Original article

Small-incision cataract surgery in patients with Fuch's heterochromic iridocyclitis

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Abstract

Introduction: Fuch's heterochromic iridocyclitis (FHI) is often complicated by cataract formation. **Objective**: To assess the results of small-incision cataract surgery (SICS) in FHI and to study the effect of preoperative factors on postoperative vision. **Materials and methods**: Sixty-three eyes of 59 patients with Fuchs heterochromic iridocyclitis who had SICS with in-the-bag implantation of intraocular lens (IOL) were evaluated retrospectively; and the primary and secondary outcome measures evaluated were the postoperative vision and complication rate. **Results**: The mean age was 39.22 ± 4.95 years. The mean pre-operative vision was 0.75 ± 0.24 Log MAR units. The mean final vision was 0.27 ± 0.10 Log MAR units (P = < 0.001). At the final follow-up, 84.1 % of the patients had a final Snellen's vision of 6/12 or better. The mean follow-up period was 12.06 ± 2.06 months. The causes of corrected distance visual acuity (CDVA) worse than 6/60 were vitreous opacities, posterior keratic precipitates (KPs), glaucoma, persistent uveitis and cystoid macular edema (CME). Preoperative factors like iris atrophy (P = 0.973), heterochromia (P = 0.10) and vessels in angle (P = 0.074) did not have a significant effect on the final vision. On the contrary, vitreous opacities (P = 0.002) and posterior KPs (P = 0.009) had a significant effect on the final visual outcome. **Conclusion**: SICS with in-the-bag implantation of IOL in patients with Fuch's heterochromic iridocyclitis resulted in good visual outcomes. SICS in complicated cataracts can be performed in rural settings and eye camps with minimal instrumentation, obviating the need for referral to tertiary care centres. Pre-operative factors like vitreous opacities and posterior KPs have a significant effect on the final vision.

Keywords: Fuchs heterochromic iridocyclitis, small-incision cataract surgery, cystoid macular edema, posterior keratic precipitates

Introduction

The association of cyclitis and heterochromia of the iris was first reported by Lawrence (1843). However, the clinical spectrum of the enigmatic Fuch's heterochromic cyclitis (FHI) was described by Fuchs (1906) in a series of 38 patients.

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What triggers inflammation in FHI is still not known; Rubella virus, Toxoplasma gondii, and cytomegalovirus have all been identified as the probable triggers (Suzuki et al, 2010).

Cataract is one of the most common complications reported in 15 to 75 % of cases (Tejwani et al, 2006). Cataract surgery in patients with complicated cataracts is primarily indicated

to provide visual rehabilitation and better fundus visualization to deal with the pathology in the posterior segment (Ganesh et al, 2004).

The most important step in the management of complicated cataract is adequate pre-operative control of the inflammation (Foster et al, 2003). Most authors consider the absence of cells in the anterior chamber synonymous with inflammatory control, as mild cellular reaction in the vitreous persist even in the inactive stage of FHI (Tan et al, 2013).

Extra-capsular cataract extraction (ECCE) was associated with the increased risk of bleeding from fragile vessels, glaucoma and exaggerated post-operative inflammation (Baarsama et al, 1991), (O'Neil et al, 1995). Therefore, phacoemulsification is now the preferred surgical modality of treatment of complicated cataracts (Murthy, 2013).

In countries of the Indian sub-continent, rural and semi-rural populations have limited access to phacoemulsification. Small-incision cataract surgery (SICS) requires minimal instrumentation and can be performed in all settings. Secondly, phacoemulsification machines have high maintenance costs as well. Thus, manual SICS has an economic edge over phacoemulsification (Bhargava et al, 2012). This may also obviate the need for referral, thereby reducing the additional burden on tertiary care centres.

To the best of our knowledge, this is the second largest series ever reported on this topic. Secondly, there are no published reports of SICS in patients with FHI (Medline search). The purpose of the present study was therefore to assess the early results of manual SICS and posterior chamber intraocular lens (PCIOL) implantation in consecutive patients with complicated cataracts secondary to FHI. The effect of pre-operative factors like angle neovascularization, iris atrophy, heterochromia, posterior keratic precipitates and vitreous opacities on the visual outcome were also evaluated.

Materials and methods

Between May 2006 to July 2011, over a period of five years and two months, 212 patients were diagnosed with FHI at the Santosh Medical College, Ghaziabad, Rotary eye Hospital, Palampur and the Laser eye clinic, Noida, India. The diagnosis of Fuchs heterochromic iridocyclitis (FHI) was based on the criteria proposed by Kimura et al (1955); and we evaluated 63 eyes of patients with FHI who had undergone SICS with PCIOL implantation. The institutional review boards and the local ethics committees approved the trial. A written, informed consent for the study, based on Helsinki protocol was obtained from all the participating patients.

Exclusion criteria

Patients were excluded if their follow-up period was of less than six months and if they had posterior synechia, cystoid macular edema (CME) and a history of trauma and systemic diseases like diabetes mellitus. Patients with sulcus-to-sulcus and sulcus-to-bag implantation of the IOL were also excluded from the study.

The primary outcome measure was improvement in the post-operative visual acuity. The secondary outcome measure was the rate of post-operative complications.

The pre-operative protocol included routine investigations such as total and differential leucocyte counts, erythrocyte sedimentation rate and blood sugar levels, Mantoux test, chest X-ray, X-rays of the cervical spine and sacroiliac joints. Special investigations included rheumatoid factor, angiotensin converting enzyme assay, anti-nuclear factor, human leucocyte antigen typing and enzyme-linked immunosorbant assay (ELISA) for TORCH infections (Toxoplasmosis, Other agents, Rubella, Cytomegalovirus and Herpes), human immunodeficiency virus and tuberculosis.

B-scan ultrasonography was performed in cases where funduscopy was not possible due to a dense cataract. Gonioscopy was done in all

patients with Sussman's four mirror, hand-held gonioscope (Ocular Instruments, USA). Intraocular pressure was measured with applanation tonometry.

A minimum inflammation free period (defined as five or less than five cells per high power field in the anterior chamber) of a minimum of three months was a pre-requisite for eligibility for surgery (Hogan et al, 1959). All surgeries were performed by two surgeons who were fellowship-trained.

Pre-operatively, topical antibiotic eye drops were prescribed to all patients. No patient received oral corticosteroids.

Surgical technique

Asepsis was achieved as per the standard norms for an intraocular procedure. Peribulbar anesthesia was delivered. A side port entry was made at the 10 O' clock position with a 20 G micro vitreo-retinal surgery (MVR) or a 15° angled knife. A 5.5 - 6 mm frown incision was made on the sclera, 2 mm posterior to the limbus in the superior quadrant and its depth was slightly less than half the scleral depth. A self-sealing (tri-planar) sclero-corneal tunnel was made with a 2.2 mm bevel-up crescent knife with adequate side pockets. The AC was formed with viscoelastic. A continuous curvilinear capsulorrhexis was intended in all cases. Adjuvant trypan blue dye was used in white cataracts. The AC main entry was performed and enlarged with a 2.8 mm keratome. Hydrodissection was performed with a 2 cc syringe attached to a 25 G cannula. The nucleus was rotated in the bag with a bent capsulotomy needle and prolapsed into the AC. The nucleus was delivered by the sandwich technique. Lens matter aspiration was performed with a Simcoe cannula. A biocompatible IOL with a 5.5 mm optic size was implanted using the double dialing technique. An in-the-bag placement was aimed for in all cases. At the end of the surgery, a sub-conjunctival injection of 20 mg gentamicin and 4 mg dexamethasone was given to all the patients.

The patients were followed-up on the first, third and seventh postoperative days, then weekly for two weeks, monthly for two months and every three months thereafter. The postoperative regimen included topical Moxifloxacin every 4 hours for seven days and topical betamethasone 0.1 %, every two hours, tapered over 6 to 8 weeks, depending on the response. At each follow-up day, the visual acuity, anterior chamber reaction and vitreous haze were evaluated. Goldmann applanation tonometry was done on the first postoperative day, and if normal, was repeated at monthly intervals for three months. Detailed fundus examination was done at one week, one month and was repeated at three-month intervals.

Statistical analysis

Pre- and post-operative vision was compared using the non-parametric Wilcoxon Test. The final vision acuity and complication rate were compared with Mann Whitney test. The *P* value was calculated at 1 % and 5 % levels. A *P* value less than 0.001 at 1 % and less than 0.005 at 5 % was considered statistically significant.

Results

Three cases were excluded as their follow-up period was of less than six months. The number of valid cases was 63. The mean age was 39.22 ± 4.95 years. The types of cataract included posterior sub-capsular cataract in 55 (87.3 %) eyes and milky cataract white in 8 (12.7 %) eyes. ELISA for TORCH infections was not positive in any case. The mean follow-up period was 12.06 ± 2.06 months. Table 1 shows the baseline characteristics of the patients.

Visual acuity

Snellen's visual acuity was converted to Log MAR units for comparison. The mean pre-operative vision was 0.75 ± 0.24. The mean Day 1 post-operative vision was 0.31 ± 0.09 (Figure 1). The mean final vision was 0.27 ± 0.10 ($P < 0.001$). Table 2 shows the percentage of patients at each level of corrected distance vision (CDVA). At the final follow-up, 84.1% of the

patients had a vision of 0.5 or better (≥ 6/12). The BCVA remained less than 6/60 due to recurrent uveitis, glaucoma, vitreous opacities, healed posterior KP's and CME (Table 4).

Pre-operative findings and visual outcome

Pre-operative findings like heterochromia, iris atrophy or nodules, and vessels on the trabecular meshwork (TM) when present did not have a significant effect on the final visual acuity. However, pre-operative vitreous opacities (P = 0.002) and posterior KP's (P = 0.009) had a significant effect on the final visual outcome (Table 3).

Ocular Inflammation

Fourteen eyes had a mild to moderate anterior chamber reaction on the first post-operative day. At the end of the first post-operative month, four eyes had 2 + anterior chamber cells and four eyes had 1 + anterior chamber cells. Topical steroids were continued for eight weeks and resulted in the resolution of inflammation in most of these cases. However, four eyes had recurrent episodes of uveitis and developed PCO subsequently. Nd: YAG capsulotomy was offered after a quiet phase of three months. The eyes with recurrent uveitis had persistent vitreous haze at the final follow-up examination. (P = 0.002).

Complications

Intraoperative complications included hyphema in four eyes (6.3 %), which did not obscure visualization during surgery. We did not encounter a posterior capsule rent or a vitreous loss in any case. The implanted IOLs were Acrylic in 19 eyes, PMMA in 39 eyes and silicone in 5 eyes. PMMA IOLs were implanted in patients who could not afford foldable lenses. The PCO was significantly more in the PMMA group (P = 0.002). There was no case of new-onset postoperative glaucoma. However, the eyes of eight patients had medically-controlled glaucoma prior to the surgery. At a mean postoperative duration of 2.12 ± 0.81 months, elevated IOP was seen in five eyes. A sustained rise of IOP, despite maximum topical therapy, developed in three eyes (P = 0.079). These patients were referred to the glaucoma clinic for further management.New-onset CME was clinically seen in six (9.5 %) eyes. CME was detected within the second month in three eyes and within four months in the rest of the eyes. Topical therapy with ketorolac four times a day for six weeks resulted in the resolution of the CME in three eyes. However, two eyes with recurrent uveitis and one eye following Nd: YAG laser capsulotomy, had persistent CME on the final follow-up (P = 0.081). Posterior capsule opacification was a common cause (12/19 %) of postoperative reduction of vision (P < 0.001). The mean duration of PCO after surgery was 4.12 ± 1.78 months. Pearl form of PCO was seen in eight (66.7 %) eyes and the fibrous form in four (33.3 %) eyes. All eyes with PCO except one achieved good vision after Nd: YAG laser capsulotomy; and CME was the cause of reduced vision in this one eye.

Table 1: Base line characteristics of the patients

Baseline Parameters	
Age (years)	39.22 ± 4.95
Sex n (%)	
Male	33 (52.4)
Female	30 (47.6)
Follow up (months)	12.06 ± 2.06
Preoperative VA (Log MAR)	0.75 ± 0.24
Postoperative VA(day 1)	0.31 ± 0.09
Postoperative VA(final)	0.27 ± 0.10

*VA: Visual acuity, MAR: minimum angle of resolution

Table 2: Visual acuity at nine months postoperatively

Preoperative			Postoperative		
Log MAR VA	n	%	n	%	P value
> 1.26	12	19.0	4	63.5	-
1.01 - 1.25	28	44.4	3	4.7	-
0.76 - 1.00	8	12.7	1	1.6	-
0.51 - 0.75	9	14.3	2	3.2	-
0.26 - 0.5	06	9.5	21	33.3	-
0 - 0.25	0	0	32	50.8	-
Total	63	100	63	100	<0.001

*The difference in visual acuity was statistically significant.

Table 3: Pre-operative findings and visual outcome

	n	%	Mann Whitney Test (P)
Heterochromia	40	63.5	0.103
Iris atrophy	9	14.3	0.973
Iris nodules	2	3.2	0.185
Vitritis	8	12.7	0.024
Raised IOP	5	7.9	0.079
Vessels on TM	5	7.9	0.074
Posterior KP's	12	19	0.009

IOP (intraocular pressure), TM (trabecular meshwork), K.P's (keratic precipitates)

Table 4: Complications and visual outcome

	n	%	Mann Whitney Test (P)
Hyphema	4	6.3	0.079
IOL deposits	2	3.2	0.185
PCO	12	19	0.001
Vitreous opacities	6	9.5	0.002
Secondary glaucoma	3	4.8	0.597
Recurrent uveitis	4	6.3	0.002
Persistent CME	3	4.8	0.081

IOL (intraocular lens), PCO (posterior capsule opacification), CME (cystoid macular edema)

Table 5: Outcomes of Cataract surgery in Fuch's Heterochromic Cyclitis in reported series

Author(year)	Surgery	Follow up	N	Mean CDVA better than 6/12 (%)
Ram et al, 2002	Phaco	24.2 ± 15.9	20	100
Tejwani et al, 2006	Phaco	12.9 ± 11.3	111	88.3
Javadi et al, 2005	Phaco	17.8 ± 8.7	41	100
Ram et al, 1995	ECCE	NA	29	82.8
Budak et al, 1999	Phaco +ECCE	24.0	35	77.8 and 53.8
Kosker et al, 2013	Phaco	6.0	55	94.5
Velilla et al, 2001	Phaco	NA	27	45.4
Jones, 1990	ECCE	NA	29	72
Bhargava et al, 2014	SICS	11.53±5.05	54	92.5
Present study	SICS	12.06±2.06	63	84.1

Phaco (Phacoemulsification), ECCE (Extra capsular cataract extraction), SICS (Small incision cataract surgery), CDVA (corrected distance visual acuity)

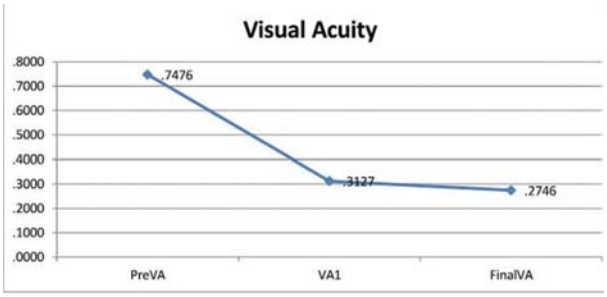

Figure 1: Graph showing preoperative, postoperative Day 1 and final corrected distance visual acuity

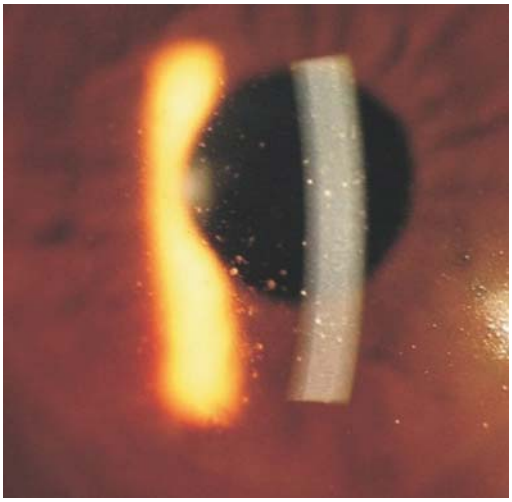

Figure 2: Diffusely scattered ground glass keratic precipitates

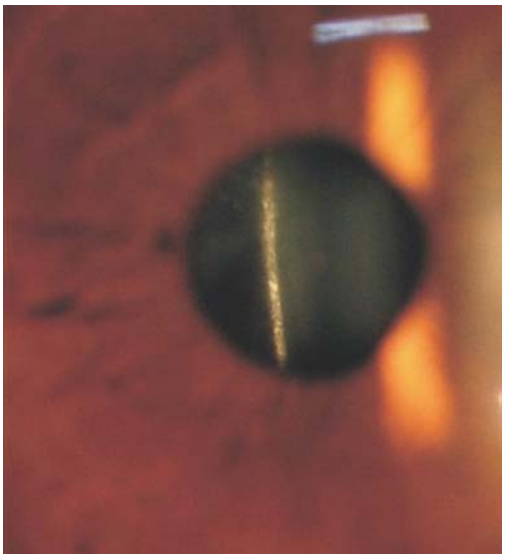

Figure 3: Posterior sub-capsular cataract in patients with Fuch's heterochromic iridocyclitis

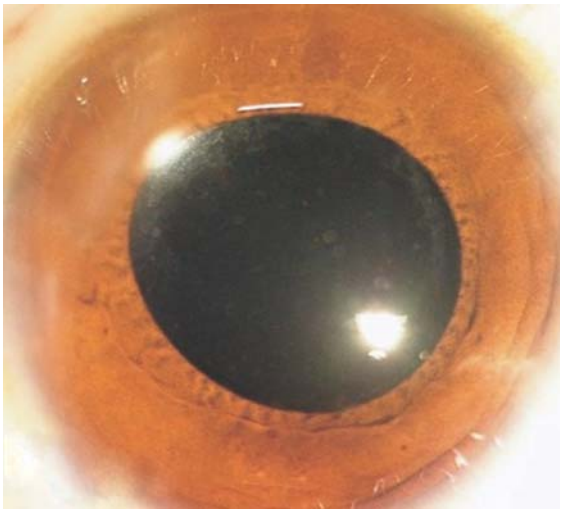

Figure 4: Small-incision cataract surgery with in-the-bag implantation of the lens

Figure 5: Eccentric pigment deposition on the intraocular lens surface

Discussion

There have been conflicting reports in the literature of cataract surgery outcomes in patients with FHI. Some initial studies reported unfavourable outcomes (Ward and Hart, 1967) and (Norn, 1968). However, most of the recent studies report a favourable outcome (Ram et al, 2002), (Javadi et al, 2005) and (Tejwani et al, 2006).

The technique of cataract surgery is believed to have an overwhelming influence on the rate of complications in FHI. ECCE and PCIOL implantation has been associated with complications like bleeding from fragile vessels, posterior capsular rent with vitreous loss, secondary glaucoma and retinal detachment (Smith and O'Connor, 1974) and (Mills and Rosen, 1982).

A younger age of the patients and posterior sub-capsular location (Figure 3) of most of these cataracts make phacoemulsification an easy procedure with fewer complications. Therefore, most surgeons now favour phacoemulsification for the management of cataract following FHI (Estafanous et al, 2001) and (Okhravi et al, 1999).

Randomized controlled trials over the past decade have established the safety and efficacy of manual SICS over phacoemulsification for age-related cataracts (Zhang et al, 2013). However, the same does not hold true for patients with uveitis. Moreover, in rural and semi-urban settings, patients with uveitis are often referred to tertiary care centres for further management due to the limited access to phacoemulsification. There are no published reports of SICS in patients with FHI (Medline search). In the present study, we evaluated the outcome of SICS in patients with FHI and the factors affecting the vision.

Severe post-operative inflammation is one of the most common complications of cataract surgery in patients with uveitis. Ram et al (1995) and Sherwood and Rosenthal (1992) reported severe post-operative uveitis in 20 - 35 % of the cases after ECCE. In another series, Budak et al (1999) reported an incidence of 17.1 % following ECCE or Phacoemulsification with IOL implantation. Kosker et al (2013) reported an incidence of severe post-operative uveitis in 12.7 % of eyes following phacoemulsification in a series of 55 eyes. Tejwani et al (2006) did not find any case of severe post-operative uveitis in a series of 103 eyes. The incidence of severe post-operative uveitis in the present study was 6.3 %.

The lower incidence in our study could be explained by the fact that all the cases had in-the-bag implantation of the IOL and peripheral iridectomy was not performed.

Most recent studies report excellent visual outcomes following cataract surgery in FHI. In our study, 84.1 % of the patients attained a best corrected visual acuity (BCVA) of 6/12 or better after surgery. Our results were comparable to the results of other studies. Table 4 summarizes the outcomes of cataract surgery in different reported series of patients with FHI.

Several studies cite new-onset glaucoma as the most severe complication of cataract extraction in patients with FHI. The incidence of glaucoma after cataract surgery varies from 3 % to 35 % (Rauz et al, 2000). Although, there was no case of new–onset postoperative glaucoma in our study, 3 (37.5 %) eyes with medically-controlled glaucoma developed a sustained rise of the IOP despite a maximum-tolerated topical therapy. These patients were referred to the glaucoma clinic and one eye had an Ahmed glaucoma valve done.

The reported incidence of PCO in FHI varies from 20 % to 45 % (Sherwood et al, 1992), (Avramides et al, 1997) and (Guzak et al, 1987). Bhargava et al, 2013, report an incidence of 16.7 % following manual SICS in patients with uveitis. The lower incidence of PCO in our study (12/19 %) could be explained by the fact that all the patients in our study had a in-the-bag implantation of the IOL. Nd: YAG laser capsulotomy was performed after a quiet post-operative period of three months. All eyes with PCO except one (due to persistent CME) gained a good vision after Nd: YAG laser capsulotomy.

Cystoid macular edema is one of the most common cause of postoperative reduction of vision in patients with uveitis. Ram et al, 2010, report an incidence of macular edema of 21.3 % and Estafanous et al, 2001, reported one of 33 % following phacoemulsification. Bhargava et al, 2013, report an incidence of 14.8 % following manual SICS in patients with uveitis. The incidence of new-onset CME in our study was lower than that of other studies (9.5 %). Good pre-operative control of inflammation could account for this difference.

The presence of keratic precipitates on the posterior surface of the posterior capsule of the lens has been less frequently reported in the literature (Zimmerman and Boyle, 2004). In present study, the posterior KPs (12/19 %) had a significant effect on the visual outcome (P = 0.009).

The reported incidence of vitreous opacities varies from 12 % to 50 % (Ram et al, 1995). In our study, 6 (9.5 %) eyes with vitreous opacities had a significant effect on the final visual outcome (P = 0.002). Some authors recommend vitrectomy for vitreous haze and floaters (Scott et al, 2001). Since most of these patients had a vision of 6/18 or better, they did not prefer another surgical procedure.

Pigment deposits on the IOL surface may cause reduced vision in 33 to 100 % of cases (Jones, 1995). However, in the present study, these deposits did not significantly affect the vision (Figure 5). Eccentric location of pigment deposits could account for this difference.

One limitation of the present study is that the design (retrospective, non-randomized) does not allow for comparison with phacoemulsification, and so the results may have been influenced by inter-observer variations and bias.

The results of the present study suggest that cataract following FHI can be safely managed by manual SICS (Figure 4). The key to success lies in an adequate pre-operative control of inflammation (anterior chamber and vitreous) and an inflammation-free period of a minimum of three months prior to the surgery.

Conclusion

Vitreous opacities and posterior KP's are the two most important pre-operative factors affecting visual outcome. Manual SICS has a comparable visual outcome and complication rate to phacoemulsification. SICS can be performed with minimal instrumentation, even in rural and semi-urban settings and in eye-camps. Thus, it may also be the appropriate technique for cataract management in eyes with FHI.

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