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CLINICAL CASE REPORT: EYEBALL ENUCLEATION IN A FEMALE LLAMA (*Lama glama*)

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ABSTRACT

This case report describes the diagnosis, surgical treatment and progression of an ocular lesion in a llama. A 4-year-old female llama was presented with epiphora, blepharospasm and corneal rupture in the left eye, suggestive of trauma-induced corneal perforation. Due to the severity of the lesion and the risk of secondary complications, enucleation of the eyeball was performed using a transpalpebral technique under general anaesthesia. Postoperative management included systemic analgesics, antibiotics and the gradual removal of cambric-type gauze impregnated with antibiotics from the orbital cavity, which promoted controlled granulation tissue formation and uncomplicated healing.

Key words: Eyeball enucleation, *Lama glama*, ophthalmic pathologies, South American camelids, transpalpebral technique

The most frequent ophthalmological diseases in South American Camelids (SAC) are trauma, congenital and acquired diseases, conjunctivitis, corneal ulcers, cataracts, lens subluxation and vitreous opacity (Gelatt *et al,* 1995). Webb *et al* (2006) provided valuable information by defining that there is a slight tendency in llamas and alpacas to develop hereditary eye diseases, the most frequent being persistent pupillary membrane, cataracts and corneal dystrophies. Currently there is an increase in the reports of eye diseases, which could be due to a greater diagnosis or to an increase in the prevalence of these diseases as a result of inbreeding (Gionfriddo, 2010).

Case history

In this study we report the diagnosis and treatment of an eye condition in a 4-year-old female llama of 120 kg. The animal was housed at the Faculty of Veterinary Sciences of the University of Buenos Aires, Argentina. On examination, vital parameters were normal and on inspection, the left eye had epiphora and blepharospasm, with a wound showing loss of continuity and extrusion of a transparent content of viscous appearance (Fig 1). It possibly occurred due to traumatic injury which had perforated the cornea. It was decided to provisionally perform a third eyelid and tarsorrhaphy as the ocular lesion which was too extensive to resolve with second-intention healing (Fig 2). Since the corneal perforations was deep an extensive it was decided to perform the enucleation of the eyeball. The topical treatment was given for 4 days pre-operatively (Table 1).

Surgical technique

General anaesthesia was induced by administration of 10% xylazine (PRO-SER®) at a dose of 0.2 mg/kg, and ketamine (PRO-SER®) at 1.5 mg/kg intravenously. 2% lidocaine (Equi Systems®) was infiltrated subcutaneously (Fig 3A). Subsequently the periorbital region was shaved, the eyelashes were trimmed, and an initial antisepsis was performed with 4% chlorhexidine digluconate. Enucleation was done by transpalpebral technique and the eyeball, conjunctiva and nictitating membrane were removed as a single mass (Fig 3B). Two Backhaus forceps were used to hold the eyelids. Then, an elliptical incision was made around the eye, approximately 5 mm from the eyelid margins. Subsequently, blunt dissection was performed by Mayo scissors to separate the subcutaneous eyeball tissues. The medial and lateral canthal ligaments were cut by curved Mayo scissors. It was followed by blunt dissection of the extraocular

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muscles peripheral to the sclera. The orbit vasculature and optic nerve were ligated independently, using laparoscopic extracorporeal knots. Finally, the eyeball was removed, together with the rim of the eyelids and adnexa. The orbit cavity was filled with approximately 2 m of cambric-type bandage, soaked in sulfadiazine, and placed in a zigzag manner. Lastly, the wound was covered with gauze, cambric bandages and 3M VetRap bandages (3MTM), and sprayed with an external antiparasitic aerosol.

Postsurgical care

The female was kept in a small pen with two other llamas. She was checked every 24 h and the wound was irrigated with saline solution and dried with sterile gauze. The cambric-type bandage that filled the cavity was progressively removed, to generate the gradual growth of granulation tissue in the orbital cavity. The rate of removal was 40 cm per day, over 5 days. Topical and systemic treatments used are described in Tables 1 and 2, respectively. The wound healed completely 1 month after surgery (Fig 4) and the llama returned to the general herd, without any complications either during or after the treatment.

Table 1. Topical treatment prior to surgery.

Eyedrops	Dose	Dosage	Duration
Tobramycin 0.3%	3 drops	every 24 h	4 days
Gatifloxacin 0.3%	3 drops	every 24 h	4 days
Phenylephrine HCI 5% + Tropicamide 0.5%	3 drops	every 24 h	4 days

Eyedrops were administered 15 minutes apart.

Table 2. Postoperative systemic treatment.

Medication	Dose	Dosage	Duration
Ranitidine 20 mg/ml	1.5 mg/kg	IM – every 24 h	10 days
Tramadol 60 mg/ml	3 mg/kg	IM – every 24 h	6 days
Amoxicillin 15 g	15 mg/kg	IM – every 48 h	10 days
Meglumine flunixin 50 mg/ml	2.2 mg/kg	IM – every 24h	4 days
Ivermectin 1%	0.5 mg/kg	SC – every 7 days	21 days

IM: intramuscular, SC: subcutaneous

Discussion

The llama of present study had a traumatic deep laceration of cornea which was managed through enucleation. However, ocular disorders in South American camelids include corneal ulceration, keratitis, conjunctivitis, cataracts, and traumatic injuries of the eyelids and globe (Fowler, 2010; Anderson and Miesner, 2018; Gelatt, 2013).

Although it is a technique used infrequently in South American camelids, ocular enucleation constitutes a valid surgical alternative for severe lesions in llamas, including corneal perforation such as reported in this case. Owing to the severity of the eye injury and poor prognosis, enucleation was preferred.

In the present case report, the transpalpebral surgical technique was performed, one of the methods most widely used in equines due to its efficacy in removing the eyeball and adnexa in a single block, reducing the risk of contamination of the orbit (Pollock *et al*, 2008). In horses, this technique has even been performed on standing animals under local anaesthesia, which, for example, reduces gastrointestinal postsurgical complications common in surgeries requiring prolonged recumbency. However, general anaesthesia is preferred in camelids because it provides a safer environment both for the animal and the surgical team. This is because camelids usually have a more sensitive temperament and their anatomy does not help standing management during invasive procedures. They also have a low tolerance to stress and forcing them to remain standing could lead to complications either during or after surgery. The prompt surgical intervention in this case avoided major complications such as self- mutilation, secondary infections or even systemic dissemination to the central nervous system, considering the direct anatomical connection between the eyeball and the optic nerve. The surgical approach also responded to animal welfare criteria, as ocular pain is among the most intense in veterinary medicine and its immediate relief is a priority. Post surgical management was successful, being noteworthy the use of a cambric-like bandage soaked in antibiotic and located in the orbital cavity and then progressively removed. Although this strategy is used in other species, we have not found a report of its use in South American camelids, thus providing a valuable reference for similar future interventions. This technique favoured the controlled formation of granulation tissue, leading to uncomplicated healing. Fugaro *et al* (2005) have reported a case where transpalpebral enucleation was performed to remove a diseased eye in a llama.

The transpalpebral enucleation technique, which involves removal of the eye with the eyelids sutured closed, has been described in camelids such as llamas and alpacas in case reports involving

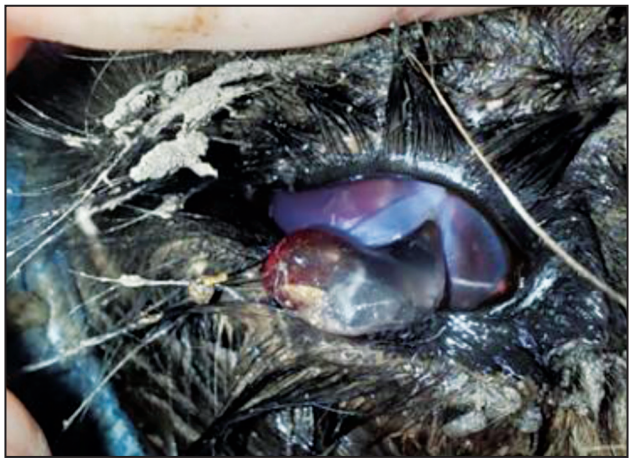

Fig 1. Left eyeball wound. Corneal perforation.

Fig 2. Third eyelid flap.

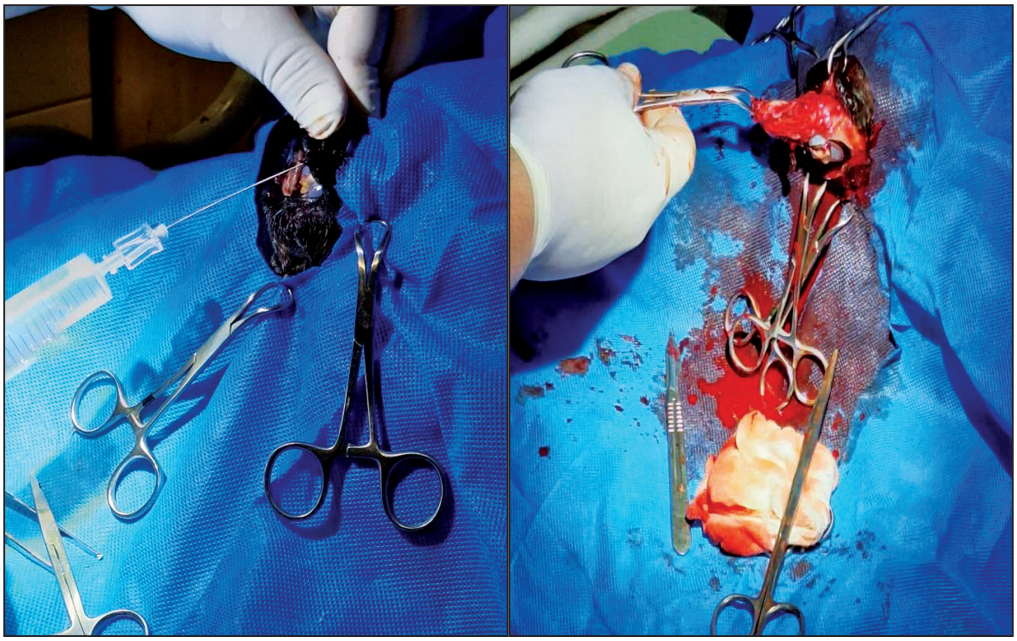

Fig 3. Surgical procedure: A: Local anaesthesia. B: transpalpebral technique.

Fig 4. Correct cicatrisation 30 days after enucleation.

ocular tumors and severe ocular disease (Fugaro *et al,* 2005; Schoeniger *et al,* 2006; Gionfriddo, 2010). Transpalpebral enucleation was performed in a 6 year old llama which had retinoblastoma, and an orbital silicone prosthesis was placed (Fugaro *et al,* 2005). Another report describes surgical removal of the eye in a llama due to an intraocular tumor-medulloepithelioma (Schoeniger *et al,* 2006).

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Conflict of interest

The authors declare no conflicts of interest.

Author Contributions

Claudia Arraztoa: was involved in doing the experiments and writing the paper. María Ignacia Carretero, Trasorras Virginia and Galleli Florencia: They participated in the treatment and were also involved in critically revising the manuscript for important intellectual content. Bertuzzi Mariana, di Fonzo Andrea and Zampini Enzo: collaborated in the experiments. Deborah Neild: supervised the research and translated and critically read the manuscript.

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