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EQUINE OCULAR SETARIASIS AND ITS MANAGEMENT

Malik Abu Rafee* and Amarpal

Division of Surgery and Radiology, Indian Veterinary Research Institute, Izatnagar, Bareilly, U.P India-243122

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KEYWORDS

Ocular setariasis

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ABSTRACT

Ocular setariasis is a common vision threatening ophthalmic condition in equine resulting from ectopic parasitism by *Setaria digitata*, *Setaria equina* and *Thelazia lacrymalis*. The disease occurs mostly in summer and autumn seasons and it displays signs of lacrimation, photophobia, corneal opacity, conjunctivitis and loss of vision. Close inspection of the eye reveals a moving worm in the anterior chamber of the eye. B-mode (brightness mode) ultrasonography helps in the diagnosis in case of complete opacity. The best treatment is the surgical removal of the parasite under regional/ general anesthesia. Needle paracentesis at 3 O' clock and nick incision at 12 O' clock position are most commonly used surgical procedure. Both the techniques give good results. A slightly modified technique of using a 21 gauge needle attached with the syringe to aspirate the worm into the syringe also gives satisfactory results. In medicinal therapy ivermectin is the most advocated drug for ocular equine setariasis, but long term tying of medicinal should be avoided and surgery should be advocated. Corneal opacity is the most common post operative complication reported. Post surgical use of placentrex has also been advocated to enhance healing and to resolve corneal opacity. The present review is aimed at etiology, diagnosis and management of ocular setariasis in equine species.

* Corresponding author

E-mail: rafeel88@gmail.com (Malik Abu Rafee)

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1 Introduction

Among the most common surgical conditions of equine ocular setariasis is a vision threatening disease of equine resulting from ectopic parasitism caused by *Setaria spp.*, a genus of filaroid worms (Gangwar et al., 2008; Radwan et al., 2016). In India equine ocular setariosis, an important cause of corneal opacity is commonly caused by *Setaria digitata*, *Setaria equina* and *Thelazia lacrymalis* (Sathu, 1974; Ladoucer & Kazacos, 1981; Parrah et al., 2004; Sellon & Long, 2013). *S. digitata* is a parasite of cattle and hoofed animals and is found mainly in Asia. *S. equina* infects horses and other equids worldwide. The usual predilection site of adult *Setaria* worms is the peritoneal cavity. Occasionally they can get into the central nervous system or the eyes (Yadav et al., 2006). Microfilariae (immature larvae) are found in the blood. The parasite is transmitted by mosquitoes (*Anopheles peditaneniatus* and *Culex nilgiricus*) through the blood stream. Adult female worms release microfilariae in the abdominal cavity of their hosts. These microfilariae get into the blood stream and reach the capillaries in the skin. Mosquitoes become infected with microfilariae when they feed blood of infected hosts that contains microfilariae. These microfilariae develop to infective larvae inside the mosquitoes in 2 to 3 weeks. The infected mosquitoes then transmit these infective larvae to other susceptible hosts during their blood meals.

The ocular setariasis spreads mostly in summer and autumn when the mosquito vectors are most prevalent (Mritunjay et al., 2011; Al-Azawi et al., 2012). The parasite exhibits migratory behavior in unusual hosts such as horses, donkeys or human beings and can be found in various organs such as heart, lung, spleen, kidney, uterus, oviduct, ovary, and urinary bladder (Varma et al., 1971). All equines are generally more prone for ocular worm (Pratap, et al., 2005; Jayakumar et al., 2012; Radwan et al., 2016). The immature worm can also invade eye (Sreedevi et al., 2002; Tuntivanich et al., 2011) through the vascular system (Townsend, 2013). The eye infection occurs when the adult worm meanders through intraocular tissue, thus it is also called as eye worm.

The infected animals usually display signs of photophobia and lacrimation (Basak et al., 2007). The serrated cuticle of the worm and lashing movements within the anterior chamber of the eye caused severe trauma and inflammation to the cornea which then results into corneal opacity, which eventually results into blindness (Jaiswal et al., 2006). Basak et al. (2007) has reported corneal edema caused by dead filarial worm attachment to the endothelium in the anterior chamber. The dead worm possibly liberates toxins into the anterior chamber, which may be lethal to the endothelium and resulting into corneal edema. It may lead to devastating sequel like synechia, cataract, and retinal detachment (Paglia et al., 2004). Though, the involvement of the eye is commonly unilateral but bilateral occurrence has also been reported (Shin et al., 2002; Buchoo et al., 2005).

2 Diagnosis

Lacrimation, photophobia, blepharospasm and corneal opacity are the common signs seen in horses with eye worm. Keen inspection of the eye usually reveals moving worm in the anterior chamber of the eye. The affected eye reacts to bright flash stimulus and fluorescein staining test is usually negative, whereas slit-lamp biomicroscopic examination reveals corneal edema (Tuntivanich et al., 2011). In eyes with complete corneal opacity B-mode ultrasonography (12 MHz, corneal contact technique) can be performed to visualize the anterior chamber and other intraocular structures (Patil et al., 2012). Though CBC (complete blood count) does not show major changes but a decrease in erythrocyte count, haemoglobin and haematocrit, together with leucocytosis and an accelerated erythrocyte sedimentation rate (ESR) has been reported in previous studies (Muhammad & Saquib, 2007). Microscopic examination of wet blood films is also recommended as it sometimes reveals motile microfilariae. Knott's test (a technique for the detection of microfilariae by haemolysis and concentration of blood samples) can be performed to detect the microfilariae of the *Setaria* species (Slim & Fouad, 1965).

3 Surgical treatments

Although both medical and surgical treatments have been advocated for the equine ocular filariasis (Muhammad & Saquib, 2007), the best treatment is the surgical removal of the parasite (Tuntivanich et al., 2011) that can be performed under general anesthesia or regional nerve blocks with or without sedation. Regional nerve blocks like supraorbital, auriculopalpebral and retrobulbar can be performed using 2% lidocaine as per the standard methods described in literature (Lumb & Jones, 2001). Akinesis of the eyelids can further be achieved by blockade of the ventral and dorsal branches of the palpebral nerve (Facial VII) (Skarda, 1996).

The supraorbital nerve is desensitized as it emerges from the supraorbital foramen, which is easily palpated 1 cm caudal to the upper orbital rim, 5–7 cm dorsal to the medial canthus. By using a 23–25 gauge needle, 1–3 ml lidocaine can be injected subcutaneously and into the foramen. This desensitizes the forehead and the middle two-thirds of the upper eyelid. Motor paralysis of the auriculo-palpebral nerve (VII) is achieved by perineural administration of local anesthetics to this nerve at the most dorsal point of the zygomatic arch or just caudal to the vertical ramus of the mandible, just ventral to the zygomatic arch. The retrobulbar block may be achieved using a 19 gauge 80 mm long spinal needle passed over the zygomatic arch in a ventro-medial direction until it encounters the medial wall of the bony orbit (Fletcher, 2004; Labelle & Clark-Price, 2013). The cornea and sclera may be desensitized most effectively spraying topical application of 1% solution of amethocaine (Durham et al., 1992) or 1% tropicamide (McMullen et al., 2014).

Surgical interventions used for the treatment of ocular setariasis include needle paracentesis at 3 O' clock (Sreedevi et al., 2002; Vadalia, 2013) and nick incision at 12 O' clock (Buchoo et al., 2005). Prior to surgery, it is better that horses should receive topical non-steroidal anti-inflammatory agent (0.3% flurbiprofen) along with systemic non-steroidal anti-inflammatory agents (flunixin meglumine or ketoprofen) and antibiotics. For preparation of the eye for surgery topical antiseptic (like 0.5% betadine) can be used (Patil et al., 2012). The head is held in still position with a twitch. Eye lids are retracted with the Castroviejo eye speculum and a stab incision is made at 12 O' clock with BP blade No. 11 (Buchoo et al., 2005). The parasite usually gets ejected along with the aqueous humor; however, sometimes the parasite gets stuck in the incision. In such cases the worm is removed with the help of forceps.

The incision is left unsutured. Dorsal and lateral approaches allow monitoring of the incision postoperatively and at the same time does not create the potential for possible suture trauma associated with excursions of the nictitating membrane (Kalpravidh et al., 1992). However, when additional protection of wound by nictitating membrane is required a stab incision at the ventral margin of limbus is preferred (Patil et al., 2012). The use of viscoelastic substance like hypromellose is injected into the anterior chamber to decelerate the vigorous movement of the worm to facilitate the removal of the worm (Patil et al., 2012).

In the second method, a 16 gauge needle is inserted into the anterior chamber of the eye at 3 O' clock position (Sreedevi et al., 2002) or at 6-8 O' clock (Gopinathan et al., 2013) position of the cornea, approximately 1 mm away from the limbus, as soon as the worm appear near this site. Due to the aqueous humor pressure, the eye worm usually escapes through the hub of the needle or it appears at the puncture site thereby facilitating removal. Aqueous humor leakage is minimal as the needle puncture hole is very small (Gopinathan et al., 2013). In a slightly modified needle technique a 21 gauge needle attached with the syringe is inserted through the conjunctiva into the anterior chamber and directed carefully towards the worm to aspirate the worm into the syringe (Yang et al., 2014). The puncture site is left without suturing. Needle stabbing technique, is economical, time saving and recommended for the removal of parasite (Singh et al., 1976). Postoperatively sub-conjunctival injection of dexamethasone (2 mg)-gentamicin (20 mg) may be given. Topical application of ofloxacin or other eye ointment is considered.

Corneal opacity at the site of stab incision is the most common postoperative complication reported (Sharma et al., 2005). Sometimes it diffuses to involve the whole upper quadrant (Patil et al., 2012). This takes days to 3 to 8 weeks to get resolved (Buchoo et al., 2005; Jaiswal et al., 2006; Patil et al., 2012). Human placenta extract has anti-inflammatory and analgesic effects and enhance wound healing (Piyali & Debasish, 2012; Changole et al., 2015; Shukla et al., 2016).

Placentrex facilitate post surgical healing at the insertion site in equine ocular setariasis (Mritunjay et al., 2011).

4 Medicinal therapies

Taking in consideration complications of surgical treatment like phthisis bulbi, corneal oedema, and scarring and prolapse of the iris (Lavach, 1990), various medicinal therapies have been advocated. However, Medical treatment has not been considered suitable because of the slow absorption of dead parasites and the attendant antigenicity (Moore et al., 1983; Lavach, 1990). The standard antilarial drug, diethylcarbamazine citrate (DEC) has given inconsistent results (Perumal & Seneviratna, 1954; Ahmad & Gupta, 1965). Also, an inconveniently large number of repeat treatments (for example, 32 treatments over 45 days) (Razig, 1989) has precluded DEC as a practical chemotherapeutic agent for equine setariasis. Muhammad & Saquib (2007) have advocated a medicinal therapy for ocular equine microfilariasis using ivermectin and death of the parasite in the eye took 15 days after administration of ivermectin. These suggested that in situations in which surgical intervention is difficult, the off-label use of ivermectin would be appropriate to treat ocular equine setariasis.

Conclusion

Ocular setariasis commonly known as eye worm is a common surgical condition of equine eye affecting horse, donkey and pony equally. The condition can be easily diagnosed on the basis of clinical symptoms like lacrimation, photophobia, blepharospasm, corneal opacity and visible worm in the anterior chamber of the eye. Surgical treatment under regional/general anesthesia is an effective treatment of the condition. Though, medicinal therapy with ivermectin is advocated, however relying on the medicinal treatment for too long should be avoided. Ophthalmic ointments decreasing inflammation and chances of infection and/or enhancing the healing can be used to reduce the chances of postsurgical complication.

Conflict of interest

Authors would hereby like to declare that there is no conflict of interests that could possibly arise.

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