CONSERVATION MEDICINE

Identifying an Effective Treatment for Corneal Ulceration in Captive Tapirs

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Abstract

Captive tapirs often exhibit debilitating eye disease, frequently in the form of corneal ulcerations. Despite the fact that this is a well-known condition, only few treatments have been established for this disease in tapirs. Here we describe a treatment protocol that successfully treated corneal ulcers and prevented loss of eyesight in captive-held South American tapirs. Two female South American tapirs (*Tapirus terrestris*), held at Huachipa Zoological Park, were diagnosed with corneal ulcerations. They were treated with an eye gel containing deproteinized calf serum along with antibiotic eye drops. This is a treatment that has been validated in other animals and in humans. Improvement was visible already within 48 hours. Within one to two weeks, the ulcerations had disappeared.

Keywords: Cornea, eye, tapir, treatment, ulceration

Introduction

Case reports generated by various professionals associated with zoological institutions have described ocular lesions in birds, reptiles and mammals (Schmidt & Toft, 1981; Montiani-Ferreira, 2001). The pathologies most commonly diagnosed include cataracts, panophthalmitis, conjunctivitis, keratitis, retinal degeneration and microphthalmia (Schmidt & Toft, 1981).

Keratitis is frequently reported in captive held tapir species (*Tapiridae*) with ocular problems including the Malayan tapir (*Tapirus indicus*) and the South American tapir (*T. terrestris*) (Montiani-Ferreira, 2001). The affected eyes typically demonstrate corneal opacification and ulceration as well as conjunctival inflammation (Montiani-Ferreira, 2001). The lesions are thought to be most likely caused by trauma and aggravated by relative overexposure to UV light (Ramsay, 1993). This hypothesis is based on the observation that keratitis is found relatively infrequently in free-ranging tapirs that live in dense tropical jungles with little exposure to direct sunlight. On the other hand, virtually every affected captive individual is exposed to an excessive amount of sunlight (Ramsay, 1993). Regardless of cause, management of corneal diseases in captive wild mammals typically follows similar treatment protocols to those used in domesticated animals (Montiani-Ferreira, 2001).

This paper discusses the diagnosis and treatment of corneal ulcers in two captive-held South American tapirs.

Statement of the Problem

A six-year-old female South American tapir kept at the Huachipa Zoological Park was presented with a deep corneal ulceration of the right eye approximately six mm in diameter (Fig. 1A). Seven months later, another female tapir was seen to have a similar, but slightly smaller lesion also of the right eye. This ulcer was measured at four mm in diameter (Fig. 1B). Both animals showed clinical signs of excessive tear production in the affected eye. The first animal also displayed involuntary closing of the eyelids, indicating discomfort of the eye. A positive fluorescein test in both cases led to the diagnosis of a corneal ulcer. Based on the severity of the clinical signs, decisions were made to sedate the animals in order to perform a thorough eye examination. The tapirs were immobilized with ketamine (4mg/kg IM), dexmedetomidine (0.015 mg/kg

Figure 1. Corneal ulcer of the right eye of two *Tapirus terrestris*. A. Diameter of ulcer is approx. six mm. Note the neovascularization originating from the limbus and proceeding towards the lesion. B. Diameter of ulcer is approx. four mm and neovascularization is less evident.

IM) and midazolam (0.1 mg/kg IM). Once recumbent, the eyes were examined for further evaluation.

In both cases, assessment of the ocular surrounding structures was unremarkable. Slit lamp biomicroscopy demonstrated diffuse corneal edema with a central area of epithelial and stromal loss six mm in diameter in the first tapir and four mm in diameter in the second case. Fundoscopy revealed a retina with normal appearance. Fluorescein staining was positive and corneal stromal loss of approximately 50% in both animals. In the first, more severe case, superficial corneal neovascularization was present, but did not extend to the margins of the corneal defect.

Cytology and bacterial culture data from the first individual revealed the presence of *Pseudomonas aeruginosa*, an opportunistic pathogen of animal skin. This gram negative organism is naturally resistant to a wide range of antibiotics, and topically applied aminoglycosides such as gentamycin and tobramycin are the drugs of choice for treatment of the cornea. The bacterial culture of the second tapir was negative. As part of a standard ocular examination, intraocular structures were examined by the use of high frequency ultrasound (Accutome B-Scan imaging, probe frequency 15 MHz) with a gel stand-off. Anterior and posterior chambers were found to be free of apparent inflammatory or other changes.

Figure 2. A flexible endovenous catheter (Abbocat no. 22) with a tuberculin syringe used as a lavage system to allow easy application of topical eye medications to the surface of the eye.

Description of the Process

Treatment of the first animal consisted of topical ophthalmic solutions of tobramycin sulphate (Trazil Ofteno® 3 mg/ml) 1-2 drops every four hours, diclofenac sodium (3-A Ofteno 1 mg/ml) 1-2 drops every eight hours and deproteinized calf serum (Solcoseryl® Ophthalmic Gel 10%) 1 cm of gel every eight hours. When multiple treatments fell at the same time, five minutes separated the application of the various medications. The second individual was treated similarly with tobramycin sulphate and deproteinized calf serum. As the second animal did not show signs of pain or discomfort, diclofenac sodium was not prescribed.

Due to the difficulty in applying topical eye drops in an very vertically set eye, all solutions were applied through a flexible intravenous catheter (Abbocat no. 22) connected to a tuberculin syringe at the medial canthus (Fig. 2). The protocol was administered for a period of thirty days.

Animal training facilitated management and handling of the animals for application of the topical solutions and fluorescein testing. Furthermore, eye examinations were carried out every seven days. Due to the overall well-being of the animals, systemic treatments were not initiated.

In the first animal, discomfort and tear production decreased considerably after the first 48 hours of therapy. After the first week, the ulcer had diminished to approximately three mm in diameter based on fluorescein staining and slit lamp biomicroscopy. Corneal edema was limited to the area immediately surrounding the ulcer (Fig. 3). Two weeks following initiation of treatment, the fluorescein test was negative (Fig. 4) and the lesion was covered with epithelium. In the second animal, tear production similarly decreased after 48 hours of therapy and the ulcer was reduced by 50% in diameter following the initial week of treatment. After termination of medicinal treatment, the eyes received one drop of hypertonic saline (5%) twice daily for thirty days to eliminate the remaining corneal edema.

Evaluation of the Process

Corneal ulceration is one of the most commonly diagnosed ocular lesions in wild animals held in captivity (Montiani-Ferreira, 2001). The treatment success is highly dependent on establishing a correct protocol at an early stage. Failure to do so may result in corneal perforation and loss of vision or the eye. Ideally, before establishing an antimicrobial treatment protocol, ulcers should be assessed with cytology and/or culture to determine correct antibiotic use (Montiani-Ferreira, 2001).

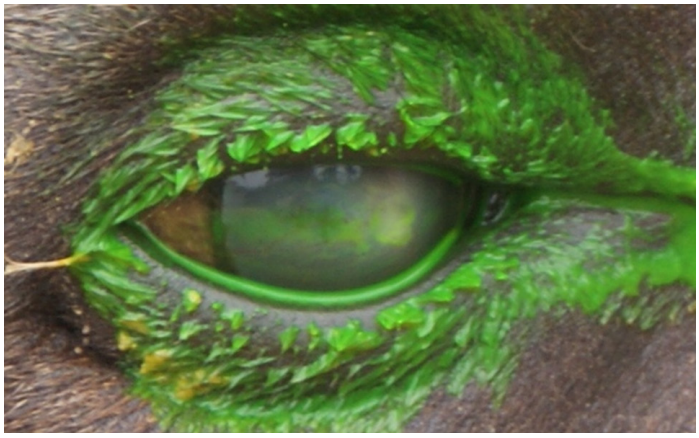

Figure 3. The eye of the first tapir a week after initiating treatment. Blood vessels in the cornea are still present but to a lesser extent. The cornea stains fluorescein positive in a horizontal band.

Figure 4. The eye of the first tapir two weeks after diagnosis. The cornea remains clouded but is fluorescein negative, as the ulcer is now covered with epithelium.

The use of calf serum is documented in human and domestic animal medicine in order to shorten recovery time and promote healing of the cornea especially when there is no response to conventional treatment (Egger *et al.*, 1999). In equine medicine, the treatment of corneal ulcers often consists of a combination of topical antibiotic and (often oral) analgesic/anti-inflammatory therapy combined with autologous serum (Brooks, 1999, 2002).

Ophthalmic gel containing deproteinized calf blood activates aerobic metabolism and oxidative phosphorylation thus increasing the intake of oxygen and glucose transport in metabolically weakened hypoxic cells (Al-Watban & Andres, 2001). Its use in the management of corneal ulceration is based on the same principles as the use of autologous serum. Serum improves reparation and regeneration of the corneal stroma by facilitating epithelialization: squamous metaplasia is diminished through the action of vitamin A; antiproteases such as alpha2 macroglobulin inhibit collagenase activity and substance P facilitates epithelial migration. The ophthalmic gel was chosen over autologous serum in these cases as it was readily at hand and positive results had been experienced when used as treatment of corneal ulcers in domestic animals. There have never been reports on the use of autologous serum for the treatment of corneal ulcers in tapirs. No irritation or other complications with the topical medications were observed.

These cases demonstrate the satisfactory inclusion in therapy of deproteinized calf blood extract in the management of corneal ulcers in captive wild animals, specifically two South American tapirs. Though it cannot be definitively determined if treatment expedited healing, the calf serum was well tolerated and the ulcerations healed well without complications. Deproteinized calf blood extract is presumed to act in this species similarly to that in humans and domestic animals.

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