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Clinical Case Report

Two-Step Approach in the Management of Angle-Closure Glaucoma Associated with Plateau Iris Configuration

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Key Points:

- Innovative two-step approach combining double-arc slow-coagulation transscleral cyclophotocoagulation protocol and cataract surgery in plateau iris angle-closure glaucoma
- Significant intraocular pressure reduction without filtering surgery
- Alternative treatment to combined cataract extraction and trabeculectomy in advanced angle-closure glaucoma cases

Abstract

Angle-closure glaucoma (ACG) is a major cause of visual impairment globally, with plateau iris syndrome presenting particular management challenges due to its unique anatomical features. This case report describes a two-step approach for managing uncontrolled ACG in a patient with plateau iris configuration: transscleral cyclophotocoagulation (TSCPC) followed by cataract extraction. It describes a 58-year-old female with advanced uncontrolled ACG and plateau iris configuration. Her ocular history only included laser peripheral iridotomy. At the presentation, she was on three glaucoma medications. Gonioscopy revealed occludable angles in both eyes, with extensive peripheral anterior synechiae in the right eye (OD) and localized in the left eye (OS). Indentation gonioscopy showed the double hump sign. Due to higher intraocular pressure (IOP) and extensive PAS in OD, a two-step approach was utilized: a slow-coagulation TSCPC using the recently published double-arc protocol followed by cataract extraction with intraocular lens (IOL) implantation. As the OS presented with lower IOP and less PAS, cataract extraction with IOL implantation was performed. Postoperatively, the IOP decreased from 25 to 13 mmHg in the OD and from 17 to 14 mmHg in the OS. Visual acuity improved to 20/20 in both eyes, and the number of hypotensive eye drops was reduced. No significant complications were observed. This case highlights the TSCPC as an alternative to traditional combined surgeries, like trabeculectomy, and underscores the potential of a staged surgical approach in managing ACG with plateau iris. The two-step approach provides a promising treatment strategy, particularly in patients with complex anatomical challenges.

Introduction

Angle-closure glaucoma (ACG) is a significant cause of visual impairment worldwide, especially in populations with a high prevalence of anatomically predisposing factors such as hyperopia and shallow anterior chamber depth. Unlike primary open-angle glaucoma, ACG is characterized by elevated intraocular pressure (IOP) due to impaired drainage of aqueous humor, often resulting from anatomic abnormalities that cause the iris to block the trabecular meshwork. Among the various forms of ACG, plateau iris syndrome presents unique management challenges due to its distinct anatomical configuration, where the iris root angulates forward, often requiring more complex treatment strategies than typical cases of angle-closure disease [1-4].

Laser peripheral iridotomy (LPI) remains the first-line treatment for angle-closure by creating an alternative pathway for aqueous humor flow, but it is often

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insufficient in cases with persistent IOP elevation or extensive peripheral anterior synechiae (PAS) formation [1-3]. Cataract extraction alone has emerged as a viable option for managing many cases of ACG by deepening the anterior chamber and widening the angle, thus relieving IOP [5,6]. However, in eyes with more advanced disease or additional anatomical challenges, such as those posed by plateau iris configuration, cataract extraction alone may not achieve adequate IOP control, necessitating combined or sequential surgical interventions [7-9]

While combined cataract extraction and trabeculectomy have traditionally been employed to manage more advanced cases of ACG, they carry a higher risk of complications, including hypotony, bleb-related infections, and malignant glaucoma, particularly in eyes with plateau iris [7-9]. An alternative approach that avoids the need for a filtering procedure involves a two-step strategy, utilizing transscleral cyclophotocoagulation (TSCPC), with Double-Arc Slow-Coagulation TSCPC (DA-TSCPC) laser protocol, followed by cataract extraction, which may offer a safer and more effective option for complex cases [10].

After conducting a literature review on September 16th of 2024 utilizing PubMed, using the key words "Transscleral Cyclophotocoagulation" and "plateau iris", we found one case-report of a successful treatment of ACG and plateau iris with combined early cataract extraction, goniotomy, and slow-coagulation TSCPC. However, we did not find any prior reports involving the two-step strategy (DA-TSCPC laser protocol followed by cataract extraction). So, this case report presents a strategy for a patient with uncontrolled ACG and plateau iris configuration, providing insights into the benefits and considerations of a staged surgical approach.

Case Report

A 58-year-old white female patient was referred to our service for surgical evaluation due to uncontrolled ACG. She had been treated for the condition over the past nine years and had no systemic comorbidities. Her previous ocular history included LPI in both eyes, but no intraocular surgeries. At the presentation, she was using three different glaucoma medications in both eyes.

On ocular examination, her best-corrected visual acuity (BCVA) was 20/25 in both eyes, with mild hyperopia. The IOP was 25 mmHg in the right eye (OD) and 17 mmHg in the left eye (OS). Biomicroscopy revealed mild cataracts in both eyes, with a shallow peripheral anterior chamber but a relatively deep central anterior chamber. Gonioscopy showed occludable angles in both eyes, with extensive areas of PAS in the OD and appositional angle closure with a few localized areas of PAS in the OS.

During indentation gonioscopy, the double hump sign was observed. Fundus examination revealed enlarged disc cupping in both eyes, more pronounced in the OD, with significant neuroretinal rim thinning. These clinical findings were further corroborated by structural and functional assessments through optical coherence tomography and visual field tests. Ultrasound biomicroscopy showed a plateau iris configuration in both eyes (Figure 1).

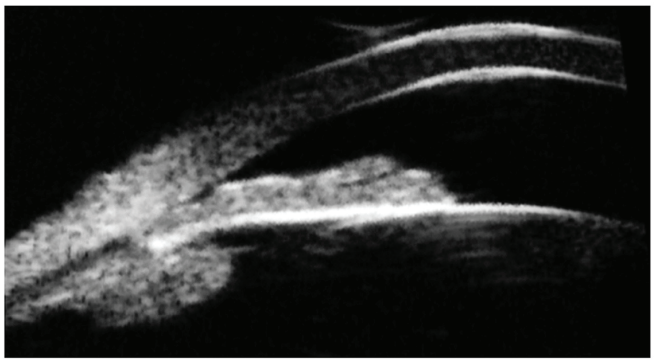

Figure 1: Ultrasound biomicroscopy before surgery.

Given these clinical findings, we decided on different surgical approaches for each eye. For the OS, which presented with lower IOP values and less PAS, cataract extraction with intraocular lens (IOL) implantation was performed. For the OD, due to higher IOP, extensive PAS, and more advanced disease, a two-step approach was indicated. The first step involved a slow-coagulation TSCPC using the recently published DA-TSCPC protocol [10]. Two months later, cataract extraction with IOL implantation was performed. In brief, for the DA-TSCPC technique, we used a conventional 810nm wavelength diode laser (Lightmed Corporation, San Clemente, CA) with a glaucoma laser probe (Lightmed Corporation, San Clemente, CA). The laser settings were 1400mW, with a duration of 4000ms. The procedure was performed in the operating room, under peribulbar anesthesia, using microscope and transillumination to determine the ciliary body position (Figure 2). A total of 28 applications were

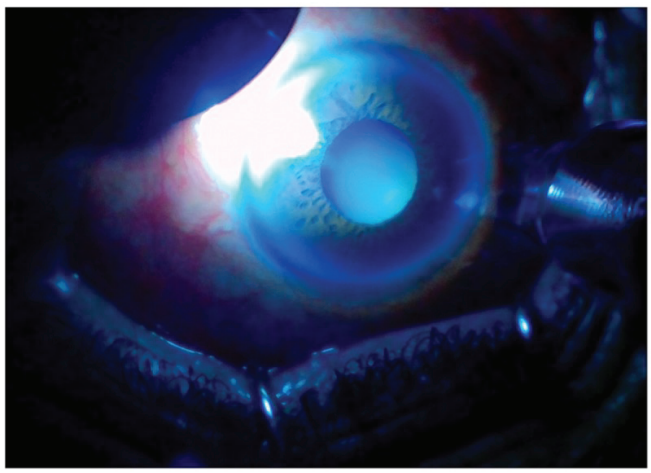

Figure 2: The position of the ciliary body determined by transillumination.

divided into two rows (upper and lower arcs – Figure 3). For each arc, it was applied 7 spots over the ciliary body shadow (peri-limbal dark band) and 7 spots 1.5mm behind, sparing the 3 and 9 o'clock meridians to avoid injury of the long ciliary blood vessels and nerves. During the postoperative period it was prescribed 0.1% nepafenac 4 times/day for 15 days, and 1% prednisolone acetate 4 times/day, with gradual tapering according to subsequent evaluations.

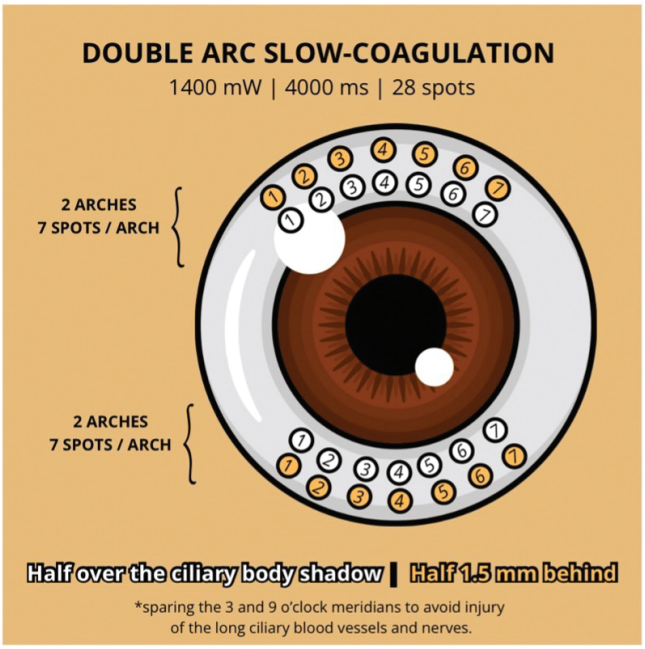

Figure 3: The double-arc slow-coagulation transscleral cyclophotocoagulation technique has a total of 28 applications, divided into two rows (upper and lower arcs).

Postoperatively, cataract extraction in the OS led to a significant reduction in IOP. After six weeks, the IOP was 14 mmHg with only two topical medications in this eye. In the OD, six weeks after DA-TSCPC, the IOP was reduced to 13 mmHg on three topical medications. The cornea was clear, with no anterior chamber reaction. Following cataract extraction, there was an additional reduction of one topical medication in this OD. At six months postoperatively, the BCVA remained 20/20 in both eyes, with IOPs of 14 mmHg in the OD and 12 mmHg in the OS. The medication regimen remained the same in both eyes.

Discussion

The present case illustrates the complexity of managing ACG, especially in eyes with plateau iris configuration. While many cases of ACG can be managed effectively with isolated cataract extraction [5], eyes with uncontrolled IOP and more advanced damage often require a combined procedure. Traditionally, combined cataract extraction and trabeculectomy have been employed in such cases [7-9].

However, combined procedures in eyes with ACG can be challenging, particularly in the presence of plateau iris. It has been shown that the anatomical configuration of plateau iris is a risk factor for postoperative malignant glaucoma [11,12] This requires exploring different surgical methods that can minimize complications and improve safety in managing these complex cases.

In this case, a two-step approach was adopted for the OD instead of a conventional combined procedure. By performing DA-TSCPC prior to cataract extraction, we avoided the need for a filtering procedure and reduced the risk of ocular decompression. It should be noted that diode laser TSCPC has been successfully used to treat cases of chronic ACG [13-15], with a one-year success rate over 80% [13]. Moreover, this approach has several advantages, including a simpler surgical technique, more predictable refractive outcomes, and more straightforward postoperative management with fewer office visits.

One should emphasize the possible risks and complications associated with TSCPC, such as corneal ulcer, prolonged inflammation and hypotony. However, while investigating the one-year safety profile of the slow-coagulation DA-TSCPC protocol, we have recently shown that these complications are uncommon and transitory, especially in eyes with better visual prognosis. [10]

Conclusions

In sum, this case highlights the potential of using TSCPC as a preparatory step before cataract extraction in eyes with plateau iris. This strategy may offer a safer and more efficient alternative to traditional combined procedures. It is important to note that this case is part of an ongoing prospective study, and the one-year results will be published soon. Further studies with larger sample sizes and longer follow-up periods are needed to confirm the safety and efficacy of this two-step approach in managing uncontrolled ACG cases.

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Abbreviations

1. ACG: angle-closure glaucoma
2. BCVA: best-corrected visual acuity
3. DA-TSCPC: double-arc slow-coagulation transscleral cyclophotocoagulation
4. IOL: intraocular lens
5. IOP: intraocular pressure
6. LPI: laser peripheral iridotomy
7. OD: right eye (oculus dexter)
8. OS: left eye (oculus sinister)
9. PAS: peripheral anterior synechiae
10. TSCPC: transscleral cyclophotocoagulation