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COMBINED REGENERATIVE TOPICAL THERAPY FOR TRAUMATIC CORNEAL ULCER IN AN ENGLISH BULLDOG: A CLINICAL CASE

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ABSTRACT

Corneal ulcers present a significant clinical challenge in the treatment of companion animals. In recent years, there has been growing interest in the use of autologous blood derivatives, noted for their high local regenerative potential, either alone or in combination with other treatments. This study aimed to evaluate the effect of a combined topical therapy – including autologous platelet-rich plasma (PRP), platelet-poor plasma (PPP), and ophthalmic drops containing sodium hyaluronate and dexpanthenol – in an English Bulldog with a traumatic corneal ulcer.

Key words: dog, corneal ulcer, platelet-rich-plasma, sodium hyaluronate, dexpanthenol.

Introduction

Corneal ulceration is a common and painful ocular condition in small animals that may progress rapidly and cause severe ocular disorders, in small animals, characterized by epithelial loss that may extend into the stroma and trigger a cascade of inflammatory and degenerative processes. he progression of a corneal ulcer typically involves stromal collagen degradation mediated by matrix metalloproteinases, leukocyte infiltration, edema, and, in more severe cases, neovascularization (Ljubimov & Saghizadeh, 2015). Healing is complex and relies on a coordinated sequence of epithelial migration, proliferation, stromal remodeling, and re-innervation, all of which may be impaired by factors such as mechanical irritation, tear film instability, or concurrent conformational abnormalities like entropion (Tsubota *et al.*, 2002; Mustafa & Zlateva-Panayotova, 2023).

Regenerative ophthalmic therapies support corneal healing by modulating inflammation and enhancing tissue repair. Platelet-rich plasma (PRP) supplies concentrated growth factors that stimulate epithelial proliferation, stromal repair, and angiogenesis regulation (Nadelmann *et al.*, 2022). Platelet-poor plasma (PPP) contributes fibrinogen and fibronectin, improving cellular adhesion and hydration (Pietrzak & Eppley, 2005; Zhang *et al.*, 2020).

Among topical agents, sodium hyaluronate stabilizes the tear film and facilitates epithelial migration (Gronkiewicz *et al.*, 2017), while dexpanthenol improves hydration and promotes epithelial healing through pro-repair mediators (Gorski *et al.*, 2020).

This case report presents a topical application combining PRP, PPP, dexpanthenol, and sodium hyaluronate in an English bulldog with traumatic corneal ulceration.

Materials and Methods

Patient

A 4-year-old, intact female English Bulldog weighing 25 kg was presented to Saint George Veterinary Clinic (Sofia, Bulgaria) with a one-week history of epiphora in the left eye. Previous treatment with ciprofloxacin and dexpanthenol eye drops had been ineffective.

Clinical examination

Focal light examination using a direct ophthalmoscope confirmed the presence of a central corneal ulcer with opacity, stromal thickening, and neovascularization while diffuse illumination allowed visualization of conjunctival hyperemia and epiphora. Additional findings included unilateral entropion of the lower left eyelid and severe conjunctivitis, which contributed to mechanical irritation of the ocular surface (Fig. 1).

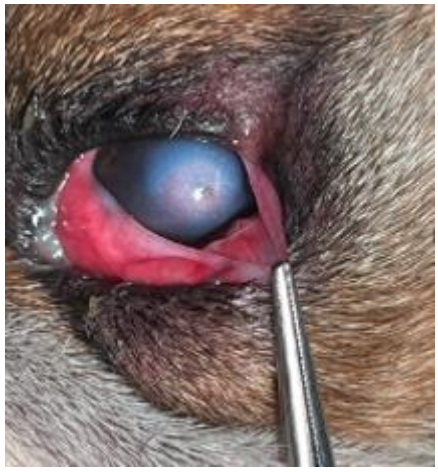

Figure 1: Corneal ulceration with neovascularization.

Differential diagnoses—including thelaziosis, ectopic cilia, and foreign bodies beneath the third eyelid—were excluded. Fluorescein staining was not performed due to the owner's report of a previous anaphylactic reaction to topical fluorescein.

Entropion surgical correction

General anesthesia was induced following premedication with dexmedetomidine (Dexmopet®) at 5 µg/kg IM, intravenous induction with propofol at 4–6 mg/kg IV, and maintenance with isoflurane (2.5vol.%) in oxygen 2.5 l/min. Surgical correction of the lower eyelid entropion was performed using a standard Hotz–Celsus technique. A crescent-shaped strip of skin and underlying orbicularis muscle was excised parallel to the eyelid margin, approximately 2–3 mm below the palpebral border line, ensuring symmetrical tissue removal along the affected segment. The defect was closed using simple interrupted sutures (2/0 polypropylene) placed in a manner that everted the eyelid margin and restored normal apposition to the cornea. Care was taken to avoid excessive tension or overcorrection, given the conformational predisposition of English Bulldogs.

PRP & PPP preparation

Preoperatively, 15 mL of venous blood was collected into tubes containing 3.8% sodium citrate (10:1). The autologous blood was processed using the double-centrifugation method described by Peng *et al.* (2016) (first: 3500 rpm, 10 min; second: 2500 rpm, 3 min). Both PRP and PPP were aspirated into sterile syringes and stored at 4 °C without activation (i.e., without calcium salts or thrombin) for up to 10 days. To maintain optimal platelet viability, fresh preparations of PRP and PPP were obtained every 10 days (days 0, 10, and 20), in accordance with the 7–10-day activity window of platelets stored at 4°C.

Application of topical regenerative agents

Postoperative therapy consisted of topical administration of pre-prepared eye drops containing PRP, PPP, and an ophthalmic solution with 0.15% sodium hyaluronate and 2% dexpanthenol (Rogodex®, Bioshield Ltd). The application schedule is presented in Table 1.

Table 1: Postoperative topical treatment.

PERIOD	MORNING	NOON	EVENING
Day 1 (Post-op)	–	Rogodex	PRP
Days 2–4	PPP	Rogodex	PRP
Days 5–7	PRP	Rogodex	PRP
Days 8–10	PPP	Rogodex	PPP
Days 11–30	Repeat cycle (3 total)		

Results

Clinical improvement was observed shortly after the initiation of the combined topical therapy. By **day 3**, corneal neovascularization was already notably reduced compared to the initial presentation. A decrease in conjunctival hyperemia and ocular discharge was also evident at this stage. By **day 10**, corneal vascularization had completely regressed, leaving only mild stromal haze. A visible contraction of the central corneal opacity (nubecula) was noted. By **day 15**, marked reduction in both the ulcer size and the density of the stromal opacity was observed, with progressive epithelialization of the defect. The corneal surface appeared smoother and more stable, while the surrounding conjunctival inflammation had resolved.

By **day 30**, complete epithelial closure of the ulcer was achieved. A residual central corneal opacity remained, requiring further management with topical corticosteroid therapy to improve transparency (Fig. 2).

Figure 2: Response to combined topical therapy.

Discussion

Corneal wound healing is a complex process influenced by the depth of the injury and the surrounding biological environment. In superficial lesions, maintaining hydration of the ocular surface and controlling inflammation are essential therapeutic goals (Tsubota *et al.*, 2002). The use of blood-derived products in ophthalmology originated from the need for tear substitutes that not only provide lubrication but also deliver key bioactive molecules that support ocular surface repair (Ribeiro *et al.*, 2017).

PRP and PPP have gained increasing attention as regenerative therapies in both human and veterinary ophthalmology. **PRP** contains a high concentration of growth factors such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), and epidermal growth factor (EGF), which regulate neovascularization, promote epithelial migration, and stimulate stromal repair (Nadelmann *et al.*, 2022). **PPP**, though containing far fewer platelets, is rich in fibrinogen and fibronectin, which facilitate cellular adhesion and proliferation and contribute to maintaining corneal hydration (Pietrzak & Eppley, 2005).

Adjunctive agents such as **sodium hyaluronate** and **dexpanthenol** provide additional therapeutic advantages. Sodium hyaluronate is used in ophthalmology for its viscoelastic and lubricating properties (Burgalassi *et al.*, 2022). Although its effect on the outer corneal epithelium remains underexplored in veterinary medicine, in vitro studies suggest that it supports epithelial migration—a key process in corneal healing (Gronkiewicz *et al.*, 2017). Sodium hyaluronate acts as a mucinomimetic agent, stabilizing the tear film and reducing friction during blinking (Kojima *et al.*, 2020).

Dexpanthenol acts primarily as a moisturizing and epithelial healing agent. It is believed to promote healing through stimulating interleukins expression, such as IL-6 and IL-8, and enhancing cell migration (Gorski *et al.*, 2020). Clinical evidence in human ophthalmology supports their use, showing accelerated epithelial recovery and improved patient comfort after corneal abrasions (Lin & Gong, 2015).

In the present case, the combination of **PRP, PPP, sodium hyaluronate, and dexpanthenol** achieved rapid improvement in corneal ulcer healing. The early regression of neovascularization, reduction in opacity, and eventual epithelial closure demonstrate the synergistic effect of these agents. Importantly, fluorescein staining was not performed due to the patient's history of anaphylaxis. Although systemic hypersensitivity to intravenous fluorescein has been documented (Kornblau & El-Annan, 2019), topical reactions are extremely rare (Shahid & Salmon, 2010). Whether this event is breed-related remains uncertain, but it underscores the need for alternative diagnostic approaches in such cases.

This case highlights the clinical value of multimodal regenerative therapy, combining autologous blood derivatives with supportive agents, as a promising strategy for the management of complicated corneal ulcers in dogs.

Conclusion

The combined application of autologous PRP, PPP, dexpanthenol, and sodium hyaluronate was safe and effective in accelerating the healing of a traumatic corneal ulcer secondary to entropion in an English Bulldog. The synergistic effects of these agents promoted epithelial repair, reduced inflammation, and preserved ocular surface hydration. Further clinical studies with more potential

patients are needed to confirm these results and to evaluate the impact of ulcer etiology on therapeutic outcomes.

Declaration of conflicting interests

No potential conflicts of interest were reported by the authors concerning this clinical case presentation, its authorship, or publication.

Ethical requirements statement

All procedures conducted during diagnosis and treatment complied with relevant animal welfare regulations and ethical standards. The dog's owner provided consent for the use of clinical data and related images in this case report.

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