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Case Report

Coenurus Cerebralis in a Bull in Northeastern Turkey: Clinical and Pathological Observations

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ABSTRACT

In this case report, the pathological and clinical symptoms of coenurosis-which was diagnosed on a simmental bull at the age of two from the region of Erzurum, brought to the clinic with the complaint of neurological symptoms- are aimed to investigate. During anamnesis, we reached the information of the implementations like injections of florfenicol, thiamine and dexamethasone, but these injections were not resulted as expected. In physical examination, neurological symptoms like rotating around itself, leaning the head to the left side, incoordination and ataxia were detected. During hematological investigation, stress leukogram depending on the injection of dexamethasone was observed. A transparent 7x5 cm sized cyst in the ventral region of brain's left hemisphere was observed during necropsy. After the dissection of this cyst, there was a grey-white fluid including protoscolex and the formation of atrophy in brain due to this cyst was detected. During the histopathological examination, a severe level of neural necrosis and gliosis, a milder level of hyperemia in vessels and infiltration of perivascular mononuclear cell and the infiltration of eosinophil leukocyte and mononuclear cell in the close regions of the wall of the cyst were observed. As a result, although clinical coenurosis is quite rare in cattle, in this report coenurosis is detected in a bull. Therefore, veterinarians should consider the possibility of encountering this illness in feeder cattle, too.

Key words: Bull, Clinical signs, Coenurosis, Histopathology

INTRODUCTION

Coenurosis is a disease settled into small intestines of dogs caused by *Coenurus cerebralis* which is larvae of the taenia called *Taenia multiceps* and seen commonly in goats and sheep worldwide and affects central nervous system (Sharma and Chauhan 2006; Scott 2012). The disease, apart from sheep and goats, is seen in cattle, horses, pigs and humans (Varcasia *et al.,* 2013). Dogs play an important role in that they are final host and spread eggs with feces. At the end of taking the herbs contaminated with intermediate hosts, oncospheres set free in small intestines of intermediate hosts are carried into brain and spinal cord. 6 to 8 months after the intake of eggs, a transparent and delicate Coenurus cyst with liquid content forms in these organs (Soulsby 1982). At the end of taking those tissues containing Coenurus cyst by dogs and other wild carnivorous, adult taenia occur in dogs intestines and in this manner life cycle of the parasite becomes complete (Sharma and Chauhan 2006).

Normally Coenurus cyst remains limited with brain and spinal cord. In addition to this, it's seen in muscles and subcutaneous tissues of sheep (Aslani 1999; Aslani and Ramzi 2001). It takes months that the cyst occurred in brain reaches the size that can cause clinical findings. A completely developed coenurus cyst may have 5-6 cm width and lead to the increased intracranial pressure resulted in ataxia, hypermetric, blindness, head deviation, headache, stumble and paralysis (Soulsby 1982; Edwars and Herbert 1982; Herbert *et al.,* 1984). When cysts occur in spinal cord, hindlimb ataxia, paresis and paralysis develop (Ozmen *et al.,* 2005). The cysts in the muscles lead to muscle pain or functional impairment of organs. However, animals remain normal without showing clinical signs in most cases and this situation is diagnosed after the death of animal (Sharma and Chauhan 2006). Common features of histopathological lesions seen in coenurosis are congestion, focal hemorrhage, demyelination, satellitosis, perivascular cuffing liquefactive necrosis and gliosis and those lead to

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microglial nodule formation (Gogoi *et al.*, 1991; Tafty *et al.*, 1997; Sharma *et al.*, 1998). In diagnosis it is benefited from clinical findings, neurological and ultrasonographic examination and post-mortem examination (Godara *et al.*, 2011; Biswas 2013). Computed tomography also has been used successfully for the evaluation of coenurosis including the determination of the location and definite size of cysts (Gonzalo-Orden *et al.*, 1999). In this case report, the pathological and clinical symptoms of Coenurosis-which was diagnosed on a simmental bull at the age of two from the region of Erzurum, brought to the clinic with the complaint of neurological symptoms- are aimed to investigate.

CASE REPORT

A two years old Simmental Bull, treated with variety of antibiotics (florfenicol) and steroidal anti-inflammatory (dexamethasone) drugs for respiratory problem, was referred to the Large Animal Clinic, Faculty of Veterinary Medicine, University of Ataturk as a result of neurological symptoms (Fig. 1). This study material consists of a simmental bull at the age of two which is showing neurological symptoms like rotating around itself, leaning the head to the left side, incoordination and ataxia. During anamnesis, we reached the information of the implementations like injections of antibiotic (florfenicol), vitamin-B_1 (thiamine) and glucocorticoid (dexamethasone), but these injections were not resulted as expected. Haemotological analyses (Abacus Junior Vet 5, Hungary) was performed. Biochemical analyses was performed by autoanalyzer (Beckman Coulter AU5800, USA). Under the light of the findings of clinical diagnosis and the data of anamnesis, we agree upon the higher probability of the presence of coenurosis and the necropsy of the animal was performed. During necropsy, *Coenurus cerebralis* cyst which is located in brain was observed. The brain tissue is evaluated histopathologically. The brain tissue fixed in 10 % formalin buffered saline and after routine histopathology process, paraffin sections of 5 mm were prepared and stained hematoxylin and eosin (H&E).

RESULTS

Clinical findings

In physical examination, neurological symptoms like rotating around itself, leaning the head to the left side, incoordination, drawing circles while walking, ataxia, bruxism and weight loss were detected (Fig. 1).

Haemotological findings

No abnormality was found in blood parameters other than stress leukogram due to dexamethasone injection (Table 1).

Biochemical findings

It is detected that there is an increase in the levels of aspartate aminotransferase (AST), alkaline phosphatase (ALP), globulin (GLOB) and total protein (TP), on the other hand the levels of albumin (ALB), gama glutamil transferase (GGT), total bilirubin (TBIL), Cholesterol (CHOL), calcium (Ca), magnesium (Mg) and phosphorus (P) were in the reference range in biochemical examination (Table 2).

Table 1: Hematologic parameters of a Simmental bull with Coenurosis.

Parameter	Results	Normal range (Meyer and Harvey, 1998)
WBC ($x10^3/\mu L$)	11.02	4.0-12.0
LYM ($x10^3/\mu L$)	3.46	2.5-7.5
MON ($x10^3/\mu L$)	0.22	0.03-0.8
NEU ($x10^3/\mu L$)	7.29	0.6-4.0
EOS ($x10^3/\mu L$)	0.04	0-2.4
BAS ($x10^3/\mu L$)	0.00	<0.2
RBC ($x10^6/\mu L$)	7.65	5.0-10.0
HGB (g/dL)	9.8	8-15
HCT (%)	31.78	24-46
MCV (fL)	42	37-51
MCH (ρg)	12.8	13-18
MCHC (g/dL)	30.8	33-37
RDWc (%)	23.6	16-24
PLT ($x10^3/\mu L$)	260	200-730

Table 2: Biochemical parameters of a Simmental bull with Coenurosis.

Parameter	Results	Normal range (Latimer, 2011)
AST (u/L)	135	60-125
ALT (u/L)	28	6.9-35
GGT (u/L)	21	6-17.4
ALP (u/L)	149	18-153
LDH (u/L)	1476	309-938
CHOL (mg/dL)	61	62-193
TBIL (mg/dL)	0.15	0-1.6
TP (g/dL)	9.4	6.7-7.5
ALB (g/dL)	3.4	2.5-3.8
GLB (g/dL)	6.0	3.0-3.5
Ca (mg/dL)	9.3	8.0-11.4
P (mg/dL)	7.3	5.6-8.0
Mg (mg/dL)	2.5	1.5-2.9

Necropsy findings

A transparent 7x5 cm sized cyst in the ventral region of brain's left hemisphere (Fig. 2) was observed during necropsy. After the dissection of this cyst, there was a grey-white fluid including protoscolex and the formation of atrophy in brain due to this cyst was detected (Fig. 3).

Histopathological findings

A severe level of neuronal necrosis (Fig. 4) and gliosis (Fig. 5), a milder level of hyperemia in vessels and infiltration of perivascular mononuclear cell (Fig. 6) and the infiltration of eosinophil leukocyte and mononuclear cell in the close regions of the wall of the cyst (Fig. 7).

DISCUSSION

Coenurosis is a disease that particularly affect sheep and goats and resulted from *Coenurus cerebralis* which is the larva of *Taenia multiceps* (Oge *et al.*, 2012). Likewise cattle, horses, wild ruminants and humans are susceptible to the disease (Soulsby 1965; Greig and Holmes 1977). The disease has been seen commonly in sheep and goats worldwide (Sharma and Chauhan 2006). The prevalence of the disease has been reported 2.9% in India (Varma and Malviya 1989) and Jordan (Abo-Shehada *et al.*, 2002), 3-7.3% in Iraq (Karim 1979) and 1.3-36.8% in Turkey (Akkaya and Vurusaner 1998; Gicik *et al.*, 2007; Uslu and Guclu 2007). The incidence of coenurosis mainly in sheep and goats in different regions of Iran has been reported 0.09-18.65% (Oryan *et al.*, 2010; Tavassoli *et al.*, 2011;

Fig. 1: Drawing circles while walking.

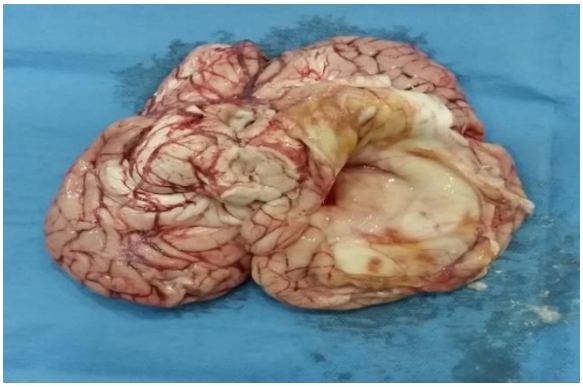

Fig. 2: The localization of cyst and atrophy in brain.

Fig. 3: The cyst containing grey-white fluid including protoscolex.

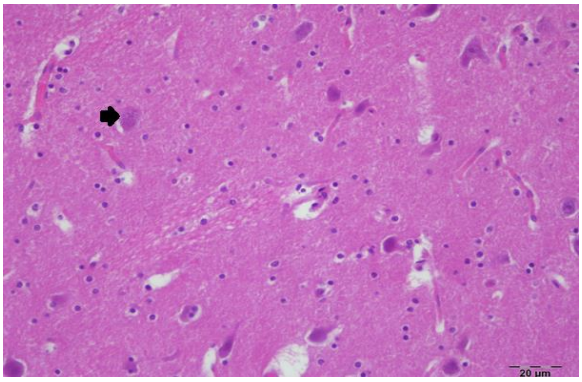

Fig. 4: Neuronal necrosis as shown with an arrow in the figure. H&E. ×400.

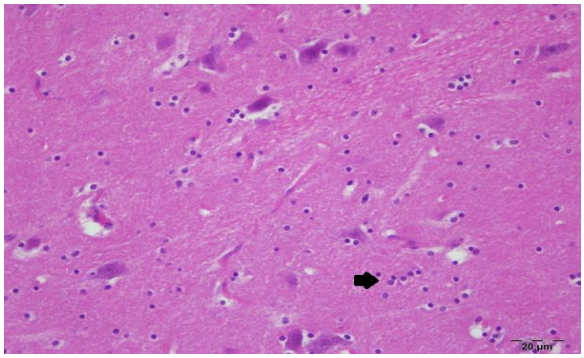

Fig. 5: Gliosis as shown with an arrow in the figure. H&E. ×400.

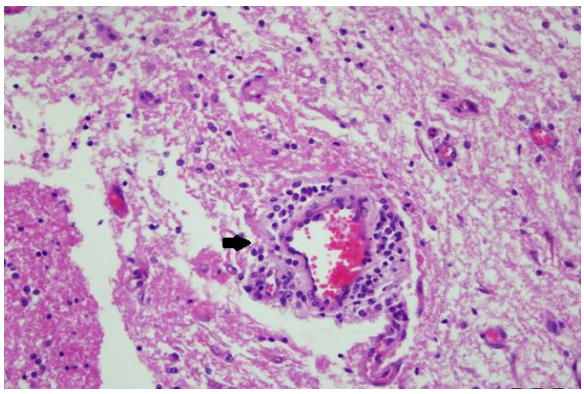

Fig. 6: Hyperemia in vessels and infiltration of perivascular mononuclear cell as shown with an arrow in the figure. H&E. ×400.

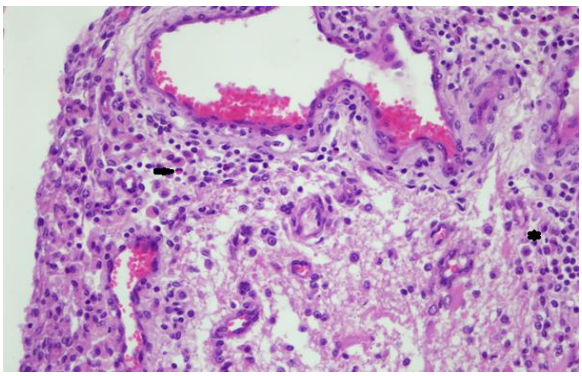

Fig. 7: The infiltration of eosinophil leukocyte shown with an arrow and mononuclear cell shown with a star in the figure. H&E. ×400.

Kheirandish *et al.,* 2012). There are reports about the disease in Ireland (Doherty *et al.,* 1989), Greece (Christodoulopoulos 2007), Russia (Aminzhanov 1988) and Africa (Miran *et al.,* 2015). However, it has been rarely reported in cattle (Yilmaz and Can 1986; Mohaddar *et al.,* 1992; Islam and Rahman 1997; Giadinis *et al.,* 2007; Giadinis *et al.,* 2009; Oge *et al.,* 2012). Islam and Rahman (1997) have reported the prevalence of coenurosis among calves is 2.47% in Bangladesh.

It has been reported that this disease is seen commonly in sheep and goats in Turkey (Akkaya and Vurusaner 1998; Biyikoglu *et al.,* 2001; Gicik *et al.,* 2007; Gul *et al.,* 2007; Uslu and Guclu 2007). However, these reports are limited in cattle (Yilmaz and Can 1986; Avcioglu *et al.,* 2011; Ozkan *et al.,* 2011; Gokce *et al.,* 2013). Avcioglu *et al.* (2011) have detected coenurus cyst in 5 cattle out of 1045 in order to determine its prevalence in cattle in Eastern Anatolia Region (%0.47). Ozkan *et al.* (2011) have detected coenurus in a 10-month old male Simmental breed calf in Van. Gokce *et al.* (2013) have detected coenurus in 4 calves in a cattle breeding enterprise formed of 20 individuals in Kars. In this case's presentation, it has been detected that clinical signs were seen only in one animal from a breeding enterprise of 40 individuals and at the end of necropsy performed the coenurus cyst was detected. It has been reported that coenurus cyst is frequently settled into central nervous system. Soundararajan *et al.* (2016) have examined 122 sheeps to be slaughtered, they detected *Coenurus cerebralis* cyst in 12.30% of them. They reported the places of cysts as follows; cerebrum (66.67%), cerebellum (26.67) and spinal cord (6.66%). The settlement place in the cattle are reported as tempo-parietal lobe, occipital lobe, cerebrospinal lobe, spinal cord (Islam and Rahman 1997), frontal lobe (Yoshino and Momotani 1988; Islam and Rahman 1997), right cerebral hemisphere, left cerebral hemisphere (Giadinis *et al.,* 2007) and front part of cranial cavity (Mohaddar *et al.,* 1992). In this case the settlement place of *Coenurus cerebralis* cyst was in the brain and it was in the left cerebral hemisphere of the brain.

It has been reported that the size of cyst varies from 2-3 to 5-6 cm in the cattle (Dinev *et al.,* 1999), it was 0.5 to 4.2 cm in sheep (Biyikoglu *et al.,* 2001) and 1.3 to 5 cm in goats (Sharma *et al.,* 1998). In the current study, it has been detected that the size of coenurus cyst is 7x5 cm in the brain of 2 old Simmental bull breeds.

Clinical findings in coenurosis vary from breeds of animal, settlement site and size of the cyst (Mohaddar *et al.,* 1992). Main clinical signs seen in sheep and goats are dullness, circling, torticollis, sometimes one-sided blindness, pain response depending on pressure of cyst in the brain and leaning of head towards right or left, feet stamping or walking in straight line (Gogoi *et al.,* 1992; Nooruddin *et al.,* 1996). Clinical signs seen in coenurosis in cattle are incoordination and visual impairment (Mohaddar *et al.,* 1992), more specifically uncontrolled movements, ataxia, stroke in legs, circling from time to time, fatigue and death have been reported (Dinev *et al.,* 1999). Circling is a common symptom (Sharma and Chauhan 2006) and Achenef *et al.* (1999) have concluded that circling side is towards cyst site. We detected like rotating around itself, leaning the head to the left side, incoordination, drawing circles while walking, ataxia, bruxism and weight loss in animal. In the current study, it has been detected that the animal turned left in compatible with reports in clinical findings and the cyst is found to be located in the left side of the brain during necropsy.

Ghosh *et al.* (1998) reported that number of erythrocyte, hemoglobin and packed cell volume (PCV) has decreased but number of eosinophil has increased, but blood values get back to normal after removing Coenurus cyst surgically. Toos and Adib (2004) reported that total protein level has decreased in the sheep with coenurosis and AST and creatinine phosphokinase (CPK) levels have increased. In this study during hematological investigation we observed stress leukogram depending on the injection of dexamethasone. We detected that there was an increase in the levels of AST, ALP, GLOB and TP; on the other hand, the levels of ALB, GGT, TBIL, CHOL, Ca, Mg and P were inside the reference range in biochemical examination.

The histopathological lesions in coenurosis are congestion, neuronal degeneration, focal haemorrhage, demylination, satellitosis, perivascular cuffing liquefactive necrosis and gliosis leading to formation of microglial nodules (Gogoi *et al.,* 1991; Tafty *et al.,* 1997; Sharma *et al.,* 1998;) and pressure atrophy in the skull (Gogoi *et al.,* 1991; Kheirandish *et al.,* 2012). In the current study we determined a severe level of neuronal necrosis and gliosis, a milder level of hyperemia in vessels and infiltration of perivascular mononuclear cell and the infiltration of eosinophil leukocyte and mononuclear cell in the close regions of the wall of the cyst. This findings are similar with the result of the previous studies (Yoshino and Momotani 1988; Gogoi *et al.,* 1991; Ozkan *et al., 2*011; Gokce *et al.,* 2013).

As a result, clinical, hematological, biochemical, macroscopic and histopathological findings of 2 old Simmental breed bull with coenurosis have been assessed in this study. Coenurosis is a worldwide significant disease of sheep and goats and this disease has been rarely reported in cattle although seen frequently. However, although veterinarians and breeders make frequently diagnosis with this disease in cattle, because animals are slaughtered before reporting disease, we consider that the incidence of disease is higher than the reports. We consider that this case report may be beneficial because there are limited reports related to incidence of coenurosis in cattle in our region and country.

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