ABSTRACT

A 7-month-old intact female Persian cat was diagnosed with symblepharon accompanied by epiphora, brownish ocular discharge, and ocular discomfort in the left eye. Superficial keratectomy (SK) was performed to remove adhesions between the conjunctiva and cornea. To prevent re-adhesion after SK, the detached conjunctival tissue was sutured to the corneal limbus, and a soft contact lens (SCL) was inserted and a partial temporary tarsorrhaphy was performed. The SCL and tarsorrhaphy sutures were maintained for 22 days, and symblepharon did not recur 347 days postoperatively. SK combined with SCL is a relatively easy and cost-effective surgical option for feline symblepharon.

Keywords: Case report; cat; keratectomy; soft contact lens; symblepharon

INTRODUCTION

Feline symblepharon is an adhesion between the bulbar or palpebral conjunctiva, cornea, and third eyelid and is caused by feline herpesvirus type 1 (FHV-1) infection [1,2]. On initial exposure to FHV-1, cats can develop upper respiratory symptoms such as serosal or mucopurulent nasal discharge, fever, and sneezing with ocular symptoms such as hyperemia, chemosis, ocular discharge, and blepharospasm [3]. However, in severe infections, FHV-1 induces cytolysis and ulceration of the conjunctival and corneal mucosal layers [2,3]. These conjunctival and corneal ulcerated surfaces rapidly adhere to each other and form a symblepharon [2,3]. During symblepharon development, the lacrimal punctum becomes obstructed or narrowed and tear drainage system can be impaired [1,3]. Moreover, the eyelids are distorted and vision is partially or completely lost due to corneal opacity or adhesion [2,3].

Surgical treatment performing superficial keratectomy (SK) for symblepharon aims to separate the adhered tissues between the cornea and conjunctiva, maintain the conjunctival epithelial surface and fornix, and restore vision [1]. To prevent recurrence that easily develops after single SK, temporary implants such as amniotic membranes (AMs) [4], soft contact lenses (SCLs) [5,6], methyl methacrylate corneal protectors [1], gelatin sponges [7], mitomycin C [8], and partial limbal stem cell implants [9,10], can be considered for the treatment of symblepharon in human and veterinary ophthalmology.
Only a few literatures have suggested that an SCL can be applied for feline symblepharon treatment [1,11]. In addition, to the best of our knowledge, no studies have described the application of SCL with SK, including the effect of SCL on preventing the recurrence of feline symblepharon. In this report, we describe the case of feline symblepharon with adhesions of the conjunctiva, cornea, and third eyelid and describe the surgical treatment of symblepharon using the combination of SK and SCL application to prevent symblepharon recurrence.

**CASE PRESENTATION**

A 7-month-old, 2.2 kg, intact female Persian cat with a 2-month history of excessive tear secretion, brownish waxy ocular discharge, and ocular discomfort with no response to antibiotic eyedrops in the left eye (oculus sister [OS]) was presented (Fig. 1A). Initial ophthalmic examination results were summarized in Table 1. Slit-lamp biomicroscopy (SL-D7®; Topcon, Japan) revealed corneal edema, distorted upper eyelid margin, and protrusion of third eyelid secondary to the adhesion of the conjunctiva, cornea, and third eyelid in the OS. Direct pupillary light reflex (PLR) was normal in the right eye (oculus dexter [OD]) and invisible in OS, owing to the opacity resulting from adhesion of the conjunctiva and cornea. Indirect PLR from OS to OD was normal, but that from OD to OS was invisible. Hematological and serum biochemical analyses were within the normal reference values. Accordingly, the cat was diagnosed with symblepharon. Because most of the corneal surface was both conjunctivalized and adhered to the adjacent conjunctiva, the surgical plan was to perform SK to separate the conjunctiva adhering to the cornea and place the SCL between the separated cornea and conjunctiva to prevent recurrence of symblepharon with the client’s informed consent.

The cat was positioned in dorsal recumbency and lateral canthotomy was performed to increase exposure, and the eyelids were retracted using a Barraquer eyelid speculum to secure...
Table 1. Ophthalmic examination results of a 7-month-old intact male Persian cat

|                      | OD    | OS    |
|----------------------|-------|-------|
| STT-1 (mm/min)       | 14    | 18    |
| IOP (mmHg)          | 16    | 21    |
| FDT                  | Negative | Negative |
| Menace response      | Positive | Positive (decreased) |
| Dazzle reflex        | Positive | Positive |
| PLR                  |        |
| Direct               | Positive | Invisible |
| Consensual           | Positive | Invisible |

OD, oculus dexter (right eye); OS, oculus sister (left eye); STT-1, Schirmer tear test-1; IOP, intraocular pressure; FDT, fluorescein dye test; PLR, pupillary light reflex.

After creating a superficial midline incision horizontally from 3 to 9 o’clock using a No. 15 surgical blade in the conjunctivalized surface on the cornea, SKs to remove the conjunctivalized surface and separate the conjunctiva from the corneal stroma were performed superiorly and inferiorly from the midline to the corneal limbus using a 2.6-mm crescent microsurgical knife (Kai Medical, Japan) (Fig. 1B and D). The adhesion between the palpebral surface of the third eyelid and palpebral conjunctiva was separated using Stevens curved tenotomy scissors. For the reconstruction of the conjunctival fornix, the adhered tissues were further separated caudally from the corneal limbus until 5–6 mm of the sclera was exposed. Then, the bluntly separated conjunctival tissues were sutured to the corneal limbal margin using 8-0 polyglactin 910 (Vicryl®; Johnson & Johnson, Germany) with simple continuous sutures (Fig. 1E and F). Care was taken to ensure that the subconjunctival tissue did not protrude between the sutures. After completion of suturing, the corneal diameter was measured using a Castroviejo ophthalmic caliper, and a 15.8-mm diameter SCL (Meni-one Corneal-Bandage One®; Menicon Nect Co., Japan) of the same size was inserted. Using a strabismus hook, the SCL was evenly pressed to fit tightly between the sutured conjunctival tissues and the corneal limbus (Fig. 1G). The lateral canthotomy was sutured with a figure-of-eight pattern using 6-0 nylon (Blue Nylon®; Ailee, Korea), and temporary partial tarsorrhaphy was performed using a simple interrupted suture to prevent the SCL from falling. Topical cyclopentolate BID (Ocucyclo®, Samil Pharm, Korea) was instilled in OS until 8 days postoperatively. Topical 0.5% levofloxacin QID (Eyelevo®, Kolmar Pharm, Korea) and trifluridine QID (Ocufridine®, Samil Pharm) were instilled in OS until 22 days postoperatively, and systemic doxycycline (Doxycycline®, Kukje Pharm, Korea) 5 mg/kg BID was administered for 22 days. An Elizabethan collar was placed on the cat to prevent self-trauma until the sutures were removed 22 days postoperatively. The cat was re-examined 8 and 22 days postoperatively. The temporary partial tarsorrhaphy sutures and SCL were removed 22 days postoperatively. At that time, the cat exhibited enhanced menace response in OS and positive dazzle reflex in the OU. Normal direct PLR and indirect PLR from OD to OS were observed in the OS and palpebral reflex was also confirmed normally in OS. The cat was able to jump up and down on a cat tower and chase a toy better than that preoperatively according to the owner’s report. At the final recheck at 347 days postoperatively, there was cosmetic improvement even with continued mild protrusion of the third eyelid, corneal opacity, and corneal vascularization. Neither ocular discomfort nor upper eyelid distortion and re-adhesions among the cornea, conjunctiva, and eyelid were observed (Fig. 1H).
DISCUSSION

FHV-1 has high affinity for the respiratory and conjunctival epithelia, replicating in these cells and inducing necrosis and ulceration [12,13]. To a lesser extent, FHV-1 can also replicate in the corneal epithelium, causing corneal ulcers, and approximately 80% of cats are known to have latent infection in the corneal stroma or trigeminal ganglia [12-14]. Clinical signs may recur with herpes virus reactivation and recrudescence caused by stress, including re-homing, overcrowding, introduction of new animals, boarding situations, anesthesia, frequent medications, parturition, or drugs such as corticosteroids. It might also lead to corneal sequestra, stromal keratitis, and eosinophilic keratitis [2,14]. In particular, symblepharons are more commonly associated with primary exposure in kittens and are rare in adult cats [12]. Therefore, if FHV-1 is not appropriately treated in the early stage of primary infection, permanent damage of the epithelium and adhesions may occur, which may reduce the effectiveness of surgical treatment, allowing the frequent recurrence of more severe forms of symblepharons [3]. Therefore, it is recommended to prescribe topical (trifluridine, idoxuridine, vidarabine, and ganciclovir) or systemic (acyclovir and famciclovir) antiviral agents to prevent symblepharon even after surgical treatment [1,2]. However, in the present case, famciclovir was not administered perioperatively because the owner disagreed to the drug prescription due to the side effects, including nephrotoxicity, and high cost; thus, topical trifluridine eyedrop was instilled.

In this case, it was impossible to construct a donor site for limbal stem cells because most of the OS cornea was damaged and conjunctivalized. Although there was an option of creating a corneal stem cell tissue graft from the limbus of the OD and implanting it into the OS, the cat’s owner refused surgery on the normal OD. Therefore, after performing SK, the separated conjunctiva was sutured to the corneal limbus, and SCL was inserted tightly between the conjunctiva and cornea to cover the exposed corneal stroma and prevent conjunctivalization of the cornea as much as possible [1,5]. Temporary partial tarsorrhaphy was also performed to retain SCL, protect the surgical site, and reduce irritation from eyelid movement [1].

The SCL is not only known to physically separate the cornea and conjunctiva until epithelialization is complete but also relieves ocular pain [1]. In a human study, the group using SCLs postoperatively to treat the pterygium had reduced postoperative pain and stinging compared with the group that did not use SCLs [5]. SCL has also been reported to reduce the time of corneal re-epithelialization [5]. Grinninger et al. [15] suggested that re-epithelialization time with the use of SCLs in dogs was obviously accelerated (mean, 14 ± 0 days) compared with those without SCLs (mean, 36 ± 17 days).

In this case report, on the 22nd day postoperatively, the fluorescein dye test result was negative in OS, confirming complete corneal re-epithelialization and there was no recurrence of symblepharon at the final recheck 347 days postoperatively. The SK combined with intraoperative SCL for the treatment of symblepharon was a relatively easy and cost-effective option, with requiring shorter surgical time and was considered to be effective in preventing recurrence compared with single SK in cats.

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REFERENCES

1. Gelatt KN, Brooks DE. Surgical procedures for the conjunctiva and the nictitating membrane. In: Gelatt KN, Gelatt JP, editors. Veterinary Ophthalmic Surgery. 1st ed. Maryland Height: Elsevier Saunders; 2011, 157-190.

2. Maggs DJ. Diseases of the conjunctiva. In: Maggs DJ, Miller P, Ofri R, editors. Slatter's Fundamentals of Veterinary Ophthalmology. 6th ed. St. Louis: Elsevier Health Sciences; 2018, 158-177.

3. Stiles J, Townsend WM. Feline ophthalmology. In: Gelatt KN, editor. Veterinary Ophthalmology. 4th ed. Ames: Blackwell Publishing; 2007, 1095-1164.

4. Patel AP, Satani DR, Singh S, Desai S. Application of amniotic membrane transplantation in cases of symblepharon. J Indian Med Assoc 2012;110(6):388-389.

5. Daglioglu MC, Coskun M, Ilhan N, Tuzcu EA, Ilhan O, Keskin U, et al. The effects of soft contact lens use on cornea and patient’s recovery after autograft pterygium surgery. Cont Lens Anterior Eye. 2014;37(3):175-177.

6. Kaufman HE, Thomas EL. Prevention and treatment of symblepharon. Am J Ophthalmol. 1979;88(3 Pt 1):419-423.

7. Yamada M, Sano Y, Watanabe A, Mashima Y. Preventing symblepharon formation with a gelatin sponge in the eye of a patient with an alkali burn. Am J Ophthalmol. 1997;123(4):552-554.

8. Rodríguez JA, Ferrari C, Hernández GA. Intraoperative application of topical mitomycin C 0.05% for pterygium surgery. Bol Asoc Med P R 2004;96(2):100-102.

9. Shi W, Wang T, Gao H, Xie L. Management of severe ocular burns with symblepharon. Graefes Arch Clin Exp Ophthalmol. 2009;247(1):101-106.

10. Hille K, Makuch D, Wilske J, Ruprecht KW. The effectiveness of limbus epithelium transplantation. Ophthalmologe. 2002;99(7):575-579.

11. Bedford P. Ocular disease in the cat. In Pract. 1983;5(2):64-70.

12. Spiess BM. Conjunctiva and third eyelid. In: Martin CL, Pickett JP, Spiess BM, editors. Ophthalmic Disease in Veterinary Medicine. 2nd ed. Boca Raton: CRC press Taylor & Francis group; 2019, 235-280.

13. Nasisse MP, Guy JS, Davidson MG, Sussman WA, Fairley NM. Experimental ocular herpesvirus infection in the cat. Sites of virus replication, clinical features and effects of corticosteroid administration. Invest Ophthalmol Vis Sci 1989;30(8):1758-1768.

14. Mitchell N, Oliver J. Feline Ophthalmology-the Manual. 1st ed. Zaragoza: Servet; 2015, 89-102.

15. Grünninger P, Verbruggen AM, Kraijer-Huver IM, Dijadiningrat-Laanen SC, Teske E, Boevé MH. Use of bandage contact lenses for treatment of spontaneous chronic corneal epithelial defects in dogs. J Small Anim Pract. 2015;56(7):446-449.