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Cataract Surgery in Uveitis-Associated Cataract: A Clinical Review

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Cataract is among the most common causes of visual impairment in patients with uveitis and represents a major indication for intraocular surgery in this population. Chronic intraocular inflammation, prolonged corticosteroid therapy, and structural ocular changes contribute to the development of uveitis-associated cataracts. Cataract surgery in patients with uveitis presents unique challenges compared with routine age-related cataract surgery because affected individuals are often younger and frequently present with coexisting ocular comorbidities, including posterior synechiae, small pupils, zonular weakness, and macular pathology.

Advances in surgical techniques and perioperative management strategies have significantly improved visual outcomes in patients undergoing cataract extraction in the setting of uveitis. Preoperative control of inflammation for at least three months is widely recognized as the most important predictor of postoperative success. In addition, appropriate use of perioperative corticosteroid therapy and the selection of biocompatible intraocular lens materials play key roles in minimizing postoperative inflammation and complications.

This review summarizes the current evidence regarding cataract surgery in patients with uveitis-associated cataracts, including indications and optimal timing of surgery, preoperative assessment and management, intraoperative considerations, and postoperative outcomes and complications.

Introduction

Uveitis refers to a heterogeneous group of intraocular inflammatory processes with varying etiologies, including infectious and noninfectious forms.1 The condition affects an estimated 38 to 714 per 100,000 people worldwide and is considered as the third leading cause of blindness, accounting for approximately 10% of preventable vision loss worldwide.[1-3]

Cataract is considered one of the most common vision-threatening complications of uveitis and arises as a consequence of chronic intraocular inflammation as well as topical or systemic corticosteroid treatment.[4] The prevalence of cataract among patients with uveitis has been estimated at 18–49% according to various reports, with cataract surgery being the most common ocular procedure performed in this-population.[1,5-7]

Cataract surgery in patients with uveitis differs from surgery for age-related (senile) cataract; as these patients are usually younger and present with multiple ocular comorbidities, leading to a more complex procedure. Therefore, additional considerations must be taken throughout the perioperative period.[8,9]

This review aims to examine the risk of cataract development in uveitis, considerations for preoperative management, potential intraoperative challenges, and the postoperative course, including potential complications.

Indications and Timing of Cataract Surgery

Indications for Surgery

The decision to perform cataract surgery in patients with uveitis is usually made under specific circumstances that reflect the unique challenges of this population. The primary indications include visually significant cataracts in eyes with sustained disease quiescence; cataracts that limit adequate

visualization of the fundus and posterior pole, thereby preventing proper disease assessment and appropriate medical or surgical management; and in cases in which cataract surgery is performed concurrently with other intraocular procedures, such as pars plana vitrectomy or glaucoma surgery.[10]

Timing and Importance of Disease Quiescence

The timing of cataract surgery in uveitic patients is critical for achieving favourable visual outcomes. Numerous studies have shown that the most important predictor of postoperative success is maintaining quiescence of intraocular inflammation for at least three months prior to surgery.

Adequate preoperative control of inflammation significantly reduces the risk of postoperative complications, particularly recurrent inflammation and cystoid macular edema. As such, sustained disease quiescence for a minimum of three months has become a cornerstone of surgical planning and remains the most important prognostic factor for optimal postoperative outcomes.[10,11]

Preoperative Assessment and Management

Clinical Evaluation and Disease Characterization

A comprehensive preoperative assessment is essential for optimizing postoperative visual outcomes, ensuring appropriate intraoperative planning, and anticipating intra- and post-operative complications.

The preoperative evaluation should include an assessment of the underlying uveitis diagnosis and the degree of inflammatory control, as prognosis varies across uveitic subtypes. For example, patients with Fuchs heterochromic cyclitis generally demonstrate more favourable visual outcomes following cataract surgery compared with other uveitic entities.

In contrast, eyes affected by uveitis secondary to Behçet disease, Vogt-Koyanagi-Harada disease, or sympathetic ophthalmia are associated with lower rates of achieving postoperative visual acuity of 20/40 or better.[4]

Perioperative Anti-Inflammatory Therapy

Perioperative corticosteroid therapy is essential for preventing exacerbation of intraocular inflammation following cataract surgery in patients with uveitis.[12] A short perioperative course of systemic corticosteroids has been shown to significantly reduce the incidence of postoperative macular edema and uveitis recurrence.

The typical approach involves initiating systemic corticosteroid pretreatment approximately two days before surgery and continuing therapy for a brief period postoperatively. The typical strategy used by many surgeons is to administer supplemental oral prednisone at a dose of approximately 1 mg/kg/day (up to 60–80 mg daily), followed by a gradual taper after surgery. Alternatively, intravenous corticosteroids or sustained local steroid delivery may be considered in selected cases.[11,12]

In patients with well-controlled uveitis for more than six months who are receiving stable systemic immunosuppressive therapy, an alternative perioperative strategy is to maintain the existing treatment regimen without escalation or the addition of systemic corticosteroids.[13]

The selection of anti-inflammatory agents, including their dosing and the duration of therapy, should be tailored based on the specific disease severity, the presence or absence of other ocular complications (glaucoma, macular edema, and others), as well as patient-specific factors such as age and past medical history.

In eyes with pre-existing or active cystoid macular edema, adjunctive intravitreal or peri-ocular corticosteroids are frequently employed at the time of surgery or in the early postoperative period. Options include sub-Tenon's or intravitreal triamcinolone acetonide, the dexamethasone intravitreal implant (Ozurdex), and the fluocinolone acetonide insert (Yutiq/Iluvien) for chronic, recurrent disease. These localized therapies provide sustained intraocular drug delivery and may reduce the need for high-dose systemic corticosteroids.[11,14]

Conversely, in patients with known steroid-responsive ocular hypertension or glaucoma, intravitreal and peri-ocular corticosteroid depot preparations should be avoided whenever possible, as these therapies may result in sustained intraocular pressure elevation that may be difficult to control. In these eyes, preference is given to topical or systemic corticosteroids, along with earlier introduction or escalation of steroid-sparing systemic

immunomodulatory therapy (e.g., methotrexate, mycophenolate mofetil, or biologic agents such as adalimumab) with close intraocular pressure monitoring.[2,12]

Particular caution is warranted in the pediatric population because of the well-documented systemic effects of prolonged systemic corticosteroid exposure, including growth suppression, weight gain, adrenal axis suppression, and bone density loss. Systemic corticosteroids should therefore be limited to the shortest effective perioperative course, with early initiation of steroid-sparing therapy (most commonly methotrexate as first-line, with adalimumab added when control is inadequate).[10,12]

Structural Assessment and Surgical Planning

A comprehensive clinical examination, supplemented by appropriate adjunct investigations, is essential for optimal surgical planning and for determining whether combined or staged procedures are necessary.[12]

Patients with uveitis frequently present with anatomical challenges, including small (miotic) pupils, posterior synechiae, iris atrophy, zonular weakness, and pupillary membranes, all of which require meticulous planning. These abnormalities increase surgical complexity and the risk of intraoperative complications.[10]

Assessment of visual potential requires evaluation of both the degree of media opacity and the integrity of posterior segment structures. The presence of significant vitreous haze, macular edema, retinal scarring, chorioretinal atrophy, or optic atrophy may limit postoperative visual recovery and should be carefully considered during surgical planning.[11]

Intraoperative Considerations and Surgical Technique

Surgical Approach

Cataract surgery in patients with uveitis is associated with significantly higher rates of both intraoperative and postoperative complications compared with routine cataract surgery. As a result, careful surgical planning and experienced surgical technique are essential to minimize complications. The surgical approach should aim to limit excessive manipulation and intraocular trauma in order to reduce postoperative inflammation.[12]

The standard surgical technique typically involves phacoemulsification with intraocular lens implantation. This is commonly performed through a 2.2-mm temporal clear corneal incision with one or more side-port corneal incisions.[13]

Management of Small Pupils and Posterior Synechiae

One of the most frequent intraoperative challenges is the presence of posterior synechiae and small (miotic) pupils. These may be managed using synechiolysis, mechanical pupil dilation techniques such as iris hooks, or other pupil expansion devices. In uveitic eyes, flexible iris hooks are often preferred over ring-type pupil expansion devices, as they remain anchored within the iris plane through the paracenteses and exert minimal contact with the corneal endothelium. This feature may be particularly advantageous given the reduced endothelial cell reserve frequently observed in chronic uveitic eyes, in which further intraoperative endothelial trauma is poorly tolerated.

Capsular staining is more frequently required in uveitic cataracts because of poor red reflex and the increased likelihood of anterior capsular fibrosis.[13]

Zonular Weakness and Capsular Complications

Zonular weakness and posterior capsular rupture are also encountered more frequently in uveitic cataract surgery, with reported rates of approximately 1.3% compared with 0.6% in control eyes.[15]

Intraocular Lens Selection

The selection of an intraocular lens remains an important consideration in uveitic cataract surgery, as the biocompatibility of the intraocular lens material plays a key role in minimizing postoperative inflammation. Single-piece, square-edged acrylic intraocular lenses are generally preferred in uveitic eyes due to their favourable biocompatibility and lower rates of postoperative complications compared with silicone lenses.[16]

Additionally, eyes receiving acrylic intraocular lenses or heparin-surface-modified polymethylmethacrylate lenses demonstrate better visual outcomes than those receiving silicone intraocular lenses.[4]

Hydrophilic acrylic intraocular lenses have also been reported to be used more frequently

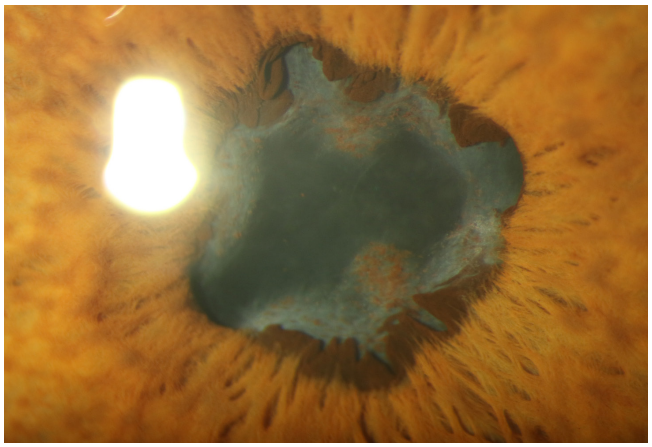


Figure 1. Dense posterior synechiae with partial fibrinous pupillary membrane in a patient with chronic uveitis secondary to sarcoidosis; *courtesy of Asma Alzuabi, MD and Eric Fortin, MD, FRCSC.*

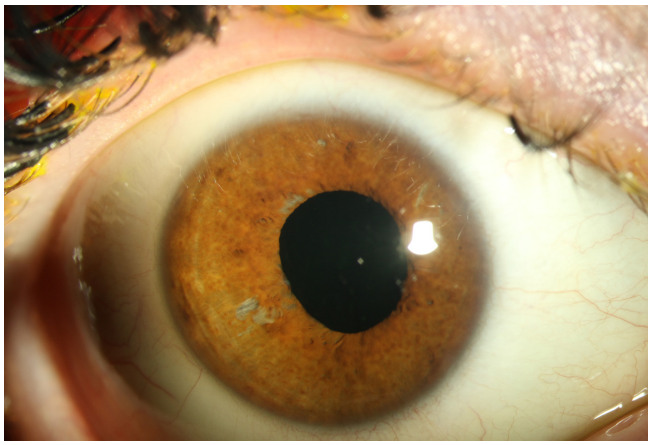


Figure 2. Post-operative appearance following cataract surgery with mechanical pupillary dilation; *courtesy of Asma Alzuabi, MD, and Eric Fortin, MD, FRCSC.*

in eyes with uveitis, reflecting their favourable biocompatibility profile.[15]

Multifocal intraocular lenses are generally not recommended in uveitic eyes because their optical performance depends on a clear visual axis, an intact macula, and preserved contrast sensitivity; all of which may be compromised by chronic intraocular inflammation. Additionally, these lenses require perfect centration which may be impeded by zonular weakness or capsular contraction also associated with chronic uveitis.[12]

Pediatric Considerations

In the pediatric population, most surgeons avoid intraocular lens implantation in uveitic eyes younger than two years of age. In older children, however, several studies have reported successful outcomes with implantation using polymethylmethacrylate or acrylic intraocular lenses.[12]

Careful patient selection is critical: eyes with persistent pupillary or cyclitic membranes carry a higher risk of postoperative complications following intraocular lens implantation. While intraocular lens implantation is appropriate in the majority of cases, in selected high-risk eyes—particularly children with chronic, poorly controlled uveitis; total lensectomy with or without pars plana vitrectomy and primary aphakia (with subsequent contact lens or secondary intraocular lens) may be the safer option.[12,16]

Postoperative Management, Outcomes, and Associated Complications

Postoperative Inflammation Control

Effective postoperative care in uveitic eyes is essential because these patients frequently exhibit an exaggerated inflammatory response after surgery. Therefore, a strict postoperative regimen—including intensive corticosteroid therapy administered topically, periocularly, or systemically, in addition to immunosuppressive therapy when necessary—is critical for achieving favourable surgical outcomes. Close monitoring is required to detect and manage postoperative complications such as cystoid macular edema or recurrent inflammation.[17]

Early and Late Complications

Both early and late complications are relatively common following cataract surgery in patients with uveitis. Early postoperative complications have been reported in approximately 52.4% of eyes, while late complications occur in approximately 63.8% of eyes. The most common postoperative complications include posterior capsular opacification, macular edema, and epiretinal membrane formation.[17] Late in-the-bag intraocular lens subluxation or dislocation is also an increasingly recognized late complication in uveitic pseudophakia and is attributed to

progressive zonular insufficiency resulting from chronic inflammation and capsular bag contraction. Management options include scleral fixation of the existing intraocular lens, intraocular lens exchange, or, in selected cases, conversion to aphakia.[10,13,15]

Cystoid Macular Edema

Excessive postoperative inflammation and cystoid macular edema represent the most significant complications limiting visual recovery after cataract surgery in patients with uveitis.[5]

Management strategies include topical and systemic corticosteroids, topical nonsteroidal anti-inflammatory drugs, and, in select cases, intravitreal anti-inflammatory therapy.[14]

Posterior Capsular Opacification

Posterior capsular opacification is among the most common late complications following cataract surgery in uveitic eyes. Hydrophilic acrylic intraocular lenses have been associated with lower rates of posterior capsular opacification compared with silicone lenses. When visually significant posterior capsular opacification develops, neodymium:yttrium-aluminum-garnet laser capsulotomy effectively restores visual acuity in most cases.[15]

Visual Outcomes

Cataract surgery in eyes with uveitis can result in substantial visual improvement when appropriate perioperative management strategies are employed. Improved visual acuity has been reported in approximately 95% of eyes undergoing cataract surgery for uveitic cataracts, with the majority (87%) achieving visual acuity of 20/40 or better.[18]

Long-Term Follow-Up

Long-term follow-up is essential for detecting delayed complications and maintaining disease control. Long-term visual outcomes in patients with uveitis are generally favourable, with stable visual acuity reported in approximately 80% of patients after 10 years of follow-up.[5]

Conclusion

Cataract surgery in patients with uveitis-associated cataracts has evolved from a relatively contraindicated procedure to a well-established surgical intervention with generally favourable outcomes when performed with meticulous perioperative control of inflammation and careful surgical technique.[10]

Key principles for successful management include achieving at least three months of preoperative disease quiescence, selecting biocompatible intraocular lens materials, minimizing intraoperative trauma, and implementing aggressive postoperative anti-inflammatory therapy.[17]

Although complication rates remain higher in uveitic eyes compared with routine cataract surgery, substantial visual improvement can be achieved in the majority of carefully selected and appropriately managed patients.[4]

Continued advances in surgical techniques, improved recognition of prognostic factors, and the integration of modern immunomodulatory therapies are expected to further improve surgical outcomes in patients with uveitis-associated cataracts.

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