Polymethyl Methacrylate Intraocular Lenses as Substitute for Gold Weight in Lagophthalmos Surgery: A Case Report

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ABSTRACT

Introduction: Paralytic lagophthalmos, typically resulting from facial nerve palsy, causes incomplete eyelid closure, leading to severe ocular surface desiccation, exposure keratopathy, and potential vision loss. Gold weight implantation remains the surgical standard of care for restoring gravity-assisted eyelid closure. However, the cost of gold often creates a significant barrier to treatment, particularly in developing nations or for patients without adequate insurance coverage, necessitating the exploration of affordable, readily available alternatives.

Case: A 41-year-old woman developed left-sided paralytic lagophthalmos following orbital cellulitis with dacryocystitis.

Observation: Persistent exposure keratopathy persisted despite the use of lubricants and previous tarsorrhaphy. Due to financial constraints, gold weight implantation was not feasible, so two polymethyl methacrylate (PMMA) intraocular lenses (IOLs) were repurposed as eyelid-loading implants and secured to the anterior tarsal surface within a submuscular pocket. Post-operative assessment showed immediate and significant improvement in eyelid closure, with maximum improvement of lagophthalmos and symptoms of exposure keratopathy. The IOL provided adequate gravitational force for effective eye closure, and the cosmetic result was satisfactory.

Conclusion: Repurposing a readily available, low-cost PMMA intraocular lens offers a safe, effective, and economical alternative to gold weight implantation for managing paralytic lagophthalmos, particularly in resource-constrained settings or for patients with limited financial means. This technique should be considered a good treatment option for incomplete eyelid closure

Key words: Cost-effective innovation; eyelid loading; gold weight alternative; intraocular lens; lagophthalmos.

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INTRODUCTION

Lagophthalmos, defined as the inability to achieve complete eyelid closure, frequently results from facial nerve palsy and may lead to exposure keratopathy, epithelial breakdown, and long-term vision-threatening complications if not adequately addressed. Conservative measures, such as lubricants, moisture chambers, and taping, provide temporary relief but may be insufficient in moderate to severe cases or when corneal exposure is persistent (Fu, and Ta, 2023; Calvaresi and Arboleda, 2023).

Upper eyelid loading with gold or platinum weights is a well-established surgical technique that provides dynamic gravitational closure of the eyelids during downgaze or blinking. First popularised by Putterman and later refined by Anderson and colleagues, gold weight implantation has demonstrated high success rates and remains the standard approach in paralytic lagophthalmos management (Baheerathan et al., 2009; Dalkiz et al., 2007). However, its use may be limited by material hypersensitivity, implant visibility, extrusion, cost constraints, or unavailability in low-resource settings (Dinces et al., 1997; Shorr et al., 1987).

In such situations, alternative materials that possess adequate weight, biocompatibility, and ease of fixation become clinically relevant. Polymethyl methacrylate (PMMA) intraocular lenses (IOLs), widely used in cataract surgery, have favourable characteristics including rigidity, stability, smooth contour, and established biocompatibility (Apple et al., 1992). Although not originally intended for eyelid implantation, their physical properties make them a potential substitute when conventional eyelid-loading implants are not feasible (Manodh et al., 2011)

This case report describes the innovative use of a rigid PMMA intraocular lens as an upper eyelid loading implant in the management of paralytic lagophthalmos, demonstrating a cost-effective and accessible alternative in settings where gold weight implants may not be practical.

CASE REPORT

A 41-year-old female from Assam presented to the Department of Oculoplasty and Oculofacial Plastic Surgery at Mechi Eye Hospital with complaints of a tightening sensation and an inability to close her left upper eyelid for the past 10 months. The patient had a history of orbital cellulitis with dacryocystitis in her left eye 10 months prior. The acute infection was managed with oral and topical antibiotics, leading to resolution of swelling. However, the patient developed residual facial nerve paresis, possibly due to skull base involvement from infection or nerve compression within the bony canal related to mucormycosis in the setting of diabetes (Detailed documents not available), resulting in incomplete recovery and paralytic lagophthalmos as a long-term sequela.

The patient had poorly controlled Type 2 Diabetes Mellitus for 10 years and was not receiving any treatment at the time of presentation. The patient attributed some of her persistent symptoms to dryness, irritation, and a gritty sensation in the left eye, particularly while sleeping, due to the inability to fully close the eyelid. These symptoms were managed with frequent (8-10 times/day) artificial tears and ointment, and they provided limited relief. After which she chose surgical intervention and was managed with both median and lateral permanent tarsorrhaphy. However, patient was not satisfied with cosmetic result.

On examination, the patient was alert and oriented with mild facial asymmetry, residual lateral eyelid sutures from prior paramedian tarsorrhaphy, impaired left blink reflex with slight brow ptosis, incomplete left eyelid closure with a 3 mm lagophthalmos in primary gaze, inferior scleral show from lower lid laxity, intact Bell's phenomenon, and slit lamp findings of punctate keratopathy with reduced tear breakup time and fluorescein-stained punctate epithelial erosions, while best corrected visual acuity (BCVA) was 6/9 in the left eye and normal in the right (Figure 1).

The diagnosis of left eye paralytic lagophthalmos secondary to facial nerve paresis, status post median and lateral permanent tarsorrhaphy was made.

Due to severe symptoms and failure of conservative therapy, surgical eyelid loading was planned; however, because gold implants were unaffordable, two stacked intraocular lenses (Fred Hollows IOLs, +32D; 12 mm diameter, 1 mm thickness, 30 mg each) were implanted as an alternative. Under local anaesthesia, the prior median tarsorrhaphy was released and repaired, a 10 mm upper eyelid crease incision was made, a submuscular pocket was created over the tarsal plate, the IOLs were secured with 6-0 vicryl sutures, and the incision was closed in layers preserving the lid crease (Figures 2, 3).

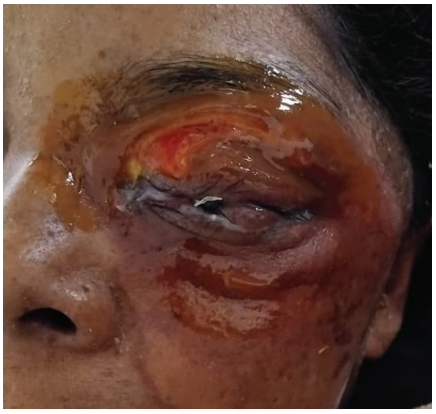

Figure 1: At the time of presentation (Note: Paramedian tarsorrhapy).

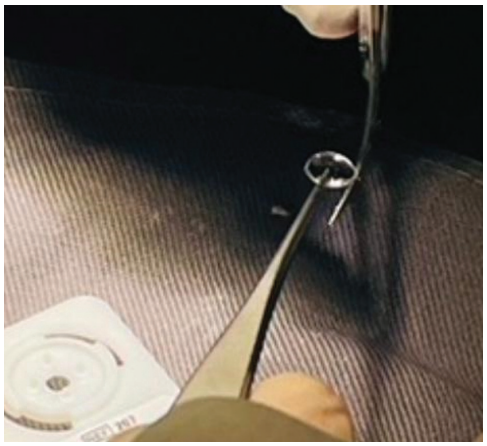

Figure 2: Preparation of IOL before implantation. Note: Trimming of both haptic and smoothening of the surface.

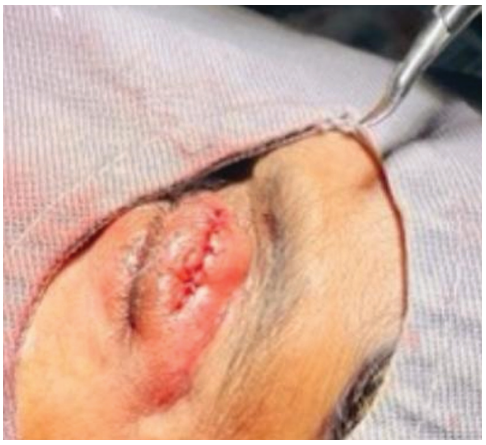

Figure 3: Implantation of IOL.

For post-operative care, the patient was prescribed oral and topical antibiotics and artificial tears as needed. The left eye was patched for the first 24 hours, and no complications such as bleeding, infection, or implant exposure occurred during the recovery period.

At 1-month follow-up, the patient reported a significant improvement in symptoms, with complete eyelid closure during sleep and reduced dryness and irritation. The punctate epithelial erosions on the cornea showed partial resolution, and no further exposure keratopathy was noted (Figures 4, 5).

At three months post-surgery, the patient remained asymptomatic with stable IOL positioning and improved eyelid function, though a mildly bulky eyelid contour was observed. The left eye visual acuity remained stable at 6/9. Artificial tears were continued, but the patient reported minimal discomfort (Figures 6, 7).

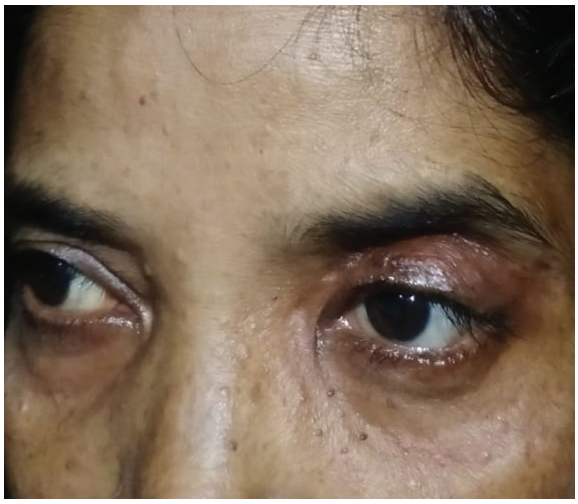

Figure 4: At one month follow-up.

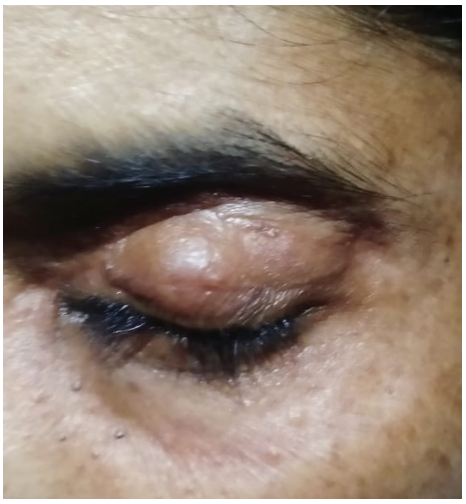

Figure 5: Good lid closure with bulky upper lid noted.

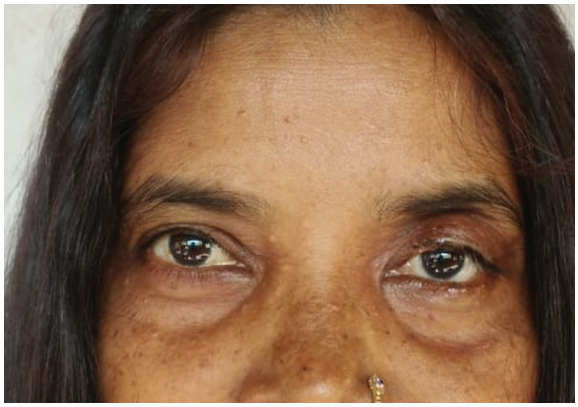

Figure 6: At three-month follow-up.

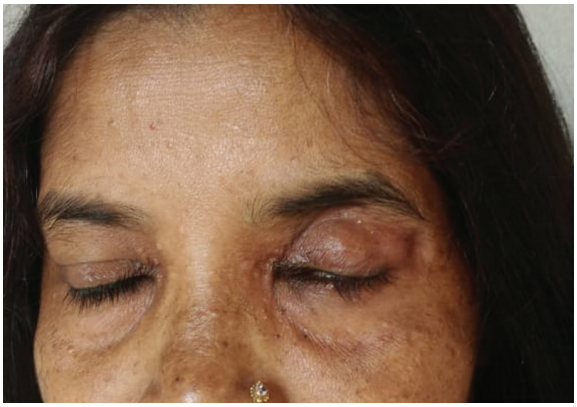

Figure 7: Good eyelid closure with minimal residual lagophthalmos.

DISCUSSION

Lagophthalmos is a debilitating sequela of facial nerve dysfunction and remains a major cause of exposure keratopathy, corneal epithelial breakdown, and visual morbidity when untreated (Fu and Ta, 2023; Calvaresi and Arboleda, 2023). Upper eyelid loading remains the gold standard for dynamic management when conservative measures fail, (Baheerathan et al., 2009; Dalkiz et al., 2007) with gold and platinum implants providing reliable gravitational closure and excellent long-term outcomes, although their use may be limited by cost, availability, or metal hypersensitivity (Dinces et al., 1997; Shorr et al., 1987).

In such situations, surgeons have explored alternative materials for eyelid loading, including steel, titanium, silicone, cartilage grafts, and custom-designed polymeric weights. (Madhusudhan et al., 2021; Kawakita and Tsubota, 2018). Each material has unique advantages and shortcomings, yet none has fully replaced traditional gold or platinum implants. The present case introduces the innovative use of a rigid PMMA intraocular lens as an eyelid loading implant, a rarely documented approach.

The PMMA has been widely used in ophthalmology for over seven decades and remains one of the most biocompatible and stable materials for long-term implantation (Apple, D.J., et al. 1992). Its smooth contour, inertness, and resistance to degradation make it suitable for adaptation to extraocular applications. Although PMMA is less dense than gold, shaping and trimming the IOL optic allows the surgeon to custom-tailor the weight to the patient's needs. IOL also comes in different dioptric powers with different convexities that might be used according to the eye lid condition (Apple, D.J., et al. 1992). This makes it a practical option when traditional weights are unavailable, especially in low-resource settings.

The successful outcome in this case aligns with previous reports evaluating alternative implant materials. Studies have shown that even non-metallic implants can yield acceptable functional results when properly positioned and secured to the tarsus (Madhusudhan, M., et al. 2021; Kawakita, T. and Tsubota, K. 2018). The absence of migration, extrusion, or inflammatory reaction in this patient supports the notion that PMMA can be a safe substitute. Moreover, its availability in every ophthalmic operating theater presents a unique advantage over specialised gold or platinum implants.

Nevertheless, limitations exist. The lower density of PMMA may render it insufficient for patients with severe orbicularis oculi weakness who require heavier loading (Shorr, N., et al. 1987). Careful intraoperative customisation is essential to achieve adequate eyelid closure without inducing ptosis or cosmetic disfigurement. Long-term data on PMMA's behavior in the upper eyelid are also limited, and more clinical experience is needed to standardise weight selection, shaping techniques, and fixation methods (Apple et al., 1992).

This case highlights the importance of surgical flexibility and resourcefulness. The use of a modified PMMA IOL provides a feasible, low-cost, and accessible alternative for managing lagophthalmos in select patients. In situations where conventional implants are impractical, this approach can offer a safe and effective

means of restoring eyelid closure and protecting the ocular surface.

CONCLUSION

This case demonstrates that a rigid PMMA intraocular lens can serve as a practical, accessible, and biocompatible alternative to traditional gold or platinum weights for upper eyelid loading in patients with paralytic lagophthalmos. When standard implants are unavailable, contraindicated, or financially prohibitive, careful customisation of an IOL can provide effective eyelid closure, restore corneal protection, and achieve satisfactory functional and cosmetic outcomes. Although further experience is needed to establish long-term safety and standardised guidelines, this technique offers a valuable option, particularly in resource-limited settings where surgical innovation is essential to preserving ocular health.

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