

# Pericardium Patch Graft for Severe Corneal Wound Burn

Zahra Ashena<sup>1</sup>, Christopher Holmes<sup>2</sup>, Mayank Ambarish Nanavaty<sup>1,3</sup>

<sup>1</sup>Sussex Eye Hospital, Brighton and Sussex University Hospitals NHS Trust, Brighton, United Kingdom, <sup>2</sup>Eastbourne District General Hospital, Eastbourne, United Kingdom, <sup>3</sup>Brighton and Sussex Medical School, University of Sussex, Brighton, United Kingdom

## Abstract

**Purpose:** To report a novel management technique using pericardial patch graft for severe corneal wound burn following phacoemulsification of dense cataract with shallow anterior chamber (AC) and overfilled AC with viscoelastic.

**Methods:** Case report.

**Results:** A 46-year-old patient with a shallow AC and dense cataract, who underwent phacoemulsification using “soft shell” technique had severe wound burn which was refractory to conventional management with corneal suturing and placing bandage contact lens. He underwent Tutoplast® (Innovative Ophthalmic Products, Inc., Costa Mesa, CA, USA) pericardium patch graft, which fully resorbed and resolved the wound leak over 6 weeks, leaving a well-healed corneal wound.

**Conclusion:** Pericardium patch graft is a safe and effective technique to manage extensive phaco wound burn which is refractory to conventional management options.

**Keywords:** Corneal wound burn, Patch graft, Pericardium

**Address for correspondence:** Mayank Ambarish Nanavaty, Sussex Eye Hospital, Brighton and Sussex University Hospitals NHS Trust, Eastern Road, Brighton BN2 5BF, United Kingdom.

E-mail: mayank.nanavaty@nhs.net

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## INTRODUCTION

Corneal wound burn is an uncommon complication of phacoemulsification surgery<sup>1</sup> that can result in further complications including high astigmatism,<sup>2</sup> corneal edema, and wound leak,<sup>2</sup> and endophthalmitis.<sup>3</sup> Several methods of treating corneal deficit and persistent wound leak have been described in the literature including cyanoacrylate or fibrin glue,<sup>4</sup> amniotic membrane (AM) patch graft,<sup>5</sup> ethanol or glycerol preserved corneal patch graft,<sup>6</sup> tectonic full thickness or lamellar corneal graft,<sup>7</sup> and conjunctival flap.<sup>8</sup> This case documents a previously unreported use of Tutoplast® (Innovative Ophthalmic Products, Inc., Costa Mesa, CA, USA) human pericardium patch graft in managing persistent wound leak and corneal gaping wound after phacoemulsification and lens implant surgery.

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## CASE REPORT

A 46-year-old male patient was referred to us from a neighboring trust for a persistent wound leak 3 weeks after complicated right eye phacoemulsification and intraocular lens implant with a phaco wound burn. His left eye was blind secondary to ischemic central retinal vein occlusion and rubeotic glaucoma and his right eye had a visually symptomatic cataract, for which he underwent cataract surgery under general anesthesia using “soft shell” technique to protect his cornea in the setting of shallow anterior chamber (AC) in the neighboring hospital. The medical records from the neighboring hospital showed that he had a dense cataract with AC depth of 2.13 mm and axial length of 22.74 mm. Occlusion of phaco tip with viscoelastic during the phacoemulsification led to severe wound burn which was stitched with interrupted 10-0

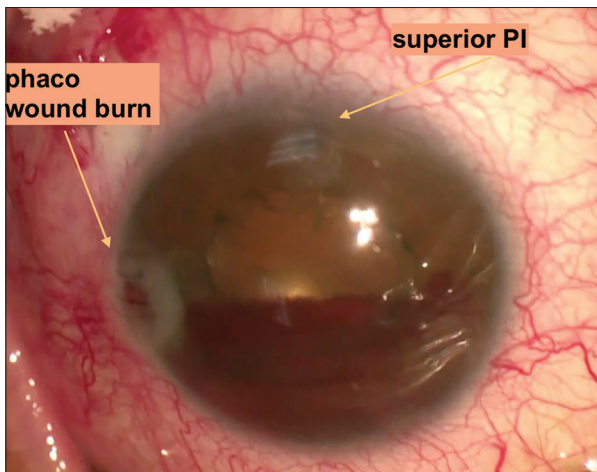
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nylon sutures and further suturing 12 days postoperatively. A course of systemic (Acetazolamide slow release 250 mg bd) and topical antiglaucoma (Bimatoprost and combined Dorzolamide/Timolol) medications were started, and a bandage contact lens was inserted by his initial surgeon. However, he had persistent micro-leak at every single postoperative visit, regardless of his intraocular pressure (IOP).

At presentation, he was on Bimatoprost and combined Dorzolamide/Timolol eye drops. His visual acuity (VA) was counting fingers (improving to 6/36 with pinhole) and no perception of light in the right and left eye, respectively. He had a 2.5 mm × 1 mm temporal corneal wound gape with two interrupted nylon sutures and persistent micro-leak and IOP of 35 mmHg. Ultrasound scan showed a flat retina with no choroidal effusion. As he initially refused the surgery, with a diagnosis of aqueous misdirection and pupillary block, laser peripheral iridotomy was performed followed by oral administration of 500 mg acetazolamide and topical apraclonidine 1% eye drop [Figure 1]. This slightly deepened the AC but caused hyphema and did not reduce his IOP. Therefore, after appropriate consenting, he underwent anterior and core vitrectomy with AC washout and 360° visco-gonio-synechiolysis and pupillary visco-synechiolysis. To address the wound gape, conjunctival peritomy was performed at the main wound and a 4 mm × 5 mm patch of Tutoplast® (Innovative Ophthalmic Products, Inc., Costa Mesa, CA, USA) pericardium was sutured using four interrupted 10-0 nylon sutures [Video 1]. At 1 week, Seidel test was negative, and the AC deepened. Over 6 weeks following his surgery, Tutoplast® pericardium patch disintegrated, and the sutures were removed. The wound completely healed, and his VA improved to 6/18 with some posterior capsule opacification. However, 4 weeks later, he had to undergo further surgery for his chronic aqueous misdirection syndrome with a glaucoma drainage device (Paul tube®, PGI; Advanced Ophthalmic Innovations, Singapore, Republic of Singapore) to control his IOP [Figure 2].



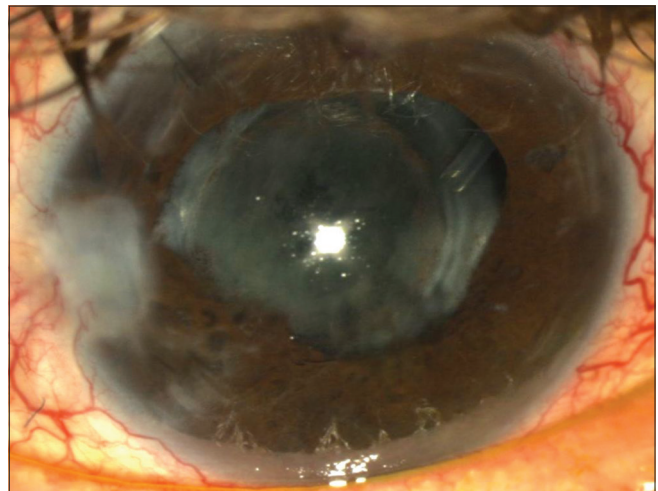
**Figure 1:** Severe corneal phaco wound burn with superior peripheral iridotomy and hyphema

## DISCUSSION

Phaco wound burn results from acute contracture of corneal collagen fiber once the incision temperature reaches 60°C.<sup>9</sup> Sorensen *et al.* reported phaco wound burn incidence of 0.037%, which was inversely associated with high volume of the surgery and full chop technique (as opposed to “divide and conquer” or “stop and chop”) and positively linked with the use of Healon5® and Viscoat®.<sup>1</sup> They advised against overfilling the AC and advocated irrigation and aspiration of the ophthalmic visco-surgical device (OVD) before start of phacoemulsification to avoid OVD blocking the irrigation in the AC and generating heat.<sup>1</sup>

Intraoperative whitening of the cornea at the incision should prompt the diagnosis. If detected postoperatively, swift management is required as persistent wound leak increases the risk of endophthalmitis.<sup>3</sup> Tutoplast® pericardium is a dehydrated, resorbable, sterile human tissue graft comprised of multidirectional matrix low-profile collagen.<sup>10</sup> It has been utilized as a replacement or reinforcement of lost or weakened connective tissue, e.g., as a patch graft for exposed glaucoma drainage devices and leaking blebs,<sup>11</sup> scleral thinning following strabismus surgery,<sup>10</sup> exposed scleral buckles,<sup>12</sup> and tectonic globe repair.<sup>13</sup> In the context of corneal tissue loss, Koay *et al.* reported two cases of traumatic and infectious corneal perforations, which were managed with temporary Tutoplast® patch graft before a donor cornea was available.<sup>11</sup> To the best of our knowledge, this is the first report of using Tutoplast® pericardium patch graft to repair a corneal wound burn.

Management of corneal defect depends on their size, location, and underlying disease. Evidently, placing sutures to the wound and insertion of bandage contact lens did not work in this case due to the large size of the defect. Cyanoacrylate or fibrin glue was not a desirable option either, as it was a large



**Figure 2:** Healed corneal wound burn post Tutoplast® (Innovative Ophthalmic Products, Inc., Costa Mesa, CA, USA) pericardial patch resorption with Paul tube for intraocular pressure control and posterior capsule opacification

gape and the glue tends to dislodge or become loose with frequent blinking or eye rubbing, and our patient had a history of eye rubbing. AM patch grafts may be efficient in providing tectonic integrity for smaller peripheral corneal perforations. However, one study showed that 33% of patients needed more than one AM application, or a patch graft treatment was necessary to close the corneal perforation. Moreover, it may be difficult to fold and stabilize the slippery layers of the AM.<sup>5</sup> Tectonic full thickness or lamellar corneal graft is an alternative option. Nonetheless, irregular astigmatism<sup>7</sup> in this patient's only eye as well as risk of graft rejection and suture-related complications were a concern in our case, in particular because he had learning difficulty with a history of eye rubbing. On the contrary, Tutoplast<sup>®</sup> patch graft's sutures are removed once the tissue disintegrates, hence less irregular astigmatism will be induced and there will be significantly reduced risk of suture-related complications and rejection. A patch of glycerol or ethanol preserved cornea<sup>6</sup> could be another option, however, considering the temporal location of the wound, the thick preserved cornea would cause irritation with each blink and trigger further eye rubbing. Alternatively, a patch of temporalis fascia could be harvested from the same side of the surgery with the assistance of an oculoplastic surgeon and grafted to the defect.<sup>14</sup> Reduced risk of immunologic reactions and viral infection transmission are the advantages of this method. However, our technique is less invasive, does not require assistance from oculoplastic surgeon, and does not involve risk of scarring or infection from the harvest site. Finally, conjunctival flap suturing to cover the wound did not seem the best option in this patient with a history of glaucoma, as he may need further glaucoma surgery in future and a conjunctival flap may not provide strong tectonic support to stop persistent leak in his only eye. Therefore, in such cases, Tutoplast<sup>®</sup> pericardium can be used successfully to treat a persistently leaking corneal wound burn.

### **Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published

and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### **Conflicts of interest**

There are no conflicts of interest.

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