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Iris-Claw Versus Scleral-Fixated Intraocular Lens Implantation for Aphakia Correction

Research Article

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Abstract

Purpose: To compare the visual outcome and complications of posterior iris claw lens and scleral fixated posterior chamber lens.
Methods: Out of 60 evaluated cases, 30 were randomly assigned in 2 group, one underwent scleral fixation and the other iris fixation. Extensive preoperative and postoperative evaluation done including Optical Coherence Tomography (OCT) and Scheimpflug imaging. Follow up done on day 1,7,28, 3 month and 6 month.
Results: Significant improvement was found in Uncorrected Visual Acuity (UCVA) in both groups ($p<0.001$). Surgical time in Iris Fixation Intraocular Lens (ICIOL) was significantly less ($P<0.001$). Change in corneal astigmatism and pupil peaking and pigment release was more in ICIOL group. Mean postoperative Intraocular pressure (IOP) in both the groups was almost same (scleral fixation=15.60 ± 2.06mm Hg, iris claw=16.07 ± 2.13mm Hg).
Conclusion: both the techniques had similar good visual results. Although operating time was shorter for iris fixation, it had several disadvantages, including induced astigmatism, immediate postoperative inflammation and ovalling of pupil. This makes scleral fixation a better choice.

Keywords: Iris Claw; Sutureless Scleral Fixation; Pupil Ovaling.

Introduction

Various causes that can hamper the endocapsular placement of Intraocular Lens (IOL) are intracapsular cataract extraction (ICCE), intraoperative complications during phacoemulsification, lens dislocation (because of ocular trauma, MarfanSyndrome, congenital or secondary weakness of zonules, etc.) [1, 2].

By far, the IOL implantation is the most appropriate treatment for visual rehabilitation and correction of aphakia in such cases. There are a variety of options for the surgical correction of aphakia in these patients lacking the adequate capsular support, such as anterior chamber IOLs (ACIOLs); Iris fixated IOLs and Scleral fixated IOLs (SFIOL) [3]. Placement of the IOL in the posterior, rather than the anterior chamber reduces the risk of damage to anterior chamber angle structures and corneal endothelium [4].

In the past, fixation of the IOL to the iris was done by fixing the haptics to the anterior surface of the iris such as the Binkhorst lens, but these are of historical importance now [5]. Recently, the retropupillary fixation of the iris claw lenses (ICIOL) have gain momentum in view of their ease of surgery and relatively good results [6, 7].

Suturing the IOL to sclera using non-absorbable sutures has been the traditionally accepted technique of IOL placements, but associated with various complications like suture-induced inflammation, suture degradation and delayed IOL subluxation or dislocation due to broken suture [8]. Recently, Scharioth et al. developed a technique of sutureless scleral fixation of a multipiece IOL [9].

This study aimed to compare the clinical efficacy, safety, and complexity between ICIOL and SFIOL.

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Methods

The ethical committee of the hospital approved the study and followed the tenets of the declaration of Helsinki. Informed consent was obtained from all patients prior to surgery. In this Comparative study, 60 eligible cases of aphakic eyes were assigned in to two groups (scleral fixation and iris fixation) using 'chit in box' method. Double blinding was done. The investigator assessing best corrected visual acuity (BCVA) was different from the operating surgeon and the type of procedure was not disclosed to the patient. All aphakic patients above 12 years who were ready to give consent were included in the study. Exclusion criteria included patients with corneal opacity, retinal disorder, optic atrophy, bleeding disorder, pregnancy and those who were unwilling to give consent. Preoperative and post-operative visual acuity, Slit lamp and Fundus examination, Applanation tonometry, Keratometry, Biometry (CARL ZEISS MEDITEC IOL MASTER), optical coherence tomography (OCT) (TOPCON 3D OCT-2000) was done for extensive evaluation of anterior and posterior segment.

Statistical analysis- with the use of Software – IBM SPSS 19.0, Qualitative data was summarized in form of proportion. Quantitative data was summarized in form of mean and SD. The significance of difference in proportion measured by chi-square test. Group differences in the continuous variables were analyzed using the Student's t-test. The significance of difference in mean measured by unpaired t-test or ANOVA whichever is appropriate. $p< 0.05$ was considered as significant.

Surgical Technique

Iris claw lens

Under peribulbar anesthesia, conjunctival peritomy was done and superior sclerocorneal tunnel (5.5 mm long and 5.5 mm wide) incision was made. Either deep core anterior vitrectomy or pars plana vitrectomy was performed following which the pupil was constricted using intracameralpilocarpine. The IOL was inserted into anterior chamber with the convex side downwards (upside down) holding it in the forceps. With a manipulator, the IOL was brought into the horizontal position from 3o'clock to 9o'clock. One haptic was guided below the iris and enclaved in the mid-peripheral iris using a blunt sinskey hook. The same procedure was repeated for the other haptic. Peripheral iridectomy was performed intraoperatively. Finally, wound integrity was checked.

Scleral fixated IOL

Under Peribulbar anesthesia, 5.0 mm conjunctival peritomy was done at the 2 o'clock and 8 o'clock positions. Then, 2 T-shaped incisions (1.5-2 mm long) were made 1.5-2.0 mm from the limbus and depth was half of scleral thickness, exactly 180 degrees apart diagonally. An infusion cannula or anterior chamber maintainer was inserted. To prevent interference with the creation of the T-shaped incision, infusion cannula should be positioned at 4 o'clock. Anterior vitrectomy (deep core) was performed, if necessary. Sclerotomy was done parallel to the iris at the T-shaped incision with a 23-gauge angled micro vitreoretinal (MVR) knife and a scleral tunnel (3-3.5 mm long) was made parallel to the limbus at the branching point of the T-shaped incision. 2.8 mm keratome was used to make a corneal incision at 10 o'clock through which IOL, with overall diameter 13 mm and optic diameter 6 mm, [AbottSensarAR40e (three-piece Foldable IOL)] was implanted with an injector; the trailing haptic was left outside the incision. The tip of the haptic was then grasped with 24-gauge IOL haptic gripping forceps, pulled through the Sclerotomy, and externalized on the left side. After the trailing haptic was inserted into the anterior chamberand the haptic tip was grasped with a 24-gauge forceps, pulled through the second sclerotomy and externalized on the right side. The haptic insertion into the anterior chamber may be difficult depending on the material or shape of the haptics, which can cause the IOL to rotate clockwise and the leading haptic to slip back into the eye. To prevent such risks, the IOL optic was pushed to the back of the iris and moved to the 2 o'clock position with a push-and-pull hook inserted through the side port at the 1 o'clock position. The tip of the haptic was subsequently inserted into the limbus-parallel scleral tunnel. A single 8-0 vicryl suture is used to fixate the haptic to the scleral bed to prevent it from shifting immediately after surgery.

Scheimpflug imaging (OCULUS PENTACAM) was done to evaluate proper centration of IOL. Follow up was done on 1st, 7th, 28th post-operative day, at 3 month and 6 month.

Results

The study population consisted of 60 patients (29 female and 31 male). A comparison of the baseline demography and preoperative ocular characteristics of patients between eyes with iris claw IOL and SFIOL is shown in Table 1.

Table 1. Baseline Demographics.

VARIABLE	SCLERAL FIXATION	IRIS FIXATION	p-value
Age (year)	52.73 ±15.81	59.23 ±10.48	0.066
Sex (M/F)	17/13	19/11	
Laterality (OD/OS)	18/12	16/14	
Underlying etiology of aphakia Complicated cataract surgery (PCR) Nucleus drop IOL drop ICCE for subluxated crystalline lens Traumatic dislocation of lens	 15 4 3 6 2	 17 3 3 5 2	
Preoperative UCVA	1.66 ±0.46	1.85 ±0.61	0.178
Preoperative IOP	15.20 ±3.00	15.93 ±2.49	0.307
Mean preoperative astigmatism	2.00 ±1.15	1.43 ±1.12	0.057
IOL placed at time of cataract surgery	4	20	<0.001

#IOL Intraocular lens, ICCE- intracapsular cataract surgery, UCVA-Uncorrected visual acuity, IOP- Intraocular pressure

Cases of aphakia due to complicated cataract surgery underwent deep core anterior vitrectomy. Anterior chamber maintainer was used and a single 23-gauge pars plana incision was made 3.5 mm behind the limbus to allow the unidirectional flow of vitreous (anterior to posterior chamber). Thereafter IOL was implanted. Iris fixation of IOL was done in primary sitting in 20 eyes in contrast to primary scleral fixation in only 4 eyes. This is attributed to the easy surgical technique, shorter learning curve and less maneuvering in iris fixation group. In rest of the cases, 23- gauge primary pars plana vitrectomy with 360° endolaser was done. Secondary IOL was implanted after 4 weeks.

Change in uncorrected visual acuity (UCVA) in LOGMAR from pre-operative value to every follow up post operatively was highly significant ($p<0.001$) in both the groups (figure 1).

Corneal topography (K1 and K2) and astigmatism was measured using scheimpflug imaging. Changes in keratometry (K1, K2) and Astigmatism was found insignificant (p value =0.4727 in scleral fixation and 0.4173 in iris fixation), showing that scleral tunnel made in this technique does not effect corneal astigmatism.

There were no intraoperative complications noted in either of the surgical groups. There was 1 case of corneal edema and AC reaction in scleral fixation group while 6 were in iris fixation group due to surgical manipulation. All got resolved by next follow up.

On day 1 all IOL were well centered in scleral fixation group but 2 IOLs were slightly decentered in iris fixation group. In SFIOL marking for sclerotomy and loop retrieval were precise and under direct vision. Iris claw fixation technique is partially blind procedure, it becomes difficult to tuck the iris in the claw of IOL because it is difficult to see through thick, dark brown iris in Indians. No serious visual impairment caused by slight IOL decentration but that larger pupils could cause visual impairment.

On day 7, IOP was raised in 2 cases of iris fixation group for which antiglaucoma drugs started and IOP was well controlled after 1 week. In scleral fixation group, on day 7, 1 IOL was decentered which was recentered surgically. That time tunnel was not fibrosed. Exposed haptic was grasped and pulled to ensure proper centration of IOL and then tucked into the same tunnel and an absorbable suture was applied to ensure the fixation till the tunnel get fibrosed. So overall decentration of IOL was much more common in iris fixation group. It was easy to reenter IOL in SFIOL group while in iris claw it is more invasive and difficult. In iris fixation group, problem of ovalling of pupil (loss of round shape of pupil) in 12 cases was there in contrast to no ovalling in SFIOL group. Pupil ovalization can occur if the fixation of the haptics is performed asymmetrically or too tightly.

At the end of 6 months, all the patients had well centered IOL on slit lamp examination (figure 2) and scheimpflug imaging (figure 3).

Table 2. Postoperative Outcomes.

VARIABLE	SCLERAL FIXATION	IRIS FIXATION	p-value
Mean UCVA at final follow up (LOGMAR)	0.45±0.17	0.49±0.21	0.451
Mean IOP at final follow up (mm Hg)	15.60 ±2.06	16.07 ±2.13	0.392
Mean astigmatism at final follow up	1.79 ±1.10	1.65± 0.96	0.601
Surgical time	43.67+3.02	18.57+1.48	<0.0001

#UCVA-Uncorrected visual acuity, IOP- Intraocular pressure

Figure 1. LOGMAR UCVA at various follow up.

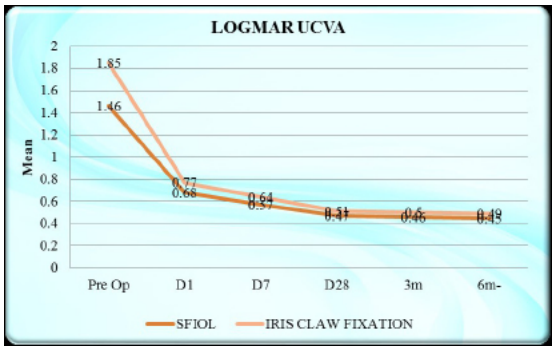


Figure 2. Well centered iris claw fixated IOL(a) and scleral fixated IOL(b) as seen on slit lamp.

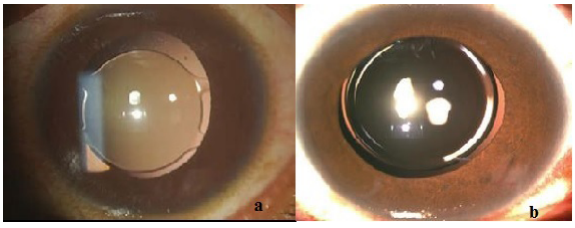
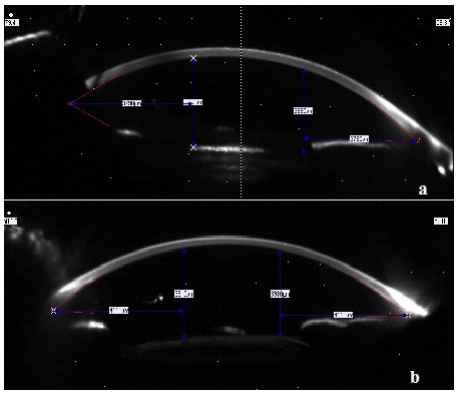


Figure 3. Well centered iris claw fixated IOL(a) and scleral fixated IOL(b) as seen on scheimpflug imaging.



Discussion

The endocapsular placement of an Intraocular lens (IOL) provides stable fixation close to the nodal point of eye. But in eyes with insufficient or no capsular support, IOL implantation is still controversial, although the sulcus placement is undoubtedly the most preferred site in such cases.

In our comparative study, more than half the iris claw IOLs were placed in the same sitting as primary cataract surgery while very few SFIOL done in primary setting. In initial postoperative period, visual outcomes in the iris claw group was slightly poor as compared to SFIOL, but this difference did not persist at 6 months. Madhivanan N et al., [10] and Kim KH et al., [11] also claimed good visual outcome by both the procedures. According to them, this difference in initial period can be due to the rubbing of haptic against the pigment epithelium of the iris during tucking of IOL haptic and releasing pigments into the anterior chamber which activate the inflammatory process. As a result clarity of the AC hampers, thus having a negative impact on vision improvement in the iris fixation group.

With technical point of view, enclaving the iris claw IOL to the posterior surface of the iris is much easier as compared to implanting the SFIOL using sutureless technique. And also, the iris claw IOL fixation is less time consuming than the SFIOL [12]. In our study also, surgical time was significantly less in iris claw fixation group as iris claw implantation was less demanding in view of surgical skills then SFIOL. Scleral incision, retrieval of IOL and tucking the loop in tunnel needed more surgical skills and time. Therefore iris fixation is the procedure of choice if IOL fixation is to be done during the time of primary surgery.

Ovalization of pupil is well documented complication of iris fixated IOL [13, 14]. Distortion of the pupil may compromise quality of vision regained by patients. Additionally, localized or generalized atrophic changes in the iris starts appearing because of enclavation of iris tissue in haptics which ultimately affect the physiological functioning of the pupil.

Postoperatively IOP was slightly higher in iris claw fixation group in comparison to scleral fixation group perhaps due to residual viscoelastic substance and more postoperative inflammation in iris claw fixation technique. Viscoelastic substance retained in anterior chamber because anterior chamber maintainer was not used in this technique. No significant differences were noted in the mean IOP between the iris claw fixation and the scleral fixation Group as consistent with other studies [15, 16]. None of the postoperative complications resulted in a significant worse mean visual acuity.

Based on our current study iris claw fixation technique could have been an alternative to scleral fixation because of less surgical time and easy technique but because of more postoperative complications scleral fixation technique is better than iris claw fixation technique. Visual rehabilitation following iris claw IOL might take longer than SFIOL and ovalization of the pupil is the commonest adverse effect reported with this type of IOL design. Lastly, as SFIOL implantation is much more technically challenging with a longer learning curve compared to iris claw IOL, the choice of IOL depends on the surgeon's expertise and previous exposure. However a long term follow up with larger sample size may help to observe and access late complications and to quantify the procedure of choice in various preoperative conditions.

• WHAT WAS KNOWN- iris claw lens and sutureless scleral fixation of IOL are used for visual rehabilitation in aphakia. Iris claw is preffered because of easy implantation.
• WHAT THIS STUDY ADD- iris claw lens is better in terms of less surgical time and easy technique and is preferred for implantation in same sitting with primary surgery. But, due to high complication rate, SFIOLs have an upper hand for long term use.

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