Comp Clin Pathol (2009) 18:85–87
DOI 10.1007/s00580-008-0742-2

BRIEF COMMUNICATION

Cerebral coenurosis in a goat: pathological findings and literature review

H. Nourani · K. Pirali Kheirabadi

Received: 23 April 2008 / Accepted: 20 May 2008 / Published online: 14 June 2008

Abstract Cerebral coenurosis is caused by *Coenurus cerebralis*, the larval stage of *Taenia multiceps*, particularly in goats and sheep. In this case report, we describe gross and histopathological characteristics of cerebral coenurosis in a goat. An 18-month-old goat with neurologic signs including circling and behavioural changes was referred to Department of Pathobiology, Faculty of Veterinary Medicine, University of Shahrekord. At necropsy, a 4-cm-diameter, fluid-filled and superficial cyst with white clusters of scolices was found in the right cerebrum. At the cut section, in addition to the superficial cyst, a deep compartment was seen in the right cerebral hemisphere that caused severe pressure atrophy of cerebral grey and white matter. A narrow opening was located between these compartments. There were 300 scolices within the superficial compartment of the cyst and none in the deep compartment. Histopathological examination of the affected cerebral hemisphere revealed multiple scolices growing on the internal layer of the cyst, neuronal degeneration and necrosis, demyelination, hyperaemia, perivascular cuffing, diffuse microgliosis and astrocytosis. Based on the results of this study and other related studies, coenurosis has to be considered as a differential diagnosis in cases with neurologic signs.

Keywords Cerebral coenurosis · Pathology · Goat

H. Nourani (✉) · K. Pirali Kheirabadi
Department of Pathobiology, School of Veterinary Medicine,
Shahrekord University,
88186-115 Shahrekord, Iran
e-mail: nourani_hossein@yahoo.com

Introduction

Taenia multiceps (Leske 1780) is a taeniid cestode that in its adult stage lives in the small intestine of dogs and other canids (Scala and Varcasia 2006). The larval stage (metacestode or coenurus) of this cestode, known as *Coenurus cerebralis*, affects the central nervous system (CNS), particularly the brain of both goats and sheep, and gives rise to the neurological signs of coenurosis (gid or stagger) that in the majority of cases result in the death of the animal from starvation after some weeks (Scala and Varcasia 2006; Welchman and Bekh-Ochir 2006). Coenurosis has also been recorded in the spinal cord of a lamb and goat causing posterior paralysis (Bussell et al. 1997; Welchman and Bekh-Ochir 2006). *Coenurus serialis*, the intermediate stage of *Taenia serialis*, has been identified as the cause of fatal cerebral coenurosis in two cats (Smith et al. 1988; Huss et al. 1994). Coenurosis is also a zoonosis with more than 100 human cases described in literature (Scala and Varcasia 2006).

In Iran, coenurosis has been reported in goats (Gharagozlou et al. 2003), sheep (Oryan et al. 1994; Ghazaei 2005) and in a wild sheep (Toofanian and Ivoghli 1976). In this case report, we describe gross and histopathological characteristics of cerebral coenurosis in a goat.

Materials and methods

An 18-month-old he-goat with neurologic signs was referred to Department of Pathobiology, Faculty of Veterinary Medicine, University of Shahrekord. After postmortem examinations, the coenurus scolices were counted, and tissue samples were taken from the brain for histopathological studies. They were fixed in 10% neutral buffered formalin,

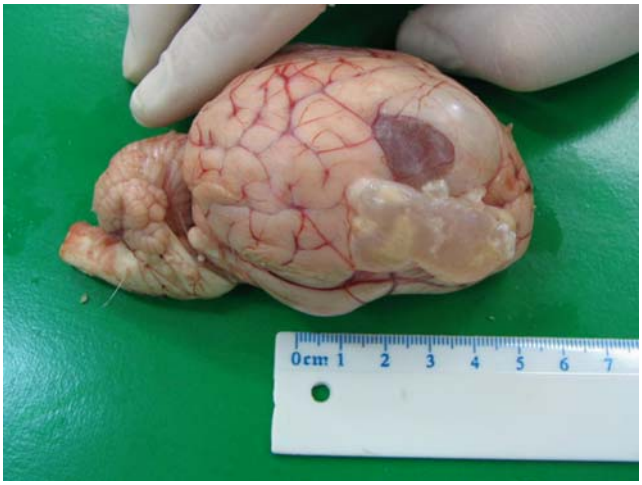

Fig. 1 Coenurus cyst on the right cerebral hemisphere. Flatting of cerebral gyri adjacent to the superficial compartment of coenurus cyst

Fig. 3 A large number of scolices as white clusters attached to the internal layer of the cyst

processed and embedded in paraffin. Sections of 5 μm were cut, stained with haematoxylin and eosin and examined microscopically.

Results

The clinical symptoms were circling and behavioural changes in the affected goat. At necropsy, a 4-cm-diameter, fluid-filled and superficial cyst with white clusters of scolices was found in the right cerebrum (Fig. 1). At cut section, in addition to the superficial cyst, a deep compartment was seen in the right cerebral hemisphere that caused severe pressure atrophy of cerebral grey and white matter (Fig. 2). A narrow opening was located between these compartments. There were 300 scolices (Fig. 3) within the superficial compartment of the cyst and none in the deep compartment.

Histopathological examination of the affected cerebral hemisphere revealed multiple scolices growing on the internal layer of the cyst, decreased thickness of cerebral grey and white matter, neuronal degeneration and necrosis (Fig. 4), demyelination, hyperaemia, perivascular cuffing or infiltration of mononuclear inflammatory cells around vessels, diffuse microgliosis and astrocytosis.

Discussion

In this study, typical clinical, macroscopic and microscopic findings of cerebral coenurosis were observed. The neurologic signs were circling and behavioural changes in the affected goat. Abo-Shehada et al. (2002) described that circling was the most prominent clinical symptom of coenurosis in naturally infected sheep. A variety of clinical signs including ataxia, incoordination, drowsiness, circling,

Fig. 2 The deep compartment of coenurus cyst and atrophy of cerebral grey and white matter

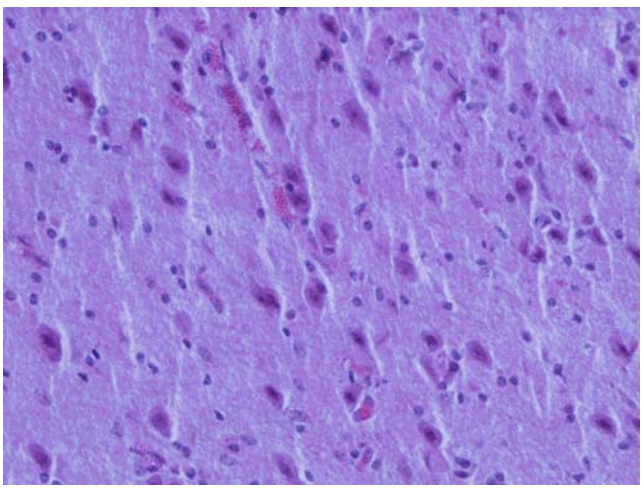

Fig. 4 Neuronal degeneration, necrosis and diffuse microgliosis (haematoxylin and eosin, ×370)

head pressing, blindness, hind leg paralysis and coma have been reported in this disease (Abo-Shehada et al. 2002; Ozmen et al. 2005).

In this case, the coenurus cyst was found in the right cerebral hemisphere. In a study about *C. cerebralis* infection of sheep, the cysts were seen in the cerebral hemisphere in 96% of the cases (43% and 57% for left and right, respectively) and 4% being in the cerebellum. The prediction of cyst locations based on the direction of circling and head deviation had a 62% success rate (Achenef et al. 1999). In goats, coenurus cysts may also develop in locations outside the CNS, including the abdominal cavity (Sharma et al. 1998; Gharagozlou et al. 2003), subcutaneous tissue, skeletal muscles, thoracic cavity and lung parenchyma (Gharagozlou et al. 2003). This may reflect a different host response to the parasite in goats or, alternatively, parasitism by larvae of another cestode species, *Taenia gaigeri* (Sharma et al. 1998).

In our study, histopathological features of cerebral coenurosis were nearly similar to the previous report by Gharagozlou et al. (2003), except for chronic granulomatous reaction with a large number of giant cells around degenerated cysts.

Based on the results of this study and other related studies, coenurosis has to be considered as a differential diagnosis in cases with neurologic signs. In addition, further investigations are needed to identify definitely the *Taenia* species in caprine coenurosis.

Acknowledgements The authors thank Mr. Hataempour and Mr. Ahmadi for the slide preparation.

References

Abo-Shehada MN, Jebreen E, Arab B et al (2002) Prevalence of *Taenia multiceps* in sheep in northern Jordan. Prev Vet Med 55:201–207

Achenef M, Markos T, Feseha G et al (1999) *Coenurus cerebralis* infection in Ethiopian highland sheep: incidence and observations on pathogenesis and clinical signs. Trop Anim Health Prod 31:15–24

Bussell KM, Kinder AE, Scott PR (1997) Posterior paralysis in a lamb caused by a *Coenurus cerebralis* cyst in the lumbar spinal cord. Vet Rec 140:560

Gharagozlou MJ, Mobedi I, Akhavan P et al (2003) A pathological and parasitological study of *Coenurus Gaigeri* infestation of goats from Iran. Indian J Vet Pathol 27:95–97

Ghazaei C (2005) Evaluation of the effect of antihelminthic agents albendazole, fenbendazole and praziquantel in treatment of coenurosis disease in sheep. J Anim Vet Adv 4:852–854

Huss BT, Miller MA, Corwin RM et al (1994) Fatal cerebral coenurosis in a cat. J Am Vet Med Assoc 205:69–71

Oryan A, Moghaddar N, Gaur SN (1994) Metacestodes of sheep with special reference to their epidemiological status, pathogenesis and economic implications in Fars Province, Iran. Vet Parasitol 51:231–240

Ozmen O, Sahinduran S, Haligur M et al (2005) Clinicopathologic observations on *Coenurus cerebralis* in naturally infected sheep. Schweiz Arch Tierheilkd 147:129–134

Scala A, Varcasia A (2006) Updates on morphobiology, epidemiology and molecular characterization of coenurosis in sheep. Parassitologia 48:61–63

Sharma DK, Singh N, Tiwari HA (1998) Prevalence and pathology of coenurosis in organized goat farms. J Vet Parasitol 12:30–32

Smith MC, Bailey CS, Baker N et al (1988) Cerebral coenurosis in a cat. J Am Vet Med Assoc 192:82–84

Toofanian F, Ivoghli B (1976) Cerebral coenurosis in a wild sheep (*Ovis ammon*). J Wildl Dis 12:550–551

Welchman DDEB, Bekh-Ochir G (2006) Spinal coenurosis causing posterior paralysis in a goat in Mongolia. Vet Rec 158:238–239