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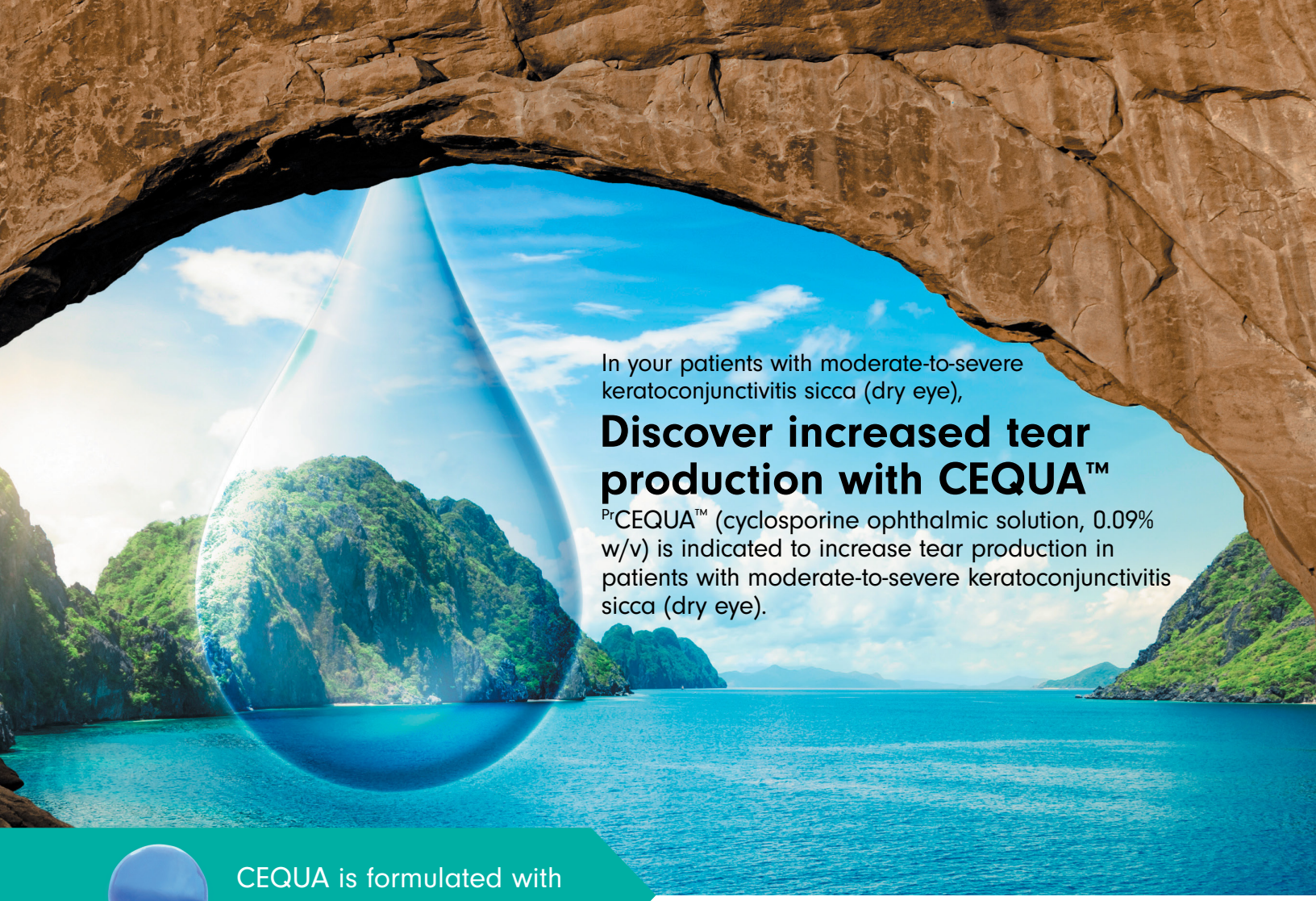

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Congenital Hypertrophy of the Retinal Pigment Epithelium: Following the Bear Tracks

Freddy Lee, MD
Amit V. Mishra, MD, FRCSC

Introduction

Congenital hypertrophy of the retinal pigment epithelium (CHRPE) is a well-recognized benign ocular finding, characterized by flat, pigmented lesions.[1] CHRPE lesions are typically unilateral and solitary but can also present as multiple or bilateral occurrences. They are relatively common, asymptomatic, and usually diagnosed incidentally during routine eye examinations. While generally benign, CHRPE or CHRPE-like lesions may warrant further evaluation to rule out systemic disorders such as familial adenomatous polyposis (FAP) or other differential diagnoses, especially in atypical or multiple lesions.

Case Report

A 19-year-old male was referred to our retina service after his optometrist noted multiple pigmented lesions in the peripheral retina of both eyes during a routine eye examination. The patient was asymptomatic, with a best corrected visual acuity of 6/6 in both eyes. Fundus examination revealed multiple flat, round, pigmented lesions with well-demarcated margins arranged in clustered distributions throughout the mid to far periphery of the retina of both eyes, consistent with a "bear track" pattern. These lesions were homogenously hypoautofluorescent.

Although no clear features suggested systemic associations, the gastroenterology service was consulted for evaluation given the widespread extent of the lesions.

Etiology

CHRPE has long been recognized as a benign pigmented lesion presenting in the midperiphery of the fundus.[2] Historically, it has been referred to as "benign melanoma of the RPE[3]" and "hypertrophy with hyperpigmentation of the retinal pigment epithelium (RPE),[4]" terms that describe the phenotypic characteristics of the lesion. Upon identification of its congenital etiology, the term "congenital hypertrophy of RPE" was later adopted.[5]

Although lesions described under the CHRPE terminology can appear similar clinically, they can vary substantially in pathophysiology and management. Currently, there is no formal consensus on the definition of CHRPE; however, three variants have been proposed: solitary, grouped, and atypical.[6]

Solitary: Solitary or unifocal CHRPE refers to solitary and unilateral lesions that develop sporadically and do not have any systemic associations. This form is typically considered to be true CHRPE lesions.[6]

Grouped: Grouped or multifocal CHRPE is usually unilateral and consists of multiple lesions clustered within a quadrant of the retina. These lesions are termed "bear tracks" due to their similarity to animal tracks. Grouped CHRPE is nonhereditary and benign, with no systemic associations.[1]

Atypical: Atypical or multiple CHRPE lesions are usually numerous and bilateral, and have a strong association with hereditary colonic polyposis and colon cancer. To reduce diagnostic confusion with benign CHRPE, multiple studies have proposed various terminology, including "pigmented ocular fundus lesions of FAP[7]," "RPE hamartomas associated with familial adenomatous polyposis,[1]" and "multiple retinal pigment epithelial hamartomata.[8]"

FAP is an autosomal dominant condition defined by the development of >100 synchronous colonic polyps that progress to colon cancer in nearly all cases.[9] FAP arises from germline mutations in the APC tumour suppressor gene located on chromosome 5q21. Up to one-third of newly diagnosed cases occur in individuals with no identified family history and are thought to arise from de novo mutations.[9] FAP associated with extracolonic features—including desmoid tumours, epidermoid cysts, osteomas, dental abnormalities, skin cancers, and CHRPE—are termed Gardner syndrome.[1,9-11] Atypical CHRPE has also been closely linked to APC gene mutations that give rise to medulloblastoma in Turcot syndrome.[12]

Given the potentially fatal nature of untreated FAP, identifying clinical features that distinguish atypical CHRPE from its benign counterparts is essential.

Epidemiology

The prevalence rate of CHRPE in the general population is not well defined in the literature but has been estimated to be 1.2%, with solitary CHRPE comprising the vast majority of cases.[13] Conversely, atypical CHRPE has been reported in up to 78–90% of FAP patients and in approximately 38% of their siblings.[16] The estimated prevalence of FAP ranges from 1 in 8,300 to 1 in 37,000.[9]

Histopathology

Most solitary and grouped CHRPE lesions demonstrate hypertrophy of the RPE monolayer, with cells appearing vertically elongated and columnar compared to normal cuboidal RPE cells.[16] These cells are densely packed with large, round pigment granules known as macromelanosomes, in contrast to wedge-shaped granules seen in normal RPE. The underlying Bruch's membrane may appear thicker due to enlargement of the RPE basement membranes, while the remainder of Bruch's membrane, choriocapillaris, and choroid remain normal. The inner retina and retinal vasculature also remain unaffected.[6] All lesions are characteristically flat.

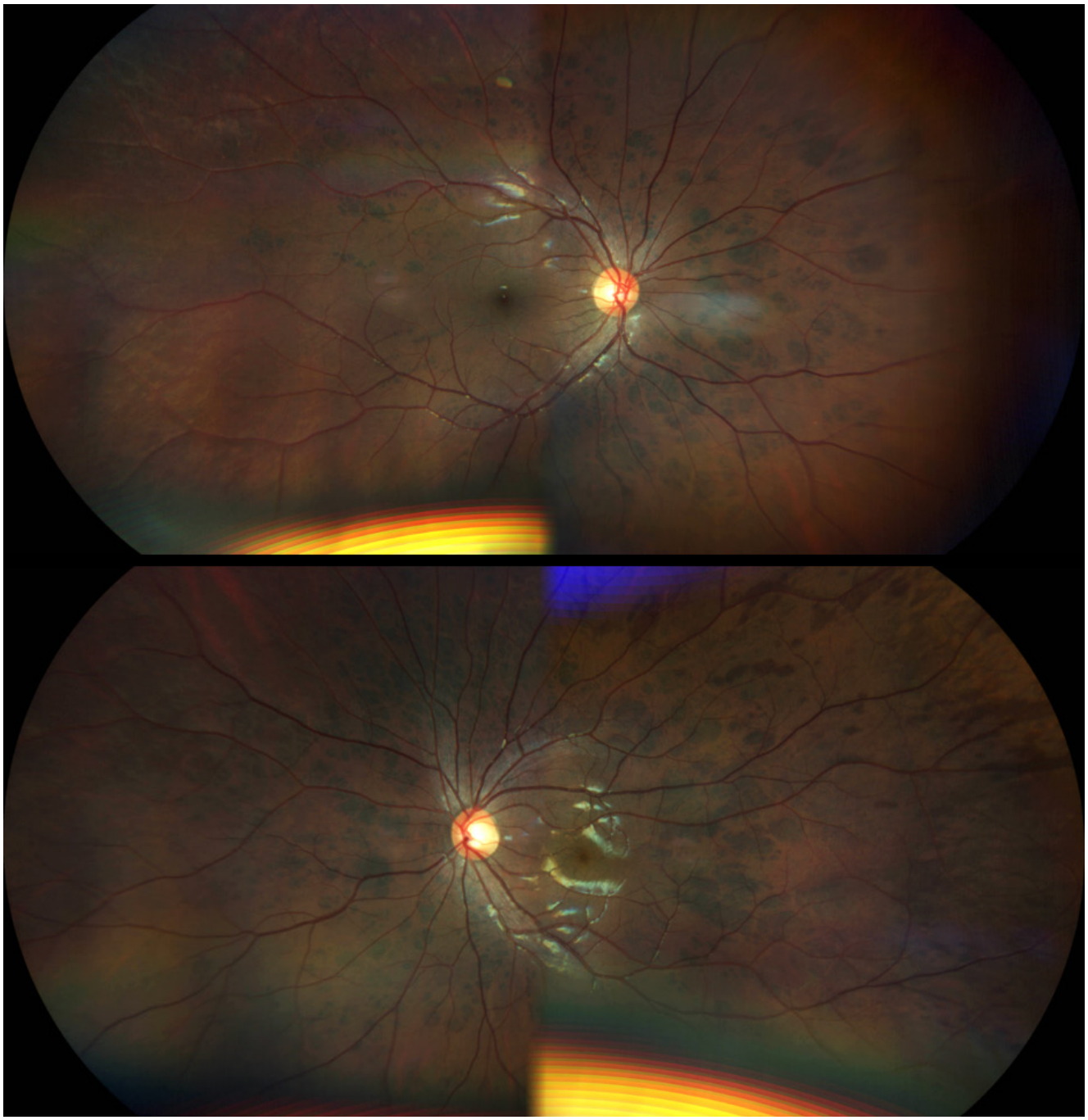

Figure 1. Montage of colour fundus images of the right (**top**) and left (**bottom**) eyes, demonstrating multiple pigmented lesions in both eyes; *patient data and images courtesy of Freddy Lee, MD and Amit Mishra, MD, FRCSC.*

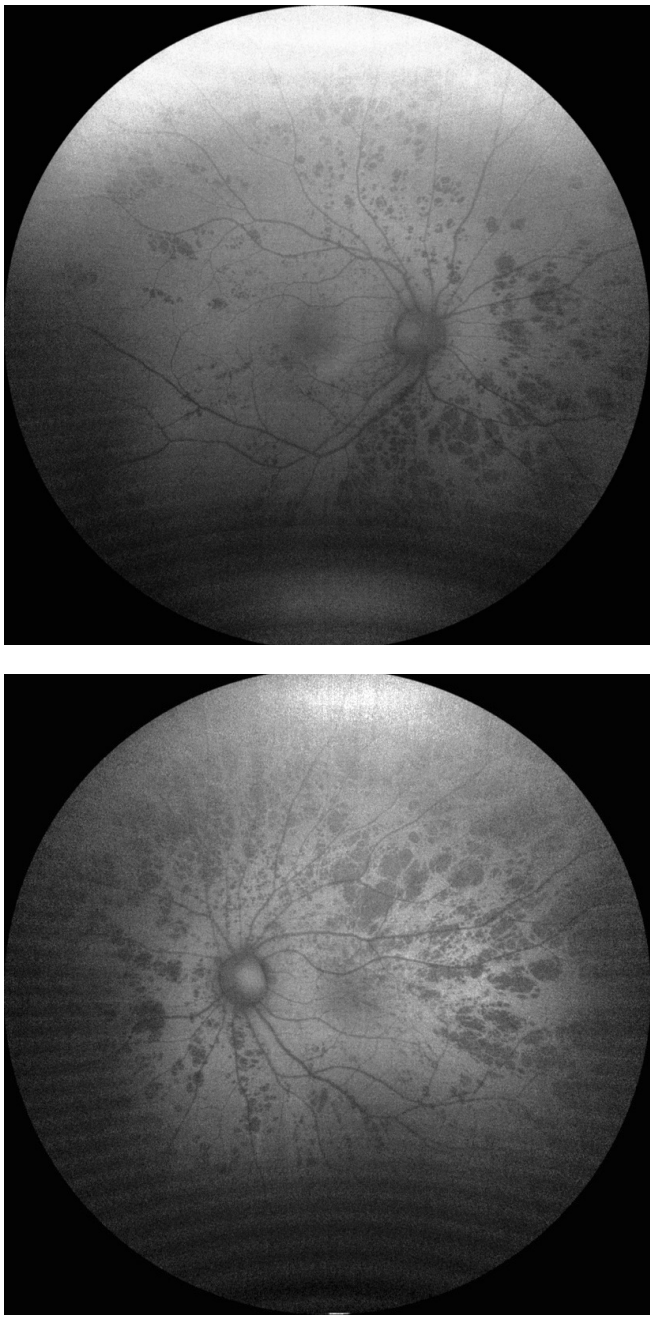

Figure 2. Fundus autofluorescence images of the right (**top**) and left (**bottom**) eyes, indicating hypoautofluorescence of the lesions in both eyes; *patient data and images courtesy of Freddy Lee, MD and Amit Mishra, MD, FRCSC.*

In contrast, atypical lesions associated with FAP demonstrate RPE hypertrophy and hyperplasia, full-thickness retinal involvement, and associated retinal vascular changes. These histopathologic features classify atypical lesions as hamartomas of the RPE.[16]

Clinical Findings

Solitary CHRPE

Solitary lesions are typically flat, round, and hyperpigmented, with well-demarcated margins separating them from the adjacent normal RPE. They may be associated with a surrounding halo or inner "punched-out" lacunae that appear depigmented.[16] The overlying retina and vasculature are typically normal; however, retinal vascular changes including blood vessel obliteration, microaneurysms, and neovascularization may be observed in some lesions.

Solitary CHRPE lesions are most commonly found in the equatorial region, within the superotemporal[16] and inferotemporal[2] quadrants. Rarely, lesions can be found in the peripapillary region or in the macula. Foveal involvement or macular neovascularization are associated with decreased vision.[6,17] The mean lesion diameter is approximately 4.7 mm but can vary from 100 µm to lesions occupying an entire retinal quadrant. Solitary lesions can demonstrate slow and benign enlargement in 46–83% of cases.[16]

Grouped CHRPE

Grouped or multifocal CHRPE consists of clusters of flat, pigmented lesions that are well demarcated. Each cluster contains 3–30 lesions, which are generally smaller than solitary lesions and vary in size from 100–300µm.[1] Lesions tend to increase in size toward the fundus periphery. Grouped CHRPE can resemble animal footprints ("bear tracks") and is typically confined to a single quadrant, though several clusters can be present in one eye.[6,16] In contrast to solitary lesions, grouped CHRPE lesions lack hypopigmented halos and lacunae.

Rarely, clusters of lesions can appear depigmented and albinotic, which are termed "polar bear tracks" and are not associated with gastrointestinal malignancy.[6]

Atypical CHRPE

Atypical CHRPE lesions associated with FAP are distinguished from their benign counterparts by characteristic clinical features. Unlike solitary CHRPE, atypical lesions are bilateral and numerous, with less well-demarcated margins. Compared to grouped CHRPE, they lack a specific distribution pattern, and instead display irregular and depigmented borders, with variable morphologies including pisciform (fish-shaped), oval, comma, or comet configurations.[1,6,16] Atypical CHRPE lesions are typically smaller (50–100µm) and exhibit varying pigmentation patterns of brown, black, and light grey. Notably, these lesions commonly display aberrant features such as retinal invasion, proliferation of glial cells, capillaries, RPE, pigmented satellite lesions, and mottled RPE changes.[1,16]

The presence of atypical CHRPE is strongly associated with Gardner syndrome; however, the absence of these lesions has no predictive or diagnostic value in the diagnosis of FAP.

Diagnostic Procedures

The diagnosis of CHRPE is clinical, and additional investigations are generally not necessary. Fundus images are helpful for documentation and longitudinal monitoring of lesions. In cases where the diagnosis is uncertain, ancillary testing may be beneficial in distinguishing lesions from other conditions in the differential diagnosis.

Fundus autofluorescence

On fundus autofluorescence imaging, CHRPE lesions display complete hypoautofluorescence. Surrounding depigmented halos or lacunae are generally isoautofluorescent or slightly hyperautofluorescent.[18]

Optical coherence tomography (OCT)

OCT reveals hyperreflectivity and thickening of the RPE, corresponding to the hypertrophy of the RPE, as well as retinal thinning and photoreceptor loss overlying the lesions. Lacunae are associated with RPE loss and increased transmission of light into the underlying tissues.[19]

Fluorescein angiography

On fluorescein angiography, the hypertrophic RPE blocks visualization of the underlying choroidal vasculature, which appears as hypofluorescent lesions. Depigmented halos or lacunae are typically hyperfluorescent, consistent with window defects. CHRPE lesions do not demonstrate leakage; however, subtle microvascular changes, including capillary nonperfusion, neovascularization, and capillary microaneurysms may be observed.[20]

OCT angiography (OCT-A)

The utility of OCT-A is generally limited due to segmentation issues related to retinal thinning and RPE thickening. When interpretable, OCT-A typically shows normal retinal and choroidal vasculature in CHRPE.[6]

A-scan or B-scan ultrasonography

Ultrasonography is non-diagnostic in CHRPE as lesions are flat and may not be readily detected. However, it can be helpful for measuring lesion thickness to rule out differential diagnoses.[6]

Electrophysiology

Electrophysiologic testing, including electroretinography and electro-oculography, is typically normal and non-contributory for the diagnosis of CHRPE.[6]

Differential Diagnoses

Choroidal nevus

Choroidal nevi typically have margins that are not well defined with a feathery appearance and lack associated lacunae. Pigmentation may range from light to dark brown, and overlying drusen or mottling may be present.

Choroidal melanoma

Choroidal melanoma is almost always elevated, with less homogenous pigmentation and demarcated margins. Growth is usually observed in all three dimensions.

Melanocytomas

Melanocytomas can resemble CHRPE clinically but are distinguished by their elevated profile and feathery margins.

Congenital simple RPE hamartoma

Clinically, these lesions appear as distinct, solitary nodules that protrude into the neurosensory retina and are most commonly located in the macular region.[1]

Combined hamartoma of the retina and RPE

Combined hamartoma of the retina and RPE are characterized by an ill-defined grey retinal mass with tortuous and straightened retinal vessels.[1]

Other pigmented fundus lesions such as focal pigmentation from trauma, inflammation, or drug toxicity, can be differentiated based on their irregular shape, associated findings, and the patient's clinical history to suggest other acquired conditions.

Management

The vast majority of patients with solitary or grouped CHRPE remain asymptomatic. These lesions are benign and do not require active intervention. The prognosis is excellent, and patients should be counselled to continue routine ophthalmic follow-up with regular eye examinations.[1]

In contrast, patients suspected of having atypical CHRPE associated with FAP require further evaluation by gastroenterology and adherence to established screening protocols to enable prompt detection of colon polyps and malignancy. Patients with a diagnosis of FAP should undergo flexible sigmoidoscopy or colonoscopy every 1–2 years, starting at 10–12 years of age or earlier if symptoms such as diarrhea, rectal bleeding, or abdominal pain develop.[9] Given that colonic adenocarcinoma is inevitable in FAP, ophthalmologists should maintain a high index of suspicion and a low threshold for identifying atypical CHRPE and initiating a referral for gastroenterology assessment.

Complications

Complications related to CHRPE are exceedingly rare and are associated with its benign growth behaviour. In some cases, CHRPE lesions can enlarge slowly, with reports of foveal extension that may affect visual acuity.[17] Nodular growth has been reported in solitary CHRPE, which can acquire a retinal feeding artery and draining vein and result in exudative retinal detachment.[1,6] CHRPE can also be complicated by choroidal neovascularization or cystoid macular edema, resulting in decreased vision.[1,21]

Conclusions

CHRPE is a common, benign finding that is often identified incidentally and referred for ophthalmologic assessment. Unfortunately, the absence of a consensus on a definition or classification for CHRPE may contribute to challenges in identifying atypical lesions associated with FAP. Although certain clinical features can help distinguish atypical CHRPE from its benign counterparts, there is considerable overlap in "high-risk" characteristics, such as ovoid shape and bilaterality, among solitary and grouped CHRPE, which can confound definitive clinical diagnoses.

Given that atypical CHRPE can indicate inevitable progression to colon cancer, referral to gastroenterology may be prudent in cases such as ours, in which lesions do not demonstrate classical features of solitary or grouped CHRPE but also lack clearly defined atypical features.

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Financial Disclosures

F.L.: None declared.
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Premium Intraocular Lenses: A Framework for Patient Selection and Expectation Management

Kelly Ann Hutchinson, MDCM, MSc
Jamie Bhamra, MD, FRCSC

Introduction

Cataract extraction with intraocular lens (IOL) implantation is among the most performed and safest operations in ophthalmology.[1,2] In Canada, cataract surgery demand is projected to more than double over the next 25 years, driven by population aging.[3] As surgical volumes rise, parallel advances in IOL design have expanded the range of postoperative visual outcomes that can be offered.[4] Modern IOLs vary substantially in optical strategy and performance profile, each offering distinct benefits, compromises, and contraindications.[5-7] This expanding landscape has made preoperative counselling more complex. Many patients arrive having prior exposure to information on "premium lenses" from online sources or through friends and family, information that can be helpful, but is often incomplete, inaccurate, or not tailored to their ocular status.[8] A surgeon-led approach that is standardized yet individualized can improve clarity and help align patient expectations with realistic surgical outcomes.

Many practices further streamline counselling by adopting a team-based approach that incorporates a dedicated surgical coordinator as part of the preoperative pathway.[9,10] After the surgeon has assessed candidacy and discussed clinically appropriate IOL categories, the coordinator then meets with the patient to reinforce lens education and operationalize the plan. This role typically includes explaining IOL function in practical terms, outlining pricing and any surgeon recommendations, discussing payment options and financing, completing consent and administrative documentation, and coordinating appointments alongside pre- and postoperative instructions. In addition to improving efficiency and reducing repetition across visits, this structure helps separate the clinical decision (what is safest and most appropriate) from the financial conversation (how elective upgrades are funded), which can reduce perceived pressure and support patient trust. In a pragmatic workflow, the initial visit therefore concludes with the coordinator reviewing consent, confirming waitlist placement and expected timelines, measurement planning for IOL calculations, reinforcing key counselling points (including the importance of ocular surface optimization for accurate biometry), and providing a clear summary of the selected pathway and associated costs.

A Standardized, Patient-centred Framework

A practical comparison of standard versus premium IOL options is provided in **Table 1** to help anchor preoperative discussions. Premium IOL counselling is most effective when delivered through a consistent structure for every patient, while allowing the final recommendation to be guided by three pillars: ocular history, objective examination/testing, and the patient's functional goals and tolerance for trade-offs. The goal is not to "sell" premium technology, but to ensure that all clinically appropriate options are discussed in a way that is accurate, safe, comprehensible, and aligned with the patient's priorities.

Indication Determines the Counselling Tone: Cataract SurgeryVersus Refractive Lens Exchange

Lens-based surgery is typically undertaken for one of two reasons, and the counselling approach should reflect the patient's underlying motivation. For medically indicated cataract surgery (cataract extraction with IOL implantation),

	Standard IOL (typically monofocal)	Premium IOLs (broad category: added functional features)
Core purpose	Restore clarity after cataract removal; prioritize a predictable outcome at one focal distance	Address lifestyle goals in addition to cataract removal (e.g., reduce glasses dependence; address astigmatism; extend range of focus)
What does "premium" mean?	Not a "lower quality" lens but rather fewer added optical features	Not necessarily "higher quality material"; typically means added function (range of vision, astigmatism correction, adjustability)
Typical postoperative vision profile	Strong performance at one set distance (often distance vision) but glasses needed for best vision	Broader functional vision (distance ± intermediate ± near depending on design) with potential trade-offs
Glasses dependence	Usually need glasses for near, intermediate, and distance tasks	Designed to reduce glasses dependence; many patients still need glasses for some tasks (especially small print or prolonged near work)
Astigmatism management	Does not inherently correct corneal astigmatism (unless additional strategies are used)	Many premium pathways include astigmatism correction (e.g., toric optics)
Cost and coverage	Usually covered by provincial medical plan when surgery is medically indicated (e.g., visually significant cataracts)	Commonly not covered; out-of-pocket reflects added technology and the diagnostic/planning pathway
Preoperative testing and postoperative course	Standard biometry and routine planning; typical follow-up schedule	Often requires additional diagnostics, tighter measurement quality, more detailed planning, and (in some pathways) additional postoperative visits/adjustments and longer chair time
Bottom-line counselling phrase	"Excellent, reliable lens to restore clarity, glasses will most likely be needed for most tasks"	"Lifestyle-focused options that can reduce glasses dependence but require careful selection and acceptance of trade-offs"

Table 1. Patient-Centred Summary of Standard versus Premium Intraocular Lens (IOL) Characteristics; *courtesy of Kelly Ann Hutchinson, MDCM, MSc and Jamie Bhamra, MD, FRCSC.*

the primary objective is to remove the cataract and restore the patient's visual potential. These patients often prioritize safety and reassurance, and may experience a higher baseline fear about complications, and frequently demonstrate greater tolerance for minor imperfections if they achieve meaningful improvement compared with their preoperative vision. In many publicly funded health systems, a standard monofocal IOL is covered as part of medically necessary cataract surgery, whereas elective upgrades are not. For refractive lens exchange (RLE), the primary objective is refractive correction and reduced dependence on glasses or contact lenses. Candidates are often older adults (usually over 45 years) who are not well suited for corneal refractive surgery (for example, due to high refractive error or corneal pathology that limits suitability for laser-assisted in situ keratomileusis [LASIK]/photorefractive keratectomy [PRK]) or those with dysfunctional lens syndrome. These patients are pursuing an elective lifestyle-oriented outcome, are commonly

more sensitive to subtle visual symptoms, and tend to have lower tolerance for residual refractive error or optical side effects. Coverage for RLE is typically different from medically indicated cataract surgery and often requires out-of-pocket payment.

Practical Language Can Reflect These Differences:

- **For cataract surgery:** "This is a safe procedure to restore your vision. Once we confirm you are a good candidate, we can also discuss options that may reduce your need for glasses."
- **For RLE:** "This is an investment in visual freedom. Safety is foremost. Let's define your priorities, distance, computer, reading, and review what trade-offs may exist with specific lens types."

Define Success Before Introducing Lens Categories

Premium IOL outcomes are largely determined by expectation alignment. The highest-risk scenario is a mismatch between what the patient believes they are purchasing and what can reliably be delivered by the optical system. Because paying for an upgrade can amplify expectations of a "perfect" result, it is preferable to remain conservative in promises and explicit about compromises.

Premium options can be framed as lifestyle-directed rather than medically required, particularly in cataract surgery. Counselling should translate a patient's daily visual activities into a realistic visual plan and clarify the costs of that plan in terms of dysphotopsias, contrast, adaptation, and postoperative effort. Key points to address early include:

- Spectacle independence is a goal, not a guarantee.
- Some optical designs increase halos and glare, particularly at night.
- Expanded near performance may come at the expense of contrast or night-time clarity.
- Measurement quality, especially those influenced by tear film stability, are a major determinant of refractive accuracy and satisfaction long term.

Patient Selection and Measurement Reliability: Outcomes are Determined Before the Operating Room

From a surgical perspective, premium IOL candidacy is primarily a function of ocular health and reliability of measurements. A thorough ocular history and examination are essential, and the sequence of care matters: ocular surface disease should be treated before definitive biometry and before the patient commits to a premium pathway.[11,12]

A pragmatic workflow is to use the first visit to establish candidacy and provide education, reserving final lens selection for the measurement visit once the surface is stable and testing has been reviewed. A routine evaluation commonly includes visual acuity and refraction, intraocular pressure, keratometry, macular assessment (often with optical coherence tomography to screen for occult pathology such as epiretinal membrane or macular degeneration), and a focused corneal and tear film assessment. When available, corneal topography or tomography and wavefront aberrometry are particularly useful for identifying irregular astigmatism and higher-order aberrations that predict dissatisfaction with diffractive optics and from ocular surface irregularities. Surface optimization can be presented as standard preoperative preparation with escalation as needed, using measures such as heat, massage, blinking, preservative-free lubricants, and prescription therapies when indicated.

Patients benefit from explicit explanation of why surface optimization is part of the surgical plan:

- "Your cornea is the windshield. If the windshield is smeared, even the best internal lens cannot produce crisp vision."
- "Surgery will temporarily worsen dryness, which can last chronically, if not addressed. We need the surface optimized to obtain accurate measurements and deliver your best postoperative vision."

Contraindications and High-risk Features for Premium Optics

Although candidacy is lens-specific, several findings consistently predict a higher risk of dissatisfaction, reduced performance, or refractive inaccuracy. Organizing these risk factors by mechanism improves the clarity of counselling for patients.

Unreliable measurements or degraded optical quality often stem from ocular surface instability (dry eye disease, blepharitis/meibomian gland dysfunction, Salzmann nodules, epithelial irregularity) until these issues are adequately treated. Irregular corneal astigmatism or corneal irregularity often reduces confidence in the use of diffractive optics.[7] Reduced visual potential and contrast sensitivity limitations include macular disease (such as age-related macular degeneration or epiretinal membrane), significant optic nerve disease, or glaucoma, where contrast reduction may be poorly tolerated.[13] Anatomic or intraoperative stability concerns include small pupils in scenarios where dysphotopsias risk is increased or optical performance may be limited, and significant zonular weakness that threatens centration and lens stability.[7] Behavioural and expectation-based risks include unrealistic expectations, perfectionistic traits, and cognitive limitations that affect compliance, and misalignment between a patient's goals and their willingness to participate in pre- and postoperative care.

A practical principle of surgical maturity is recognizing when to recommend against a premium pathway. Declining an inappropriate premium option protects outcomes and patient experience.

Communicating Options: Prioritize Experience Over Optics

Effective counselling avoids technical language and focuses on what the patient will be able to do after surgery. Describing vision in functional zones: distance, intermediate, and near, helps link IOL categories to real-world tasks patients immediately recognize. Distance vision is most relevant for activities such as driving, recognizing faces across a room, watching television, and reading street signs. Intermediate vision aligns with "arm's-length" activities including computer work, using a tablet, cooking and meal preparation, viewing a car dashboard, shopping, and many household tasks. Near vision pertains to close-work activities such as reading print, texting, sewing or knitting, threading a needle, medication labels, and other fine-detail tasks. Framing expected postoperative vision in these functional zones helps patients understand the trade-offs between lens designs and sets practical expectations for spectacle needs in daily life. Visual aids including diagrams, clinic-approved videos, defocus curves, and dysphotopsias simulations, used selectively to complement the surgeon's narrative, can support comprehension and reduce later disappointment.

A consistent message that reduces confusion is to distinguish "quality" from "function." Both standard and premium lenses are high-quality implants; "premium" typically denotes added functional features and the diagnostic and planning pathway required to support them, rather than a universal guarantee of superior performance in all conditions.

Premium IOL Categories and Counselling Framework

Premium IOLs encompass a heterogeneous group of non-standard implants intended to address functional goals beyond restoration of clarity after cataract removal. For routine patient counselling, it is practical to present premium options by category rather than by brand, emphasizing the expected range of vision and the trade-offs inherent to each design. In Canadian practice, the major categories include toric lenses for astigmatism correction, extended depth-of-focus (EDOF) or enhanced monofocal platforms to expand distance–intermediate function with variable near performance, diffractive multifocal/trifocal lenses to maximize spectacle independence, and postoperative-adjustable technology such as the light adjustable lens, which allow refinement of refractive accuracy after surgery. A comparative summary of these categories, typical spectacle expectations, and key counselling points is provided in **Table 2**.

Patients may also inquire about "tinted" or blue-light–filtering optics. These lenses typically provide an optional filtering feature rather than a presbyopia-correcting strategy and, when included in a standard monofocal supplied by a given centre, are not associated with additional out-of-pocket cost. Similar filters may also be incorporated within premium platforms (e.g., toric,

Lens type (premium options)	What it improves	Vision tasks that may still benefit from glasses	Key things to know (common trade-offs)
Toric *(astigmatism-correcting; usually monofocal)*	**Distance** vision (and often sharper overall clarity) by correcting astigmatism	**Computer and near** (reading)	Does **not** create near focus; best for patients with regular astigmatism who prioritize distance vision
EDOF *(extended depth-of-focus)*	**Distance + computer** and **some near**	**Near/reading** (especially small print)	Usually fewer night-vision symptoms than multifocal/trifocal, but near may be incomplete
Multifocal / Trifocal	**Distance + computer + near**	Some patients still need glasses for **fine print**, prolonged reading, or very low light	Higher chance of **halos/glare** and contrast trade-offs; requires careful screening
LAL *(light adjustable lens)*	Typically, excellent distance/computer range; can be **fine-tuned after surgery** for higher accuracy	Depends on target plan; still need glasses **for fine print** and prolonged reading	Requires **multiple post-op adjustment visits** and strong compliance with ultraviolet light protection; major value is customization/accuracy

Table 2. Simplified Premium Intraocular Lens Categories in Canada; *courtesy of Kelly Ann Hutchinson, MDCM, MSc and Jamie Bhamra, MD, FRCSC.*

EDOF, or multifocal families), in which case the lens remains "premium" based on its functional optics rather than the presence of tint alone. Tinted optics may be discussed when patients have a strong preference for ultraviolet light/blue-light–filtering IOLs or those reporting glare sensitivity, and should be explained thoroughly to inquisitive patients. In particular, they should be avoided when precise colour discrimination is central to the patient's occupation or quality of life (e.g., dentists matching tooth shades, artists, photographers, graphic designers), where even subtle shifts in colour perception may be unacceptable or a previous clear IOL has been placed in the other eye.

Visit Structure to Reduce Repetition and Support Decision-making

A structured multi-visit pathway keeps counselling coherent and prevents information overload.

1) Initial Visit (Qualification and Education, with Surgeon and Surgical Coordinator)

- Confirm diagnosis and surgical candidacy
- Identify ocular comorbidities that may limit premium options
- Introduce standard versus premium pathways using functional language
- Initiate ocular surface optimization when indicated
- Provide clinic-approved IOL pricing and resources (hand-outs and online videos) for at home review to reinforce consistent messaging

2) Measurement Visit (Biometry and Commitment, with Surgical Coordinator and Ophthalmic Technician)

- Confirm ocular surface stability; repeat key measurements as needed
- Finalize functional goals (distance/intermediate/near priorities)

- Select the most appropriate IOL category and refractive target
- Reiterate the trade-offs most relevant to the chosen pathway (e.g., halos/glare, contrast, near performance, likelihood of readers)

3) Additional Visit (Selective, as Needed with Surgeon)

- Reserve for unresolved ocular surface disease, complex findings (e.g., irregular cornea, borderline macula/optic nerve head), or patients requiring further discussion before commitment

Conclusion

Counselling patients on premium intraocular lenses is most effective when it is structured, surgeon-led, and explicitly anchored to ocular candidacy and realistic functional goals. A standardized framework, beginning with clarification of indication and alignment of expectations, followed by rigorous assessment of measurement reliability and ocular comorbidities, helps reduce refractive surprise and dissatisfaction, while ensuring patients are neither steered toward, nor inadvertently deprived of, appropriate premium options. Presenting lenses by category and emphasizing the experiential trade-offs of each design improves patient comprehension and supports shared decision-making. Ultimately, consistent communication across visits, early ocular surface optimization, and a willingness to recommend against premium technology when risk factors are present are central to achieving predictable outcomes and durable patient trust.

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Updates in the Management of Thyroid Eye Disease

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Introduction: *Thyroid eye disease (TED) is an extrathyroidal manifestation of autoimmune thyroid diseases such as Graves' disease (GD) and Hashimoto's thyroiditis. TED frequently causes severe, sight-threatening symptoms requiring prompt medical or surgical intervention. Recent therapeutic advances are revolutionizing TED treatment, prompting an updated review on TED management.*

Epidemiology and Classification: *The estimated incidence of TED is 4.2/100,000 population/year, with a female-to-male ratio of 3.7:1. Risk factor control includes maintaining euthyroid function, smoking cessation and steroid prophylaxis following radioactive iodine therapy. The European Group on Graves' Orbitopathy (EUGOGO) denotes TED severity, whereas the clinical activity score (CAS) describes disease activity.*

Medical and Surgical Management: *Mild TED is treated conservatively using ophthalmic lubricants, selenium supplementation, cold compresses, and head elevation. Intravenous glucocorticoids are first-line for sight-threatening and moderate-to-severe TED with low activity, and for patients experiencing pain and discomfort with moderate-to-high activity, without sight-threatening symptoms. Newer targeted therapies for moderate-to-severe TED, such as teprotumumab, have promising outcomes, although exact therapeutic indications require further investigation. Surgery is indicated in refractory hyperthyroidism, sight-threatening keratopathy, optic neuropathy, and fibrotic disease. Interventions include total thyroidectomy, orbital decompression, strabismus correction, eyelid surgery, and aesthetic considerations. Patients require close follow-up with reclassification of CAS and EUGUGO severity at each visit to address refractory disease early.*

Conclusions: *TED is a severe extrathyroidal manifestation of autoimmune thyroid diseases, requiring precise disease stratification and longitudinal monitoring for optimal outcomes. Continued refinement of treatment algorithms is essential to improving long-term outcomes. Real-world data on emerging treatments will be critical in determining the future management of patients requiring intervention.*

Introduction

Thyroid eye disease (TED), also known as Graves' ophthalmopathy or Graves' orbitopathy, is an extrathyroidal manifestation of the autoimmune thyroid diseases such as Graves' disease (GD) and Hashimoto's thyroiditis.[1] The autoantibodies in GD and HT bind to thyroid-stimulating hormone receptors (TSHR) and insulin-like growth factor-1 receptors (IGF-1R).[2,3] Both TSHR and IGF-1R are also found on orbital fibroblasts, which are activated in TED, leading to the clinical sequelae of TED such as soft tissue inflammation, fat deposition, extraocular muscle enlargement and inflammation, and fibrotic remodelling of the orbit.[2–4] The disease can present both unilaterally and bilaterally. TED frequently causes severe, sight-threatening symptoms which require prompt medical and/or surgical intervention. Until recently, glucocorticoids served as the foundation of TED management, with adjunctive therapies and off-label, non-specific biologics providing alternative options in refractory cases.[5] However, advances in monoclonal antibody research are revolutionizing TED treatment, leading to the Health Canada regulatory approval of the selective IGF-1R antagonist teprotumumab in 2025.[6] On account of the recent treatment advances and

potentially sight-threatening nature of TED, we provide an updated review of the optimal management of TED.

Epidemiology And Risk Factors

The overall incidence of TED is estimated to be 4.2/100,000 population/year, with an approximate female-to-male ratio of 3.7:1.[1,7] A meta-analysis from 2020 calculated the pooled prevalence of TED in patients with GD to be 40%.[8] Incidence peaks in two similar age groups for each gender; 45–49 and 65–69 years in men, and 40–44 and 60–64 years in women.[9] TED can be further subdivided by severity, with a recent review in The Lancet reporting that mild, moderate, and sight-threatening disease occur in 77%, 22%, and 1% of patients, respectively.[10] Risk factors for the development and severity of TED include older age, male sex, cigarette smoking, cannabis usage, high serum thyroid-stimulating immunoglobulin, hyper- and hypothyroidism, radioactive iodine therapy, vitamin D deficiency, selenium deficiency, dyslipidemia, and diabetes.[1,5,10–12] Evidence-based prevention strategies and mitigation of disease severity include control of underlying thyroid hormone abnormalities, smoking cessation, and steroid prophylaxis in patients undergoing radioactive iodine therapy.[5,10,13,14]

Natural History and Classification

The natural history of TED was first described by F.F. Rundle in 1957 using "Rundle's curve", which demonstrated that TED is characterized by an 18–24 month period of activity with three stages–an initial inflammatory phase related to a pathogenic cascade caused by orbital fibroblast activity, a static stabilization phase with no change in inflammation, and finally an inactive phase with cessation of inflammation and incomplete restoration of orbital anatomy and fibrotic sequelae.[15] Indeed, this self-limiting pattern of disease activity is most applicable to mild forms of TED, which typically only require conservative management.[16] However, various risk factors and individual variation in presentation of the disease may result in more severe clinical presentations of TED, which require medical or surgical intervention to prevent sight-threatening complications.

The most widely endorsed guidelines for grading the severity of TED are the 2021 European Group on Graves' Orbitopathy (EUGOGO) severity scale, which classifies TED into mild, moderate-to-severe, and sight-threatening.[16] Mild TED includes lid retraction of <2 mm, mild soft-tissue involvement, exophthalmos of <3mm, intermittent diplopia, and corneal exposure responsive to lubricants. Moderate-to-severe TED involves greater lid retraction, soft-tissue involvement, and exophthalmos, with inconstant or constant diplopia. Finally, sight-threatening TED involves dysthyroid optic neuropathy and/or corneal breakdown.

TED activity is separately scored through classification systems such as the clinical activity score (CAS). The CAS initially predicts the level of inflammation according to a 1–7 score; **1-** painful, oppressive sensation on or behind the globe, during the last four weeks, **2-** pain on attempted up, side, or down gaze, during the last four weeks, **3-** eyelid(s) redness, **4-** diffuse conjunctival redness, covering ≥1 quadrant, **5-** swollen eyelid(s), **6-** chemosis, and **7-** swollen caruncle.[17] Additional scores during 1–3 month follow-up include **8-** increased proptosis ≥2 mm, **9-** decreased eye movements in any direction ≥5°, and **10-** decreased visual acuity of ≥1 line(s) on the Snellen chart using a pinhole.[17]

In addition to the EUGOGO severity scale and the CAS, additional classification systems such as the VISA and NO SPECS classifications provide valid methods of grading disease activity and/or severity. The VISA classification is an acronym for assessing disease severity using four categories, which include vision, inflammation, strabismus, and appearance.[18] Disease activity is determined by longitudinally assessing for worsening signs and symptoms within any of these four categories.[18] Similarly, the NO SPECS classification is an acronym for assessing disease severity, including **0- N**o physical signs or symptoms, **I- O**nly signs (eyelid retraction), **II- S**oft-tissue involvement, **III- P**roptosis, **IV- E**xtraocular muscle signs, **V- C**orneal involvement, and **VI- S**ight loss.[18] However, NO SPECS does not assess clinical activity.

Medical Management

Mild TED

Mild TED is the most common form of the disease, representing 77% of all TED cases.[10] On account of the self-limiting nature of mild TED, it is typically managed conservatively with local, supportive treatment.[16] Patients with mild TED often develop dry eye, necessitating artificial tears

during the day (preferably preservative-free), whereas ophthalmic lubricating gels/ointments can be used at night for more robust corneal protection to prevent exposure keratopathy.[16] Additionally, 100 mg twice daily of sodium selenite supplementation has been shown to improve quality of life and reduce disease progression.[19] Some patients may anecdotally report benefit from at-home interventions such as head elevation during sleep and cold compresses.

Moderate-to-severe TED

Management of moderate-to-severe TED is primarily guided by disease activity as per the CAS. Treatment of relatively inactive disease (CAS 1-2) involves supportive therapy similar to mild TED.[16,20] In cases of mild-to-moderate activation, such as CAS 3-4, intravenous (IV) glucocorticoids such as methylprednisolone remain the first-line therapy for disease inactivation.[16,20] Various studies have demonstrated superior efficacy of IV glucocorticoids compared with oral glucocorticoids through larger reductions in disease activity and greater improvements in markers of disease severity, such as visual acuity and chemosis.[21,22] IV glucocorticoids have also been shown to have higher treatment response rates and a more favourable safety profile compared to oral glucocorticoids, such as reduced risk of weight gain and development of Cushingoid features.[21-23] Glucocorticoids have a broad mechanism of action, which involves altered distribution, trafficking, and survival of leukocytes, interference of B- and T-lymphocyte function, and impaired recruitment of monocytes and macrophages to orbital tissue.[24] The most common dosing regimen is 500 mg weekly for 6 weeks followed by 250 mg weekly for 6 weeks, which is relatively well-tolerated in most patients, although major adverse events such as hepatotoxicity can occur at cumulative doses beyond 8000 mg.[16] Disease activity is reduced in 58–83% of patients.[5] However, glucocorticoids mainly reduce soft-tissue inflammation, while only achieving a modest reduction in proptosis and diplopia.[25] Additionally, 20–40% of patients can experience treatment failure.[5]

IV glucocorticoids can be combined with adjunctive therapies such as orbital radiotherapy or other immunosuppressive agents, such as mycophenolate, to reduce steroid exposure or increase efficacy of therapy.[5,20] Although this practice may persist in areas with limited access to biologics, teprotumumab is increasingly preferred as a targeted therapy for patients with TED with CAS 3-4.[26] Additionally, in patients with moderate-to-severe TED with CAS ≥4, teprotumumab is now being considered as a potential first-line therapy over IV glucocorticoids.[26,27] Teprotumumab is a selective IGF–1R antagonist, which is thought to prevent communication between IGF-1R and TSHR in orbital fibroblasts, significantly reducing the level of orbital inflammation.[28] Health Canada approved teprotumumab in 2025 as per the findings from the landmark TED01RV (phase II) and OPTIC (phase III) trials, which found a pooled proptosis improvement in 77% of treated patients, and improvements in all secondary outcomes, including CAS, diplopia, and quality of life score.[6,29–31] Serious adverse events are rare, with the most prominent being hyperglycemia and hearing loss.[29,30] It is administered as an IV infusion every 3 weeks, with the first dose at 10 mg/kg body weight and the following doses at 20 mg/kg.

Although teprotumumab may achieve similar results to glucocorticoids in less active TED, the high cost and lack of coverage as a newly approved therapy in Canada mean broad use is not currently feasible for many patients. There is also limited data on the efficacy of teprotumumab in patients with CAS <4 since the major clinical trials which led to regulatory approval only included patients with CAS ≥4.[29,30] A study conducted on the durability of teprotumumab following the TED01RV, OPTIC, and OPTIC extension studies found that among CAS responders, 90.7% maintained CAS reductions at week 72.[32] Additionally, three new patients became responders at week 72.[32] However, rates vary between studies, with a recent retrospective case series of 21 patients reporting only 33% of patients maintaining treatment response over two years.[33]

Teprotumumab is contraindicated in patients who are pregnant and carries a significant warning in patients with inflammatory bowel disorder.[5] Patients with pre-existing diabetes or hearing loss should be closely observed due to the risk of further hearing loss and hyperglycemia.[29,30] Some patients may experience treatment failure on teprotumumab, in which case tocilizumab and rituximab have previously been shown to be effective.[16,20] Tocilizumab is an interleukin-6 (IL-6) antagonist which prevents activation of orbital fibroblasts, adipogenesis, and production of pro-inflammatory cytokines and autoantibodies.[34] Rituximab inhibits activation of B-lymphocytes

through antagonism of the CD20 antigen, which prevents autoantibody formation.[35] Both agents are used off-label, and most studies agree that they achieve a modest effect in CAS reduction with little impact on proptosis.[16,20] A multicenter, randomized controlled trial was recently completed comparing IV tocilizumab to methylprednisolone in moderate-to-severe TED, which may provide further support for its use as a first-line therapy.[36]

Sight-threatening

In patients with severe, sight-threatening forms of TED as per the EUGOGO criteria, high-dose IV glucocorticoids remain the first-line therapy over newer therapies such as teprotumumab and tocilizumab.[16] Sight-threatening TED is characterized by serious complications such as compressive optic neuropathy and exposure keratopathy, requiring timely management to prevent permanent vision loss. Evidence supporting the use of teprotumumab in such cases is scarce, and glucocorticoids offer a more rapid anti-inflammatory effect than any other available therapy. Therefore, these patients should receive 500–1000 mg IV methylprednisolone for three consecutive days or more, or every second day for 1–2 weeks to reduce the risk of steroid-related adverse events.[16] According to the EUGOGO guidelines, if TED is refractory to high-dose glucocorticoids with deterioration of visual acuity or visual fields, urgent orbital decompression surgery is mandatory.[16] Significant keratopathy with risk of corneal melt also requires urgent surgery and antibiotic prophylaxis to avoid an open globe and sight-loss.[16]

Targeted Therapies

Novel TED therapies under investigation were identified by conducting a search of the World Health Organization International Clinical Trials Registry Platform, the European Union Clinical Trials Information System, and the United States National Institutes of Health Ongoing Trials Register. The search identified 24 unique targeted therapies under investigation for TED. The drug names, current status, and reference trial numbers are provided in **Table 1**.

Surgical Intervention

Surgical management of TED involves several interventions for sight-threatening complications, persistent functional impairment, and corrective surgery for aesthetic complications with severe psychosocial impacts. While mild TED is typically managed conservatively, facial appearance and quality of life may be affected with even subtle degrees of proptosis, eyelid retraction, or periorbital fat prolapse necessitating surgical intervention.[37] For moderate-to-severe disease, surgery is generally reserved for the inactive phase to correct changes in orbital anatomy following stabilization of inflammatory activity and achievement of euthyroidism.[5] In the setting of multiple surgeries, it was traditionally thought that a 3-step approach beginning with orbital decompression, followed by strabismus surgery, and finally eyelid surgery, would result in superior outcomes.[38,39] However, a recent systematic review found that the clinical benefit of this approach is minimal, further suggesting that a single combined surgery may achieve comparable outcomes while increasing efficiency.[40]

Although most patients with TED do not require surgical intervention, patients with hyperthyroidism refractory to medical therapy, compressive symptoms from a large goiter, and suspicious or malignant nodules may benefit from total thyroidectomy followed by lifelong thyroid hormone replacement therapy.[41,42] Orbital decompression may also be indicated in patients with dysthyroid optic neuropathy (DON), exposure keratopathy, or disfiguring/progressive proptosis.[43] Decompression alleviates elevated intraorbital pressure by expanding the orbital compartment through either removal of orbital walls, resection of orbital fat, or both. While decompression effectively improves visual function and reduces proptosis, complications may include new-onset diplopia, sensory disturbances, and sinus-related issues.[44]

Restrictive strabismus arises from fibrotic extraocular muscle involvement and may be exacerbated by prior decompression. Surgical correction is considered once ocular deviation has been stable for at least 4–6 months.[45] The goal of surgery is to restore or expand binocular single vision, most commonly through recession of affected rectus muscles.[45] Adjustable sutures may improve postoperative alignment, though residual diplopia may persist in severe cases, necessitating prism correction.[5]

Drug	Current Status	Registration Trial Number(s)
IBI311	Approved in China	-
Tocilizumab	Phase 2	NCT04876534
MHB018A	Phase 3	NCT06989918
Satralizumab	Phase 3	NCT05987423, NCT06106828
Teprotumumab	Approved in Canada	-
Linsitinib	Phase 2b	NCT05276063
Lu AG22515	Phase 1	NCT06557850
LASN01	Phase 2	NCT06226545
Rilzabrutinib	Phase 2	NCT06984627
IMVT-1402	Phase 2b	NCT07018323, NCT06727604
BHV-1300	Phase 1	NCT06980649
MER511	Phase 1	NCT07305818
Batoclimab	Phase 3	NCT05524571
CFZ533	Phase 2	NCT02713256
GenSci098	Phase 1	NCT06569758
Veligrotug	Pending FDA approval	NCT05176639, NCT06021054
AMG 732	Phase 1/2	NCT06401044
VV-14305	Phase 1/2	NCT07404111
ZL-1109/VRDN-003	Phase 3	NCT07211776
SCTT11	Phase 1/2	NCT06769984
Kamuvudine-9	Phase 1	NCT06467435
TOUR006	Phase 2	NCT06088979
ZB001	Phase 1	NCT05776121
Lonigutamab	Phase 1/2	NCT05683496

Table 1. Current Status of Novel Drugs Under Investigation for Treatment of Thyroid Eye Disease; *courtesy of Syed Ahmad, BSc, Abdelrahman Abuosba, BSc, and Ahsen Hussain, MD, FRCOphth.*

In addition to functional outcomes, oculoplastic surgeons should also consider aesthetic/cosmetic changes in the periocular region. Eyelid surgery may be indicated in patients with TED for Graves' associated upper eyelid retraction (GAUER), lagophthalmos, and periorbital fat prolapse, and is typically performed after decompression or strabismus correction.[5] GAUER is the most common indication and results from levator dysfunction and compensatory mechanisms, while lower eyelid retraction may require spacer grafts.[46] A recently published scoping review found that Botulinum Toxin A was the most effective non-surgical intervention to correct GAUER.[47] However, surgeries targeting the levator-Müller complex, including anterior levator disinsertion and Müllerectomy, represented the greatest average reduction in GAUER.[47] In cases of severe retraction or fibrosis, spacer grafting may be the most effective intervention.[47]

Although medical therapies reduce disease activity and anatomical severity in some patients, surgery remains essential for those with fibrotic disease, those refractory to medical therapy, or for acute sight-threatening complications.[5] Optimal outcomes are achieved through individualized surgical planning within a multidisciplinary TED care model.

Follow-up

In TED, longitudinal follow-up is essential due to the disease's variable clinical course and potential for irreversible vision loss. Follow-up strategies should be individualized based on disease severity, activity, and treatment modality. Patients with active TED should be reviewed at regular intervals, depending on severity and risk of progression, with more frequent follow-up in moderate-to-severe or sight-threatening disease. Most patients with mild TED require observation and symptomatic management; for these patients, follow-up every 3–6 months is generally sufficient unless symptoms worsen or new features develop.[5] If the activity of the disease is unclear or progression is suspected, a repeat assessment in 4–6 weeks is recommended to clarify the disease course.[5] Refractory disease requires reassessment of disease activity, treatment adherence, and modifiable risk factors. Indicators of clinical progression when managing TED include a rising EUGOGO severity or CAS score, and/or new/worsening symptoms. Failure to control TED with first-line therapy should prompt consideration of alternative treatments, referral to a specialized TED center, or surgical intervention as appropriate.

At each visit, assessment should include standardized evaluation of disease activity and severity using measures such as the CAS and EUGOGO classification.[48] A comprehensive ophthalmic examination should also be performed, including best-corrected visual acuity, colour vision, pupillary responses (including subjective and objective RAPD), IOP, ocular motility and diplopia assessment, exophthalmometry, corneal evaluation for exposure-related disease and optic nerve assessment. Visual fields, optic nerve imaging (such as ganglion cell and retinal nerve fibre layer analysis) and electrodiagnostic tests can be utilized to affirm the presence of optic neuropathy.[49-51] Orbital imaging is not routinely required in stable disease; however, noncontrast computed tomography (CT) may be used to assess disease severity via extraocular muscle size or optic neuropathy according to optic nerve and intraorbital changes.[52,53] Preoperative assessment for acutely indicated orbital decompression may also be conducted using non-contrast CT, as it is a fast and readily available imaging modality.[52] If contrast imaging is required, CT should be avoided due to the risk of developing Wolff-Chaikoff or Jod-Basedow phenomena, with possible worsening of thyroid eye disease.[54] Instead, gadolinium-enhanced magnetic resonance imaging (MRI) offers a safer alternative.[54] MRI also offers higher resolution of soft tissue changes and demonstration of compressive optic neuropathy, allowing TED to be differentiated from other orbital pathologies and to evaluate disease activity with T2 relaxation times.[52,55]

A summary flowchart of the proposed management for TED is provided in **Figure 1**.

Conclusion

TED is a complex extrathyroidal manifestation of autoimmune thyroid disease with the potential for significant morbidity. Whilst glucocorticoids remain foundational to TED treatment in many cases, recent advances in biologic therapies such as teprotumumab are revolutionizing the management of moderate-to-severe TED. There are ongoing clinical trials and advances in therapies which will impact future care, with approved therapies requiring further scrutiny in clinical practice. Optimal TED outcomes largely

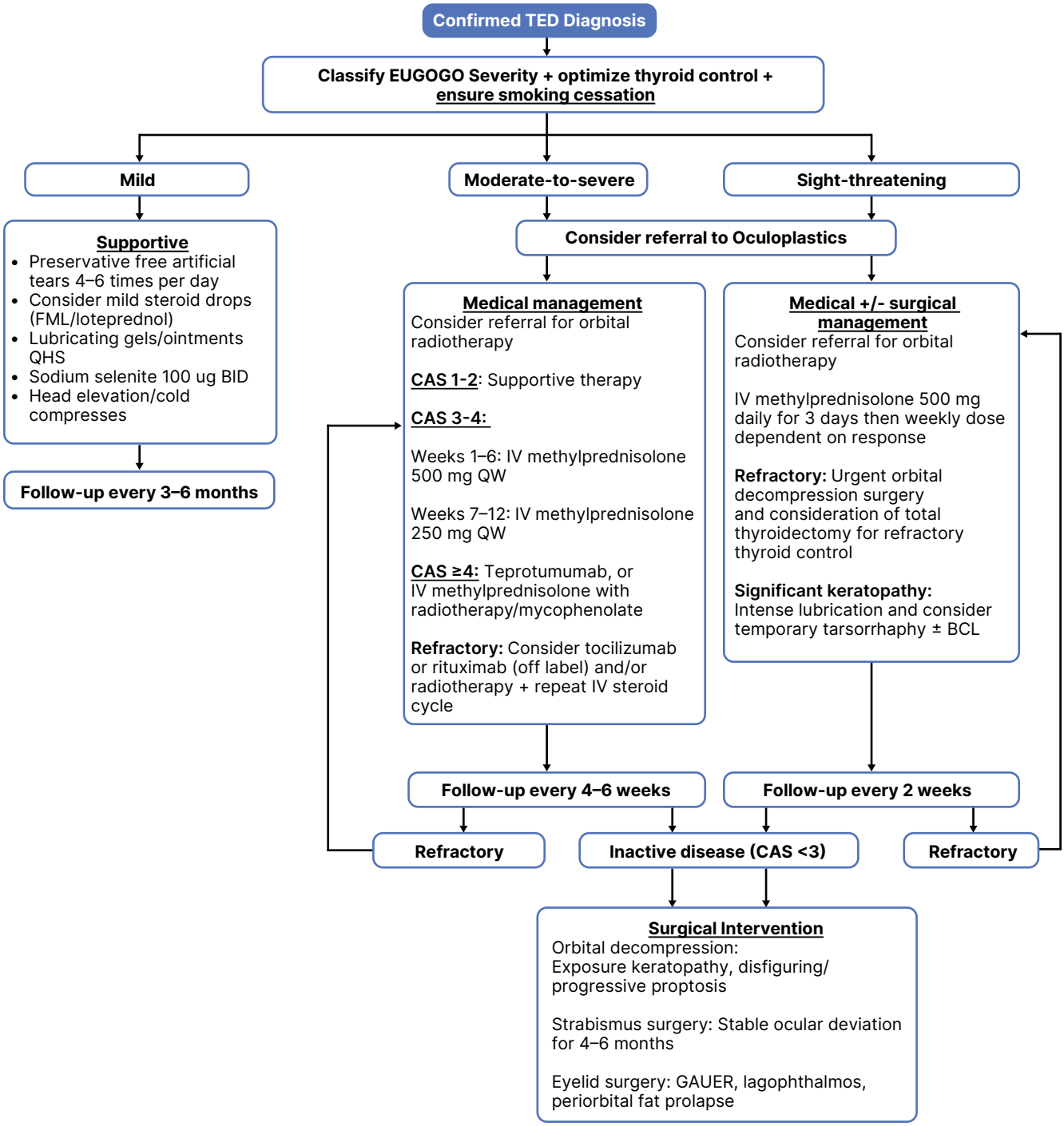

Figure 1. Summary flowchart for the management of thyroid eye disease*; *courtesy of Syed Ahmad, BSc, Abdelrahman Abuosba, BSc, and Ahsen Hussain, MD, FRCOphth.*

*Patients should always be counselled regarding the risks and benefits of treatment, and should be routinely monitored for adverse events when administering any of the recommended steroid, biologic, immunosuppressive, and/or radiation therapies. Incidence of severe complications should prompt immediate discontinuation of the offending therapy and consideration of alternative management strategies.

Abbreviations: BCL: bandage contact lens; **BID:** twice daily; **CAS:** clinical activity score; **EUGOGO:** European Group on Graves' Orbitopathy; **FML:** Fluorometholone; **GAUER:** Graves' associated upper eyelid retraction; **IV:** intravenous; **QHS:** nightly; **QW:** weekly; **TED:** thyroid eye disease

depend on accurate disease stratification, close longitudinal monitoring, and coordinated multidisciplinary care. Certain challenges remain, such as the long-term durability of biologic therapy, identifying predictors of treatment response, and clarifying the role of newer agents in less active or chronic disease. As therapeutic options continue to advance, refinement of individualized, evidence-based treatment algorithms will be essential to improving long-term outcomes for patients with TED.

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Dr. Myrna Lichter received her undergraduate and MD degrees from the University of Manitoba and completed her ophthalmology training at the University of Toronto. She followed this with a Pathology fellowship at AFIP in Washington, DC, and returned to Toronto to do comprehensive ophthalmology. She joined Saint Michael's Hospital as outdoor attending physician, and in 2000 was asked to run the HIV eye clinic, after Saint Michael's Hospital merged with the Wellesley Hospital. At her clinic she met a blind homeless Indigenous patient and recognized the need to do more for the homeless community. Since 2010, she has been actively involved in Eyecare for Homeless. She has visited over 50 shelters, given out hundreds of pairs of glasses (thanks to a generous donor), and encouraged many students who have volunteered with her over the years. She has also been involved with refugee vision screening, examining over 1000 refugees in collaborative clinics. She is director of Public Health and Global Ophthalmology at the university Department of Ophthalmology and is Vice Chair at CAPHGO (Canadian Association for Public Health and Global Ophthalmology for the Canadian Ophthalmological Society. She has won awards for her work, including EPSO Innovator of the year Award in 2015, Saint Michael's Urban Angel award, and the John Vincent Hughes Humanitarian award, as well as the Governor General Meritorious service decoration in 2024.

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My Experience in Advocacy for Eye Care

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Introduction

Advocacy is defined as" **the act or process of supporting a cause or proposal**; the act or process of advocating". When thinking about advocacy in the context of this article, three thoughts came to mind: **1)** Who was I advocating for–my patients? My profession? Myself? **2)** How did I go about advocating? **3)** What has changed because of my advocacy? The last question is perhaps the most difficult to address.

Patient advocacy is a process in health care concerned with advocacy for patients, survivors, and caregivers. When considering our most vulnerable patients—the homeless, the elderly, refugees, minority groups such as our First Nations, those with poor access to care, those with disabilities (mental and physical), and children—advocating for their care is a daunting task. Providing eyecare for the most vulnerable and advocating for their care has been a major goal of my group over the past decade.

I first explored providing eyecare for individuals experiencing homelessness and those who are marginally housed in Toronto in 2010 and received a Ministry of Health Grant. It was not until 2013, with the help of two medical students, that this initiative was accomplished. Our first study, published in *JAMA* in 2014,[1] detailed vision screening in 100 homeless adults living in shelters. Consistent with subsequent studies, we showed a 25% incidence of visual impairment, mostly refractive. More importantly, the study highlighted that patients who were unhoused had poorer access to care compared with the general population. The study was rudimentary, limited by poor follow up and an inability to ameliorate the situation. We repeated this screening the following year with unhoused youth living in shelters,[2] again finding visual impairment in approximately 20% of participants. Notably, this second study showed the impact of visual impairment on vulnerable youth, and their lived experiences.

In 2017, I received a substantial grant from a generous donor (Gerry Schwartz and Onyx Foundation) which enabled us to purchase better equipment. This funding allowed me to hire an assistant to facilitate our outreach visits. The funding also allowed me to prescribe and cover the cost for, eyewear, as well as to provide procedures not covered by the healthcare system. Findings from this more comprehensive study were subsequently published.[3] In collaboration with Nasrin Tehrani, a pediatric ophthalmologist, we also examined eyecare access among families living in shelters. This work showed that while children generally had good care, parents often neglected their own care.[4] One case remains particularly vivid: a woman who presented to my clinic shortly after obtaining permanent housing. She had been diagnosed with advanced glaucoma, but because of circumstances did not attend follow up.

By the time she presented to my clinic, she had irreversible vision loss, one of many tragic outcomes encountered through this work. My group went on to examine women who were survivors of violence or human trafficking,[5] Indigenous homeless adults and children, and individuals living in encampments during the COVID-19 pandemic.[6] My most recent "passion project" focuses on late-life homelessness, and the results of this work will be published soon.

The unhoused population is rapidly increasing. Historically, homelessness was most commonly associated with mental illness and addiction; however; economic pressures have now come to bear. As noted in a recent study: "*Homelessness in Toronto has more than doubled since 2021, with over 15,400 people experiencing homelessness as of late 2025, driven by a severe housing crisis, high cost of living, and, in many cases, evictions. Shelters are consistently at capacity, and the city is exploring solutions like micro-shelter communities to address the rising need.*" Similar trends are evident in other Canadian cities, including Vancouver (5200 people) as well as smaller cities such as Red Deer, Calgary, and Edmonton, which report higher per capita numbers of homeless individuals. Although people experiencing homelessness have other pressing health and social issues, poor vision increases the risk of violence, makes navigating their environment more difficult, and serves as a major barrier to employment or education.

I often ask myself whether this work (over 1000 unhoused patients seen) makes a meaningful difference? I believe it did. The work with the Women Victims of Violence group had a very positive effect; many of these women were returning or participating in the workforce after escaping domestic violence, and good vision was certainly an asset. Among older adults experiencing late-life homelessness, access to proper eyecare, including expedited cataract surgery, glaucoma diagnosis and management, as well as free corrective eyewear, did improve the quality of their lives. For the rest of my patients, I can say unequivocally that the work mattered. One of the ministers at the church participating in the "Out of the Cold" program, recently shared that during our church visits, a patient who received glasses subsequently got a haircut, and re-joined the work force. I cannot overemphasize that benefit is not only to our patients, but to our learners and all who participate in these visits. I am sure my friend and colleague Benoit Tousignant (who does similar work in Montreal) will agree, that the attitudinal change in treating these patients spreads into clinic and emergency settings.

The next group that I would like to discuss is newcomer (refugee) vision screening. Following the outbreak of the civil war in Syria, large numbers of people were displaced and resettled to Canada as refugees. When a student approached me with the idea of a refugee vision screening clinic, I readily agreed. We held five screening clinics between July 2016 and November 2017. This was a very collaborative effort, partnering with Mes Amis Canada (a volunteer group), as

well as a team of volunteer ophthalmologists, optometrists, medical students, residents and technicians. In total we screened 248 adults and 274 children.[7,8] Among the adults 27% were found to have uncorrected vision problems, nearly 19 times the Canadian average. Other diagnoses included cataract, glaucoma, and other retinal diseases. One family encountered at our first clinic was particularly poignant. A young man presented with his elderly parents and his two dysmorphic siblings in their forties.

After carefully examining his siblings, it was determined that they had retinitis pigmentosa. Upon examining the young man who brought them in, it was determined that he also had early retinitis pigmentosa. He had a wife and four children at home. Fortunately, we were able to refer him for excellent retinal care, as well as appropriate social supports.

Did advocating for this refugee population have a measurable impact? Unequivocally yes. We subsequently applied a similar model with Afghan refugees,[9] conducting five clinics at Saint Michael's Hospital. Again 350 newcomers were examined, and their results paralleled the Syrian study. Similar studies have been planned in London, Ontario and by other organizations such as Forsee Canada, which recently published their results in *BMJ*.[10] This screening is not without its difficulties, including language barriers, transportation to screening sights, organizing and recruiting examiners, as well as food and entertainment for participants.

A survey conducted in 2025 identified 73,000 refugees living in Canada, originating from a wide range of countries, including Nigeria, Uganda, Congo, and Ethiopia.[11] In response to the ongoing needs of these and other underrepresented populations, I currently lead a clinic at Kensington Eye Institute that serves multiple shelters as well as the Canadian Centre for Victims of Torture.

Through a generous grant to Kensington Eye Institute, I conduct clinics at least once a month seeing up to 25 patients per session, from various shelters and organizations serving the underrepresented populations of Toronto. These clinics provide free eye examinations (regardless of insurance coverage), along with free glasses and procedures as needed, and a referral to specialists as needed.

It has now been over ten years since this program has started, during which time over 1,000 individuals experiencing homelessness and 1,000 refugees have received free eyecare. I lead the Public Health program at the department of Ophthalmology at the University of Toronto. I have been very fortunate to work alongside a wonderful chair (and friend), Marie-Josee Aubin at the Canadian Association for Global Health and Public Ophthalmology (CAPHGO) within the Canadian Ophthalmological Society (COS) The aim is to bring those of us in the field working together to promote the needs of those who are largely under-represented. In the upcoming year, my group is planning to start a project with refugee and unhoused youth, providing free eyecare, as well as comparing their experiences and needs. We are also exploring a small project engaging the First Nations community, under their guidance and leadership.

Much of my advocacy has focused on underrepresented urban populations; however, it would be remiss not to acknowledge one of our most vulnerable populations, the First Nations communities. Self-advocacy has resulted in some meaningful changes for the community, including the institution of OCAP rules governing First Nations research: The OCAP® principles are a framework governing ethical research and data governance with First Nations communities in Canada. OCAP, which stands for Ownership, Control, Access, and Possession, provides an ethical framework for research and data governance, affirming that Indigenous peoples have authority over data collected about them and their communities.

The framework was developed by the First Nations Information Governance Centre (FNIGC) to address the historical misuse and exploitation of Indigenous data in research. OCAP establishes that Indigenous communities have the right to own, control, access, and physically possess data about themselves, ensuring ethical and respectful research relationships.[12] It is known that Indigenous people have a higher burden of eye disease and face barriers to accessing care due to geography, jurisdictional complexity, and racism. A notable example of community-engaged advocacy is the Indigenous Children's Eye Examination (ICEE) program spearheaded by Dr. Kourosh Sabri.[13] ICEE travels to remote communities, delivering eyecare to children in a compassionate and culturally respectful manner. Program details are provided below, and volunteer participation is welcomed. Similarly, Dr. Christian El Hadad travels eight times a year to Nunavut, with students. He and his student developed

eye charts in Inuktitut, Cree and Ojibway to better service those communities.[14,15] My group also embarked on a project looking at homeless Indigenous adults and children in Toronto. Data were collected and shared with the community with the intention that these findings can be purposed to benefit them. It was an enlightening experience to engage with many survivors of generational trauma and witness their resilience. The advocacy for better eyecare for First Nations did result in the Non-Insured Health Benefit (NIHB) program, a program covering eye examinations, glasses or contact lenses, replacement glasses, and vision aids.

Many underrepresented groups in Canada continue to require focused attention. Many rural communities are underserviced. Initiatives such as the Eye Van,[16] servicing northern Ontario communities since 1972, the Timmins project,[17] collaborating with University of Toronto; FYi doctors' mobile optometry clinics, and Indigenous Mobile Eye Clinics provide important services. However, wait lists and geographic barriers remain substantial, particularly for routine procedures such as cataract surgery, intravitreal injections for age related eye disease, and diabetes. Advances in teleophthalmology with AI capabilities may improve care in these areas. Many groups across the country have expanded their teleophthalmology practices. In Toronto, my group is developing a project comparing portable equipment with smartphone capability to conventional equipment, and we have just received RIB approval. I look forward to forming a nationwide collaborative group soon.

There is also a substantial need for advocacy in eyecare internationally, and many groups are involved. ORBIS,[18] for example, provides eyecare services and education internationally. The Department of Ophthalmology and Vision Services (DOVS) at University of Toronto supports an outreach program with resident involvement in Costa Rica, and my group supports a program in Nigeria, supplying eye surgery and glasses for children.[19] There are many more opportunities to support global eye health.

The federal government introduced a private member's bill—Bill C-284, the Canadian federal law called the National Strategy for Eye Care Act, introduced by Judy Sgro, the Member of Parliament for Humber River—Black Creek. The bill was introduced in June 2022 as a private member's bill and received Royal Assent on November 7, 2024, thereby becoming law in Canada. Its goal is to establish a national strategy for eye care in Canada. I had the privilege of attending a research meeting related to this bill, along with approximately 50 other participants.

My group represents only a small part of the advocates for better eyecare in the country. Through COS, as well as other organizations, I hope that we can have collective meetings to learn and benefit from each other.

Conclusion

I would like to conclude with a less frequently discussed topic—advocating for yourself. It is neither possible nor sustainable to care about everything. Within your limits, you can choose a focus—whether volunteering with the Eye Van, participating in the Timmins project, engaging in international missions, or supporting refugee vision screening clinics. Each contribution, no matter its scope, advances advocacy for underrepresented populations. We all are finite, each "paddling our kayaks down the river." It is important to enjoy the journey, even if there are rough waters. I encourage everyone to advocate for yourself, and find what gives you joy.[20]

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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

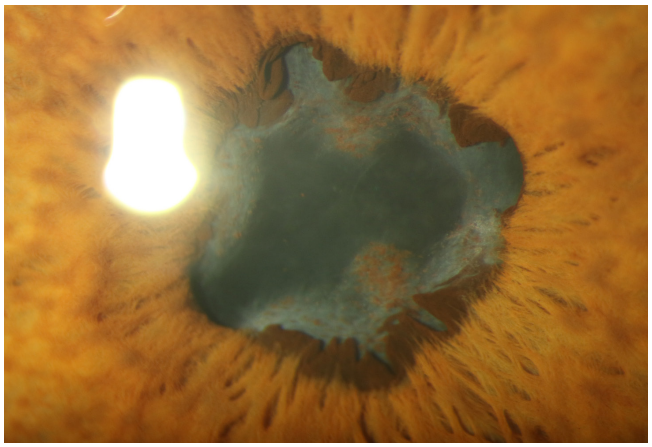

Figure 1. Dense posterior synechiae with partial fibrinous pupillary membrane in a patient with chronic uveitis secondary to sarcoidosis; *courtesy of Asma Alzuabi, MD and Eric Fortin, MD, FRCSC.*

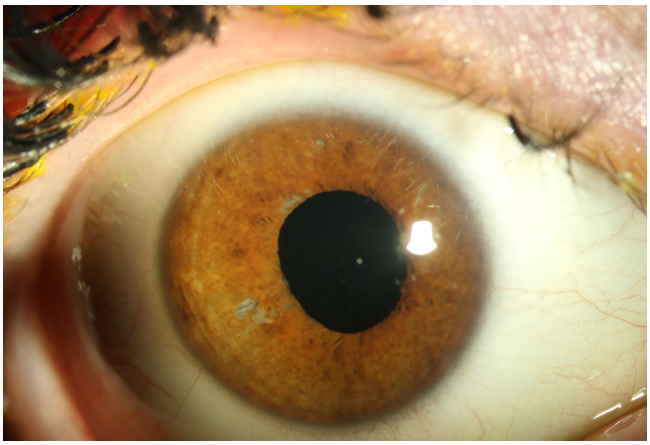

Figure 2. Post-operative appearance following cataract surgery with mechanical pupillary dilation; *courtesy of Asma Alzuabi, MD, and Eric Fortin, MD, FRCSC.*

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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