Original Article

Visual outcome and prognostic factors in cataract surgery in ocular tuberculosis

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Purpose: To analyze the outcome of cataract surgery in patients with ocular tuberculosis (OTB). **Methods:** Medical records of patients with OTB who underwent cataract surgery between 2005 and 2018 were retrospectively reviewed. The primary outcome measure was corrected distant visual acuity (CDVA), and a good outcome was defined as CDVA 20/40 or better. **Results:** There were 35 patients (41 eyes), of whom 13 (37.1%) were males and 22 (62.9%) were females. The mean age was 41.6 ± 13.8 (range 18–65) years. Anterior uveitis was present in 24 (58.5%) eyes, intermediate uveitis in 5 (12.2%) eyes, posterior uveitis in 6 (14.6%) eyes, and panuveitis in 6 (14.6%) eyes. Posterior sub-capsular cataract (51.2%) was the most common type of cataract. Total cataract was present in 9 (22%) eyes. The two most common ocular comorbidities were small pupil (85.4%) and glaucoma (17.1%). Phacoemulsification was performed in 36 (87.8%) eyes and ECCE was performed in 5 (12.2%) eyes. Intraoperatively the pupil was mechanically dilated in 36 (87.8%) eyes. Overall 26 (63.4%) and 23 (56.1%) eyes achieved CDVA 20/40 or better at 1- and 6-month follow-up visit, respectively. The mean preoperative LogMAR CDVA significantly improved from 1.28 ± 0.57 to 0.38 ± 0.36 at 1-month ($P < 0.0001$). One eye had fibrinous anterior chamber reaction and 24 (58.5%) eyes had 1 or more episodes of reactivation of uveitis in the follow-up period. The three commonest complications were glaucoma (26.8%), posterior capsule opacification (19.5%), and epiretinal membrane (17.1%). Postoperative posterior segment complications like epiretinal membrane formation, vitreous inflammation and cystoid macular edema affected final visual acuity ($P < 0.002$). **Conclusion:** The visual outcome after cataract surgery in OTB was satisfactory as significant number of patients achieved a good final visual acuity.

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The Collaborative Ocular Tuberculosis Study Workshop (2019),[1] has defined ocular tuberculosis (OTB) as: "*The ocular inflammation is considered to be tubercular in origin by the treating ophthalmologist based on positive immunological tests (such as Mantoux/interferon gamma release assay) and/or radiological tests (such as chest computerized tomography indicative of old/healed tuberculosis) and not necessarily a confirmed test such as histopathology or polymerase chain reaction.*" OTB is the most common cause of infectious uveitis in India.[2-4] It causes a spectrum of uveitis—anterior, intermediate, posterior, and panuveitis.[5,6] The important causes of visual impairment in OTB are cataract, glaucoma, and secondary macular scarring.[7-9] Cataract formation is secondary to the prolonged intra-ocular inflammation, and its treatment with corticosteroids.

Management of cataract in OTB poses many challenges. Control of intra-ocular inflammation before and after cataract surgery can be challenging. Studies have reported that 12–46% of patients have treatment failures despite adequate treatment.[10-12] The lack of a standard consensus driven diagnostic criteria over all these years has made diagnosis of OTB complicated. A delay in diagnosis and treatment with anti-tubercular therapy (ATT) prolongs the inflammation which can lead to significant visual impairment.[8] Inflammation in the anterior chamber results in broad-based posterior synechiae and a small pupil[10] that makes the surgery challenging. Lastly the vision may not improve or remain poor due to macular scarring even after an uneventful surgery. Previous studies have evaluated the outcomes of cataract surgery in uveitis of mixed etiologies,[13-18] or specific entities like Vogt–Koyanagi Harada (VKH) syndrome[19,20] or pars planitis,[21] and to the best of our knowledge there are no studies reporting the outcome of cataract surgery in OTB. Therefore, in this study we evaluated the outcome of cataract surgery in patients with OTB.

Methods

Patients

This was a retrospective review of medical records of patients diagnosed with OTB at a tertiary eye care institute in central India who underwent cataract surgery between 2005 and 2018.

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We included only those patients who were positive for both Mantoux test and interferon gamma release assay (IGRA), and had no other causes of uveitis.[1,22,23] We excluded patients with less than 6 months follow-up examination. The study was approved by the institutional ethics committee and adhered to the tenets of Declaration of Helsinki.

Data collection

The medical records were reviewed for demographic data, disease duration, clinical signs, use of ATT and topical, oral and sub-tenon's corticosteroids or other systemic immunosuppressive agents, time interval between last episode of inflammation and cataract surgery, duration of postoperative follow-up visits, pre- and postoperative best corrected distant visual acuity (CDVA), type of surgery, management of small pupil, type of implanted intra-ocular lens (IOL), and intra- and postoperative complications.

Clinical evaluation of the patients included assessment of visual acuity, applanation tonometry, slit-lamp evaluation, and indirect ophthalmoscopy. The Standardization of Uveitis Nomenclature (SUN) Working Group recommendations were followed for nomenclature, classification, and grading of uveitis.[24] As this was a retrospective series spanning more than a decade the management protocols for OTB varied and all patients did not received ATT. Patients advised ATT received isoniazid 5 mg/kg/day, rifampicin (10 mg/kg/day), 450 mg/day if body weight was ≤50 kg and 600 mg/day if body weight was >50 kg, ethambutol 15 mg/kg/day, and pyrazinamide 25 to 30 mg/kg/day for initial 2 months. Thereafter, rifampicin and isoniazid were used for another 7 months.

Surgical methods

Cataract surgery was performed when anterior chamber cells were ≤ Grade 0.5 (1–5 cells). The frequency of topical prednisolone acetate 1% was increased to 8 times daily 1 week before the surgery. Phacoemulsification or extracapsular cataract extraction were performed at the surgeon's discretion under peribulbar anesthesia using standard techniques. The surgical technique essentially remained the same throughout the study period. Hydrophobic single-piece acrylic IOL or rigid single-piece polymethylmethacrylate (PMMA) IOL were implanted. Small pupil was managed with any of the following methods: release of posterior synechiae with an iris spatula, stretching of the pupil with Oshers Y-hooks, self-retaining nylon iris hooks or multiple sphincterotomies. Peripheral button-hole iridectomies were done in all eyes with posterior synechiae. At the conclusion of the surgery all patients were injected with 2 mg dexamethasone injection in the lower fornix.

Postoperatively all patients were treated with hourly topical 1% prednisolone eye drops, cycloplegics and oral prednisolone (1 mg per kg body weight/day). While oral corticosteroids were tapered over 4–6 weeks, topical corticosteroids were continued longer with very slow taper depending on the status of inflammation.

Statistical analysis

The primary outcome measure was postoperative CDVA of 20/40 or better. Quantitative and qualitative variables were expressed as mean ± standard deviation and percentages respectively. Snellen's visual acuity was converted to Log MAR values to enable statistical analysis.[25] The change in CDVA at 1- and 6-month was analyzed with analysis of variance. Prognostic factors associated with primary outcome measure were analyzed with Pearson's Chi-square test. Continuous variables were analyzed with linear logistic regression. SPSS version 23.0 (SPSS Inc, Chicago, IL) software was used for statistical analysis. A 2-tailed $P < 0.05$ was considered to be statistically significant.

Results

Demographic data

Cataract surgery was performed in 43 eyes of 36 patients during the study period. One patient who underwent cataract surgery in both the eyes was excluded because she was lost to follow-up. Therefore, 41 eyes of 35 patients were finally analyzed. There were 13 (37.1%) males and 22 (62.9%) females. The mean age of the patients was 41.6 ± 13.8 (median 45, range 18–65) years. The right eye was operated in 24 (58.5%) cases and left eye in 17 (41.5%) cases.

Types of uveitis, comorbidities, and treatment

Anterior uveitis was present in 19 (46.3%) eyes, intermediate uveitis in 5 (12.2%) eyes, posterior uveitis in 6 (14.6%) eyes, panuveitis in 6 (14.6%) eyes, and both anterior and intermediate uveitis in 5 (12.2%) eyes. All the patients with intermediate uveitis had pars planitis. In patients with posterior uveitis, 4 eyes had multi-focal choroiditis, while serpiginous-like choroiditis and retinal vasculitis was seen in 1 eye each. The mean time interval between symptom onset to cataract surgery was 43.7 ± 48 (median 24, range 6–240) months. Two patients were uncertain about the duration of symptoms. Chest radiography showing healed tubercular lesions in 2 patients and active pulmonary tuberculosis was present in 1 patient. The treatment pattern of patients is given in Table 1. ATT was given in 25 (71.4%) patients.

Coexisting ocular morbidities are given in Table 2. The two most common ocular comorbidities were small pupil with broad based posterior synechiae and glaucoma. Seven patients had raised intra-ocular pressure, of whom 3 patients had secondary angle closure glaucoma, and creeping angle closure was noted on gonioscopy. In the remaining 4 patients, 3 were diagnosed to be steroid responders and had been earlier treated with sub-tenons depot steroid injections. All these patients were treated with topical anti-glaucoma medications and oral acetazolamide. YAG-laser peripheral iridotomy was done in 3 eyes, and trabeculectomy with mitomycin-C was done in 2 patients.

Table 1: Treatment pattern before cataract surgery (*n*=35 patients)

Treatment	Number of patients (percent)
Only 1% Prednisolone acetate	4 (11.4)
ATT and oral Prednisolone	20 (57.1)
ATT and sub-tenon Triamcinolone	4 (11.4)
1% Prednisolone acetate and Azathioprine	3 (8.6)
1% Prednisolone acetate and sub-tenon Triamcinolone	2 (5.7)
Sub-tenon Triamcinolone and oral Prednisolone	1 (2.9)
ATT, oral Prednisolone, sub-tenon Triamcinolone	1 (2.9)

ATT: Anti-tubercular therapy

The intra-ocular pressure was controlled in all patients prior to cataract surgery. The systemic comorbidities were diabetes mellitus in 8 patients, and hypertension in 1 patient.

Cataract surgery

Cataract surgery was performed after a mean duration of 4.4 ± 3 (range: 1–12) months after control of intra-ocular inflammation. Cataract surgery was performed in 35 (85.4%) eyes when the eye had been quiet for ≥3 months, while in 6 (14.6%) eyes it was performed between 1 and 2 months. Morphologically the most common type of cataract was posterior sub-capsular cataract (21 eyes, 51.2%) followed by total cataract (9 eyes, 22%), combined posterior sub-capsular cataract and nuclear sclerosis (8 eyes, 19.5%), and nuclear sclerosis (3 eyes, 7.3%). In 4 eyes, a partial cataract progressed to total cataract during treatment period. Phacoemulsification was performed in 36 (87.8%) eyes and extracapsular cataract extraction was performed in 5 (12.2%) eyes. In one eye phacoemulsification was converted to extracapsular cataract extraction as there was a large tear in the anterior capsule. Intraoperative dilatation of the pupil was done in 36 (87.8%) eyes. Osher's Y hooks were used in 19 (46.3%) eyes, disposable iris retractors in 8 (19.5%) eyes, sphincterotomy in 3 (7.3%) eyes, and broad-based iridectomy in 1 (2.4%) eye. Releasing the posterior synechiae with an iris spatula achieved sufficient pupil dilation in the remaining 5 eyes. In the 4 eyes where multiple sphincterotomies or broad based iridectomy was performed, 3 were undergoing extracapsular cataract extraction and in the remaining eye, stretch pupilloplasty with the Osher's Y hook proved inadequate to obtain adequate pupillary dilatation. Acrylic IOL was implanted in 27 (65.9%) eyes, PMMA IOL was implanted 10 (24.4%) eyes and heparin surface-modified PMMA IOL in 3 (7.3%) eyes. Intraoperative zonular dialysis with complete aspiration of the lens capsule occurred in one eye and the eye was left aphakia. No other intraoperative complication was noted.

Visual outcome

CDVA of 20/40 or better at 1- and 6-month postoperative visits was achieved in 26 (63.4%) and 23 (56.1%) eyes, respectively [Table 3]. A representation of such outcomes is illustrated in Figs. 1 and 2. The mean preoperative LogMAR CDVA significantly improved from 1.28 ± 0.57 to 0.38 ± 0.36 at 1-month ($P < 0.0001$) and 0.45 ± 0.43 at 6-months ($P < 0.0001$) postoperative visit. The difference between the 1- and 6-month postoperative CDVA was not significant ($P = 0.16$). Four (9.8%) eyes had 1–2 lines improvement of Snellen's visual acuity, 6 (14.6%) eyes had 3–5 lines improvement and 30 (73.2%) eyes had more than 5 lines of improvement. Only in 1 eye there was a 1-line reduction in postoperative CDVA. This patient with serpiginous choroiditis on ATT and azathioprine presented 3-weeks after an uneventful phacoemulsification with sub-hyaloid hemorrhage. Post-vitrectomy his CDVA improved to 20/100, but optical coherence tomography revealed central macular thinning.

Postoperative control of inflammation

Postoperatively all patients were treated with topical corticosteroids with a slow taper tailored to the severity of the inflammation. All patients also received oral corticosteroids. Sub-tenons depot corticosteroid were required in 1 patient. Seventeen patients were on ATT at the time of cataract surgery. Five patients were treated with azathioprine and 1 patient with mycophenolate mofetil.

Postoperative complications or sequelae

The mean duration of follow-up was 37.4 ± 27.2 (median 36, range 6–108) months. Ten patients (28.6%) completed 5 years or more of follow-up. Fibrinous anterior chamber reaction in the immediate postoperative period was seen in only 1 eye and required frequent topical corticosteroids. This patient had undergone multiple sphincterotomies and extracapsular cataract extraction. Twenty-four (58.5%) eyes had 1 or more

Table 2: Co-existing ocular morbidities in the operated and un-operated fellow eyes of patients with OTB undergoing cataract surgery (*n*=41 eyes)

Operated eye	Number (percent)	Un-operated eye	Number (percent)
Small pupil with broad posterior synechiae	35 (85.4)	Uveitis	26 (63.4)
Glaucoma	7 (17.1)	Small pupil with broad posterior synechiae	10 (24.4)
Significant vitreous opacities	2 (4.9)	Glaucoma	2 (4.9)
High myopia	2 (4.9)	Phthisis bulbi	2 (4.9)
Status post trabeculectomy	2 (4.9)	High myopia	2 (4.9)
Ocular hypertension	1 (2.4)	Chronic hypotony	1 (2.4)
Small pupil without posterior synechiae	1 (2.4)	Significant vitreous opacities	1 (2.4)
Epiretinal membrane	1 (2.4)	Cataract	1 (2.4)
Macular scar	1 (2.4)		
Status post radial keratotomy	1 (2.4)		

Table 3: Pre-operative and post-operative corrected distance visual acuity (*n*=41 eyes)

Snellen's visual acuity	Pre-operative Number (percentage)	1-month post-operative Number (percentage)	6-month or more post-operative Number (percentage)
20/20-20/40	1 (2.4)	26 (63.4)	23 (56.1)
20/50-20/160	10 (24.4)	10 (24.4)	12 (29.3)
20/200 or worse	30 (73.2)	5 (12.2)	6 (14.6)

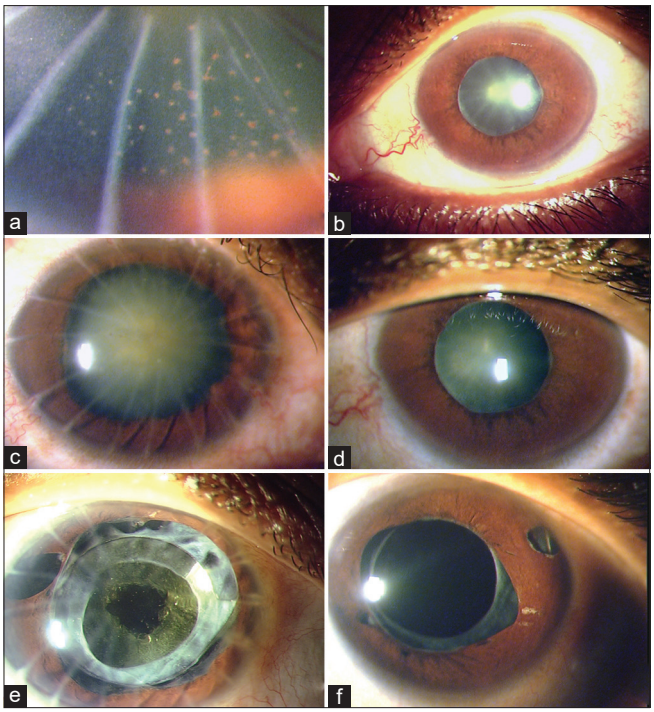

Figure 1: Slit-lamp photographs of the right (a, c and e) and left eye (b, d and f) of a 44-year old lady with chronic uveitis in both the eyes of 10 years duration before she was diagnosed with OTB, and treated with ATT. The right (a) and left eye (b) at presentation with granulomatous inflammation and broad-based posterior synechia. Pre-operative photographs (c and d) shows significant cataract. Post-operatively visual acuity improved to 20/50 (+1.0dsph-2.0dcyl x20^0) in the right eye and 20/20 (-0.50dsph-0.75dcyl x130^0) in the left eye. The right eye after Nd: YAG laser capsulotomy (e). The left eye after cataract surgery (f) with clear posterior capsule

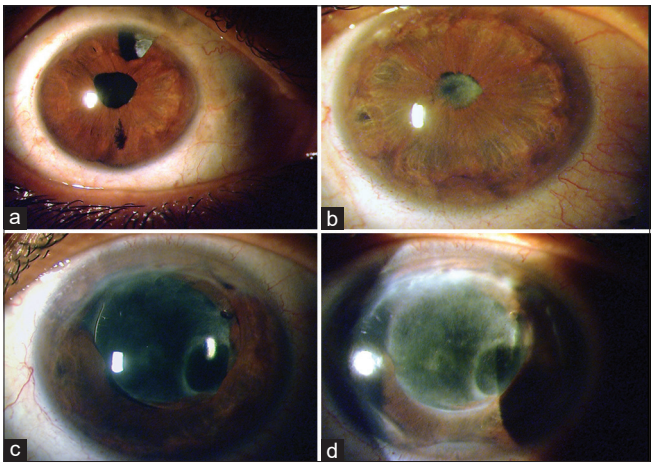

Figure 3: Slit-lamp photographs showing good outcome in the right eye that had undergone phacoemulsification and a poor outcome in the left eye that had undergone extra-capsular cataract extraction and multiple sphincterotomies. The right (a) and left eye (b) before surgery in the latter. Two months after surgery there was pupillary capture of the poly-methyl metha-acylate intra-ocular lens (c). Irregular treatment, and persistent anterior chamber inflammation resulted in a hypotonus eye, *seclusio pupillae*, peripheral anterior synechiae, and a fibrous membrane over the intra-ocular lens (d)

episodes of reactivation of uveitis. Of these only 4 patients had not been treated with ATT. The other complications seen

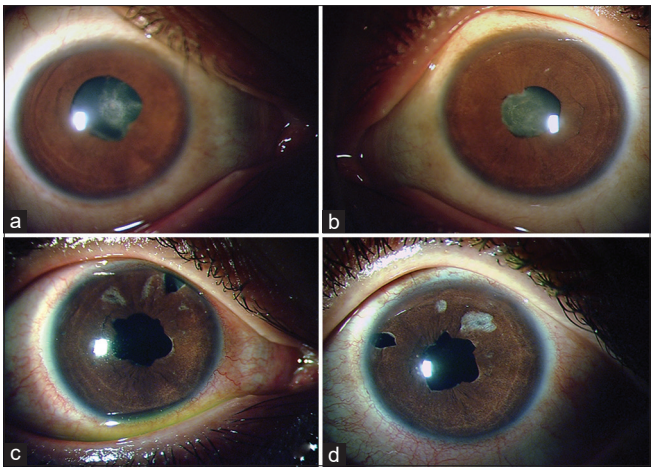

Figure 2: Pre- and post-operative slit-lamp photographs of a 28-year old lady with chronic anterior uveitis. Initially, she was treated with only topical and sub-tenon's corticosteroids, and not ATT due to pregnancy. The right (a) and left (b) eye before cataract surgery. Following uneventful phacoemulsification, the best spectacle- corrected visual acuity in the right eye (c) was 20/50 (-1.0dcyl x20^0) and in the left eye (d) was 20/20 (-1.0dcyl x160^0). There was an epiretinal membrane in the right eye

in the patients were raised intra-ocular pressure in 11 (26.8%) eyes, most of whom were previously under treatment with anti-glaucoma medication, posterior capsule opacification in 8 (19.5%) eyes, epiretinal membrane in 7 (17.1%) eyes, vitritis in 6 (14.6%) eyes, cystoid macular edema in 6 (14.6%) eyes, posterior synechiae/optic capture in 5 (12.2% eyes), central macular thinning in 4 (9.8%) eyes, hypotony (IOP less than 5 mmHg) in 3 (7.3%) eyes, macular hole in 2 (4.9%) eyes and optic atrophy in 2 (4.9%) eyes. Macular ischemia, choroidal neovascular membrane, sub-hyaloid hemorrhage, glaucomatous optic atrophy, branch retinal vein occlusion, pseudophakic corneal edema, and phthisis bulbi were seen in 1 eye each.

Prognostic factors

Preoperative CDVA of better than 20/200 was associated with good visual outcome (P = 0.006). Linear regression analysis also identified better preoperative CDVA (P = 0.006) to be associated with good postoperative CDVA. The duration of uveitis in patients with CDVA better than 20/200 (n = 10) was 49.7 ± 45.3 (range: 6–136) months, whereas in patients with CDVA 20/200 or worse it was 39.6 ± 72.4 (range: 8–240) months and this difference was not statistically significant (P = 0.55). Presence of posterior segment complications of uveitis/cataract surgery [Table 4] were associated with poor visual outcome (P = 0.002). Age of patients, type of surgery or intra-ocular lenses or duration of uveitis were not associated with outcome.

Discussion

A recent collaborative workshop by global uveitis experts[1] attempted to resolve some of the ambiguities in OTB.[26] The new diagnostic guideline does away with the requirement for polymerase chain reaction assay or histopathology evidence of infection with *M tuberculosis* bacilli for diagnosis.[1] Not only are these tests invasive, they are also complicated, expensive, and not widely available. Hence the new guideline broadens the case definition of OTB. The guideline also replaces the

Table 4: Prognostic factors for good visual outcome

	Good outcome (CDVA 20/40 or better) Number (percent)	Poor outcome (CDVA worse than 20/40) Number (percent)	*P*
Bilateralism			
Bilateral uveitis	18 (69.2)	8 (30.8)	0.102
Unilateral uveitis	6 (40.0)	9 (60.0)	
Type of uveitis			
Anterior	13 (68.4)	6 (31.6)	0.342
Others types of uveitis*	11 (50.0)	11 (50.0)	
Anti-tubercular therapy			
Treated with ATT	18 (60.0)	12 (40.0)	0.753
Not treated with ATT	6 (54.5)	5 (45.5)	
Preoperative CDVA			
Better than 20/200	11 (91.7)	1 (8.3)	0.006
20/200 or worse	13 (44.8)	16 (55.2)	
Quiescence period prior to surgery			
3 months or more	23 (65.7)	12 (34.3)	0.066
<3 months	1 (16.7)	5 (83.3)	
Type of surgery			
PE	23 (63.9)	13 (36.1%)	0.141
ECCE	1 (20.0)	4 (80.0)	
Type of IOL			
Acrylic	16 (59.3)	11 (40.7)	0.896
PMMA	6 (57.1)	8 (42.8)	
Post-operative reactivation of uveitis			
Absent	13 (76.5)	4 (23.5)	0.062
Present	11 (45.8)	13 (54.2)	
Glaucoma or ocular hypertension			
Present	8 (72.7)	3 (27.3)	0.309
Absent	16 (53.3)	14 (46.7)	
Posterior segment complications of uveitis/cataract surgery			
Absent	13 (92.9)	1 (7.1%)	0.002
Present	11 (40.0)	16 (59.3)	

ATT: Anti-tubercular therapy; CDVA: Corrected distant visual acuity; ECCE: Extra-capsular cataract extraction; IOL: Intra-ocular lens; PE: Phacoemulsification; PMMA: Polymethyl metha-acrylate; *Others: Intermediate, posterior, panuveitis and mixed anterior and intermediate uveitis

various nomenclatures[5,7,10,12,22,23] used to describe tubercular associated uveitis with the term "*ocular tuberculosis*," which we have also used in this study. However, we selected a narrower diagnostic criterion of both Mantoux test and IGRA positivity, to avoid including any other remotely possible entities. Even though there are many reports of cataract surgery in uveitis in literature, we felt that the singular features in OTB affected surgical outcomes in ways different than other uveitis entities. For example, most of our patients were middle-aged adults (mean 41.6 years). This is because OTB commonly affects this age group.[5,12] Visual impairment in this "working age" has a far more adverse socioeconomic effect than the other age groups particularly the elderly. In contrast the patients in some of the other uveitis-related studies from the west are nearly 1–2 decades older (52.8–66.4 years).[14,17]

A significant number of our patients presented with fairly advanced cataract, including total cataract. This appeared to be mostly due to a delay in diagnosis and treatment of OTB, rather than the disease *per se.* The lack of standard diagnostic criteria in OTB and varied levels of eye care facilities in India are the reasons. Similar scenario is also seen in some Indian reports related to other uveitis entities. For example, a study on VKH syndrome from south India[20] reported the median time interval from disease onset to diagnosis to be 3 years which was even longer than the time period (median time, 2 years) in our study. Studies from western countries do not report many total cataracts in their patients,[13,14,16,17,19,27] but it is not so in Indian studies. This is highlighted in two studies on VKH syndrome. No single eye with total cataract is reported in the study from United States,[19] while 32% of eyes are reported with total cataract in the study from south India.[20]

One of the prognostic factors associated with good visual outcome in our study was better preoperative CDVA. We observed that patients with preoperative CDVA better than 20/200 had better visual outcome. The duration of uveitis did not affect the preoperative visual acuity, as patients with better visual acuity had slightly delayed presentation in comparison to patients with worse visual acuity, although the difference was statistically not significant. Therefore, it must be related to the anatomical location of intra-ocular inflammation. Phacoemulsification was the preferred mode of cataract extraction in our study, but in eyes with total or hard cataracts, extracapsular cataract extraction was favored. Although in our study, eyes undergoing extracapsular cataract extraction tended to do poorly [Fig. 3], the difference did not reach statistical difference [Table 4]. Alio *et al.*,[27] had

reported that phacoemulsification and acrylic IOL provided a better visual outcome and lower complication rate than PMMA IOL in uveitis patients, but this was not evident in our study.

Mechanical dilatation of the pupil during surgery was required in nearly all our patients. This was achieved satisfactorily with Osher's Y hooks or disposable iris retractors in most instances. Although pupillary stretching led to larger postoperative pupil size, no patients complained of debilitating glare. In few patients sphincterotomies or iridectomy with a Vannas scissor was performed. Although sphincterotomies carry the risk of increased postoperative anterior chamber inflammation, these may be needed if adequate intraoperative pupillary dilatation is not achieved with Osher's Y hooks, or in extracapsular cataract extraction where placing the iris-hooks is not possible or if devices to mechanically dilate the pupil are not available. Few of our patients had increased intra-ocular inflammation which mostly resolved with corticosteroid treatment. Often after dilating the pupil the cataract was found to be less dense. Intraoperative complications were uncommon in our study and this could be because only experienced surgeons performed all the surgeries. Chu *et al*. in their multicentric study had also observed that intra-operative complications were less when the surgeon was senior and experienced.[17]

Postoperative vision improved in nearly all patients. Overall 63.4% of the eyes achieved CDVA of 20/40 or better. This is similar to the Multicenter Uveitis Steroid Treatment trial study,[16] and another large multicentric study from United Kingdom,[17] where 62% and 69% eyes, respectively, had postoperative CDVA of 20/40 or better. This is marginally lower than the 71.3% eyes reported in the study by Ram *et al*.[15] Interestingly 30% of their patients had been diagnosed with OTB but as the authors have not reported visual outcome in different types of uveitis we cannot directly compare our results with them. In a metanalysis of outcomes of cataract surgery in uveitis, Mehta *et al*. reported that the good outcome (20/40 or better) was highest in Fuchs heterochromic cyclitis (92%), and least in Behcet's disease (36%), sympathetic ophthalmia (40%), and VKH syndrome (49%). Thus, it appears that our outcome results in OTB lie somewhere in the middle of the uveitis spectrum. In OTB pure anterior segment inflammation without posterior segment involvement appeared to have a better prognosis than intermediate, posterior, or panuveitis (68% versus 50%).

A 3-month period of inactive uveitis (period of quiescence) prior to cataract surgery is universally recommended. However, at times this period cannot be strictly followed because of advanced cataract with significant visual impairment or to prevent complications of mature cataract. In these instances, the surgery must be performed within the window period when the inflammation is minimized and stabilized.[13] Few of our patients had to be operated earlier due to advanced cataract. However, patients operated earlier than 3-months quiescent period tended to have a poorer outcome. Reactivation of uveitis was seen in 58.5% patients, and this was also associated with a poorer outcome [Table 4], although statistical significance was not reached. Inadequate treatment was probably not a cause for reactivation, as majority of these patients were treated with ATT. Reactivation of uveitis despite adequate ATT has been previously reported by other investigators.[8,10-12] This is of concern as repeated episodes of intra-ocular inflammation may affect final visual acuity. Patients need to be counselled and regularly monitored over a longer period of time.

The three commonest postoperative complication seen in our patients were raised intra-ocular pressure, posterior capsule opacification and epiretinal membrane. These complications are not uncommon in the management of cataract in uveitis. Various investigators have reported raised intra-ocular pressure in 10–50% patients, posterior capsule opacification is 12–58% patients, and epiretinal membrane is 4.5–56% patients.[27] Secondary glaucoma was present in quite a number of our patients. Hamade *et al*. reported glaucoma in 28.6% of their patients which is similar to ours.[7] Multiple mechanisms can cause glaucoma in uveitis.[28] The chronic and persistent inflammation and presence of broad-based synechiae makes glaucoma likely in OTB, not to mention the steroid response to topical or peri-ocular steroids. Glaucoma management can be challenging in such patients if simultaneous control of anterior chamber inflammation is not achieved. Sometimes surgical intervention is required like in few of our patients, if medical management fails to control the intra-ocular pressure. Other studies have also reported the necessity of surgical intervention to manage secondary glaucoma in OTB.[9] Posterior capsule opacification was the second most common complication seen in our patients. This was the commonest complication in another Indian study, where the authors observed it in 31.8% eyes undergoing cataract surgery in various types of uveitis.[15] Alio *et al*. had reported that posterior capsule opacification occurred less with acrylic IOLs in eyes with uveitis in comparison to silicone or PMMA lenses.[29] About two-third of our patients were implanted with acrylic IOLs and this could account for the smaller number of eyes with posterior capsule opacification. Posterior segment complications of either uveitis or cataract surgery were an important risk factor for poor outcome in the present study [Table 4]. Cystoid macular edema was less in our patients compared to other reports,[14,15,19,21] while epiretinal membrane and macular thinning were more common. Macular lesions are a common cause of poor vision after cataract surgery in uveitis. Basu *et al*. reported that after cataract and vitreous hemorrhage, macular scarring was the commonest cause of visual impairment in OTB.[9]

Our study has some limitations. Like any retrospective study some of these are inherent to the study design. The small sample size may have resulted in failure of some of the prognostic factors to reach statistical significance in our analysis. However, many other reports of cataract surgery in specific uveitis entities like Vogt-Koyanagi Harada syndrome[19,20] or Behcet's disease[30] had a small sample size. It is expected that with the retrospective study design and a study period spread over more than a decade, there would be variation in treatment protocol for OTB. In the initial years ATT was not prescribed to all patients. However, the perioperative management of cataract in our study remained the same. Cystoid macular edema may be under reported in this study because optical coherence tomography was not routinely performed in the postoperative period in all patients, and only those with suspected lesions underwent the investigations. Therefore, subclinical lesions may have been missed. Nevertheless, this is one of the first papers to evaluate cataract surgery outcome in OTB, and the

findings in this study should provide ophthalmologists with valuable insights in managing such patients.

Conclusion

In conclusion, there was significant improvement in visual outcome after cataract surgery in patients with OTB. No significant complications were noted. The small pupil which is commonly encountered in such eyes can be adequately managed. Early cataract surgery, adherence to 3-month period of uveitis control prior to surgery, and phacoemulsification are associated with better postoperative visual acuity. Studies with larger sample size may elicit other prognostic factors.

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Conflicts of interest

There are no conflicts of interest.

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