Pathology in Practice

A 1-year-old female Corriedale ewe from a farm in southern Brazil was evaluated because of a 3-month history of anorexia, isolation from the flock, and neurologic signs. An extensive cyst has effaced most of the cerebellum. Adjacent cerebellar folia (asterisk), the underlying brainstem (arrow), and telencephalon (arrowhead) are compressed and atrophied owing to the expansion caused by the cyst. Bar = 1 cm.

Formulate differential diagnoses from the history, clinical findings, and Figure 1—then turn the page →
Histopathologic Findings

The cyst cavity was filled with a translucent fluid, and the cyst wall was lined by a fine, translucent, pale membrane containing multiple, elongated, white cestode scolices measuring 1 × 2 mm. On microscopic examination, the cerebellar cyst wall was composed of an outer and an inner acellular eosinophilic layer surrounded by necrosis and mineralized debris admixed with epithelioid macrophages, multinucleated giant cells, and layers of fibrovascular tissue containing scattered lymphocytes and plasma cells (Figure 2). Numerous cross sections of acoelomate parasitic scolices measuring 1 mm in diameter were observed arising from the inner cyst layer. Scolices were lined by a smooth eosinophilic tegmentum and had a body parenchyma containing no digestive tract and numerous round basophilic concretions (calcareous bodies). A sucker apparatus could be observed in a few scolices. The remaining adjacent cerebellar medulla and cortical layers were compressed and atrophied with rare vacuoles in the neuropil and neuroparenchyma. Scattered lymphocytes and plasma cells were observed surrounding leptomeningeal capillaries.

Morphologic Diagnosis and Case Summary

Morphologic diagnosis: focally extensive cerebellar parasitic cyst (coenurus cerebralis), with granulomatous meningoencephalitis and secondary compressive brain atrophy.

Case summary: cerebellar coenurosis in a sheep.

Comments

The gross and histologic findings in the sheep of this report were consistent with ovine coenurosis.1–8 Coenurosis is a worldwide parasitic infection that affects sheep and less often goats and cattle.1–8 Coenurosis is caused by the larval form of *Taenia multiceps*; the larvae are referred to as coenurus cerebralis. *Taenia multiceps* inhabit the small intestine of domestic and wild canids (definitive hosts).1–11 The adult cestodes lay eggs containing oncospheres that are excreted with the feces and ingested by ruminants (intermediate hosts). In the intestinal tract of ruminants, oncospheres are released from the eggs, penetrate intestinal vessels, and reach the CNS through the bloodstream and lymphatic system, where the larvae develop into space-occupying cysts that may or may not lead to clinical disease. The cycle is complete when the definitive host ingests ruminant carcasses containing the cysts with larval cestodes.1–11

Two clinical forms of coenurosis have been described.3 An uncommon acute form may develop approximately 1 month after larval invasion into the CNS, causing severe ataxia, trembling, hyperesthesia, hypermetria, and recumbency.3,4 A much more common and chronic form of coenurosis (highlighted by the case described in this report) develops 2 to 4 months after infection.3 Clinical signs in all species with the chronic form of coenurosis develop secondarily to the presence of space-occupying cysts within the CNS.1,2,3,6 In such cases, clinical signs are attributed not only to the presence of the cyst itself, but also to cyst-associated compression of and other secondary changes in the adjacent brain tissue.3 Thus, for sheep with chronic coenurosis, a wide range of clinical signs including isolation from the herd, signs of depression, blindness, circling, head tilt, and incoordination has been reported.1,2,6,7 In addition, a small percentage of affected animals may develop cranial bone resorption secondary to the pressure exerted by the cyst.8 Affected bones may be soft on palpation, a finding that can be useful for a clinical diagnosis of cerebral coenurosis.8

Figure 2—Photomicrographs of the area surrounding the cyst (A) in the sheep in Figure 1 and a cestode scolex (B) in the translucent membrane that lined the cyst. In panel A, there are extensive accumulations of necrotic debris (top) surrounding the cyst and successive layers of epithelioid macrophages and multinucleated giant cells infiltrating into fibrovascular tissue (bottom). H&E stain; bar = 100 µm. In panel B, notice the acoelomate cestode larva lined by a smooth eosinophilic tegmentum (thin arrows). The larva contains a body parenchyma (arrowheads) and a sucker apparatus with hooks (thick arrow). H&E stain; bar = 500 µm.
Although parasitic cysts usually develop in the brain,\textsuperscript{1} they can also form in the spinal cord and rarely in the abdominal cavity, subcutaneous tissue, and skeletal muscle.\textsuperscript{6,7,9,10} Acoelomate platyhelminth parasites belonging to the class Cestoda or Trematoda can be differentiated on the basis of the fact that cestodes do not have a digestive tract and contain scattered calcareous bodies embedded within the parenchyma, whereas trematodes are distinguished by the presence of a digestive tract and absence of calcareous bodies.\textsuperscript{11} The presence of oral hooks is typical of members of the family Taeniidae.\textsuperscript{11} In addition, results of recent phylogenetic studies suggest that sequencing of the mitochondrial cytochrome c oxidase 1 gene of \textit{T multiceps} may allow molecular identification of \textit{Taenia} spp and the determination of morphological and pathological differences between parasitic genotypes.\textsuperscript{12}

The prevention of coenurosis in areas in which \textit{T multiceps} is endemic is based on the interruption of the parasitic life cycle, including administration of anthelminthic to dogs and proper disposal of ruminant carcasses or tissues to prevent their consumption by intermediate hosts.\textsuperscript{31} Treatment of affected ruminants involves administration of anthelminthic drugs or surgery, although surgery has been regarded as difficult and uneconomical.\textsuperscript{13}

References