

Surgical management of non-cerebral coenurosis in goats in the foothills of Arunachal Pradesh, India

Coenurosis is a condition in which the larval stages of *Taenia multiceps*, a canine tapeworm develop in the brain and spinal cord in sheep and goat¹. It may also occur in other animals and humans². However, *Coenurus cerebralis* is reported to occur in locations outside the central nervous system (CNS) such as subcutaneous fascia, intramuscular and peritoneal areas, and have been referred to as the larval stage of *Taenia gaigeri*³⁻⁹. Occurrence of Coenurosis in the CNS may cause acute meningoencephalitis resulting in neurological signs, such as staggering gait, circling movement, blindness, etc. depending upon the location of the cyst¹. *C. cerebralis*, if present, intramuscularly may cause pain, muscular degeneration, necrosis and atrophy¹⁰. Most of the cases of non-cerebral coenurosis remain undiagnosed¹¹.

An Assam hill goat (female) was reported to the Teaching Veterinary Clinical Complex at Lakhimpur College of Veterinary Science, Joyhing with swellings on the cervical and upper thigh regions (Figures 1 and 2). Clinical investigation revealed absence of calor, dolor and rubor, but uniform fluctuation for both swellings. Exploratory puncture after proper disinfection with a sterile needle revealed a clear fluid, thus indicating a cyst.

Both the cysts were removed surgically following standard surgical procedure. The cyst on the upper thigh was underneath the *tensor fascialata* and the other on the cervical region was embedded under *brachiocephalicus* and under the belly of *multifidous dorsi* muscle.

Therefore, after surgical removal, cavity formed on both the areas, which was painted with 5% povidine iodine (betadine) solution. To reduce the dead space, few stay sutures were put using 3-0 chromic catgut. The wounds were closed surgically with 1-0 BB silk. Antibiotics for post-7 days followed by antihistaminic and NSAID for post-3 days were injected as part of post-operative care.

The cysts measured 159.14 and 97.20 sq. cm in area in the thigh and cervical region respectively; they were filled with fluid and weighed 32.98 and 21.34 g respectively (Figure 3). The outer layer of the cyst was characterized by a thick, fibrotic and grayish-brown capsule, whereas the inner layer was thin, transparent with several white clusters of invaginated scolices attached to

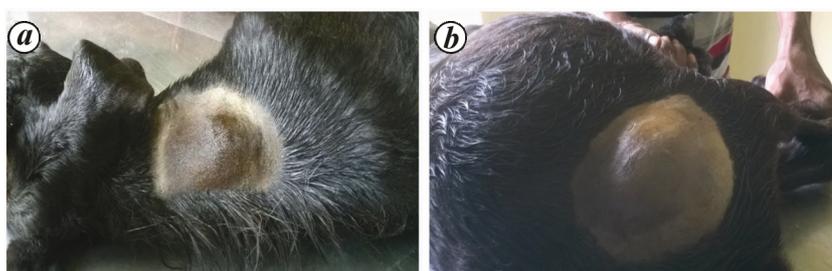


Figure 2. Swelling in (a) cervical and (b) upper thigh region after shaving of hairs of the goat.

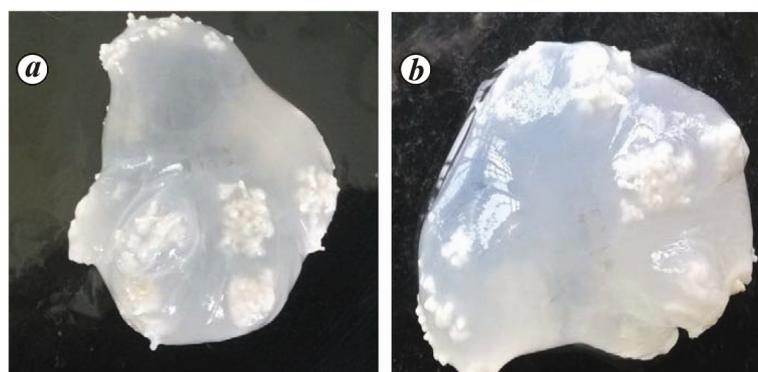


Figure 3. Photograph of cyst recovered from (a) cervical and (b) thigh region.



Figure 1. Goat with swelling in cervical and upper thigh regions.

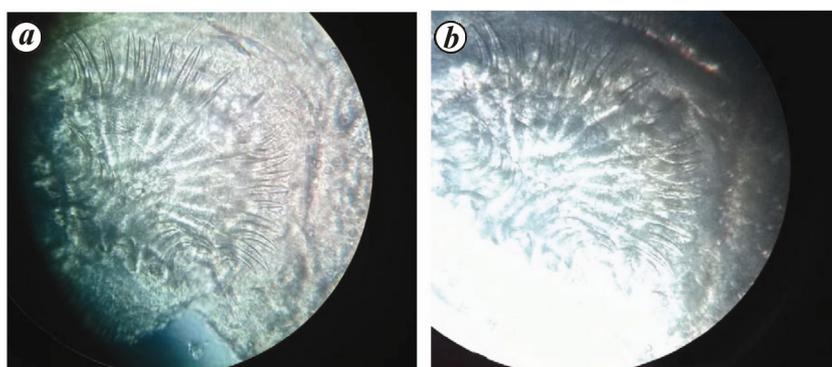


Figure 4. Photograph of rostellor hooks recovered from cyst of (a) cervical and (b) thigh region.

the surface. The scolices were attached to the lucent germinal layer of the cyst.

However, on removal of the thick fibrotic capsule, some scolices emarginated outside the lucent germinal membrane. The scolices have four suckers and one rostellum armed with a double crown of 30–32 hooks with hooklets (Figure 4). On the basis of morphological studies, the cyst was diagnosed as *C. cerebralis*.

Cerebral coenurosis is worldwide in distribution. However, information on non-cerebral coenurosis from Asia is limited. Most of the cases are reported from the Middle East only¹⁰. Prevalence of non-cerebral coenurosis in goats in India was recorded^{6,12,13} up to 1.1–2.41%. Coenurosis was reported from various body parts of goats in India, including diaphragm⁴, the base of the ear and thigh muscles, and ocular coenurosis¹⁴. The present finding on occurrence of coenurosis cyst underneath the *tensor fascialata* of the upper thigh and also under *brachiocephalicus* and *multifidus dorsi* muscle in the cervical region of a goat is the first report from North East India.

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Skeletal microfauna from the Cambrian Series 2 (Stage 4) Kunzum La Formation, Parahio valley, Spiti region (Tethyan Himalaya), India

Small shelly fossils (SSFs)¹ consist of a variety of shells, sclerites and other biomineralized structures² that mark the advent of widespread biomineralization among animals in the Cambrian period³. SSFs are commonly known worldwide from the Terreneuvian Series to unnamed Series 2 of the Cambrian System³. The less diverse SSFs are known from the Cambrian Series-3 (refs 4, 5) to Carboniferous⁶. In the Indian Himalaya, SSFs are recorded from the Early Cambrian Tal Group^{7–9} of the Lesser Himalayan Zone and in the Tethyan Himalayan Zone from the Middle Cambrian part of the Kunzum La Formation (Spiti region)¹⁰, and Lolab Formation^{11,12} (Kashmir Basin). Here we report an assemblage of mineralized skeletal microfossils from the Lower Cambrian part of the Kunzum La Formation of the Spiti region, Tethyan Himalaya.

Most of the previous palaeontological work in the Cambrian of the Spiti region

pertains to the trilobites^{13–20}, brachiopods and hyoliths^{14,21} and trace fossils^{22–32}. Only one record of SSFs *Oneotodus* sp., *Sagittodontus* sp., *Problemocoenites*, *Westergaardodina* sp., and *Furnishina* spp. is available from the Middle Cambrian dolomitic beds of the ‘Parahio Series’ at the Parahio valley section¹⁰.

The Cambrian succession is well exposed in the Parahio valley of the Spiti Himalaya, Himachal Pradesh, India (Figure 1 a and b). The Cambrian of the Spiti Himalaya is grouped under the Haimanta Group, which is divided into Batal and Kunzum La formations^{33,34}. The Batal Formation mainly consists of phyllite, quartzite and intervening shale, and contains acritarch *Pulvinomorpha*, *Sphaerolithozoa* and *Anguloplanina* suggestive of latest Precambrian age³⁵. The 2700 m thick Kunzum La Formation³⁵ comprises of shale, sandstone, quartzite, dolomite and limestone, and is rich in trilobite and trace fossils of Early–Middle Cambrian

age. Based on the incoming carbonate material in upper part, the Kunzum La Formation was subdivided into two members³⁵. The lower 2210 m of the Kunzum La Formation, which is devoid of carbonate, was grouped under the Debsakhad Member³⁵ which yielded abundant trace fossils. The upper 590 m of trilobite-bearing part belonged to the Parahio Member³⁵, which is equivalent to the Parahio Series³⁶; it contains carbonate rocks. However, recent work suggests that the carbonate beds also occur within the Debsa Khad Member³⁷, making the subdivision redundant. More recently, the term ‘Parahio Formation’³⁷ is suggested for the Parahio Series which originally signified a biostratigraphic unit, and used for the entire Kunzum La Formation, which has been contested^{38,39} and retention of the term ‘Kunzum La Formation’ was suggested (Figure 1 c).

The present studied section of the Cambrian Kunzum La Formation in the