Scientific Works. Series C. Veterinary Medicine. Vol. LX (1)
ISSN 2065-1295, ISSN Online 2067-3663, ISSN-L 2065-1295

TREATMENT OF BULLOUS KERATOPATHY IN THE DOG

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Abstract

Primary bullous keratopathy is a pathological condition of the cornea characterized by bullae formation within the stroma, the primary cause being an endothelial dystrophy. Fluid accumulation results in progressive corneal oedema, that can affect vision. The condition will become painful when the epithelium is affected and ulceration develops.
There are a variety of medical and surgical options to alleviate the pain and reduce the corneal oedema. This article reviews these treatment options, with some emphasis on thermokeratoplasty and the use of hyperosmotic solutions.
Thermokeratoplasty is a surgical procedure that uses heat for shrinking the collagen of the corneal stroma, in this way preventing further fluid accumulation.
Topical hyperosmotic preparations can be used as a symptomatic treatment for bullous keratopathy. They can decrease the extent of epithelial oedema and bullae formation,but do not decrease the stromal oedema. In this study, 5% sodium chloride in hylan protective eye drops was used for supportive treatment in bullous keratopathy in several dogs.

Key words: *bullous keratopathy, dog, hyperosmotic solution, thermokeratoplasty.*

INTRODUCTION

The endothelium, the posterior layer of the cornea, plays an important role in maintaining corneal transparency, by pumping the fluid from the stroma to the anterior chamber (Joyce, 2003; Møller-Pedersen, 2004). Any dysfunction of this monolayer can lead to fluid accumulation within the stroma and further corneal oedema (Joyce, 2003; Rodrigues et al., 2006).

The cornea has a compact architecture, it's transparency relying on the lattice-like arrangement of the collagen fibrils (Dawson et al., 2006; Edelhauser, 2006).

It is often difficult to distinguish between primary and acquired endothelial disease, the later being much more common (Brooks et al. , 1990). Breed related corneal endothelial dystrophy is more frequently seen in Boston Terriers and Chihuahuas, but can also be seen in English Springer Spaniels, Boxers and Dachshunds (Gwin et al., 1982; Gwin, Polack et al., 1982).

Bullous keratopathy is a pathological condition of the cornea that appears when the pumping function of the endothelial cells is not working properly anymore (Michau et al., 2003; Edelhauser, 2006). As a result, excessive fluid accumulates within the corneal parenchyma, forming small vesicles that coalesce (Glover et al., 1994). In chronic cases, these bullae can rupture, leading to corneal ulceration and associated pain (Michau et al., 2003). The pain is manifested by blepharospasm and tearing and is caused by the exposure of the nerve endings (Al-Aqaba et al., 2011). Depending on the severity of the corneal oedema, the condition can progress to visual impairment and even vision loss (Gilger, 2007; Pot et al., 2013).

Treatment for primary bullous keratopathy can be medical or surgical. The medical options include topical application of hyperosmotic preparations, which have a palliative effect by reducing the epithelial bullae formation (Knezović et al., 2006; Gilger, 2007). Long term use of soft contact lenses may help protect corneal epithelium (Lefranc T., 2003). The surgical options include thermokeratoplasty, covering of the cornea with a thin conjunctival flap, penetrating keratoplasty, amniotic membrane transplantation or UV-A collagen cross-linking (Hansen and Guandalini,, 1999; Stechschulte and Azar, 2000; Michau et al., 2003; Espana et al., 2003; Spiess at al., 2014).

This paper reviews the use of hyperosmotic topical solution as a symptomatic therapy in corneal oedema resulting from bullous keratopathy and also thermokeratoplasty as the surgical treatment for the condition.

CASE STUDIES

In all the cases presented at the Animal Medical Centre Referral Services between 2010 and 2013, the dogs had a history of corneal oedema of at least two months' duration. Hyperosmotic solution was used as a supportive treatment in three cases, whereas thermokeratoplasty was performed in ten cases where oedema was almost involving the corneal epithelium and it was a high risk of bullae rupture and subsequent ulceration.

Before being referred to our practice, the dogs underwent treatment with topical and systemic corticosteroids and protective eye drops, but with no improvement. The dogs had an average age of 6 years old, with no sex predisposition, the Boston terrier being the most represented breed. They were all diagnosed with bullous keratopathy secondary to endothelial dystrophy, in the absence of any other clinical abnormality of the eyes.

Investigation was performed by slit-lamp biomicroscopy, tonometry and ophthalmoscopy. The clinical signs were diffuse corneal opacity, usually bilateral, which led to decreased vision, and where there was corneal erosion, blepharospasm and photophobia.

The hyperosmolar preparation used in these cases was protective hylan eye drops (Eyesoothe, TransEuropa Associates Limited, England*)* with added sodium chloride as to be a 5% solution .

Thermokeratoplasty was performed using a small tip of an electrocautery handpiece (Ellman Dento-Surg 90 F.F.P., Oceanside, NY, U.S.A) that was applied to multiple sites on the surface of the cornea. The lowest intensity of heat was used in order to coagulate the collagen of the corneal stroma, in this way preventing further fluid accumulation, by stopping the expansion of the normally uniform periodic spacing of the collagen fibrils.

All the dogs were reexamined after 1, 3, 6, 12 weeks, 6 and 12 months after the procedure was performed. There was persistent corneal scarring associated with the procedure. All the owners reported that the animals had slightly improved, and certainly, adequate vision.

Dino, a seven years old male Boxer presented with a history of recurrent blepharospasm, photophobia and corneal oedema of four months duration. Slit-lamp examination revealead the presence of corneal opacity with large epithelial bullae in both eyes (figure 1 and figure 2). The menace, dazzle and pupillary light reflexes were normal in both eyes and the fluoresceine test was negative in both eyes. The intraocular pressure was 8 mmHg in the left eye and 10 mmHg in the right eye. Posterior segment examination was difficult to perform due to the dense corneal oedema.

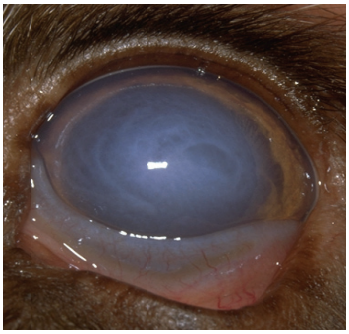

Figure 1. Left eye bullous keratopathy

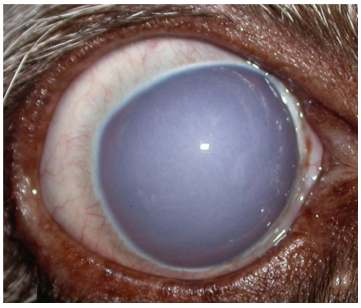

Figure 2. Right eye dense corneal oedema

Thermokeratoplasty was performed in both eyes. The patient was discharged from the clinic on the day of the procedure, with mild persistent discomfort controlled by oral antiinflammatories and protective hylan eye drops. At the one week recheck the eyes were comfortable, with no blepharospasm and no further bullae formation.

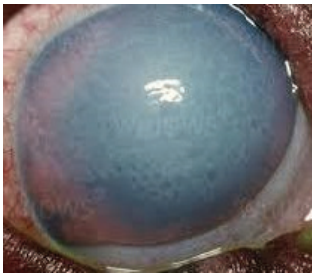

Figure 3. Right eye- one week
after theromokeratoplasty was performed

No changes were noted at the three and six weeks reexamination. At the three months recheck, a slight improvement in visual acuity was reported by the owner. No further changes were noticed during the rest of the check-ups, the last one being after one year from the procedure.

In one of the patients, a ten year old female Dachshund that presented with advanced bullous keratopathy in the right eye, the significant pain with blepharospasm and photophobia reoccurred in one month after thermokeratoplasty was performed. In this case, a thin conjunctival flap was applied on the surface of the cornea and the clinical signs decreased in intensity after one week, with no reoccurrence.

Hyperosmotic solution was used as a supportive treatment in three of the dogs that presented in our practice with a history of bullous keratopathy. Because the hyperosmotic sodium chloride ointment was difficult to be purchased, we prepared a 5% solution by disolving sodium chloride in hylan protective eye drops.

Ernie, a four years old male Boston terrier, presented with a history of bilateral progressive corneal oedema secondary to endothelial dystrophy. Ophthalmic examination revealed the presence of dense corneal oedema in both eyes, which led to decreased vision. The recommended treatment was Eyesoothe with 5% saline in both eyes four times a day. At the one week reexamination, the eyes were comfortable, with no further fluid accumulation. At the three weeks recheck, a slight decrease in anterior stromal fluid accumulation was noted.

The eyes remained comfortable over a period of six month, when the last ocular examination was performed.

CONCLUSIONS

Primary bullous keratopathy in dogs is a pathological condition that appears when the normal architecture of the cornea has been disrupted, leading to fluid accumulation within the stroma.

The significant clinical sign is the dense corneal oedema that impedes vision. The condition may

become painful when the epithelium is affected and ulceration develops.

The treatment options can be medical or surgical. In this study, the surgical treatment was thermokeratoplasty, whereas the medical option was the use of hyperosmotic solutions.

Hyperosmotic preparation was used in the early stage of the disease, when there was no associated pain. This method of therapy has the advantage of being a cheap way of keeping the eyes comfortable for a long period of time.

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