Coenurus cerebralis cyst in the orbit of a ewe

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A 4-year-old Rahmani breed ewe was presented for surgery to the Veterinary Teaching Hospital, South Valley University, Egypt with enlargement and protrusion of the eye ball, blepharitis and congestion of the conjunctiva. On examination, a cyst 2.5 cm x 3.5 cm in diameter containing sandy fluid was detected in the perioptic nerve fat. Histopathological examination revealed that the epithelial lining of the conjunctiva was necrotic and severely infiltrated by neutrophils. The underlying connective tissue was oedematous, hyperaemic and severely infiltrated by neutrophils. Desquamation of the corneal epithelium was seen, together with oedema of the stroma. The tissue surrounding the cyst was compressed and the lacrimal glands revealed pressure atrophy. The muscular tissue was atrophied and infiltrated by fat cells. The cyst wall was lined with white scolices protruding from the inner wall. Based on the gross and histopathological characteristics of the cyst observed, the cyst was diagnosed as *Coenurus cerebralis*. This is the first report of orbital coenurosis in a sheep.

Introduction

Coenurus cerebralis is the larval stage of *Taenia multiceps*, an intestinal cestode of wild and domestic canids (the definitive host) (Sharma & Chauhan 2006). *Coenurus cerebralis* is commonly located in the cerebrum in sheep, goats, cattle and humans. It constitutes a major health problem in sheep and goats worldwide, with significant economic repercussions (Haridy *et al*. 2013; Sharma & Chauhan 2006).

Sheep are the usual intermediate hosts of *T. multiceps*. Other herbivorous animals, non-human primates and humans can also be infected. *Taenia multiceps* coenuri are usually found in the brain and spinal cord of animals (Jones & Pybus 2008). Lagomorphs, including hares and rabbits, are the usual intermediate hosts of *Taenia serialis*. Infections have also been reported in squirrels, other rodents, cats and humans (Jones & Pybus 2008). *Taenia serialis* coenuri are usually found in the subcutaneous tissues, muscles and retroperitoneum in animals (Ing *et al.* 1998).

Causes of exophthalmoses include: orbital abscess, orbital cellulitis, orbital cyst, eosinophilic myositis, lacrimal gland disease, foreign body granuloma, haematoma and trauma (Boydell 1991). Reports on orbital parasitic cysts are uncommon in veterinary literature and have been attributed to hydatidosis, cysticercosis and *T. serialis* in a horse, hogs and pet rabbits, respectively (Barnett *et al.* 1988; Cardenas-Ramirez *et al.* 1984; Holmberg *et al*. 2007; O'Reilly *et al*. 2002; Wills 2001). However, human ocular coenurosis is common and has been reported in Uganda and Nigeria (Ibechukwu & Onwukemr 1991; Williams & Templeton 1971). The present study describes a case of orbital coenurosis in a sheep with a complete pathological picture following enucleation of the left eye.

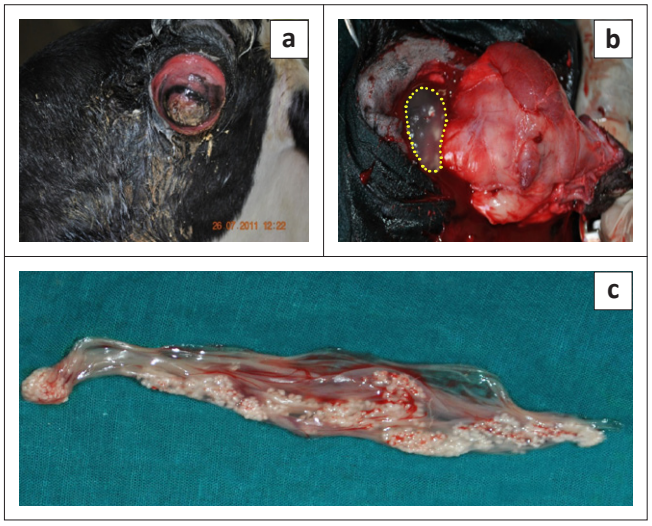
Materials and methods

A 4 year-old Rahmani ewe was admitted for surgery to the Clinic of Surgery, Veterinary Teaching Hospital, South Valley University, Egypt for enucleation of the left eye. Clinical examination revealed blepharitis, congestion of the conjunctiva, and enlargement and protrusion of the eye ball. Enucleation of the affected eye ball was performed using the tranquilliser Rompun (Xylazine HCL) (Bayer, UK) at a dose rate of 0.2 mg/kg weight intramuscular (I/M) in combination with local infiltration anaesthesia (Xylocaine 2%). After aseptic preparation of the affected eye, incisions were made 3 mm – 5 mm from the eyelid margins, and were connected at the level of the medial and lateral canthi. Blunt dissection was applied until the eye ball came free from the orbital cavity and was totally excised. The orbital cavity was packed with sterile gauze, and cephalexin (25 mg/kg weight) was administered intramuscularly for five consecutive days post operatively. The enucleated eye ball was fixed in 10% neutral buffered formalin and embedded in paraffin by routine methods. Sections measuring 4 µm in thickness were stained with haematoxylin and eosin (HE) (Bancroft *et al.* 1996).

Results

Clinical signs were mainly: proptosis, blepharitis, congestion of the conjunctiva, chemosis, peri-ocular swelling, especially of the superior fornix (fossa), and enlargement and protrusion of the left eye ball with no vision (Figure 1a). The cornea of the eye was opaque, necrosed and covered with faecal matter, with complete loss of vision. During enucleation of the eye, a cyst filled with a translucent sandy fluid was observed in the periorbital fat, after cutting the retractor bulbar muscles. The cyst was loosely located between the retractor bulbar muscles and the orbital fat. The cyst measured 2.5 cm x 3.5 cm and contained a large number of white clusters of scolices (Figure 1b). White scolices were protruding from the inner wall of the cyst and the majority of the scolices were located in a longitudinal line at one side of the cyst (Figure 1c).

Microscopically, the epithelium of the conjunctiva was necrotic and severely infiltrated by neutrophils. The underlying connective tissue was oedematous, hyperaemic and severely infiltrated by neutrophils (Figure 2a and Figure 2b). The corneal epithelium was necrotic, with neutrophil infiltration. The stroma was oedematous and infiltrated by neutrophils. The tissue surrounding the cyst was compressed and lacrimal glands revealed pressure atrophy. The muscular tissue was atrophied and infiltrated by fat cells (Figure 2c). There was a minimal cellular reaction in the muscles. Fresh unstained samples of the internal fluid of the cyst revealed typical protoscolices of *T. multiceps* with rose-thorn hooks. The scolices had four suckers and a rostellum armed with a double crown that ranged between 28–30 hooks (Figure 3a and Figure 3b). The rostellar hooks ranged from 100 µm – 116 µm and 155 µm – 170 µm in length for small and big hooks, respectively, and the suckers ranged from 300 µm – 320 µm each in diameter.

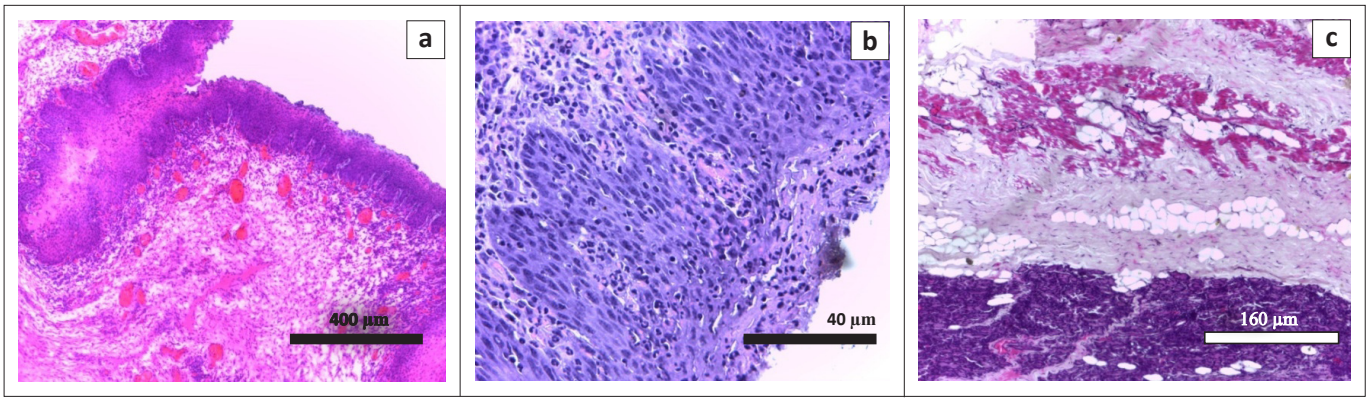


Source: Authors' own pictures. Gross taken by Dr Madeh Sadan

FIGURE 1: (a) Photograph of a ewe suffering from orbital coenurosis showing blepharitis, congestion of the conjunctiva and enlargement and protrusion of the eye ball; (b) coenurus cyst observed during enucleation of the eye (dotted line) located retrobulbarly in the periocular fat as a transparent cyst with white scolices and (c) scolices located in a longitudinal line at one side of the cyst.

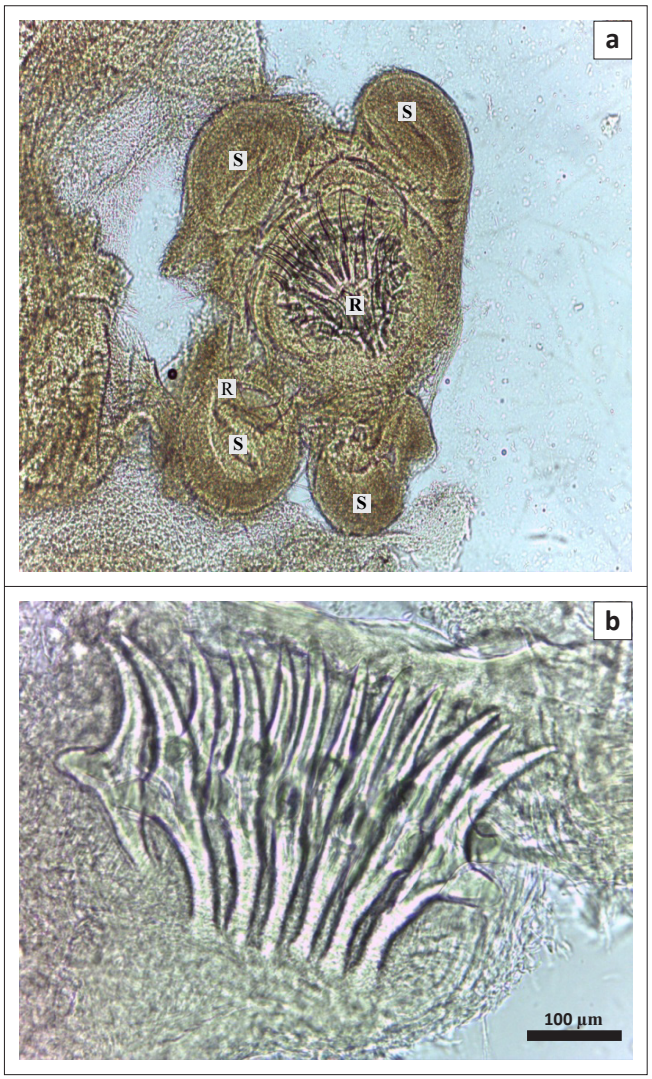
Discussion

Coenurus cerebralis cysts are often localised in the nervous system, including the brain and spinal cord (Haridy *et al.* 2013). However, their occurrence in the subcutaneous and muscular tissues and other organs has also been recorded, especially in goats (Oryan *et al.* 2010). The extra-cerebral cysts in goats have been erroneously referred to be due to *Coenurus gaigeri* (Sharma *et al.* 1998). The only orbital coenurosis that has been recorded in animals is *T. serialis* cysts in the orbit of a pet rabbit and chinchilla (Holmberg *et al.* 2007; O'Reilly *et al.* 2002), but it has been frequently recorded in humans (Ibechukwu & Onwukeme 1991; Williams & Templeton 1971). The two most common *Taenia* species forming coenuri are *T. seralis* and *T. multiceps*. Differentiation can be achieved by measuring the lengths of the rostellar hooks (Edwards & Herbert 1981) and verifying host specificity**.** In the present study, the scolices had four suckers and a rostellum, as described in the Results section. The ranges of values of the dimensions in the present study are similar to those of *T. multiceps* (Edwards & Herbert 1981). Moreover, the sheep is a common host for *C. cerebralis*, and coenuri of *T. serials* have never been reported in sheep. Although there have been no reports of *C. gaigeri* in the central nervous system or eye, it has not been possible to differentiate morphologically between *C. gaigeri* and *C. cerebralis* (Oryan *et al.* 2010). Recently, *C. cerebralis* and *C. gaigeri* were considered to be non-analogous metacestodes for the same tapeworm (Kheirandish *et al.* 2012). Moreover, it was possible to differentiate the characteristic features of



Source: Authors' own pictures. Histopathology taken by Dr Mohie Haridy

FIGURE 2: Photomicrograph of the eyeball of the ewe; (a and b) necrosis of the lining epithelium with suppurative conjunctivitis and (c) pressure atrophy of the tissues surrounding the cyst including lacrimal glands and muscular tissue: Haematoxylin and Eosin.



Source: Authors' own pictures. Fresh sample of the parasite taken by Dr Mosab Omar
S, suckers; R, Rostellum.

FIGURE 3: Fresh unstained sample showing typical *Taenia multiceps* protoscolices (a) whole mounted protoscolex (b) rosellar hooks.

the *Coenurus* cyst in the present study from hydatid cysts (Naghashyan & Harutunyan 2001). The cyst wall in the present study was thin, translucent, easily separated from the surrounding tissues, had no vascularity and lacked the laminated layer usually found in hydatid cysts. Moreover, the cyst was filled with a transparent watery fluid and the daughter cysts were tightly attached to the germinal layer (Naghashyan & Harutunyan 2001).

Human ocular coenurosis involves the vitreous anterior chamber or subconjunctival tissues (Ibechukwu & Onwukeme 1991; Manschot 1976; Williams & Templeton 1971). It is suggested that the larvae of *T. multiceps* enter the eye by way of the ciliary arteries or direct inoculation of the larva to the conjunctiva (Ibechukwu & Onwukeme 1991). However, orbital coenurosis due to *T. serialis* larvae has been observed in a pet rabbit and chinchilla (Holmberg *et al.* 2007; O'Reilly *et al.* 2002). These species are infected after ingesting eggs (oncospheres) that have been shed in faeces by the definitive host. The oncospheres migrate through the intestinal epithelium and travel through the circulatory system to the predilection sites, including the orbit (Heath 1971). In the present study, the cyst was found in the orbital fat, causing exophthalmia of the left eye. Proptosis led to exposure keratitis and conjunctival congestion, as well as ulceration of the cornea (Barnett *et al.* 1988). Exophthalmoses are caused by space-occupying lesions; usually a retro-bulbar abscess, tumour or cyst (Wilcock 2007). In sheep, exophthalmos has been observed in cases of enzootic nasal adenocarcinoma (De las Heras *et al.* 2003) and conidiobolomycosis (Silva *et al.* 2007). There is no knowledge of either parasitic or dermoid cysts being recorded in sheep.

Coenurus cysts have been reported to cause softening and pressure atrophy of the overlying skull, to the extent of perforation (Nooruddin *et al.* 1996; Ozkan *et al.* 2011). Coenurus cysts might creep into the orbital cavity through the optic canal or through softening and perforation of the sphenoid bone.

Conclusion

The present study described a unique case of orbital coenurosis in a sheep. *Taenia multiceps* coenurus most likely occasionally lodges in the eyes of domestic ruminants and must be considered as a differential diagnosis for ocular pathology in regions where the parasite is endemic. Effective control measures in endemic regions include: public awareness of the epidemiology of the disease, hygienic disposal of offal, prophylactic anti-parasitic drugs on sheep farms, and deworming of dogs.

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Competing interests

The authors declare that they have no financial or personal relationship(s) which may have inappropriately influenced them in writing this article.

Authors' contributions

M.H. (South Valley University) was the pathologist and wrote the manuscript draft. M.S. (South Valley University) was the surgeon and reported the clinical signs. M.O. (South Valley University) was the parasitologist and reported the parasite description. H.S. (Gifu University) reviewed the technical and scientific basis of the manuscript and T.Y. (Gifu University) reviewed the manuscript.

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