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CASE REPORT

Allogeneic Tectonic Anterior Lamellar Keratoplasty for the Treatment of Large Corneal Perforation in a Dog

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ABSTRACT

A four-year-old, intact male, Greyhound presented with a large corneal perforation in the right eye (OD). There were many eye-worms in both of the patient's eyes. Ophthalmic examination revealed conjunctival hyperemia, corneal edema, corneal perforation and iris prolapse, and menace response and pupillary light reflex were absent whereas the dazzle reflex was present in the OD. Ophthalmic examination of the left eye (OS) revealed conjunctival hyperemia, keratitis, mild corneal edema, and the neuro-ophthalmic examination confirmed menace response, palpebral reflex, dazzle reflex, and pupillary light reflexes were present. Adult eye-worms were removed with forceps from both eyes under general anesthesia. Then allogeneic lamellar keratoplasty and equine amniotic membrane transplantation were planned for treatment. At 112 days after surgery, the patient's vision had recovered sufficient vision to do outdoor activities though there was slight scarring. This case demonstrates the potential for good visual recovery following allogenous tectonic lamellar keratoplasty.

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INTRODUCTION

In veterinary medicine, corneal trauma such as from a cat scratch, other accidents or wounds, injury to the corneal surface may all produce corneal erosion. The eye worm (*Thelazia callipaeda, T. californiensis*) is a small nematode that usually resides in the conjunctival sac and under the eyelids of humans and animals causing lacrimation, epiphora, conjunctivitis, keratitis, cataracts and ulceration can occur (Chanie and Bogale, 2014). Corneal ulceration is one of the most common eye diseases and if untreated, the cornea is in imminent danger of perforation. Once a corneal perforation has occurred, it is an ophthalmic emergency that requires immediate detection and prompt attention to prevent loss of vision.

The structural integrity of the cornea must be restored as soon as possible using direct suturing, cyanoacrylate tissue adhesive, conjunctival flap (Goulle, 2012). Except for that, penetrating keratoplasty or lamellar keratoplasty is one of the options for treating a wide range of corneal perforations. Lamellar keratoplasty is a procedure in which a partial-thickness graft of donor tissue is used to restore the corneal thickness and provide acceptable visual results while avoiding complications associated with other procedures (Hansen and Guandalini, 1999). Here we report a case of an allogenous lamellar graft performed to repair a large corneal perforation in a dog.

Case history and surgical intervention: A four-year-old intact male Greyhound presented with a large corneal perforation in the right eye. There were many eye worms inside both of the patient's eyes. Ophthalmic examination of the right eye (OD) revealed conjunctival hyperemia, corneal edema, corneal perforation, and iris prolapse (Fig. 1A). Neuro-ophthalmic examination confirmed the presence of palpebral and dazzle reflexes. But menace response and pupillary light reflexes could not be performed exactly. Ophthalmic examination of the left eye (OS) revealed conjunctival hyperemia, keratitis, and mild corneal edema, and the neuro-ophthalmic examination confirmed the presence of menace response and palpebral, dazzle, and direct/indirect pupillary light reflexes.

Adult eye worms were removed from both eyes with forceps under general anesthesia. And Castroviejo corneal scissor (Amann Ophthalmic Instruments, Liptingen, Germany) was then used to complete the excision of the recipient corneal button. To prepare the host graft bed, the

iris was detached from the cornea using an iris hook (Amann Ophthalmic Instruments, Liptingen, Germany). Fibrin and necrotic tissue was undermined using the iris hook (Amann Ophthalmic Instruments, Liptingen, Germany) and then excised with the Castroviejo corneal scissor (Amann Ophthalmic Instruments, Liptingen, Germany). After removal of the diseased cornea, it was able to confirm that the defect of the cornea is 11 mm. Viscoelastic agent (Hyaluronic acid, Hyaltech Ltd. Livingston, UK) was injected into the anterior chamber to maintain the depth of the chamber during surgery. The donor lamellar graft was harvested from a dog euthanatized for reasons unrelated to this surgery. The full cornea was harvested 3 hours before the surgery and stored in an antibiotic solution containing neomycin and bacitracin at a temperature of 4°C. Then it was placed in isotonic solution right before surgery. Thereafter a 12-mm biopsy punch was used to create an area 2/3 the thickness of the donor cornea graft at the surgery. Then donor's button was placed over the recipient bed and sutured in. First, four simple interrupted 8-0 blue nylon sutures (Ailee Co. Ltd., Busan, Korea) secured the donor corneal button in the recipient bed without Descemet's membrane. Then simple interrupted 8-0 nylon sutures secured the corneal button between the initially placed stitches. After suturing the anterior chamber was filled with BSS. Next, the equine amniotic membrane was sized to cover the corneal defect and then the edges were sutured to the limbus with 8-0 nylon interrupted sutures (Fig. 1B). To promote the healing of the corneal epithelial defect, amniotic membrane transplantation was performed after surgery.

Cefazolin (Cefazolin®, Chongkundang Pharm, Seoul, Korea) 22mg/kg bid and tramadol (Toranzin®, Shinpoong Pharm, Seoul, Korea) 3mg/kg bid were given orally beginning the day before surgery and for four weeks thereafter. In addition, autoserum drops were applied every two hours for one week until the corneal epithelium was completely closed. Twenty percent acetylcysteine (Mucomyst®, Boryung Pharm, Seoul, Korea) diluted to a 5% concentration with artificial tears (Numaren Eye Drops®, Hanlim Pharm, Seoul, Korea) was used three times daily for two weeks after surgery. Ciprofloxacin (Ciloxan®, Alcon, Puurs, Belgium) and atropine sulfate (1% Isopto atropine®, Alcon, Puurs, Belgium) eye drops were given beginning the day before surgery and discontinued during the follow-up period. Systemic and topical steroids and 0.2% cyclosporine A ointment (Optimmune®, MSD Animal Health GmbH, Luzern, Switzerland) were given beginning two weeks after surgery. The equine amniotic membrane had dissolved by postoperative day 3 (Fig. 1C), and the donor graft and recipient bed edges were well secured after five days (Fig. 1D). A negative Seidel test, negative fluorescein dye test and positive dazzle reflex were confirmed at 14 days postoperatively.

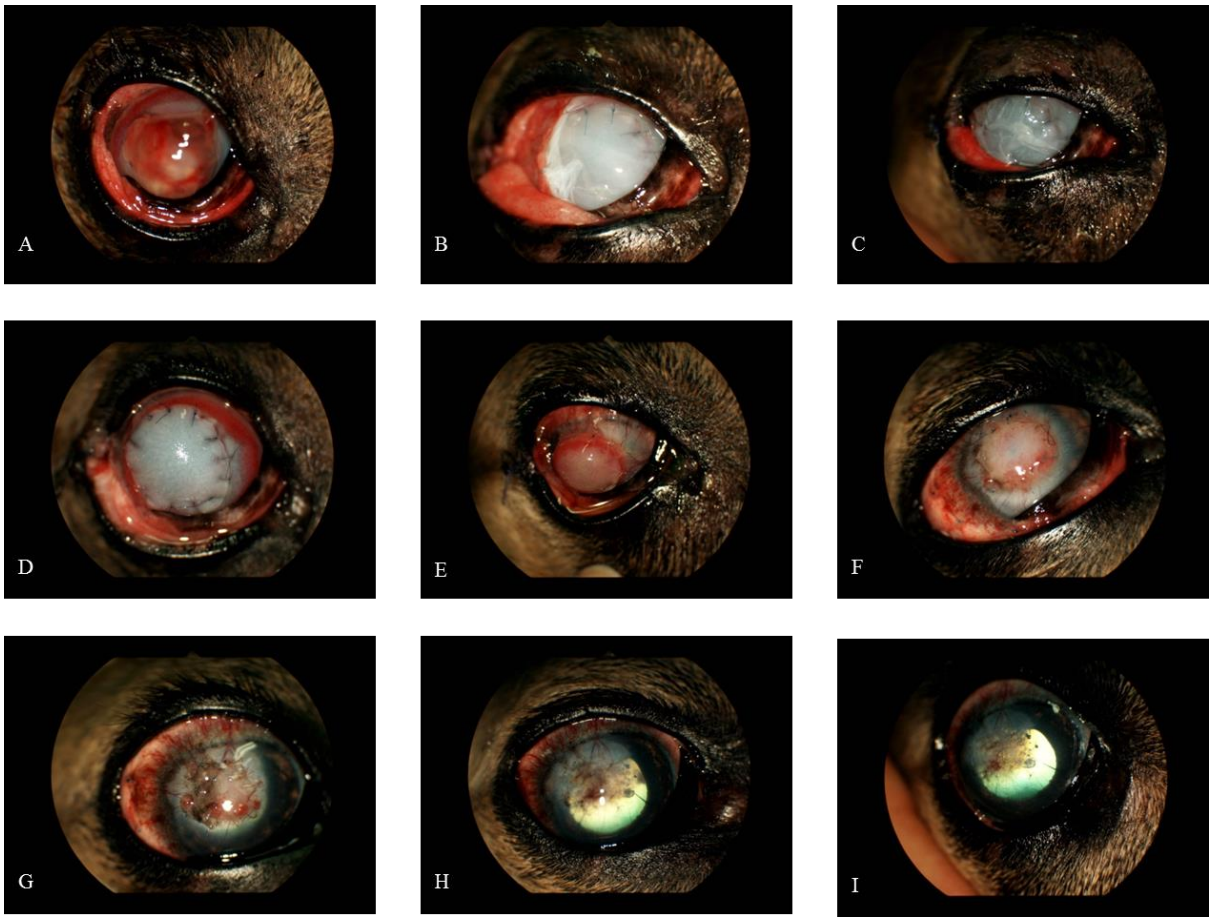

Fig 1: A) Preoperatively and B) immediately after surgery. C) Postoperative (PO) 3 days - equine amniotic membrane had dissolved. D) PO 5 days - donor graft and recipient bed edges were well secured. E) PO 21 days - graft bulging occurred. F) PO 33 days - the graft bulging was reduced. G) PO 54 days – restored corneal transparency. H) PO 82 days - corneal transparency had improved. I) PO 112 days - the patient had recovered vision sufficient to do outdoor activities.

At 21 days postoperatively, graft bulging occurred because of instability of the donor's graft margin (Fig. 1E). A third eyelid flap was created to protect the graft and help maintain pressure on the graft surface. Upon removal of the third eyelid flap at 33 days postoperatively, the graft bulging was reduced, the corneal edema began to clear from the limbus, and corneal vessels were no longer visible (Fig. 1F). At 54 days post operatively, corneal transparency was achieved except in the area of the graft and the menace response was restored (Fig. 1G). At 82 days after surgery, corneal transparency had improved both in the donor graft and recipient bed (Fig. 1H). At 112 days after surgery, the patient had recovered vision sufficient to do outdoor activities, though there was slight scarring, and the menace response, dazzle reflex and PLR were normal (Fig. 1I).

DISCUSSION

Several techniques are available to treat wide corneal perforations such as a conjunctival flap, penetrating keratoplasty, and lamellar keratoplasty. Our major issue was corneal clarity because this patient was a hunting dog, thus we considered penetrating keratoplasty, autologous lamellar keratoplasty and allogenous lamellar keratoplasty. We decided against penetrating keratoplasty in consideration of a report indicating that severe graft rejection results when the defect is more than 8mm and glaucoma develops when the defect is less than 8mm in human study (Hansen and Guandalini, 1999; Li *et al*., 2012). Autologous lamellar keratoplasty was not possible due to the presence of chemosis, keratitis, and edema in the other eye. As a result, we decided upon allogenous lamellar keratoplasty in this case. The main disadvantage of lamellar keratoplasty is diminished transparency due to the lack of endothelium in the donor graft. The endothelium is the major contributor to controlling the aqueous humor balance on the corneal stroma by a pumping reaction (Tadeu *et al*., 2006). Excess fluid accumulates within the stroma, leading to loss of transparency, and corneal edema causes the collagen lamella to wear away (Tadeu *et al*., 2006). However, in this case, proceeding with lamellar keratoplasty in the absence of donor graft corneal endothelium provided enough corneal clarity for the patient to engage in outdoor activities, and there were no signs of corneal edema.

The main advantages of lamellar keratoplasty include the lack of corneal graft rejection as well as a reduction in the chance of intraocular spread of infection (Anshu *et al*., 2009). This immunological process causes reversible or irreversible damage to the grafted cornea in despite the use of intensive immunosuppressive therapy. Endothelial rejection is one of the most symptomatic and devastating types of immune response (Panda *et al*., 2007). But, lamellar keratoplasty results in preservation of the recipient endothelium, which greatly reduces the risk of allograft rejection and subsequent late endothelial failure (Anshu *et al*., 2009).

In affected animals by eye worm, chronic conjunctivitis will usually result, with symptoms such as photophobia and sometimes accompanied by blepharitis, lacrimation, corneal opacity, corneal ulceration, or even corneal perforation (Chanie and Bogale, 2014). In this case, we have considered the corneal perforation caused by eyeworm and performed lamellar keratoplasty for treatment of perforation. But the corneal transplant and recipient bed were not aligned properly resulting in temporary keratoconus even though the patient had normal intraocular pressure. The cornea normalized after a third eyelid flap was prepared and maintained for 12 days. Although the transparency of the cornea could not be completely restored, the recovery of vision was sufficient for outdoor activities and there were no signs of corneal edema.

To conclude, this case demonstrates that allogenous lamellar keratoplasty can be a good treatment option for large corneal perforations as it avoids the disadvantages of penetrating keratoplasty.

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REFERENCES

Anshu A, Parthasarathy A, Mehta JS, *et al*., 2009. Outcomes of therapeutic deep lamellar keratoplasty and penetrating keratoplasty for advanced infectious keratitis: a comparative study. J Ophthalmol 116:615-23.

Chanie M and Bogale B, 2014. Thelaziasis: Biology, species affected and pathology (conjunctivitis): A Review. Acta Parasitol Globalis 5:65-8.

Goulle F, 2012. Use of porcine small intestinal submucosa for corneal reconstruction in dogs and cats: 106 cases. J Small Anim Pract 53:34-43.

Hansen PA and Guandalini A, 1999. A retrospective study of 30 cases of frozen lamellar corneal graft in dogs and cats. Vet Ophthalmol 2: 233-41.

Li C, Zhao GQ, Che CY, *et al*., 2012. Effect of corneal graft diameter on therapeutic penetrating keratoplasty for fungal keratitis. Int J Ophthalmol 5:698-703.

Panda A, Vanathi M, Kumar A, *et al*., 2007. Corneal graft rejection. Sur Ophthalmol, 52:375-96.

Tadeu JA, Abib FC, Pereira GT, *et al*., 2006. Density of corneal endothelial cells in eyes of dogs using specular microscopy. Braz J Vet Res Anim Sci 43:476-80.