



Gore-Tex- as an adjuvant to Tenon's patch graft for large perforated corneal ulcers during Covid times

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ABSTRACT

Purpose: Covid-19 has profoundly affected the day-to-day lives of individual citizens. It has strained all aspects of health care including eye banking and corneal transplantation. Although elective procedures like optical Keratoplasty can be postponed, management of perforating ulcers needs tectonic Keratoplasty to avoid permanent ocular morbidities. It has become inevitable for corneal surgeons to innovate newer methods of treatment for such corneal diseases. The large corneal perforations if left untreated may lead to permanent visual loss. An alternative method of managing a large peripheral corneal perforation of size 5 × 5.5 mm was done using Tenons patch graft with Gore-tex in a 50-year-old female patient, during the lockdown.

Observations: Tenons graft with Gore-tex, effectively sealed the large corneal perforation in our case without iris incarceration, favourable for future visual rehabilitation.

Conclusions and Importance: Tenons and Gore-tex are readily available. It is not necessary to rely on the donor corneas or the distributing eye banks during this pandemic situation. In the future, this procedure can reduce the burden of the pre-existing increase in the gap between the need and supply of donor corneas in developing countries.

1. Introduction

COVID-19 has rapidly emerged as a global threat. Eye banks are in a state of turmoil nowadays. Seeking management of large corneal perforations through alternative methods has gained interest among corneal surgeons especially in one-eyed patients. Corneal ulcers are the most common cause of corneal blindness in adults from developing countries.¹ If left untreated, it can progress to perforation and ocular morbidities. The complications of corneal perforations include endophthalmitis and glaucoma, hence requires prompt closure of the defect either through conservative treatment like tissue glue, bandage contact lens, Amniotic membrane graft (AMG), Tenons patch graft (TPG), Conjunctival flaps, or the tectonic corneal grafts. The choice of treatment depends on the aetiology, size, site, and depth of the perforation and most importantly the availability of donor corneas.^{2,3} Few authors have used even autologous lamellar scleral flaps, periosteal flaps from the anterior tibial crest, pericardium, purified polyurethane

material, or even multi-layered Gore-tex patches in absence of donor corneas in a moment of crisis.⁴⁻⁶ We present a case of a 50-year-old female with a large peripheral perforated ulcer following a thorn injury. She came to us one month later during the lockdown, when donor cornea was not available. We successfully used TPG with Gore-tex to close the perforation, reformed the anterior chamber without iris incarceration amenable for future optical keratoplasty.

2. Case summary

A 50-year-old female, a farmer by occupation presented to us with a one-month history of pain, redness, and watering in the left eye following the history of injury with thorn, during the lockdown. She was not suffering from any systemic diseases. On examination, vision in RE was 20/30 and LE was 20/80p. The duct was normal in both eyes. Intraocular pressure (IOP), anterior and posterior segment examination in the right eye was normal. Slit-lamp examination of the Left eye

Abbreviations: AMG, Amniotic membrane graft; TPG, Tenons patch graft.

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revealed a large peripheral, almost circular perforated ulcer of size 5 × 5.5mm (Fig. 1a) in the inferior peripheral cornea involving 5/0'clock to 7/0'clock position with iris plug in the area of perforation. Infiltrate was extending <1mm beyond the perforation. The anterior chamber was flat with a lens showing an immature cataract and dispersed pigments over the anterior lens capsule. The pupil was dragged inferiorly towards the perforation, mid dilated. IOP was low digitally. Fundus was hazy. B scans revealed shallow choroidal detachment. Donor corneas retrieval through community or hospital was temporarily stopped during the complete lockdown period. Due to the crisis of donor corneas, we planned for a tectonic tenon graft with gore-tex and AMG in the left eye under local anesthesia.

Intraoperatively, the recipient corneal bed was prepared by dissecting the necrosed tissue around the perforation, carefully by avoiding damage to the iris and lens. After dissection, the defect area appeared slightly larger than the actual perforation (Fig. 2a). The tenons graft was harvested from the superior bulbar conjunctiva 2 mm posterior to the limbus. A graft size of 6 × 6.5 mm was taken after conjunctival dissection. The side port was made at 1/0'clock limbus, pilocarpine was injected and peripheral iridotomy was done. The removed necrosed tissue was then sent for microbiological examination. Tenons graft was placed over the perforated area and secured with 10-0 nylon on all sides (Fig. 2b). AMG was covered over the tenons graft to promote epithelialization (Fig. 2c). On attempting to form the anterior chamber with

saline, there was a persistent leak through the perforated site that was covered with tenons. The tenons graft was not rigid enough to withstand the AC reformation. Hence, Gore-Tex expanded PTFE, an inert synthetic material that was hand fashioned based on the size of the tenons and secured over the tenons and cornea with 10-0 nylon (Fig. 2d). AMG was covered over the Gore Tex as an onlay graft. Now, the anterior chamber was tightly formed without the leak.

Gore-tex along with tenons maintained globe integrity. Microbiology results revealed no growth. Postoperatively topical low dose steroid Loteprednol 0.5% four times a day in tapering doses for four weeks, Moxifloxacin eye drops 0.5%, six times a day for four weeks and Homide two times a day for two weeks was given. A short course of injectable steroid dexamethasone 8mg once a day for two days was given for the initial inflammation to subside with blood sugar monitoring. The patient was followed up every week for worsening of signs and symptoms (Fig. 1b). IOP was measured at each visit using Perkins tonometer. She was improving well with resolving Conjunctival congestion; there were no signs of anterior chamber inflammation and no evidence of infiltrates seen beyond the Gore-tex margin. After four weeks of follow-up, Gore-tex appeared slightly detached from the tenons with loosened nylon sutures, hence, Gore-tex was removed in the slit lamp under aseptic precautions. The underlying tenons appeared well epithelised with complete incorporation into the surrounding corneal tissue. The anterior chamber was well-formed. The perforation was sealed well with tenons

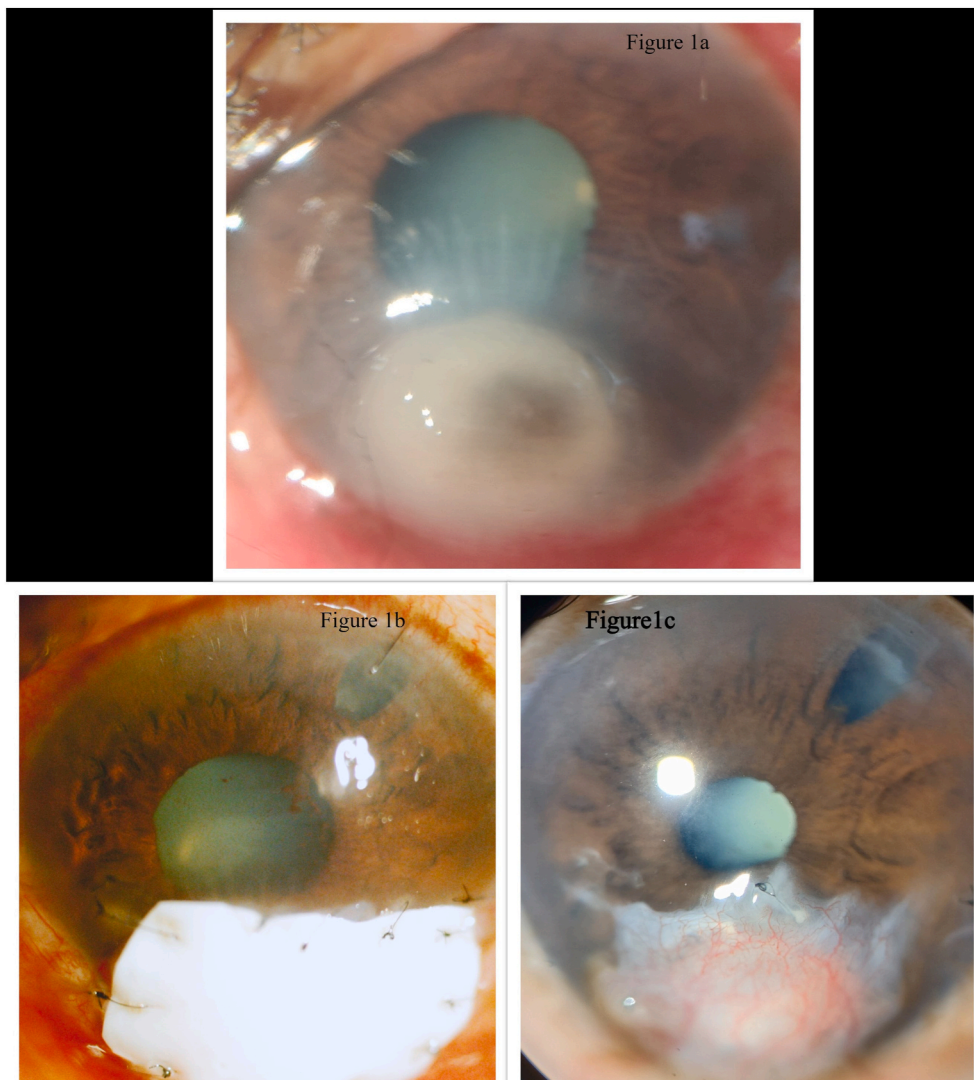


Fig. 1. The clinical images.

Fig. 1a) Perforated ulcer on presentation Day 1,

Fig. 1b) After TPG and Gore-tex on day 7,

Fig. 1c) at the final visit 6 months.

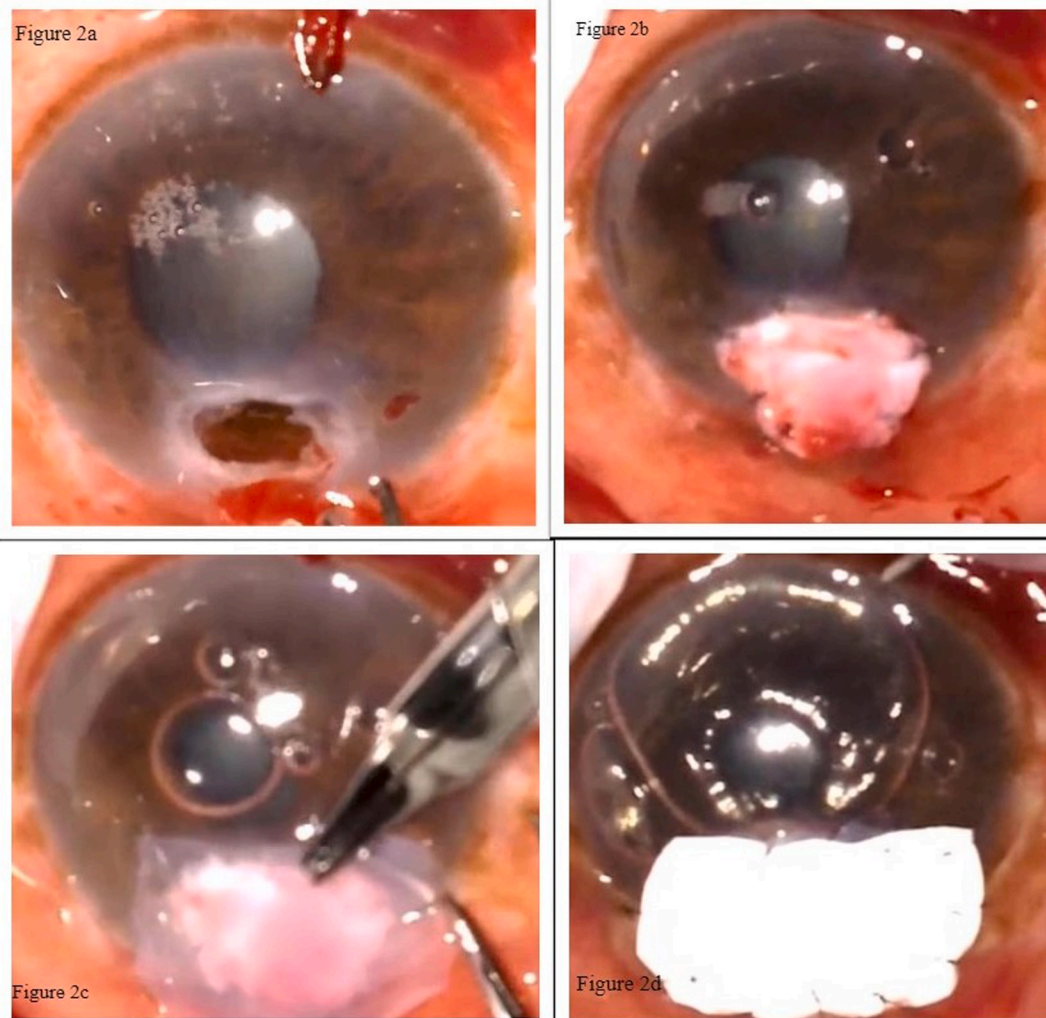


Fig. 2. The Intraoperative images of management of Large Perforated ulcers with Tenons patch graft and Gore-tex.

Fig. 2a) after removal of necrotic tissue.

Fig. 2b) after placement of TPG.

Fig. 2c) after covering TPG with AMG, the anterior chamber was shallow.

Fig. 2d) after reinforcing the TPG with Gore-tex, the anterior chamber was formed air-tight.

without iris incarceration. The vision was 20/120 in the left eye at the final visit (at six months postoperative period) with peripheral leucoma without evidence of fibrous ingrowth (Fig. 1c).

3. Discussion

Tenons capsule is a sheet of dense connective tissue that encases the globe, also known as facial sheaths of the eyeball. It has been previously used by many authors for the management of scleral melts following pterygium excision, scleral perforations, leaking Trabeculectomy blebs, and recently in corneal perforations. Sharma et al. had used Tuck-in TPG with sutures for closing corneal perforations up to 5mm and achieved success in 82.7% of the cases without any fibrous ingrowth. The mean size of the perforation was 4.2+/-0.6mm. The mean duration of epithelial healing with tenons graft noted was 25.7+/-6.7 days.⁷ Similarly, we too observed epithelisation of tenons graft at four weeks postoperative period. Korah et al. described the use of cyanoacrylate glue along with TPG in 27 cases of corneal perforations of size 3–6mm. He achieved a 74% success rate with adherent leucoma in all the cases, as the final result with variable anterior chamber depth.⁸ The disadvantage of using TPG in sealing larger perforations is that it may not provide sufficient tectonic support. Similarly, in our patient too, TPG

could not perfectly seal the larger area of perforation, even though we had applied sutures all around the TPG for better sealing effect and to avoid secondary ectasia, but could not withstand anterior chamber reformation with saline injection intraoperatively. We had used Gore-tex, a synthetic inert material over the TPG, to provide mechanical support to the tissue and to maintain the globe integrity without iris incarceration, which leads to a good prognosis for optical Keratoplasty. Gore-tex expanded polytetrafluoroethylene (ePTFE) was first used experimentally as a venous substitute in 1972, developed by W.L Gore and associates in the late 1960s.⁹ It is being used in vascular, plastic, and reconstructive cardiac surgeries. The clinical use of Gore-tex in ocular surgery was first reported way back in 1991 by Legeais and associates in sealing corneal perforations.¹⁰ It is well tolerated and resistant to invasion by fibrovascular tissue and the adhesion between the graft and surrounding tissue does not occur. Due to its high tensile strength and durability, it was chosen to support the TPG in our case, until the tenons get incorporated into surrounding host corneal tissue by producing autologous fibroblasts.^{12,13} Huang and associates did not recommend, using Gore-tex alone for sealing corneal perforations as a routine practice due to insufficient wound closure and preferred it to be used if alternative material was not available.¹⁴ Hence combined TPG and Gore-tex would be a better choice of treatment for sealing perforations

with the size of more than 6mm in the future. The only disadvantage would be the lack of transparency of the Gore-tex material which may lead to unnoted infection of the anterior chamber. However, monitoring for the anterior chamber inflammation was done circumventing the Gore-tex, in our patient because of the peripheral location of the ulcer. Ruffer F et al. had used gore-tex patch in 39 eyes of 38 patients with non-infectious, deep corneal defects due to autoimmune disorders.⁶ It was maintained in place for days up to 32 months till Keratoplasty was planned. Gore-tex was also used by D Pahor et al. to seal corneal perforations in infectious keratitis in eight patients recently in 2016.¹⁵ Both TPG and gore-tex are non-immunogenic, with no risk of transmissible diseases, not limited by the availability of graft. Gore-tex can be easily sterilized with the ETO technique. TPG has an additional advantage; it is a biological tissue, which gets incorporated in the corneal tissue as it heals. After the cornea is re-epithelized, gore-tex can be removed safely. Most of the eye banks have stopped collection through Hospital Corneal Retrieval Program (HCRP) due to the pandemic. It is now become inevitable to switch over to alternative methods for managing large corneal perforations. Hence, it is a safer and cost-effective procedure that leaves a scarred cornea amenable to early optical Keratoplasty.

CONCLUSION:

We have to live with the pandemic for an extended period. It's the era of uncertainty. Before the eye bank activities get stabilized, there is a persistent rise in the burden of the gap between the demand and supply of corneal tissue. This pandemic has allowed us to ponder newer and effective methods to replace tectonic corneal grafts with TPG and Gore-tex for large corneal perforations. Gore-tex along with the tenons graft would be an ideal method to seal large perforations in the future, whenever there is a similar crisis for donor corneas. It carries an added advantage of early visual rehabilitation for optical keratoplasty with a good prognosis.

4. Patient consent

The Consent to this case report was not obtained from the patient as this report does not contain any personal information that could lead to the identification of the patient.

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Author's contributions

Authors contributed to manuscript writing (*), Review of the manuscript (**, #,) and they meet the current ICMJE criteria for authorship.

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Declaration of competing interest

No financial interest in any of the product mentioned.

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