E-ISSN: 3050-9459
Journal of Ophthalmology and Advance Research

ATHENAEUM SCIENTIFIC PUBLISHERS

Case Report

Peripheral Corneal Burns and Presumed Limbal Stem Cell Deficiency Following Transscleral Diode Cyclophotocoagulation: A Case Report

Saleena Nurmohamed[1*], Ojasvi Sharma[1], Habib Khan[1], Monali Chakrabarti[1]

[1]Royal Free London NHS Foundation Trust, UK

***Correspondence author:** Saleena Nurmohamed, Royal Free London NHS Foundation Trust, UK; Email: saleena.nurmohamed1@nhs.net

Citation: Nurmohamed S, et al. Peripheral Corneal Burns and Presumed Limbal Stem Cell Deficiency Following Transscleral Diode Cyclophotocoagulation: A Case Report. J Ophthalmol Adv Res. 2026;7(2):1-5.

https://doi.org/10.46889/JOAR.2026.7212

Received Date: 29-05-2026

Accepted Date: 22-06-2026

Published Date: 29-06-2026

Abstract

Background: Transscleral diode cyclophotocoagulation (cyclodiode laser) is an established treatment for refractory glaucoma which reduces aqueous humour production through targeted ablation of the ciliary body, thus reducing intraocular pressure. Though considered relatively safe, inappropriate probe positioning or excessive anterior treatment may cause thermal injury to adjacent ocular structures. Corneal burns and limbal stem cell deficiency are uncommon but potentially sight-threatening complications.

Case Presentation: A 78 year old male with left neovascular glaucoma on a background of proliferative diabetic retinopathy and rubeosis iridis underwent left eye inferior 180° cyclodiode for poorly controlled intraocular pressure despite maximal topical therapy. The laser was set to a power of 1500 to 2000 milliwatts and duration of 1500 to 2000 milliseconds with eighteen applications. The postoperative note highlighted burns on some laser spots with subsequent reduction in the duration and power. Within days of receiving cyclodiode the patient developed severe ocular pain, photophobia, foreign body sensation and keratitis. There was a progressive reduction in visual acuity in the left eye from 6/18 preoperatively to hand movements vision in two months. There was associated corneoscleral thinning, severe corneal burns and ocular surface instability which was clinically consistent with iatrogenic limbal stem cell deficiency secondary to thermal injury.

Conclusion: This case demonstrates a rare but serious anterior segment complication following cyclodiode. It highlights the importance of meticulous technique, correct probe positioning, careful energy titration and awareness of limbal anatomy to minimise the risk of anterior segment injury. Early recognition and management of complications may improve long term visual outcomes.

Keywords: Cyclodiode; Transscleral Diode Cyclophotocoagulation; Refractory Glaucoma; Neovascular Glaucoma; Corneal Burn; Limbal Stem Cell Deficiency

Introduction

Transscleral diode cyclophotocoagulation, commonly known as cyclodiode laser, is an established treatment used to manage refractory and neovascular glaucoma. It can also be used in non-surgical patients and those who are non-compliant with treatment and is therefore increasingly seen as a primary treatment option. It involves the transscleral application of infrared light which causes destruction of the ciliary body epithelium, resulting in a reduction in aqueous humour production and therefore a lower intraocular pressure [1].

Despite being a relatively straightforward procedure, some common complications of cyclodiode include: red eye, sore eye, conjunctival burns, conjunctival hyperpigmentation and transient anterior chamber inflammation. More rare but significant risks include: loss of visual acuity, hypotony, phthisis bulbi, vitreous and choroidal haemorrhage, hyphaema, cataract formation, scleral perforation, lens subluxation, sympathetic ophthalmia and malignant glaucoma. Complications involving the cornea are uncommon but can be sight-threatening specifically when limbal structures are affected [1-4].

The corneal limbus contains the palisades of Vogt which house epithelial stem cells essential for ongoing corneal regeneration and maintaining ocular surface integrity. Thermal damage to this area can lead to limbal stem cell deficiency with clinical features of progressive visual loss, corneal neovascularisation, conjunctivalisation, stromal scarring, impaired epithelial regeneration and persistent epithelial defects [5,6].

This present case demonstrates severe peripheral corneal burns and suspected iatrogenic limbal stem cell deficiency following inferior cyclodiode laser treatment for the management of neovascular glaucoma.

Case Report

Presentation to Clinic

A 78 year old male presented with severe ocular pain, photophobia, foreign body sensation and keratitis. On examination, corrected visual acuity was 6/6 in the right eye and 6/18 in the left eye which improved to 6/9 with pinhole. Intraocular pressure was 23 mmHg in the right eye and 34 mmHg in the left eye despite maximal topical therapy.

The past ocular history included bilateral diabetic macular oedema, bilateral cataract, left rubeosis iridis, left epiretinal membrane and past ocular procedures included previous left panretinal photocoagulation, left cycloablation, left selective laser trabeculoplasty, left laser peripheral iridotomies and intravitreal injections. There was also a past medical history of type 2 diabetes mellitus, hypertension and asthma.

Gonioscopy showed open angles bilaterally and optic disc assessment demonstrated a normal cup to disc ratio of 0.7 in the right eye and 0.9 in the left. Corneal thickness was also in the normal range bilaterally, measuring 512 micrometres in the right eye and 501 micrometres in the left. In view of the patient's persistently elevated intraocular pressure and progressive neovascular glaucoma, he was listed for inferior 180° cyclodiode laser of his left eye.

Procedure

Cyclodiode laser was performed in December 2025 using an OcuLight SLx 810 nanometre infrared laser. Eighteen laser applications were delivered with power settings ranging from 1500 to 2000 milliwatts and treatment durations of 1500 to 2000 milliseconds. During the procedure, minor burns were noted at several treatment sites, prompting a reduction in both laser power and duration. Postoperatively, the patient was prescribed Maxitrol ointment three times daily for one week and Maxidex eye drops six times daily for one month.

Early Phase Postoperative Issues

The patient presented to eye clinic casualty six days after cyclodiode laser treatment with severe ocular pain (8/10 in severity), photophobia, foreign body sensation and keratitis. Examination of the left eye demonstrated a reduction in left visual acuity from 6/18 preoperatively to 6/24 postoperatively and a reduced intraocular pressure of 26 mmHg. There were associated cyclodiode scars and corneal epithelial abrasion. The patient was treated with topical Chloramphenicol and Cyclopentolate in addition to his ongoing glaucoma drops.

Intermediate Phase Postoperative Issues

The patient re-presented to the eye clinic one month after cyclodiode laser treatment with ongoing ocular pain and worsening photophobia and blurred vision. Visual acuity had deteriorated further to 6/60 in the left eye, improving to 6/36 with pinhole. Eye examination showed keratitis, persistent anterior chamber inflammation with 2+ cells and regressing neovascularisation of the iris. Treatment was escalated with topical Atropine and corticosteroids as well as Acetazolamide and simple eye ointment.

Late Phase Postoperative Issues

On follow up two months after cyclodiode laser, despite treatment there was progressive ocular surface instability. As a result, the patient's visual acuity had deteriorated to hand movements in his left eye. Examination of the left eye revealed severe cyclodiode related corneoscleral thinning and corneal burns corresponding to the treated inferior hemisphere. Due to progressive corneal thinning, most topical glaucoma medications were stopped to reduce the risk of further ocular surface damage. The plan was for trabeculectomy or preserflo if the intraocular pressure exceeded 30 mmHg to help preserve the cornea. The clinical features and progression of symptoms were consistent with severe thermal injury involving the limbus which resulted in presumed iatrogenic limbal stem cell deficiency (Fig. 1).

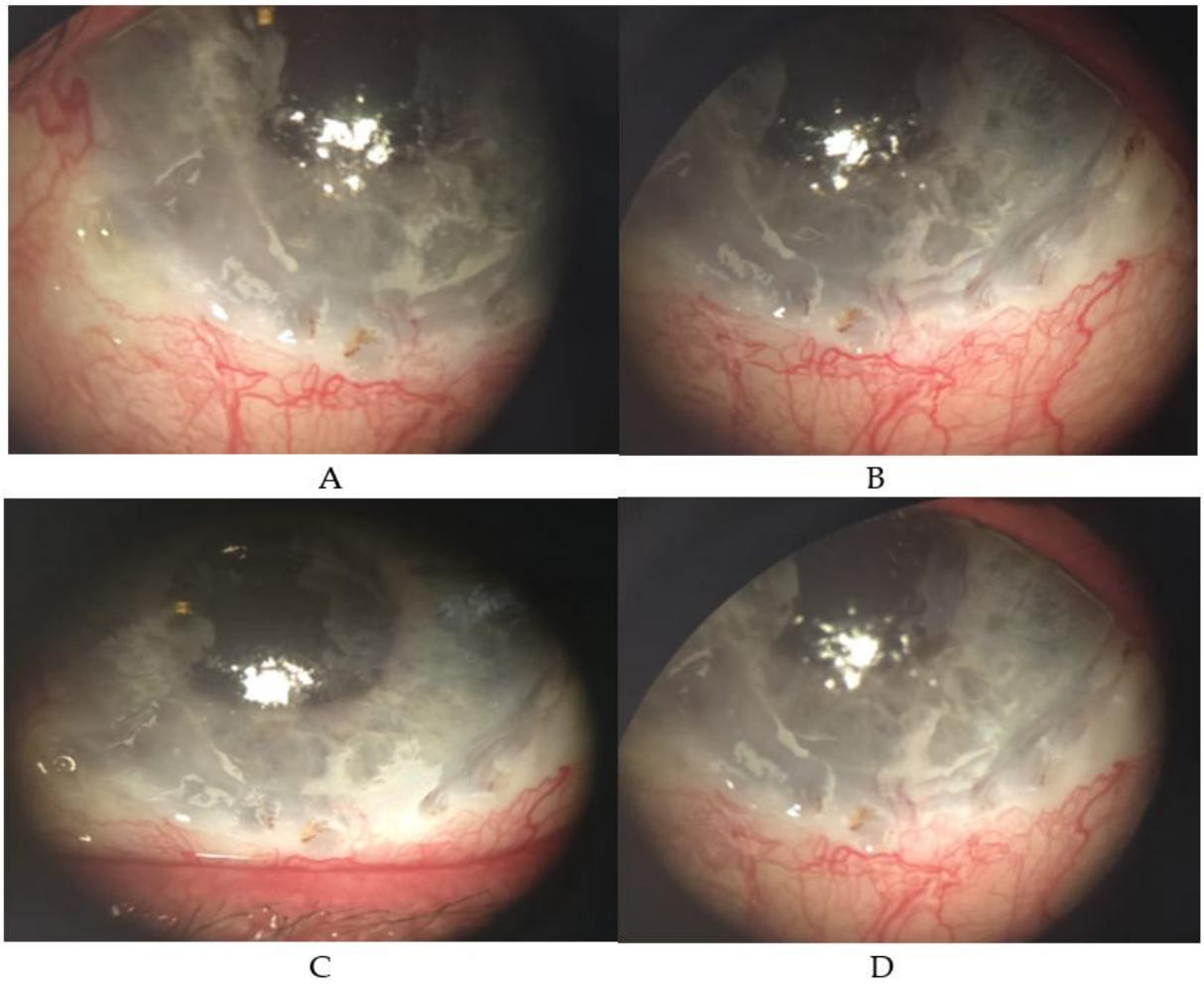

Figure 1: Slit-lamp photographs of the left eye following transscleral diode cyclophotocoagulation demonstrating features consistent with thermal limbal injury and presumed limbal stem cell deficiency. A: Inferior peripheral corneal opacification with adjacent superficial corneal vascularisation involving the treated inferior hemisphere; B: Inferior limbal conjunctivalisation and superficial vascularisation extending onto the peripheral cornea, consistent with limbal stem cell dysfunction; C: Extensive inferior corneal epithelial irregularity and stromal haze with associated corneoscleral thinning corresponding to the treatment zone, D: Composite view demonstrating diffuse inferior corneal opacification, conjunctivalisation and superficial vascularisation, illustrating the overall extent of thermal ocular surface injury following cyclodiode laser treatment.

Discussion

Cyclodiode laser is an established treatment for advanced refractory glaucoma, particularly in patients with neovascular glaucoma, limited visual potential, high surgical risk and poor compliance to topical treatment. The procedure is considered safe and effective in reducing intraocular pressure, however due to the destructive nature of the treatment, there is a risk of thermal injury to adjacent ocular structures [2,7].

Correct cyclodiode technique requires accurate identification of the ciliary body, often aided by transillumination, to ensure that laser energy is directed towards the pars plicata rather than adjacent anterior segment structures. The probe is typically positioned 3 to 3.5 millimetres posterior to the limbus and treatment is delivered while avoiding the 3 and 9 o'clock meridians to minimise injury to the long posterior ciliary nerves and vessels. Laser energy is gradually titrated until an audible "pop" is heard and then reduced slightly, as repeated popping may indicate overtreatment and excessive tissue disruption. These technical principles are important because inaccurate probe positioning or excessive energy delivery can increase the risk of unintended thermal injury to the cornea and limbus. In the present case, the documented intraoperative burns and subsequent development of corneal burns, corneoscleral thinning and presumed limbal stem cell deficiency suggest that thermal injury may have occurred despite energy adjustment during the procedure (Fig. 1) [3,5,6].

The limbus is a rim of tissue located at the junction between the cornea and sclera. It contains the palisades of Vogt which house epithelial stem cells essential for ongoing corneal epithelial homeostasis. Thermal injury to the limbus can lead to ischemia which impairs normal epithelial renewal. If healthy corneal epithelium is not present, the conjunctiva can proliferate over the cornea which leads to corneal opacification and vascularisation. This subsequently can cause persistent epithelial defects resulting in chronic inflammation, progressive visual deterioration, superficial vascularisation and stromal scarring [6,8-10].

Limbal stem cell deficiency is an uncommon disorder that may arise from a range of primary and secondary causes, most commonly severe chemical or thermal injury. In the present case, the combination of peripheral corneal burns, conjunctivalisation, superficial vascularisation, corneoscleral thinning and progressive ocular surface instability was clinically consistent with partial limbal stem cell deficiency secondary to thermal limbal damage. The close anatomical correlation between the affected inferior corneoscleral region and the treated inferior hemisphere further supports a likely association between cyclodiode laser delivery and the subsequent ocular surface changes [8].

Merits of Procedure

This case has important future implications for clinical practice, training and postoperative monitoring. As cyclodiode laser continues to be used for refractory and neovascular glaucoma, clinicians should be aware that anterior segment thermal injury, although rare, can result in significant ocular morbidity. Future practice should emphasise structured operator training, careful identification of limbal and ciliary body anatomy, accurate probe positioning, avoidance of areas of scleral thinning or previous surgery and cautious energy titration. Postoperatively, persistent pain, photophobia, epithelial instability or progressive corneal changes should prompt early assessment for possible limbal injury and timely referral to a corneal specialist. Greater awareness of this complication may help prevent delayed diagnosis, reduce progression to established limbal stem cell deficiency and improve long-term visual outcomes [5,6].

Conclusion

Limbal stem cell deficiency following transscleral diode cyclophotocoagulation is a rare but significant complication that can lead to permanent visual loss. This case demonstrates corneal burns, corneoscleral thinning and suspected limbal stem cell deficiency following left eye inferior 180° cyclodiode laser for refractory neovascular glaucoma. Meticulous cyclodiode technique and particular attention to probe positioning, energy titration and limbal anatomy awareness is essential to minimise risk of damage to adjacent intraocular structures. Early recognition and management of postoperative complications may reduce progression and improve long term visual outcomes.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial or non-profit sectors.

Acknowledgement

The authors thank the Worcestershire Acute Hospitals NHS Ophthalmology team involved in the patient's care.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethical Statement

In accordance with the UK Health Research Authority and NHS Research Ethics Committee guidance, this work was considered a case report and therefore exempt from formal ethical review.

Informed Consent Statement

Informed consent was obtained from the patient and there is no patient identifiable information in this article.

Authors' Contributions

All authors contributed equally to this paper.

References

1. Spencer AF, Vernon SA. "Cyclodiode": Results of a standard protocol. Br J Ophthalmol. 1999;83(3):311-6.
2. Bloom PA, Tsai JC, Sharma K, Miller MH, Rice NSC, Hitchings RA. Efficacy and safety of contact transscleral diode laser cyclophotocoagulation for advanced glaucoma. J Glaucoma. 2001;10(4):294-301.
3. Al Habash A, Al Ahmadi AS. Cyclodestructive procedures in treatment of glaucoma. In: StatPearls. Treasure Island (FL): StatPearls Publishing. 2024.
4. Moorfields Eye Hospital NHS Foundation Trust. Cyclodiode laser [Internet]. London: Moorfields Eye Hospital NHS Foundation Trust. 2026. [Last accessed on: June 22, 2026] https://www.moorfields.nhs.uk/for-patients/information-hub/cyclodiode-laser
5. Aquino MCD, Barton K, Tan AMWT, Sng CCA, Li X, Loon SC. Micropulse versus continuous wave transscleral diode cyclophotocoagulation in refractory glaucoma: A randomized exploratory study. Clin Exp Ophthalmol. 2015;43(1):40-6.
6. Bloom PA, Tsai JC, Sharma K, Miller MH, Rice NSC, Hitchings RA. "Cyclodiode": Trans-scleral diode laser cyclophotocoagulation in the treatment of advanced refractory glaucoma. Ophthalmology. 1997;104(9):1508-19.
7. Schlote T, Derse M, Rassmann K, Nicaeus T, Dietz K, Thiel HJ. Efficacy and safety of contact transscleral diode laser cyclophotocoagulation for advanced glaucoma. J Glaucoma. 2008;17(3):217-22.
8. Maslin JS, Barkana Y, Dorairaj S. Update on transscleral cyclophotocoagulation. J Glaucoma. 2015;24(9):740-6.
9. Puangsricharern V, Tseng SCG. Iatrogenic limbal stem cell deficiency: When glaucoma therapies contribute to vision loss. J Glaucoma. 2001;10(6):476-82.
10. Sanchez FG, Peirano-Bonomi JC, Grippo TM. Micropulse transscleral cyclophotocoagulation: A hypothesis for the ideal parameters. Med Hypothesis Discov Innov Ophthalmol. 2021;10(1):94-100.

About the journal

ATHENAEUM SCIENTIFIC PUBLISHERS

Journal of Ophthalmology and Advance Research is a peer-reviewed, open-access scholarly journal published by Athenaeum Scientific Publishers. The journal publishes original research articles, case reports, reviews, editorials and commentaries within its defined scope, with the aim of supporting scientific research and clinical knowledge in ophthalmology.

All manuscripts are evaluated through an independent peer-review process conducted in accordance with the journal's editorial policies and established publication ethics. Editorial decisions are made solely on the basis of academic merit.

Manuscript submission: https://athenaeumpub.com/submit-manuscript/