

Surgical Intervention of Non-cerebral Coenurosis in Sheep- Case Study

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Abstract

This study reports a rare case of non-cerebral coenurosis in sheep. A sheep with bilateral mandibular swelling presented with a history of weakness, dullness in appearance, pain, unable to chew grass for the past seven days. The visual examination and palpation revealed the presence of a coenurus cerebralis cyst. Both the cysts were removed with a surgical intervention using local anesthesia and the cystic fluid was subjected to analysis. The sheep regained their body weight and recovered completely within two months period. This approach of surgical intervention-involved treatment coupled with antibiotic therapy was proven to be an efficient way of managing non-cerebral coenurosis cases. The removed cyst was identified as a non-cerebral coenurus cyst based on the characteristic morphological features, such as the presence of the bladder filled with watery fluid surrounded by a thin, fibrous, and semi-opaque transparent membrane with numerous scolices attached to its inner surface. The cystic fluid analysis revealed the presence of total proteins, lymphocytes, and monocytes with a range of total nucleated cells from 87 to 166 and a foamy cytoplasmic appearance.

Keywords: Cystic Fluid Analysis, Non-cerebral Coenurosis, Sheep

Introduction

Coenurosis, is a disease caused by the larval stages of *Taenia multiceps* cestodes that inhabits the small intestines of carnivores as definitive hosts. Coenurosis commonly occurs in two forms viz. cerebral form caused by invasion of the ovine brain by larval stages of *Taenia multiceps* and the non-cerebral form caused by the invasion of intramuscular and subcutaneous regions by metacestodes of *Taenia gaigeri* (Varcasia *et al.*, 2022). The cystic larval forms of coenurus are found in the central nervous system of intermediate hosts, which include mainly sheep and goats. Although less common, these forms can also be seen in camel, deer, pig, and horse, and more rarely in cattle and humans (Varcasia *et al.*, 2013). These species become intermediate hosts by ingesting the feed or food contaminated with *Taenia* eggs. The term ‘non-cerebral coenurosis’ or ‘muscular coenurosis’ refers to the occurrence of coenurus cysts in locations of a host other than the brain and spinal cord (Christodoulopoulos *et al.*, 2016).

The non-cerebral coenurosis constitutes a problem of food hygiene due to its intra-muscular location, causing rejection of such infected carcasses during meat inspection. Proper diagnosis of any infectious or non-infectious diseases may aid in efficient treatment, thereby preventing economic losses in the form of rejections and mortalities (Yasaswini *et al.*, 2021; 2022). A presumptive diagnosis of coenurosis mainly depends on physical and neurological examinations as well as collecting general information on age, symptoms, flock mortality, and biochemical and cytological analysis of cystic fluid (Gazioglu *et al.*, 2017). Because of the multi-facet utility, the practice of sheep rearing provides a dependable source of income to rural India (Karthik *et al.*, 2021a, b). Despite the fact that non-cerebral coenuri were published for the first time by Benkovskij (1899), the literature pertaining to its incidence in sheep is outnumbered compared to cerebral coenurosis. Considering the importance of sheep rearing and the lacunae in the literature pertaining to non-cerebral coenurosis, this case study aims at diagnosing non-cerebral coenurosis by examining the clinical signs, and cystic fluid analysis in addition to the treatment.

Materials and Methods

A sheep aged 5 years was presented to Veterinary Dispensary, Peddaputta, Vallurumandal of Kadapa district with a history of painful and fluctuating swellings on both sides of the mandible region (Fig. 1a, 1b). The animal was dull and weak. The signalment revealed no deworming history and the sheep was not able to chew grass for 7 days. After visual examination and palpation, the swelling was identified as a cyst. Treatment was performed through surgical intervention by providing local anesthesia and both cysts were extracted by careful dissection of the surrounding tissues.



Fig. 1 Non-cerebral coenurosis in sheep. (A) Skin lump due to subcutaneous cyst – Left side (B) Skin lump due to subcutaneous cyst – Right side (C) Coenurous cyst (removed) of left side (D) Coenurous cyst (removed) of the right side

The collected cysts were examined to confirm their identity and to measure their morphological characteristics (Figure 1c, 1d). The morphological characteristics of each cyst were measured. Initially the volume of cyst was measured by placing it in a measuring cylinder filled with tap water. Later, the cyst was laid on a flat surface to count the number of scolices and their arrangements in clusters. For final confirmation, a piece of larval membrane containing a cluster of scolices was placed on a glass slide pre-added with saline drops, tight pressed with coverslip, and examined under light microscope. The metacestode was identified as coenurus larvae as per the descriptions of Soulsby (1982) and Loos-Frank (2000). Analysis of cystic fluid for parameters like specific gravity, total proteins and total nucleated cells was carried in the laboratory at 37°C by means of U.V. Double Beam Spectrophotometer (Shimadzu corporation, Japan).

Results and Discussion

This study reports the non-cerebral form of coenurosis (mandibular region), its therapeutic management and cystic fluid analysis. The clinical signs observed were dullness, weakness, and inappetence (difficulty in chewing the grass due to painful and palpable swellings of cysts in the mandibular region). The clinical signs reported in the current study are similar to the earlier reports of non-cerebral coenurosis (Ahn *et al.*, 2021; Naveen and Anjaneya, 2015). The identified coenurus cysts were fluctuating and found subcutaneously on the left and right mandibular regions. The removed cysts were identified as coenurus cysts based on characteristics like the presence of a bladder filled with watery fluid and a thin and transparent wall with numerous scolices attached to its inner surface (Soulsby, 1982). Likewise, Shiva Prakash and Reddy (2009) also found multiple subcutaneous cysts in the neck, pre-scapular region, abdomen, and limbs because of the extra-cranial location of these coenurus cysts. In a clinical study, Oryan *et al.* (2014) observed cysts in the intramuscular region. Besides, the non-cerebral coenurus cysts were also identified in the visceral cavity of the serous pericardium, myocardium, thoracic cavity, diaphragm, abdominal cavity, and pelvic inlet (Venkatesan *et al.* 2018).

The morphological characteristics of coenurus cysts removed from infected sheep are shown in Table 1. The coenurus cysts found in the present study were medium-sized with few scolices. The observed ranges of average volume of cysts, no. of scolices, mean intensity of cysts, and no. of clusters per cyst are in complete agreement of the results of Christodoulouopoulos *et al.* (2015). It is accepted that cerebral coenurosis in sheep can reach 95 cm³ in size and can contain up to 700 scolices (Boev *et al.*, 1964, Schuster *et al.*, 2010). Similarly, Schuster *et al.* (2010) found that the cyst sizes vary between 1 and 40 cm³ with the number of scolices per cyst between 46 and 474.

Table 1: Morphological characteristics of coenurus cysts removed from infected sheep

Number and location of cysts	Average volume of cyst (cm ³)	No. of scolices	Mean intensity of cysts	No. of clusters per cyst
One number, located subcutaneously in the right mandibular region	9.37 (4-8)	58.70 (23-110)	1.80 (1-2)	7.00 (5-8)
One number, located subcutaneously in the left mandibular region	5.13 (3-5)	43.33 (24-97)	1.50 (1-2)	5.00 (1-8)

*Values in parenthesis indicate the range

The gross cytoplasmic appearance of the cystic fluid was foamy. Similarly, analysis of cyst fluid analysis in sheep suffering from chronic coenurosis revealed foamy cytoplasm in all the animals (n=24; Zobba *et al.*, 2014). The parameters related to cystic fluid analysis viz. cyst volume, macroscopic appearance, specific gravity, total protein conc., total nucleated cell count, lymphocytes, and monocytes were shown in Table 2. These counts or values are hardly distinguishable from the results of Kish *et al.* (2015) who analysed the biochemical and inflammatory cells' content of acute coenurosis in a sheep herd. These values reinforce the point that the findings of cyst fluid along with clinical examination could be indicative of parasitic infection.

The location of coenuri outside of the central nervous system suggests that there may be a different strain or genetic variant of *Taenia multiceps* (Varcasia *et al.*, 2022). The taxonomic status of the non-cerebral coenurosis cysts remains to be determined by molecular techniques. The remaining sheep in the flock were administered with Fenbendazole and Praziquantel at 7.5 mg/kg BW orally and herbal liver tonics to relieve stress and increase immunity. As per the recommendation of Venkatesan *et al.* (2018), the coenurosis control program should include, community dogs management, stray dog control programs, deworming the mongrels, and preventing the availability

of edible offal to dogs.

Table 2: Cystic fluid-related parameters of acute coenurosis

Name of parameter	Measurements	Measurements
Location of cysts	On right mandibular region	On left mandibular region
Cyst volume (Cm ³)	9.37	7.13
Macroscopic appearance (MA)	Cloudy white color	Cloudy white color
Specific gravity	1.007	1.005
Total protein conc. (mg/dl)	61	30
Total nucleated cell count (TNCC)	166	87
Lymphocytes (%)	68.7	51.6
Monocytes (%)	36.3	46.9
Cytoplasm appearance (Gross)	Foamy	Foamy

Conclusion

The major clinical manifestation in non-cerebral coenurosis include weight loss, weakness, and inappetence coupled with outgrowing skin lumps due to subcutaneous cysts. The macroscopic and microscopic examination of the capsules' aspirate revealed the presence of *Taenia gaigeri*. The current case study reveals the surgical incision together with antibiotic therapy as an efficient mean of treating non-cerebral coenurosis.

Contribution by Authors

All the authors contributed equally to writing the manuscript. The final manuscript was read by all others and consented to publication.

Conflict of Interests

There is no conflict of interest.

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