Magnetic resonance imaging in a lamb with compression of the thoracic spinal cord by an abscess

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Summary

This report describes a two-month-old Ouessant ram lamb with hind limb ataxia, knuckling and falling attributable to an abscess in the thoracic vertebral region. A swelling palpated adjacent to the spinous processes of the 9th to 12th thoracic vertebrae was identified via ultrasonography as an abscess located on the transverse processes of these vertebrae. Magnetic resonance imaging of the lamb postmortem revealed that the abscess had invaded the vertebral canal through a channel at the level of the 9th thoracic vertebra causing extradural spinal cord compression. Postmortem examination confirmed these findings, and histological examination showed acute spinal cord degeneration.

Keywords: sheep, hind limb ataxia, vertebral column, spinal cord, abscess, MRI

Magnetresonanz-Tomographie bei einem Schaf mit Kompression des thorakalen Rückenmarks durch einen Abszess

Es wird ein 2 Monate altes, männliches Ouessant-Schaf mit Abszess im Bereich der thorakalen Wirbelsäule beschrieben. Die wichtigsten klinische Befunde waren Nachhandataxie, Überköten hinten beidseits, Schwanken der Nachhand und Umfallen. Bei der Adspektion und Palpation wurde neben den Dornfortsätzen der Brustwirbel 9 bis 12 eine Umfangsvermehrung festgestellt. Diese stellte sich bei der Ultraschalluntersuchung als kavitäre Läsion dar (Verdacht auf Abszessbildung), welche seitlich auf den Querfortsätzen der Brustwirbel lag. Das Schaf wurde euthanasiert. Bei der postmortem durchgeführten MRT-Untersuchung (Magnetresonanztomographie) konnten Ausmass und Lage des Abszesses genau charakterisiert werden. Auf Höhe von T9 war ein Kanal zu sehen, der vom Abszess ausging und sich in den Wirbelkanal erstreckte und das Rückenmark komprimierte. Die Sektion bestätigte die MRI-Befunde. Histologisch war an der Kompressionsstelle eine akute Degeneration des Rückenmarks zu sehen, welche für die klinischen Symptome verantwortlich war.

Schlüsselwörter: Schaf, Nachhandataxie, Wirbelsäule, Rückenmark, Abszess, MRI

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Introduction

Hind limb ataxia attributable to a lesion in the thoracolumbar vertebral column is rare in sheep but may occur because of trauma, neoplasia or abscess (Passler et al., 2012). Cerebrospinal nematodiasis (Tschuor et al., 2006) and enzootic ataxia resulting from copper deficiency (Passler et al., 2012) are other causes of hind limb ataxia in sheep. Localisation of the neurologic lesion is based on clinical findings, and in sheep with thoracic spinal cord damage, signs typically include difficulty in rising, posterior paresis and paralysis, hind limb ataxia and dog-sitting posture (Radostits et al., 2007; Passler et al., 2012). Ancillary tests include cerebrospinal fluid analysis, radiography, myelography, computed tomography and magnetic resonance imaging (MRI) (Passler et al., 2012). The latter technique was used to diagnose lymphoma in the lumbar vertebral canal of a goat (Gygi et al., 2004) and paraspinal abscesses in dogs and cats (Naughton et al., 2005; Schmidt et al., 2015). This case report describes a two-month-old Ouessant ram lamb with acute posterior paresis of attributable to an abscess in the thoracic spinal canal.

Case presentation

On presentation, the lamb had a good appetite, a normal behavior, a rectal temperature of 39.5 °C, a heart rate of 160 bpm and a respiratory rate of 36 breaths per minute. The tail had not been docked, the faeces were normal in colour and consistency, and there were no ruminal contractions. The physical appearance of the lamb appeared normal on visual inspection, but palpation revealed a firm painful mass adjacent to the transverse spinous processes of the 9th to 12th thoracic vertebrae (Fig. 1); the mass could be seen after shearing the area. Hind limb ataxia and knuckling in both hind feet were seen at a walk, followed by swaying, falling and difficulty in rising from a dog-sitting position (Fig. 2). Loss of proprioception was evident by failure of the lamb to correct its stance after abduction, adduction and crossing of the hind limbs. The lamb fell when the pelvic area was pushed sideways and during hemistanding and hemiwalking. Mentation, cutaneous sensitivity and cranial nerve reflexes were normal. Haematological analysis showed leucocytosis (12,200 leucocytes/µl, normal 4.5 to 11.4, Tschuor et al. 2008) with 39.3% neutrophils and 56.6% lymphocytes. Ultrasonographic examination using a 7.5 MHz linear scanner showed that the mass was likely an abscess. It had an echoic capsule and heterogeneous content (Fig. 3) and was located dorsal to the transverse processes of the thoracic vertebrae. An echoic core was surrounded by hypoechoic fluid. The mass was poorly delineated medially and was associated with a small fistula ventrally.

Figure 1: Swelling attributable to an abscess at the level of the 9th to 12th thoracic vertebrae in a two-month-old Ouessant ram lamb.

Figure 2: Ataxia and knuckling in the hind limbs in a two-month-old Ouessant ram lamb with an abscess in the thoracic vertebral column. The clipped area on the back marks the abscess. The neck bandage serves to protect the indwelling jugular catheter.

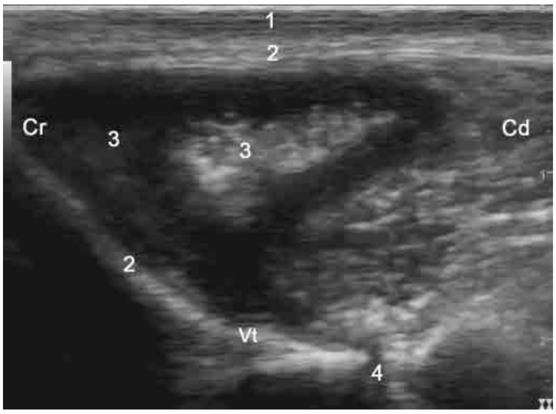

Figure 3: Ultrasonogram of an abscess at the level of the 9th to 12th thoracic vertebrae in a lamb with hind limb ataxia. 1 Skin, 2 Abscess capsule, 3 Heterogeneous content, 4 Fistula. Cr Cranial, Cd Caudal, Vt Ventral.

Central nervous system disease originating in the thoracic area of the spine was diagnosed based on all the findings. The cause was believed to be an abscess that had expanded into the vertebral canal. The lamb was euthanized, and an MRI scan of the thoracic and lumbar vertebral spine was conducted to confirm the diag-

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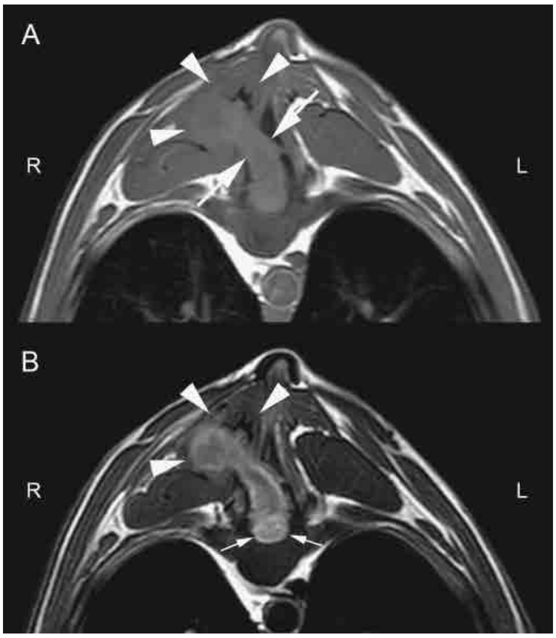

Figure 4: Transverse images of the spine and paravertebral soft tissues at the level of the mid aspect of the vertebral body of 9th thoracic vertebra. A: T1-weighted (T1W) TSE, B: T2-weighted (T2W) TSE. There is expansion of the cavitary space occupying lesion (white arrow heads) into the spinal canal through a large defect in the spinous process and the dorsal lamina of the thoracic vertebra (white, large arrows). There is ventral displacement and flattening of the spinal cord (white, small arrows) secondary to the mass effect.

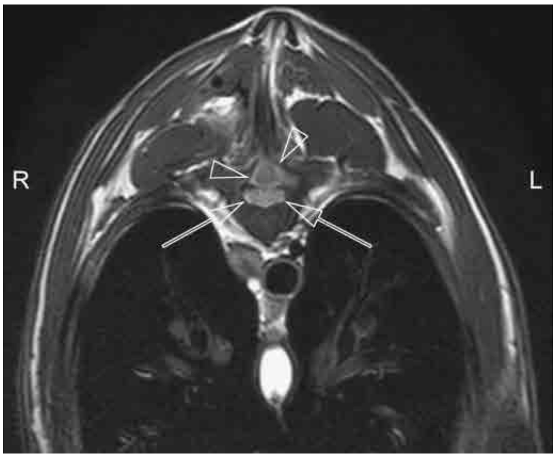

Figure 5: T2-weighted (T2W) transverse image at the level of the mid aspect of the vertebral body of 8th thoracic vertebra. There is loss of the normal T2 hyperintense fluid and fat signal intensity in the epidural and subarachnoid space. The intravertebral extension of the cavitary lesion (white arrow heads) has resulted in severe dorsoventral compression and deviation of the spinal cord (white arrows).

nosis and to visualise the pathological changes. The MRI study included sagittal T2 and dorsal T2 with fat saturation TSE sequences of the thoracic and lumbar spine, completed with transverse T1 and T2 TSE sequences of the caudal aspect of the thoracic spine at the level of the soft tissue swelling. A large, oval, well-

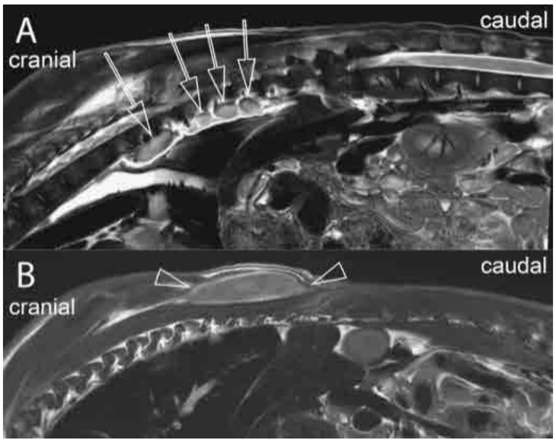

Figure 6: T2-weighted (T2W) parasagittal images of the thoracic and cranial aspect of the lumbar spine.
A: Multiple, enlarged, rounded, well-defined aortic lymph nodes (white arrows) that are T1 isointense and T2 hyperintense relative to the epaxial musculature, are seen between the ventral aspect of the thoracic vertebral bodies of the caudal thoracic spine and dorsolateral to the caudal thoracic aorta.
B: A large (approximately 6 cm in length), oval, well-defined T2 hyperintense (relative to adjacent musculature) abscess (white arrow heads) is seen adjacent to the spinous processes of the midthoracic spine.

defined, cavernous lesion (6.0 × 1.7 x 3.0 cm, length × height × width) extended dorsal to and along the epaxial musculature from the 6th to the 11th thoracic vertebrae (Fig. 4) was seen adjacent to the spinous processes of the thoracic vertebral column. At the level of the 9th thoracic vertebra, a tract from the lesion extended through a large defect in the spinous process and the lamina from laterodorsal into the vertebral canal. This extension caused moderate ventral displacement and moderate flattening of the spinal cord and obliteration of the epidural and subarachnoid spaces (Fig. 5). It was not possible to differentiate gray and white matter at the level of the compression. The signal intensity of the spinal cord was normal. Multiple, well defined, oval to spherical thoracic aortic lymphnodes of variable size were seen bilaterally ventral to the vertebral column and dorsolateral to the thoracic portion of the aorta (Fig. 6A). The lymph nodes were isointense to the cavernous lesion, and the largest measured 2.7 × 1.2 × 7.2 cm. The diagnosis of extradural spinal cord compression by an abscess (Fig. 6B) at the 9th and 10th thoracic vertebrae with regional lymphadenopathy was made based on these findings.

The postmortem examination confirmed the presence of a 3-cm abscess adjacent to the thoracic spinal column with a tract extending into the spinal canal (Fig. 7). Histological examination showed severe acute degeneration of the affected spinal segment due to compression, but there was no evidence of infiltration of the abscess through the meninges (Fig. 8). Signs of degeneration

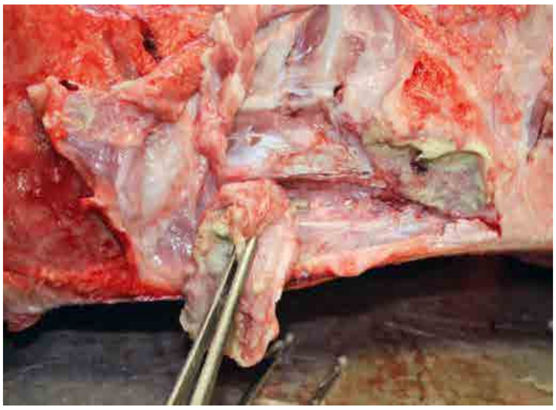

Figure 7: Post-mortem examination showed an encapsulated abscess with a diameter of 3 cm diameter located in the paravertebral soft tissues on the right side at the level of the 9th to 12th thoracic spinous processes. The abscess extended into the spinal canal at the level of the 9th thoracic vertebra (site of capsule attachment is under the forceps).

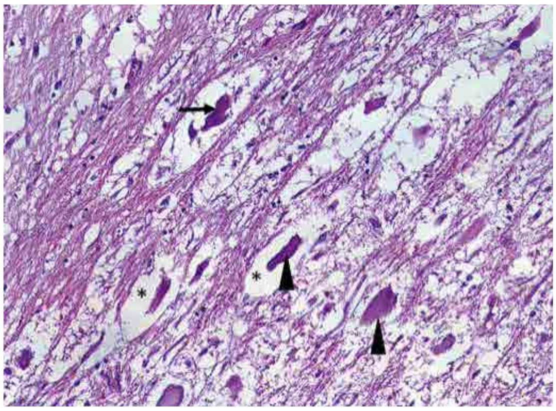

Figure 8: Spinal cord white matter at the level of grossly observed compression showing severe acute axonal degeneration with axonal swelling and spheroid formation (arrow heads), myelin sheath swelling (*), and axonal fragmentation (arrow). HE x 400.

were not seen in the spinal segments cranial and caudal to the 8th thoracic vertebra. Bacteriological culture of the abscess contents showed growth of *Trueperella pyogenes*. A primary skin wound was not seen, and there were no other abnormal findings.

Discussion

Although relatively rare, spinal abscesses have been described in sheep and goats by several authors (Palmer and Hickmann, 1963; Scott et al., 1991; Scott and Will, 1991; Perl et al., 2003; Rissi et al., 2010; Souza et al., 2012). In a study from Brazil, only four (6.8%) of 58 sheep with neurologic disorders had a spinal abscess (Rissi et al., 2010). Spinal abscess usually results from osteomyelitis of a vertebral body; haematogenous spread of bacteria to a vertebra may occur in animals with sepsis, bronchopneumonia, endocarditis, rumenitis and other infectious diseases (Maxie and Youssef, 2007; Passler et al., 2012). Spinal abscess can be caused by contaminated hypodermic needles (Perl et al., 2003; Maxie and Youssef, 2007; Passler et al., 2012) and is a common occurrence in lambs after tail docking (Radostits et al., 2007). The most common infectious agent isolated from vertebral abscesses is *Trueperella pyogenes* in cattle and *Corynebacterium pseudotuberculosis* in sheep (Radostits et al., 2007; Souza et al., 2012). The spinal cord also can be compressed by epidural abscesses that are not associated with a vertebral body (Scott and Will, 1991; Radostits et al., 2007).

In the patient presented, hind limb ataxia and paresis pointed to a lesion in the thoracolumbar vertebral column, and palpation of the heavily-fleeced lamb revealed a soft tissue swelling along the thoracic vertebrae. Ultrasonography showed the swelling to be an abscess, although a cause was not found. There was no visible injury to the skin and no history of injection in this area. Based on the location of the abscess, it is conceivable that the lamb incurred a skin puncture that had healed by the time clinical signs were noticed. We suspected that the locomotor deficits were due to expansion of the abscess into the vertebral canal. This was supported by the results of MRI, which revealed a channel between the abscess and the vertebral canal. Extension of the abscess led to extradural spinal cord compression and associated histological evidence of spinal cord degeneration, which resulted in the clinical signs. Magnetic resonance imaging also has been used to document spinal and paraspinal abscesses in dogs and cats (Naughton et al., 2005; Schmidt et al., 2015) and to diagnose lymphoma involving the 2nd to 5th lumbar vertebrae in a goat with hind limb paraparesis (Gygi et al., 2004). Magnetic resonance imaging of our patient under general anaesthesia would have been feasible, but because of welfare considerations and a poor prognosis, it was carried out postmortem. Magnetic resonance imaging is particularly important in animals that are potential candidates for surgical treatment. The results of MRI are better than those of radiography for making a prognosis as well as for providing the surgeon with precise anatomical detail, thereby allowing a more targeted approach.

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