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Surgical management of *Coenurus gaigeri* Cyst. in Pattanam sheep

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Abstract
Six pattanam sheep, 1 to 2 years of age was presented to VCC, VCRI, Orathanadu with a history of soft fluctuating swelling over the body and no pain on palpation. On clinical examination, non-inflammatory, soft uniform fluctuating swelling was noticed and further fine needle aspiration technique revealed clear watery fluid. The cases were tentatively diagnosed as cyst and for confirmative diagnosis animals undergone for exploratory surgery. The location of cysts in different sheep was the thigh region, eyeball, Thoraco- lumbar region, and right lateral neck region in three cases. Under local infiltration of 2% lignocaine, the swollen mass was operated and the entire fluid containing the cyst was surgically exteriorized without damaging the cyst wall. After the removal of the cyst, the muscles were sutured with a simple continuous suture using 1-0 polyglycolic acid (PGA) absorbable suture material, and the skin was sutured with the simple interrupted pattern using silk 1-0. The fluid was sent for further parasitological examination and confirmed as a case of *Coenurus gaigeri*. Postoperatively animal was administered an antibiotic, anti-inflammatory, and a combination of fenbendazole–praziquantel. The animals recovered completely by the 12th postoperative day without any complications.

Keywords: *Coenurus gaigeri* Cyst., exploratory surgery, non-cerebral coenurosis, pattanam sheep

1. Introduction
Coenurosis is caused by *Coenurus cerebralis*, the metacestode of *Taenia multiceps* in various livestock species ovine, caprine, and bovine (Oge *et al*., 2012) [10]. The cyst occurs in both solitary as well as in a generalized cyst form (Dey *et al*., 1988 and Patro *et al*., 1997) [5, 11]. This is an economically important disease as it causes serious problems, especially in the sheep and goat industry. Among the parasitic diseases, Coenurosis is one of the most important zoonotic diseases. Ovines are intermediate hosts which mainly infected after ingestion of eggs of *Taenia multiceps* contaminated foliage. Once entered into the stomach the oncosphere escape from the eggs, penetrates the gut wall to reach the brain via circulation and forms as a fluid-filled mass in the brain and various tissues called as coenurosis (Acha *et al*., 2003) [1]. Dog being a definitive host, this plays a major role in the spreading of Taenia multiceps to various domestic animals (Alemu *et al*., 2015) [3]. The intramuscular and subcutaneous tissue cyst of *Taenia multiceps* in goats and sheep has been referred as Taenia gaigeri. The larval stage may also sheaths in the thigh (Bordoloi. *et al*., 2015) [4], Shoulder (Saravanan. *et al*., 2016) [14], Diaphragm, heart, kidney, uterus, rectum, and urinary bladder of domestic goats (Varma *et al*., 1989) [17]. This paper describes the surgical removal of Coenurosis gaigeri from subcutaneous and intramuscular tissues in sheep.

2. Materials and Method
Six pattanam sheep, with in the age group of 1 to 2 years old presented to VCC, VCRI, Orathanadu. With a history of soft fluctuating swelling over the body for weeks to months and no pain on palpation, the size of the swelling was gradually increased over a period. Physical parameters were within the normal range and animal having good appetite with healthy condition. There was no proper history of vaccination and deworming.
On clinical examination, the swelling was located over the different body surfaces such as the thigh region, eyeball, Thoraco-lumbar region, and right lateral neck region in three cases (Fig. 1). On physical examination, the size of the swelling may vary from small to medium in range, non-painful, soft uniformly fluctuating masses were noticed under the skin which was confirmed as a cyst. Further fine needle aspiration technique clear fluid was observed and a direct microscopic examination of aspirated fluid confirmed as a case of coenurosis (Fig. 2).

Based on clinical signs, surgical removal of the cyst was warranted to prevent the spread of disease to other body surfaces and other species. After getting the owner's concern the surgical site was prepared aseptically and draped (Fig. 3). Under local infiltration of 2% lignocaine at the site (Fig. 4), the skin incision was made over the mass and subcutaneous tissue and muscles were separated bluntly (Fig.5). The fluid-filled cyst was surgically exteriorized without rupturing the sac (Fig. 6).

After the removal of the cyst, the muscles were sutured with a simple continuous suture by using 1-0 polyglycolic acid (PGA) absorbable suture material, and the skin was sutured with the simple interrupted pattern using silk 1-0 (Fig. 7). As part of Post-operative care, antibiotics (Enrofloxacin 5mg/kg) were administered for 5 days and anti-inflammatory (Meloxicam 0.5mg/kg) were administered for 3 days along with antiseptic wound dressing of the operative site with povidone-iodine and topical ointment application were advised about 10 days to prevent the infection. All the animals were recovered uneventfully on the 10th day and the sutures were removed on the 12th postoperative day without any complications.

Fig 1: Swollen mass on lateral neck region

Fig 2: FNAC-Clear fluid aspirated

Fig 3: Aseptic preparation of site

Fig 4: Local infiltration of 2% LA

Fig 5: Incision was made over the cyst

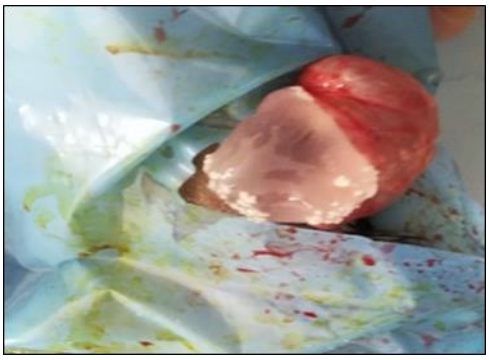

Fig 6: Fluid-filled cyst was surgically exteriorized without rupturing the sac

Fig 7: Skin sutured with 1-0 silk

3. Results and Discussion

Clinical findings and history confirmed that sheep were affected with cysticercosis. All the cysts were present in the subcutaneous tissue and muscles except in one case where the cyst was present in the eyeball. Animals recovered uneventfully after the surgical removal of cysts without any reoccurrence after two months. The cyst size ranged from 4

cm to 6 cm in length. The outer layer of the cyst wall was thicker and grayish in color whereas the inner wall was thin, and translucent with clusters of invaginated scoleces attached to the inner germinal layer of the cyst (Fig. 8).

The present study results were similar to the previous study according to the shape and number of rostellar hooks in the cyst (Monsang *et al*., 2016; Rashmi. *et al*., 2018) [9, 13]. It was found that there was no difference between *T. multiceps* and *T. gaigeri* in cyst morphology features and shape of the rostellar hook (Fig. 9&10) but immunological and molecular methods should be developed to differentiate the coenurosis. Coenurosis (Gid or sturdy) highly fatal disease for sheep and humans are caused by Taenia multiceps. The Cyst predominantly develops in the brain and spinal cord which affects the normal functioning of the central nervous system (CNS) of coenurosis-affected sheep and men (Sharma *et al*., 2006; Aiello and Mays 1998) [15, 2].

Sometimes a cyst may develop an aberrant location in the subcutaneous tissue and muscles in goats. Previously they thought that different species were involved in the pathogenesis of coenursis affection in CNS and subcutaneous tissue (El-Sinnary *et al*., 1999) [6]. But later on, they confirmed that both cysticercus coenurosis and cysticercus gaigeri have the same morphological features (Kheirandish *et al*., 2012) [7]. However, the differences in the habitat of the larval stage are present in the species of the host, not the parasite. This is most likely due to the host difference. Similar results were found in the present study, where the cyst was present in the subcutaneous tissue and muscles of sheep and it was confirmed as a case of coenurus gaigeri.

The presence of cyst in subcutaneous tissue and muscles reduces the meat and hide the value of the animals. This was concurrent with the study of Radfar *et al*., 2005 [12]. Coenurosis causes severe muscle damage, reduction in production and significant economic losses due to the condemnation of infected organs of the herbivores and even death of the heavily infected animals (Radfar *et al*., 2005) [12]. Sharma *et al*., 1995 [16] also reported that non-cerebral coenurus cysts were located in the different body parts of black Bengal goats in the lateral neck region in two animals and 3 in thoraco-lumbar region. Similar findings were noticed in the present study. In the majority of the cases, the cyst developed slowly and causes asymptomatic focal lesions in unusual locations. This was concurrent with the study of Sharma and Chauhan, (2006) [15] where the cyst may be permanently present the whole life span of the host without producing any clinical symptoms until it was removed surgically. The animal may exhibit clinical symptoms depending upon the host-parasitic relationship, the number of eggs ingested, the age and immune response of the sheep, etc. Chronic infestation is more common in goats aged between one and two years old.

The disease is of more zoonotic importance since one to two-year-old sheep and goats were preferred for human consumption. These animals were an important source of disease. From the history, it has been confirmed that shepherd dogs have never received medication against Taenia spp. and have been fed raw offals and uncooked meat. Dogs being the definitive host of *T. gaigeri* play an important role in the spreading of the disease. Sheep and goats are getting an infection from dog excreta, therefore, preventing the entry of dogs into the farm and grazing areas (Madhu *et al*., 2014) [8]. Sheep, being an intermediate host usually get the infection from the contamination by dog's excreta therefore the treatment of dogs in and around the farms for tapeworms should be made. Entry of street dogs into sheep flocks should be prevented for control of this ailment.

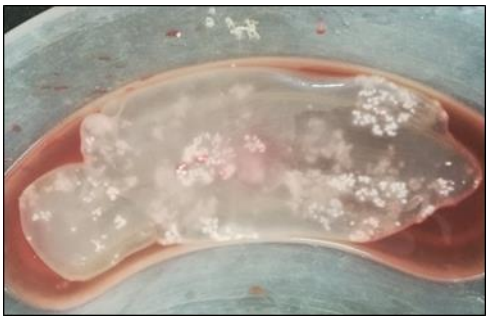

Fig 8: Layer of the cyst wall and translucent with clusters of invaginated scoleces attached to the inner germinal layer of the cyst

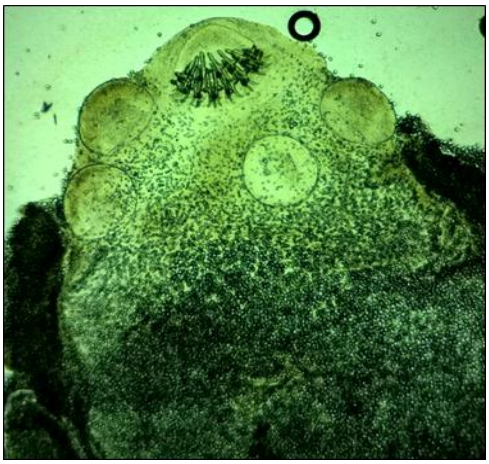

Fig 9: Protoscoleces have four suckers

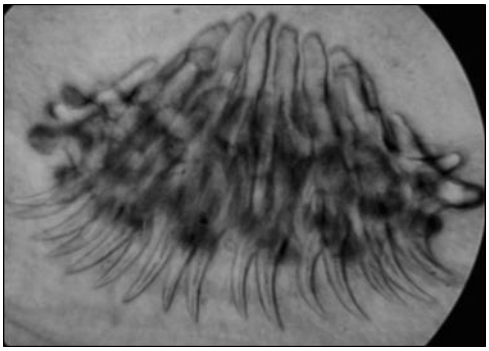

Fig 10: 20-30 hooks with hooklets

4. Conclusion

The cyst was surgically removed successfully and confirmed as *Coenurus gaigeri*. *T. gaigeri* spread may be controlled by regular deworming of dogs for up to 6-8 weeks intervals periodically with effective anti-helminthic and feeding the animal with cooked meat rather than giving raw meat of slaughtered sheep and goat. Treatment of the disease was not satisfactory except for surgical removal of the cyst but that is not cost-effective. Prevention of disease would be done by avoiding dog contact with pasture, creating community awareness among the people, and followed by regular deworming of sheep with broad spectrum anthelmintic like albendazole, praziquantel, and fenbendazole or a combination of both praziquantel and fenbendazole.

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