are similar to the study conducted by **Kelkar AS et al., (2019)¹⁷**.

In our study, mean preoperative Intraocular pressure in iris Claw anterior chamber IOL group was 15.71 ± 2.89 mmHg which then decreased to 12.97 ± 3.72 mmHg at 6 month follow up. In suture less intrascleral fixated IOL group mean intraocular pressure was 14.92 ± 3.78 mmHg and it rose to 23.19 ± 7.83 mmHg at one week but returned to normal levels at 1 month. The results are consistent with the similar study conducted by **Negretti G et al., (2020)¹⁸** and **Kansal V et al., (2019)¹⁹**.

Most common complication was pigment precipitates (73.3%) followed by ovalisation of pupil in 26.7% and anterior uveitis (13.3%) in iris claw anterior chamber IOL group. Intraocular pressure (33.3%) followed by corneal edema (13.3%), haptic breakage (6.7%) and transient hypotony (6.7%) were seen in Sutureless intrascleral fixation of IOL. Our results were consistent with the results of **Agarwal L et al (2016)¹⁶** and **Kelkar AS et al., (2019)¹⁷**.

Conclusion:

Our study concluded that both iris Claw anterior chamber IOL fixation and suture less SFIOL using flange are viable options for surgical correction of aphakia. Visual outcomes are excellent at 1 month and maintained till 6 months follow up. Complication rates are acceptably low, but pigment precipitates occur in significant proportion of eyes that receive their iris claw anterior chamber IOLs.

References:

1. Garin M. Aphakia in adults and children. Burman and Zuckerbrod Ophthalmology Associates PC: 2018.
2. Cellini M, Strobbe E, Toschi PG, et al. Secondary IOL Implantation without Capsular Support: A Laser Flare Cell Meter Study; ISRN Ophthalmology 2011; 1-5.
3. Elkington AR, Frank HJ, Greaney MJ. Optics of ametropia. Clinical optics. 3rd ed. Blackwell science 2005:113-140.
4. Por YM, Lavin MJ. Techniques of intraocular lens suspension in the absence of capsular/zonular support. Surv Ophthalmol. 2005; 50(5): 429-462. Pubmed PMID: 16139038.
5. Apple DJ, Brems RN, Park RB, Norman DK, Hansen SO, Tetz MR, et al. Anterior chamber lenses. Part I: Complications and pathology and a review of designs. J Cataract Refract Surg. 1987; 13(2): 157-74. Pubmed PMID: 3572772.
6. Kelkar AS, Kelkar JA, Kothari AA, Kelkar SB. Comparison of flanged intrascleral intraocular lens

- fixation versus iris claw intraocular lens fixation: a retrospective study. *Indian Journal of Ophthalmology* 2019; 67: 1838-42.
7. Yamane S, Inoue M, Arakawa A, Kadonosono K. Suture less 27- Gauge needle guided intrascleral intraocular lens implantation with lamellar scleral dissection. *Ophthalmology* 2014; 121: 61- 66.
 8. Czajka MP, Frajdenberg A, Stopa M, Pabin T, Johansson B, Jakobsson G. Suture less intrascleral fixation using different three- piece posterior chamber intraocular lenses: a literature review of surgical techniques in cases of insufficient capsular support and a retrospective multi-centre study. *Acta Ophthalmol.* 2020; 98: 224-36.
 9. Riazi M, Moghimi S, Najmi Z, Ghaffari R. Secondary artisan- verysise intraocular lens implantation for aphakic correction in post- traumatic vitrectomized eye. *Eye* 2008; 22: 1419-24.
 10. Toro MD, Longo A, Avitabile T, Nowomiejska K, Gagliano C, Tripodi S, et al. Five-year follow-up of secondary iris-claw intraocular lens implantation for the treatment of aphakia: Anterior chamber versus retro pupillary implantation. *PLoS ONE* 2019; 14(4): e0214140.
 11. <https://doi.org/10.1371/journal.pone.0214140>
 12. Chen Y, Liu Q, Xue C, Huang Z, Chen Y. Three-year follow-up of secondary anterior iris fixation of an aphakic intraocular lens to correct aphakia. *J Cataract Refract Surg* 2012; 38:1595–1601.
 13. Guell JL, Velasco F, Malecaze F, Vazquez M, Gris O, Manero F. Secondary Artisan- Verysise aphakic lens implantation. *J Cataract Refract Surg* 2005; 31: 2266-71.
 14. Zafar SN, Siddiqui SN, Khan A. Effects of Artisan aphakic intraocular lens on central corneal thickness and intra ocular pressure in pediatric eyes with crystalline subluxated lenses. *Oman J Ophthalmol.* 2013;6(1):44-47.
 15. Anbari A, Lake DB. Posteriorly enclavated iris claw intraocular lens for aphakia: long-term corneal endothelial safety study. *Eur J Ophthalmol.* 2015;25(3):208-13.
 16. Shekhawat N, Goyal K. Suture less glueless intrascleral fixation of posterior chamber intraocular lens: Boon for aphakic. *Indian J Ophthalmol.* 2017;65(12):1454-58.
 17. Agarwal A, Kumar DA, Jacob S, Baid C, Agrwal A, Srinivasan S. Fibrin glue- assisted suture less posterior chamber intraocular lens implantation in eyes with deficient posterior capsules. *J Cataract Refract Surg* 2008; 34: 1433-38.
 18. Kelkar AS, Kelkar JA, Kothari AA, Kelkar SB. Comparison of flanged intrascleral intraocular lens fixation versus iris claw intraocular lens fixation: a retrospective study. *Indian Journal of Ophthalmology* 2019; 67: 1838-42.
 19. Negretti GS, Chan WO, Muqit SM. Smartian iris-claw intraocular lens implantation in vitrectomized eyes. *Eye* 2020; <http://doi.org/10.1038/s41433-020-1022-x>.
 20. 1022-x.
 21. Kansal V, Ona Sanya O, Colleague K, Rawlings N. Outcomes of Using Suture less, Scleral-Fixated Posterior Chamber Intraocular Lenses. *Seminars n*