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CASE REPORT

Clinical Coenurosis (*Coenurus cerebralis*) and Associated Pathological Findings in a Calf

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ABSTRACT

This study aims to investigate clinical and pathological findings of a clinical *Coenurus cerebralis* case in a 10-month-old Simmental male calf. Clinical examination of the calf revealed incoordination, irregular gait, failure to hold the head straight, leftward head tilt, and circling. The animal was diagnosed with *C. cerebralis* and euthanazia was recommended. The autopsy demonstrated a cyst (9x7 cm) in the caudal of the left cerebral hemisphere within the cranium. The cyst caused compression over the ventral portion of the left cerebral hemisphere, while a marked perforation of 3-4 cm diameter was found on the sphenoid bone. Histopathologically, hyperemia and perivascular mononuclear cell infiltration were observed. In conclusion, we found it beneficial to present the clinical and pathological findings of this calf infected with *C. cerebralis* which is known to be a rare clinical entity among cattle.

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INTRODUCTION

Coenurus cerebralis is the larval form of *Multiceps multiceps* which is seen in the small intestines of carnivores (Güçlü *et al.,* 2006; Christodoulopoulos, 2007). Infection occurs as a result of the oral intake of eggs spreading via fecal dumps of those animals, by intermediate hosts (Sharma and Chauhan, 2006). The disease is known as gid or sturdy which disease primarily localizes in the central nervous system of sheep and goats mostly, but can also seen in camels, deer, pigs, horses, however rarely in cattle and humans (Yoshino and Momotani, 1988). Most of the cysts are located in the cerebral hemispheres and spinal cord, while rarely invading the subcutaneous and intramuscular tissues along with other organs (Sharma and Chauhan, 2006). Symptoms vary depending on the cyst's location, size, and compression the brain (Sharma and Chauhan, 2006; Gül *et al.,* 2007). While *C. cerebralis* initially causes purulent meningoencephalitis, later as the cyst grows, it leads to central nervous system symptoms resulting in death (Christodoulopoulos, 2007). Most of the characteristic clinical findings are observed 2-8 months after the intake of pathogen (Gül *et al.,* 2007).

Infected animals manifest circling, head tilt towards the side of the cyst location, incoordinated and uncontrolled movements, ataxia, failure to hold the head straight, blindness, teeth grinding, salivation, paresis, convulsions, cerebral atrophy, thinning and morphologic changes in the cranium (Yoshino and Momotani, 1988). Although clinical manifestations raise suspicion of the disease, definite diagnosis is generally reached after determination of cysts in the brain at necropsy (Sharma and Chauhan, 2006).

C. cerebralis is an important problem in sheep and goats across the world and its incidence in Turkey is reported to be 1.3-36.8% (Uslu and Güçlü, 2007). Among cattle, *C. cerebralis* is a very rare clinical entity in Turkey and across the world (Yılmaz and Can, 1986). In this study, we aimed to present the clinical and pathological features of a clinical *C. cerebralis* case in a calf. Presenting this case would be beneficial because there is scarce literature on this disease among cattle in Turkey and no report at all in our region, as it is the first clinical case of *C. cerebralis* among cattle in Van province.

MATERIALS AND METHODS

A 10-month-old male Simmental calf was brought to the Department of Internal Diseases Clinic, Faculty of Veterinary Medicine, University of Yuzuncu, Yil. History taken from the owner revealed incoordination, failure to hold the head straight, circling, and poor appetite for the previous 5-10 days. As a result of the systemic clinical

examination of the animal, *C. cerebralis* was suspected and monitoring was recommended. The following day, the animal fell to the ground, hit its head severely onto the ground while having convulsions, and demonstrated severe nervous symptoms; as a result the calf was euthanized. Necropsy was performed. Cranium was dissected. Morbid samples were fixed in 10% formalin solution. After preparing paraffin blocks, sections of 5 µm thick were cut and stained by Hematoxylin-Eosin (H&E) and were examined under light microscope.

RESULTS

Clinical Findings

Systematic clinical examination of the animal demonstrated the following symptoms: inertia, incoordination, irregular gait, failure to hold the head straight, leftward head tilt and circling. Other than those clinical manifestations, no abnormal clinical sign was observed. The size of the lymph nodes, status of the conjunctivas, respiratory rate, heart rate, body temperature, and rumen movements were within physiological limits.

Pathological Findings

Systematic necropsy revealed no pathological findings in the internal organs. Dissection of the cranium exhibited a cyst of 9x7 cm size over the caudal portion of the left cerebral hemisphere. Owing to the drainage of the cystic fluid during removal of the brain, the cerebral tissue in this area was observed to be collapsed (Fig. 1A). Moreover, following careful removal of the brain, cyst formation was found to be more significant, causing a compression over the ventral portion of the cerebral hemisphere and leading to a marked perforation of 3-4 cm size on the sphenoid bone (Fig. 1B). After separation of the hemispheres, cyst formation was also observed which effected caudal aspect of the right hemisphere. Smaller cystic formation, communicating with the one on the left hemisphere was also determined. Cyst formation was observed to comprise almost the entire caudal hemisphere where the brain tissue was atrophied and it had an inner surface of yellowish color in patches. The cyst formation extending towards left lateral ventricle was found to cause internal hydrocephalus which was particularly marked over the left ventricle. Inner surface of the cyst wall had many protoscolices (Fig. 2A).

Histopathologically, there was a compressive atrophy in the cerebral tissue surrounding the cystic wall. Occasional micro-abscesses over cerebral tissues close to the cystic wall were present. A pyogenic membrane enclosing the cystic wall was also observed. Moreover, hyperemia and perivascular mononuclear cell infiltration were observed in the vessels surrounding the cysts (Fig. 2B).

DISCUSSION

In this study, we evaluated the clinical, macroscopic, and microscopic findings of the 10-month-old male Simmental calf with cerebral coenurosis. Clinical symptoms in *C. cerebralis* vary depending on the location of the cyst (Sharma and Chauhan, 2006). The clinical symptoms reported in cattle are incoordination, impaired vision, ataxia, uncontrolled movements, paralysis in the legs, occasional circling, fatigue, and mortality (Yoshino and Momotani, 1988; Gül *et al.*, 2007). Animals are noted to tilt their head towards the side of the cyst and/or circle to the direction of the cyst (Sharma and Chauhan, 2006). In our case, the presenting clinical symptoms of the

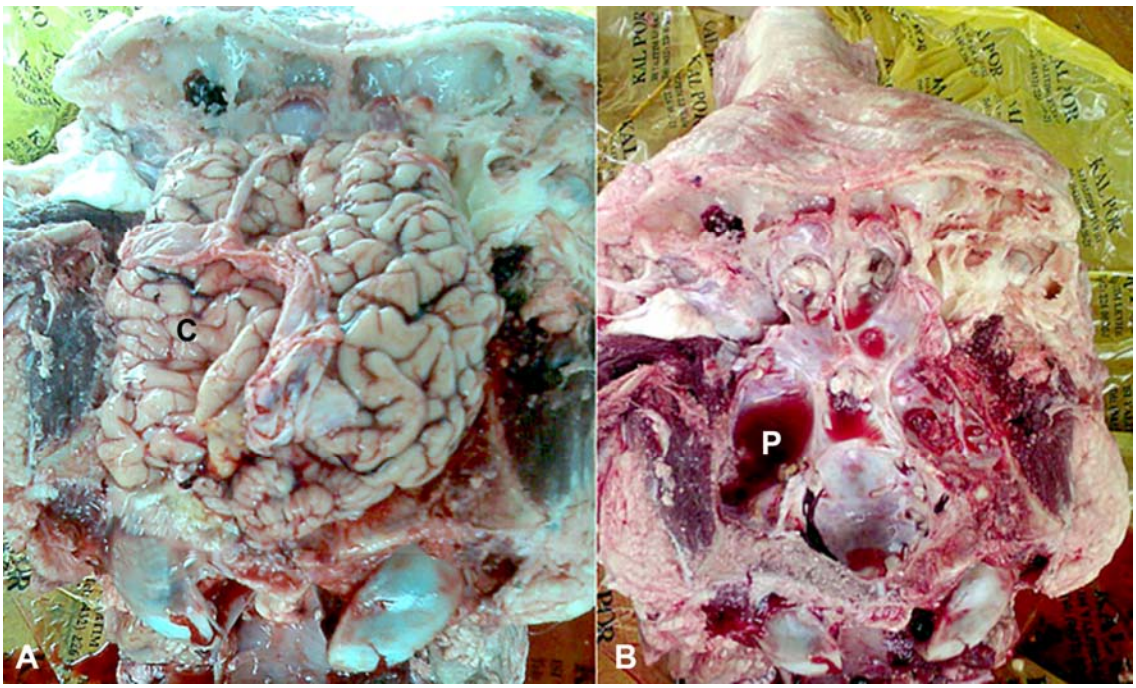

Fig. 1: (A) Brain tissue is collapsed (because of the drainage of the cystic fluid during removal of the brain) over the cystic formation extending from caudal to cranial in the left cerebral hemisphere (C). **(B)** Marked perforation on the sphenoid bone where it contacts with the ventral portion of the left cerebral hemisphere exhibiting a severe cyst formation (P).

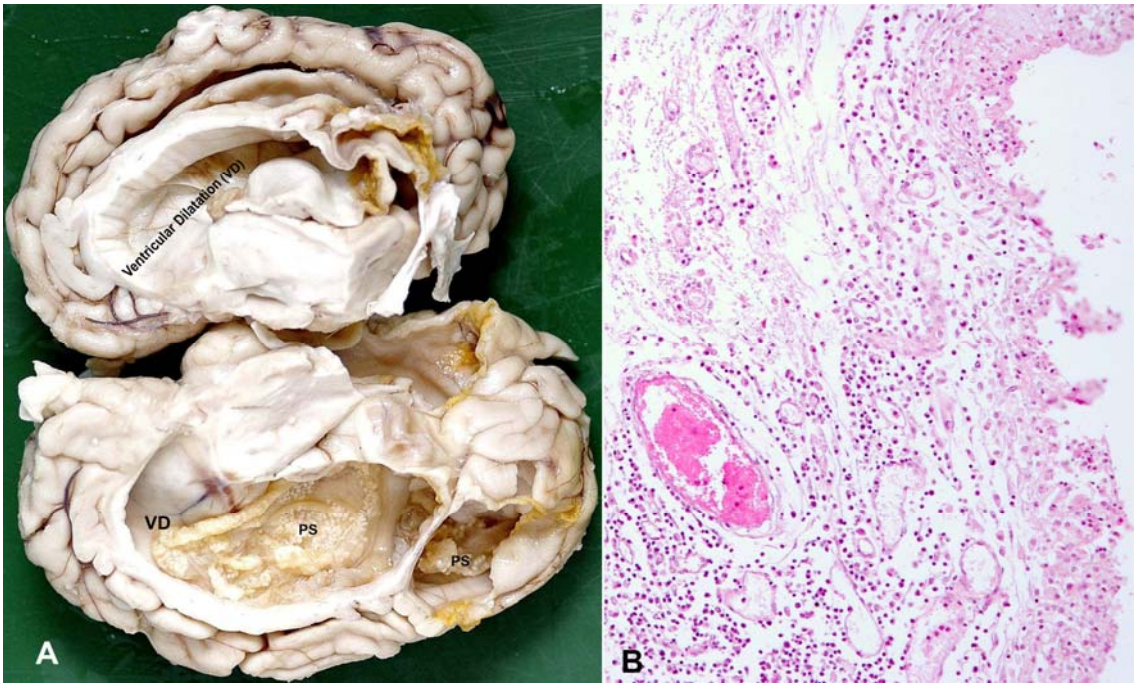

Fig. 2: (A) Cyst formation covering almost the entire caudal portion of the left hemisphere while affecting caudal part partially, both of which leading to dilated and atrophied appearance of the cerebral tissue over those areas. The mass comprising the protoscolices (PS) in the inner surface of the cystic wall, is lining the ventricle lumen, and both ventricles are demonstrating a dilatation (VD). **(B)** Cerebral tissue in contact with the cystic wall exhibiting a pyogenic membrane consisting of capillary vessels, plasma cells, microphage and macrophage proliferation (H&E x 200).

animal such as inertia, incoordination, irregular gait, failure to hold the head straight, leftward head tilt, and circling, was in consistence with the above mentioned reports.

Previous studies (Achenef *et al.,* 1999; Güçlü *et al.,* 2006) have shown that atrophy and perforation might be observed in the cranial bones due to compression of the cyst over cranium. Similarly, in the current case, we determined a compression over the ventral portion of the left cerebral hemisphere and a perforation of 3-4 cm diameter on the sphenoid bone, both of which were because of the cyst located in the left cerebral hemisphere.

In *C. cerebralis*, cysts have been reported to often localize in the central nervous system. Studies show that while being more prevalent in the left hemisphere, 96% of the CNS cysts are located in the left or right hemisphere and 4% are located in the cerebellum (Nourani and Kheirabadi, 2009). Yoshino and Momotani (1988) determined a cyst in the left hemisphere of a calf, whereas Yılmaz and Can (1986) found a cyst in the right hemisphere in a heifer. In another study on calves (İslam and Rahman, 1997), cysts were located in the temporoparietal lobe (28.5%), occipital lobe (23.31%), frontal lobe (19.04%), cerebellum (14.28%), cerebrospinal lobe (9.52%) and spinal cord (4.99%).

In the current study, we determined a cyst of 9x7 cm size in the caudal portion of the left cerebral hemisphere. The size of this cyst was larger than the ones reported in other studies (Yoshino and Momotani, 1988; Dinev *et al.,* 1999). The diameter of the cysts located in the brain are reported to be 0.5-6.5 cm in sheeps (Güçlü *et al.,* 2006), and 2-3 and 5-6 cm in calves (Dinev *et al.,* 1999). In our study, pathological macroscopic and microscopic findings were consistent with the results of the previous studies (Yoshino and Momotani, 1988; Gül *et al.,* 2007), and there was no significant difference.

Similar to other countries, *C. cerebralis* exists in Turkey as well (Yılmaz and Can, 1986; Sharma and Chauhan, 2006); however, it is noted to be observed rarely among cattle compared with sheep and goats (Yoshino and Momotani, 1988). The prevalence of coenurosis among sheep is reported to be 0.35-9.8% in various countries and 1.3-36.8% in Turkey (Uslu and Güçlü, 2007). In another study, prevalence of coenurosis among calves was found to be 2.47% (İslam and Rahman, 1997). However, although clinical *C. cerebralis* cases have been reported among sheep and goats as well as in cattle, many animals are noted to be diagnosed only after death because of demonstrating no symptom while alive (Sharma and Chauhan, 2006; Gül *et al.,* 2007).

In conclusion, we observed clinical symptoms of *C. cerebralis* in our case which were verified on the basis of histopathological lesions. We believed that presenting this case would be beneficial because there was scarce literature on this disease among cattle in our country and no report at all in our region, as it was the first clinical case among cattle in Van province. We think that it would be appropriate to take due precautions for prevention of the spread of the disease among cattle, as well.

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