

## Case Report

# Internal hydrocephalus caused by *Coenurus cerebralis* in a ewe

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## ABSTRACT

**Objective:** Coenurosis is a parasitic disease that particularly affects sheep and goats. The disease is caused by *Coenurus cerebralis* which is the larval stage of *Taenia multiceps*. The objective of this study was to investigate the clinical and the pathological lesions caused by *C. cerebralis* in a ewe.

**Materials and methods:** Two-and-a-half year-old female ewe showing neurological signs was presented to the Veterinary Teaching Hospital, Assiut University, Egypt. Postmortem and histopathological examinations were done to investigate the pathological lesions caused by *C. cerebralis*.

**Results:** Postmortem examination of the brain revealed *Coenurus* cyst measuring 5×3 cm associated with dilated lateral ventricle. Histopathological examination revealed extensive areas of liquefactive necrosis in the cerebrum. The necrotic area was infiltrated with lymphocytes, microglia cells and eosinophils. Internal hydrocephalus and atrophy of the ependymal cells of both lateral ventricle and choroid plexus were also seen.

**Conclusion:** It was concluded that coenurosis might be associated with internal hydrocephalus along with some clinical and pathological findings.

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## KEYWORDS

Brain, Coenurosis, Ewe, Necrosis, Pathology

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## INTRODUCTION

Coenurosis (commonly known as gid or sturdy), a zoonotic parasitic disease of several livestock animals, is caused by the metacestodes of *Taenia multiceps*. *Coenurus cerebralis* causes important problems for sheep production. It is distributed across the world but the incidence is most common in Asia and Africa ([Abo-Shehada et al., 2002](#); [Sharma and Chauhan, 2006](#); [Nourani and Kheirabadi, 2009](#)). The larval stage of this cestode is known as *Coenurus cerebralis* which affects the central nervous system (CNS) of sheep, goats but also seen in cattle ([Soulsby, 1982](#)).

Infected animals developed nervous signs in the form of anorexia, dullness, ataxia, stumbling paralysis, frequent muscle fasciculation, grinding of the teeth, blindness in severe condition, incoordination and erratic movement ([Sharma et al., 1998](#)). *Coenurus* cysts are mostly located in the cerebral hemispheres of infected sheep ([Achenef et al., 1999](#)). The cysts may be found in the brain and spinal cord, near the surface of the parietal cerebral cortex or protruding into the cerebral ventricles ([Brown et al., 2007](#)). The presence of *C. cerebralis* cysts in the subarachnoid space of the cerebral hemispheres of sheep, help the nourishment of the cyst by cerebrospinal fluid (CSF) ([Epstein et al., 1959](#)). Histopathological examination revealed neuronal degeneration, necrosis, demyelination in the affected cerebrum and multiple scolices growing on the internal layer of the cyst ([Nourani and Kheirabadi, 2009](#)). This study aimed to describe the clinical and the pathological lesions caused by *Coenurus cerebralis* in a ewe.

## MATERIALS AND METHODS

Two-and-a-half year-old female Rahmani ewe, belong to owner in Assiut governorate, Egypt, was included in this study. The animal was submitted to the Veterinary Teaching Hospital, Assiut University in February 2014, with a history of nervous manifestations including dullness, loss of appetite, torticollis, failure to hold the head straight, irregular gait, circling, ataxia and death. Postmortem examination was performed on the brain and the collected specimens were fixed in 10% buffered formalin. The samples were then dehydrated in a graded series of alcohol, and were cleared with methyl benzoate and embedded in paraffin wax. Sections of 4-5  $\mu\text{m}$  in thickness were prepared, and were stained with hematoxylin and eosin (HE), as described by [Bancroft et al. \(1996\)](#). The stained sections were examined by light microscope, and were photographed using digital camera (Olympus, Camedia C-5060).

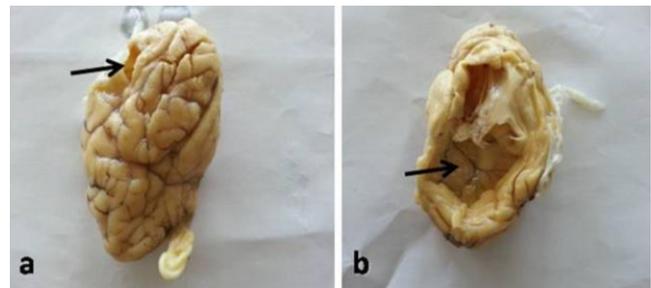
## RESULTS

### Clinical Findings

Clinical examination of the animal revealed the following symptoms: dullness, incoordination, irregular gait, circling and failure to hold the head straight. The heart rate, respiratory rate, body temperature, rumenal movement and size of lymph nodes were within physiological limits.

### Gross Pathology

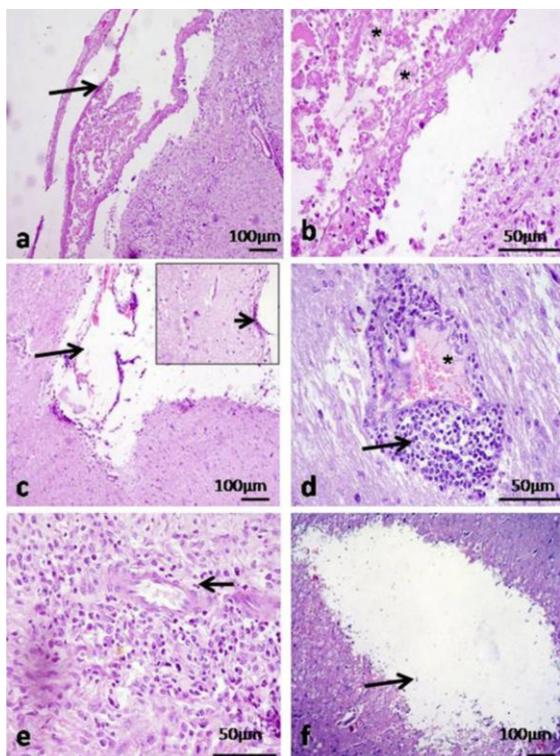
According to the pattern of arrangement of scolices, the cysts can be identified as *C. cerebralis*. *Coenurus* cyst containing a clear fluid measuring 5 $\times$ 3 cm occupied the subarachnoid space and protruding into the lateral ventricle. Budding of numerous scolices from the internal layer of the cyst was seen as white clusters. The cerebral tissue was congested and atrophied. The cyst was ruptured during incision of the brain. Internal hydrocephalus with marked dilation of the cerebral ventricles was also seen (**Figure 1**).



**Figure 1.** Photographs of the brain of ewe showing (a) Cyst formation on the cerebral hemisphere (arrow) (b) Lateral ventricle showing dilatation and atrophy of cerebral tissue (arrow).

### Histopathology

Histopathological findings of H&E stained sections of cerebral hemisphere revealed presence of cyst with thick dense eosinophilic capsule and multiple scolices (**Figure 2a, b**). The ventricle was dilated indicating internal hydrocephalus, the ependymal cells lining the choroid plexus in the lateral ventricle were also noticed (**Figure 2c**). Vascular changes were prominent and in the form of congestion and perivascular cuffing of mononuclear cells consistent to lymphocytes (**Figure 2d**). Extensive areas of liquefactive necrosis in the cerebrum was seen, which was formed due to *Coenurus* cyst evacuation. The necrotic area was infiltrated by lymphocytes, microglia cells and eosinophils (**Figure 2e**). Residual cyst from malacic foci was demonstrated (**Figure 2f**).



**Figure 2.** Photomicrographs of cerebral tissues revealed (a) *Coenurus* cyst (arrow), (b) Cyst contained capsule with thick dense eosinophilic layers and scolices (asterisks), (c) Lateral ventricle showing dilatation due to hydrocephalus, the insert showing atrophy of the ependymal cells (arrow), (d) Congestion (asterisk) and perivascular mononuclear cell infiltration (arrow), (e) Necrotic foci infiltrated by lymphocytes, microglia cells and eosinophil (arrow), (f) Residual cyst from malacic foci (arrow) (H&E staining).

## DISCUSSION

*Coenurus* cysts are mostly located in the brain and spinal cord. In sheep, the cysts were more prevalent in the cerebral hemisphere in 96% of diseased cases (57% in the right hemisphere and 43% in the left) and 4% are presented in the cerebellum (Achenef et al., 1999). Similar localization of *Coenurus* cysts in the lateral ventricle was reported in goats (Kheirandish et al., 2012), and in sheep (Haridy et al., 2013).

*Coenurus* cysts grow through the CSF pathway (Epstein et al., 1959). The CSF pathway is incriminated in causing arachnoiditis and ependymitis in human coenurosis (Ing et al., 1998). Previous studies demonstrated that the *coenurus* cysts in sheep are located in the brain parenchyma and subarachnoid space (Scala et al., 2007; Haridy et al., 2013).

In the current study, a wide area of cerebral liquefactive necrosis was infiltrated with lymphocytes, microglia and eosinophil cells. Internal hydrocephalus of the ventricle with atrophy of the ependymal cells was observed.

Beside, vascular changes in the form of congestion and perivascular cuffing were observed. Similarly, perivascular lymphocytic infiltration, neuronophagia, liquefactive necrosis and gliosis were reported in previous studies (Sharma et al., 1998; Haridy et al., 2013). The alterations in the ependymal cell lining are related to the occurrence of cysts in the ventricle. Echinococcosis of 43 Armenian sheep has been reported in the cerebra, exhibiting nervous manifestations similar to those of cerebral coenurosis. The *Coenurus* cysts were larger with 20-75 scolices and the surrounding area appears dark pink in color (Naghshyan and Harutunyan, 2001). In this case, the cysts are mostly similar to *C. cerebralis*. Internal hydrocephalus observed in this study was similar to Yoshino and Momotani (1988) who reported that Coenurosis induced hydrocephalus in calf besides perforation of frontal skull and eosinophilic aggregations around the metacystode and spongiosis of the cerebral white matter and brain-stem were noticed. Encephalomalacia observed in this study was similar to the findings reported by Nourani and Kheirabadi (2009). Internal hydrocephalus described in this case was due to the pressure induced by *Coenurus* cyst which causes obstruction of cerebrospinal fluid pathway.

## CONCLUSION

From this report, we can conclude that Coenurosis in sheep might be associated with internal hydrocephalus along with some clinical and pathological changes related to the pressure on the pathway of cerebrospinal fluid circulation and other adjacent vasculature. We think that it would be suitable to take precautions for prevention of the spread of the disease among sheep and goats in Assiut Province via control the tape worm infections in dogs as well as prevent dogs to contact with sheep carcasses.

## CONFLICT OF INTEREST

The authors declare that they have no competing interest.

## ACKNOWLEDGEMENT

Nothing to declare.

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