

REPAIR OF A TRAUMATIC CORNEAL LACERATION IN A CAT USING A TECTONIC HETEROGRAFT

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Summary

A 3-year-old neutered male Scottish Fold cat weighing 4.4 kg presented with a corneal laceration of the left eye. The cornea was not perforated, as determined by a Seidel test. Vision was normal. The defect was successfully repaired using deep lamellar keratectomy and application of a tectonic graft, using glycerin-preserved canine corneal stroma. Thirty-two days after surgery, corneal neovascularization surrounding the graft was evident. Forty-six days after surgery, part of the graft was slightly cloudy but the cornea was mostly clear. Therefore, canine glycerin-preserved corneal stroma may be suitable for use in tectonic heterologous grafting to repair deep lamellar keratectomy during keratoplasty in cats.

Key Words: cat, corneal laceration, heterologous grafting, glycerin-preserved cornea

Introduction

In dogs and cats, tectonic corneal grafting has been performed in the treatment of melting ulcers, descemetocles, corneal sequestra, trauma, lacerations, and acute bullous keratopathy^{4, 5}. Although many other techniques are available for the repair of these corneal conditions, the application of a graft after keratectomy provides a transparent protective covering and reduces secondary corneal scarring in varying degrees^{4, 5, 16}. Tectonic corneal grafting is usually performed with fresh or frozen cornea^{3, 5, 6, 15}. This report discusses the use of canine-derived glycerin-preserved corneal stroma to perform tectonic grafting in the repair of a traumatic corneal laceration in a cat.

Case Report

A 3-year-old neutered male Scottish Fold cat weighing 4.4 kg was presented with recurrent corneal ulceration and sequestration of the left eye (Figure 1). The cat had normal visual function in both eyes, as assessed by the menace response and pupillary light and dazzle reflexes. Schirmer tear test values were 22 mm/min in the right eye and 18 mm/min in the left eye. The cat exhibited conjunctival

hyperemia, mild pain, and photophobia of the left eye, and fluorescein staining revealed a corneal ulcer. A sequestrum was visible as a 4-mm-diameter black macule near the corneal ulcer in the left eye. Administration of 0.2% acetylcysteine eye drops three times a day was prescribed, and a contact lens (CANIS III, Cutting Edge Div., Canada) was placed in the left eye to protect the corneal surface. Oral treatment consisted of L-lysine (250 mg, BID, PO) and doxycycline hydrochloride hydrate (7 mg/kg, BID, PO).

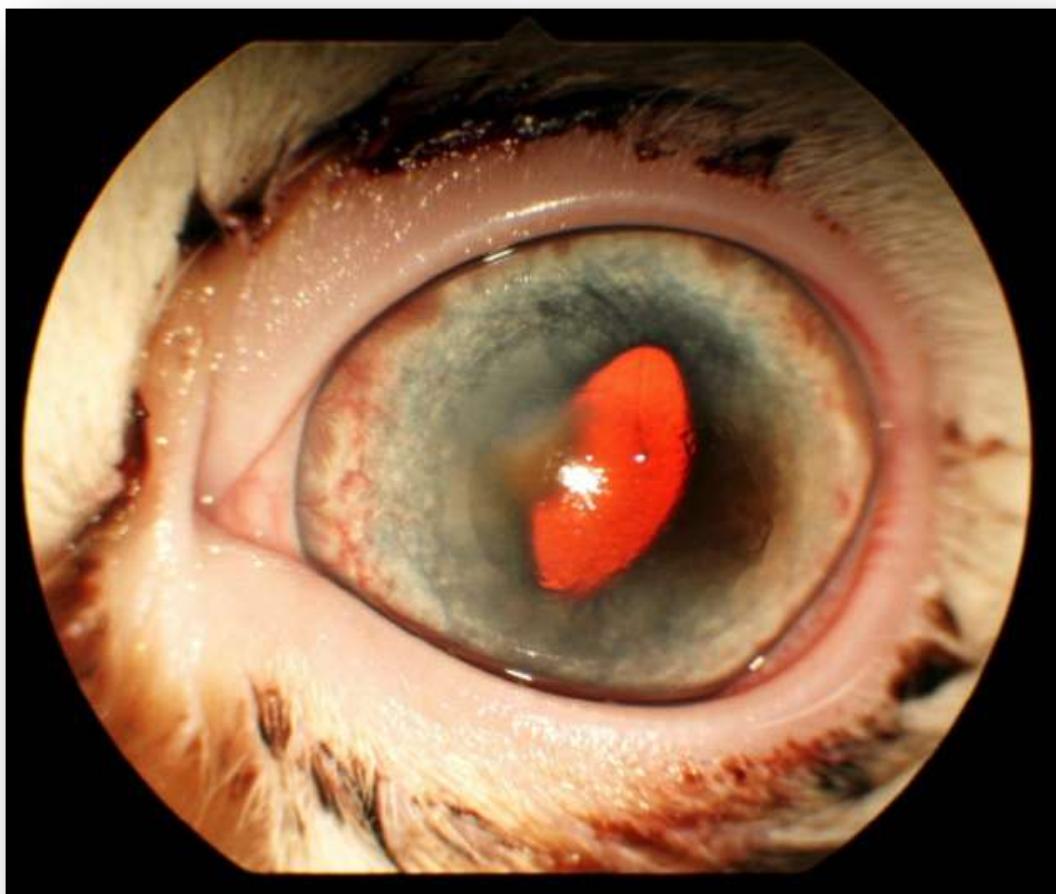


Figure 1. The corneal ulcer and sequestrum in the left eye at the initial visit.

Seven days after the initial visit, the owner returned with the cat and reported that it was exhibiting signs of severe pain in the left eye. Corneal laceration was apparent at the center of the cornea in the left eye, with associated severe corneal edema and corneal neovascularization. The cornea was not perforated, as determined by a Seidel test. Traumatic corneal laceration was diagnosed, and the owner consented to it being repaired using a canine glycerin-preserved cornea. After receiving approval from our university's animal research committee, we obtained a donor cornea with a 3-mm rim of adjoining sclera, which had been aseptically preserved in pure sterile glycerin in a freezer (-30°C) for 2 years^{2, 10}. The preserved cornea was immersed in sterile saline for 2 h. Then, the graft was prepared by removing the epithelial layer by wiping thoroughly with gauze, and by removing the endothelial layer and peripheral tissue, such that the cornea was two-thirds of its original thickness and 10 mm in diameter. The cornea was sutured with 9-0 nylon (Mani, Inc., Japan) and 6-0 polyglactin 910 suture (Ethicon, Inc., USA).

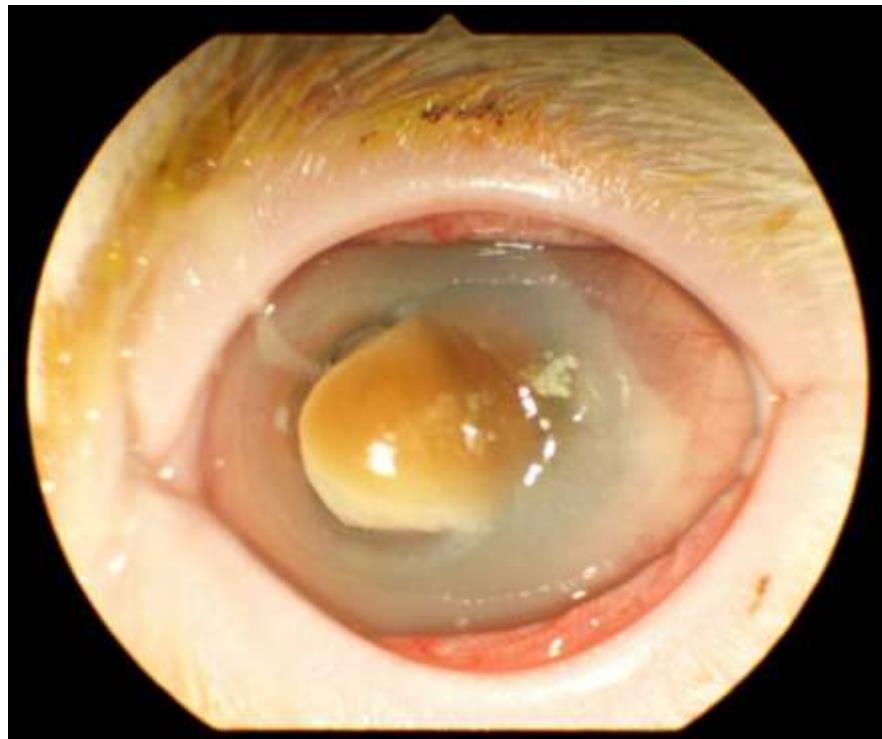


Figure 2. A corneal laceration was evident in the left eye 7 days after the initial visit.

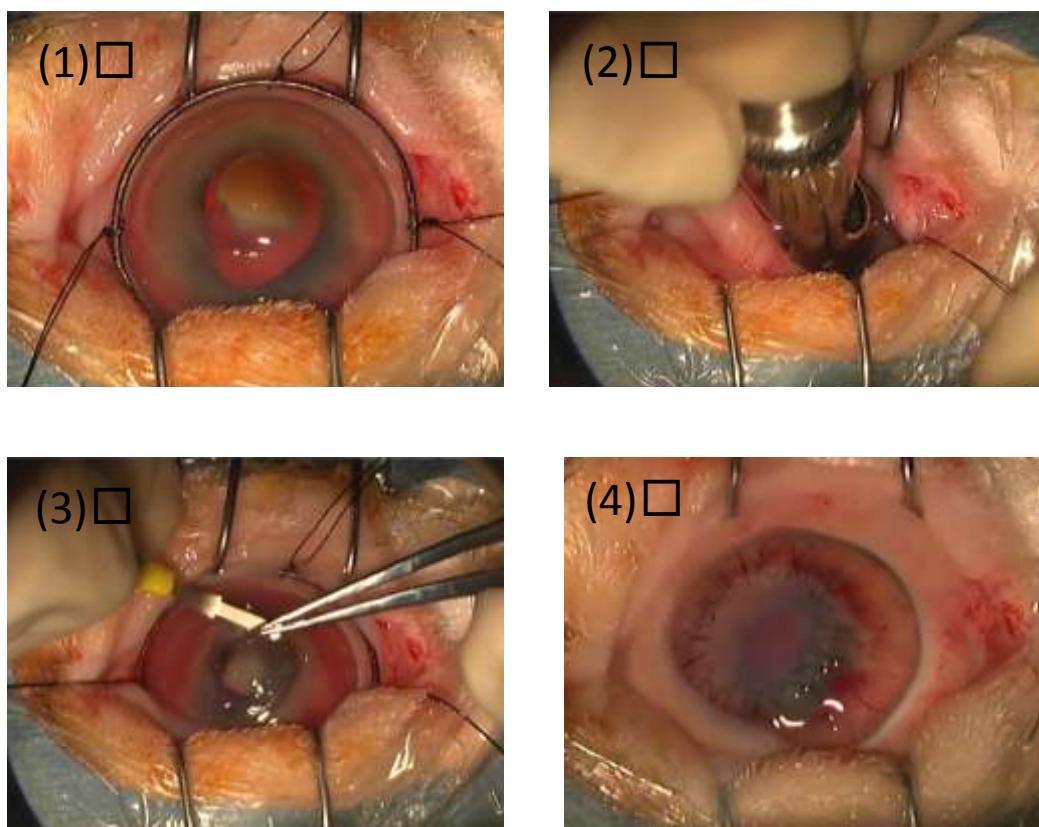


Figure 3. Photographs showing repair of the corneal lesion using glycerin-preserved canine corneal stroma. (1) Exposure of the lesion with Jaffe's wire speculums and a scleral fixation ring. (2) Trephination using a 10-mm corneal trephine. (3) Deep lamellar keratectomy performed with a crescent knife. (4) Graft consisting of glycerin-preserved canine corneal stroma.

The cat was hospitalized for a week following the operation, during which time intravenous drip infusions of 20% D-mannitol (2 mL/kg) twice daily, prednisolone succinate (1 mg/kg) once daily, and ampicillin (20 mg/kg) thrice daily were administered. Instillations of 0.3% cefmenoxime hydrochloride three times daily, autologous serum eye drops, and 3% acetylcysteine eye drops were administered for 7 days after surgery. An Elizabethan collar was placed on the cat postoperatively to prevent self-trauma to the surgical site. Two weeks after surgery, oral administration of lysozyme hydrochloride (15 mg/head, OID, PO) was initiated.

Engrafting was apparent at 7 days after surgery, but fluorescein staining revealed ulceration (4.0 × 2.5 mm in size) on the graft. Corneal neovascularization was observed surrounding the graft (Figure 4). Eye drops continued to be prescribed. The fluorescein-positive lesion disappeared 18 days after surgery, at which point autologous serum eye drops were stopped. Thirty-two days after surgery, mild corneal neovascularization was evident.



Figure 4. The left eye at 14 days after surgery.

Sutures were removed 46 days after surgery (Figure 5). Part of the graft was slightly cloudy, but the cornea was mostly clear; 0.3% ofloxacin and 3% acetylcysteine eye drops, three times daily, were prescribed. Corneal transparency remained the same at 74 days after surgery.

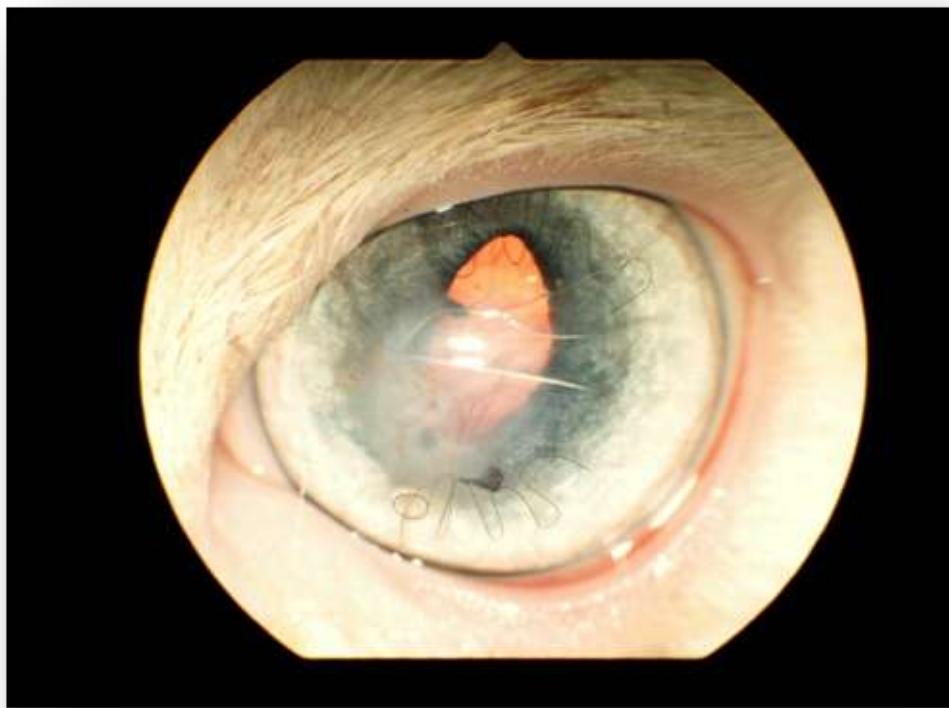


Figure 5. The left eye at 46 days after surgery.

Discussion

The first report of glycerin-preserved cornea grafting in dogs and cats in Japan was published by Dr. Kudo, one of our colleagues, in 1993¹¹. Since then, homologous, but not heterologous, grafting in dogs and cats has been commonly performed in Japan^{8, 9}.

Feline corneal diseases are often caused by herpes virus infections¹³. Dendritic corneal ulcer, corneal sequestration, and eosinophilic keratitis in cats are reported to be commonly associated with herpes infections, and herpes viruses have been detected in the corneas of clinically normal cats¹⁴. Thus, it is important that feline corneas used for homologous transplantation are confirmed as herpes-negative to prevent infection of the recipient. A heterograft is an alternative option, which reduces the risk of viral transmission when a screened donor is not available^{15, 16}. In the case reported herein, a defect after deep lamellar keratectomy was repaired with a tectonic graft in a cat, using glycerin-preserved canine corneal stroma.

Tectonic grafting using fresh or frozen corneas is commonly utilized in veterinary medicine. However, full-thickness corneal grafts may elicit a host-rejection reaction^{1, 17}. The major drawbacks of a host reaction are that the graft becomes vascularized and opaque after transplantation, and long-term administration of corticosteroids and other immunosuppressive drugs is necessary to maintain transparency of the graft. The antigenic molecular components of the graft responsible for rejection are contained in the endothelium and epithelium, rather than the stroma, of the cornea^{7, 18}. However, antigenicity can be reduced by removal of the endothelial and epithelial layers as well as by glycerin preservation¹². Therefore, glycerin-preserved heterologous corneal stroma is presumed to be suitable for tectonic grafts in cats.

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