Computed tomographic findings in a calf with actinomycosis: a case report

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ABSTRACT: In this report a case of actinomycosis in a five-month-old Holstein calf is described. The patient displayed a hard and immobile swelling in the mandible and fever. Computed tomography (CT) imaging of the skull was performed under deep sedation and revealed an asymmetrical appearance of the mandible with the presence of intra-mandibular hypodense lesions. Haematologic and serum biochemical profiles revealed leukocytosis, neutrophilia, hypoalbuminaemia and hypergammaglobulinaemia. Treatment consisted of flushing the lesion and administration of antibiotics and non-steroidal anti-inflammatory drugs. The calf responded to therapy and had recovered almost completely four months later. The present case indicates that CT is an effective non-invasive means of identifying mandibular lesions in cattle.

Keywords: cattle; radiography; diagnosis; lumpy jaw; treatment

Computed tomography (CT) is a medical and veterinary imaging technique; however, it is less widely performed on veterinary patients (Dennis, 2003). Although CT was originally developed for imaging the brain, CT scanners are used today for a wide range of examinations of most parts of the body, particularly the head, thorax, and abdomen. CT is gradually becoming more widely available in veterinary referral practices; therefore, it is important that practitioners be aware of this imaging modality (Whatmough and Lamb, 2006). The number of reports involving diagnosis with CT in both companion and production animals have been increasing (Marshall et al., 1995; Gerros et al., 1998; Nagahata et al., 2002; El-Khodery et al., 2008; Ohba et al., 2008; Lee et al., 2009, 2011; Schultz et al., 2009; Shimizu et al., 2009). This case report describes the clinical findings and examination, including the use of CT, and the treatment of a case of actinomycosis in a five-month-old Holstein calf.

Case description

The calf was referred to the Veterinary Teaching Hospital, Rakuno Gakuen University, Japan, with a history of inappetance and mandibular swelling. On presentation, the lesion appeared as a hard and immobile swelling in the left mandible (Figure 1). Values of rectal temperature, pulse and respiratory rates were 39.6 °C, 92 beats/min and 29 breaths/min, respectively. Sticky, honey-like fluid containing minute, hard, yellow-white granules were collected by fine needle aspiration biopsy. Smears made from crushed granules in pus revealed the presence of sulphur bodies that appeared microscopically as club-like rosettes (Figure 2).

Without contrast medium, CT imaging of the skull was performed under deep sedation with 2% xylazine (0.1 mg/kg *i.v.*, Rompun, Bayer HealthCare, Germany). Image acquisition was obtained using a single-slice helical CT scanner (Legato DUO, GE-

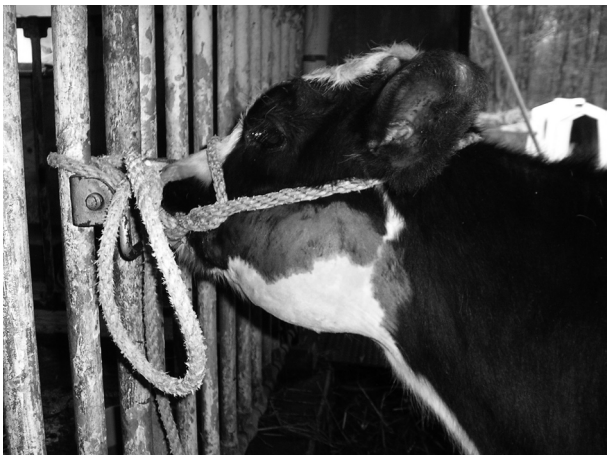

Figure 1. A five-month-old calf with actinomycosis. The lesion appeared as hard and immobile swelling in the left mandible

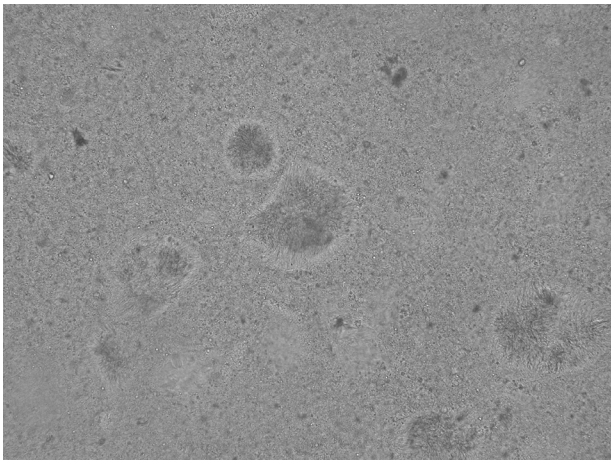

Figure 2. A smear made from crushed granules in pus revealed the presence of sulfur bodies that appeared microscopically as club-like rosettes (direct smear × 40)

Yokogawa Medical Sys., Tokyo, Japan) at settings 80 kV and 130 mA in 2-mm-thick contiguous views and transverse CT images were obtained. The images were processed, reconstructed, and formatted on imaging film. CT images showed sharp details of the affected mandible. The bony components of the

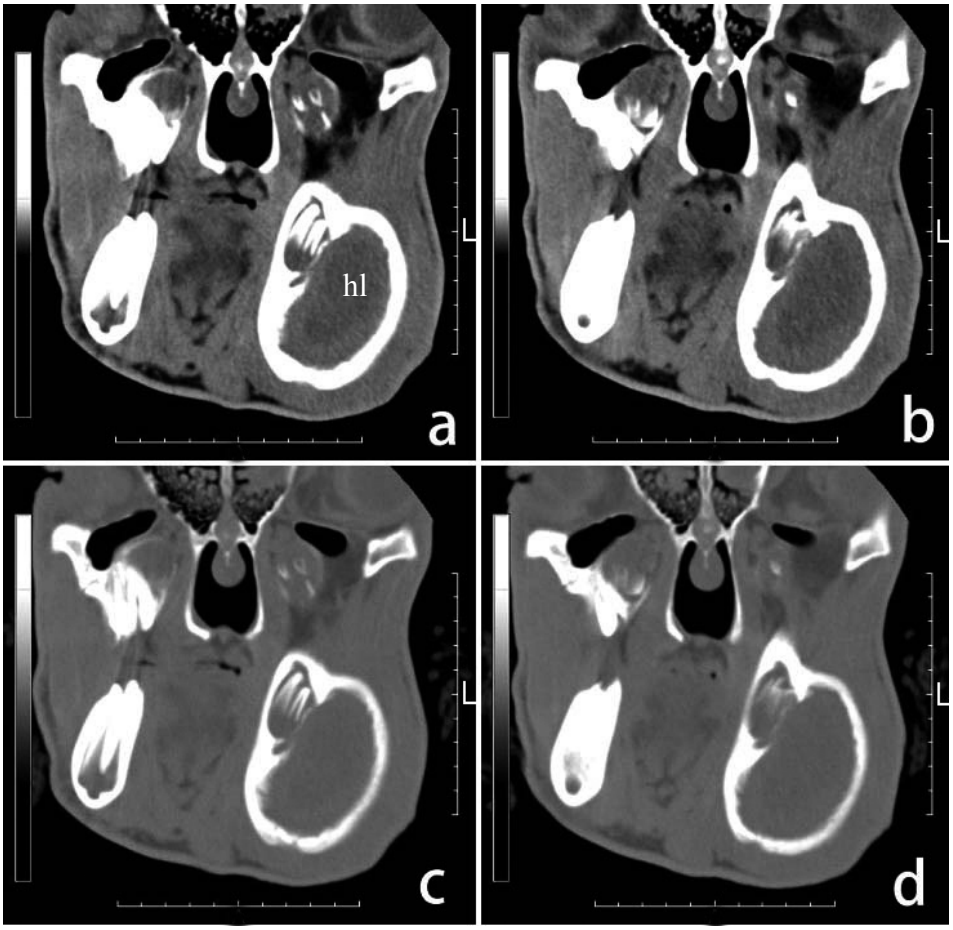

Figure 3. Transverse (axial) CT images of actinomycotic lesions in the left mandible. Asymmetrical enlargement with hypodense lesions (hl; CT value is 20 H.U.) of the left mandible was observed (a, b); a, b = soft tissue window level; c, d = bone window level; L = left

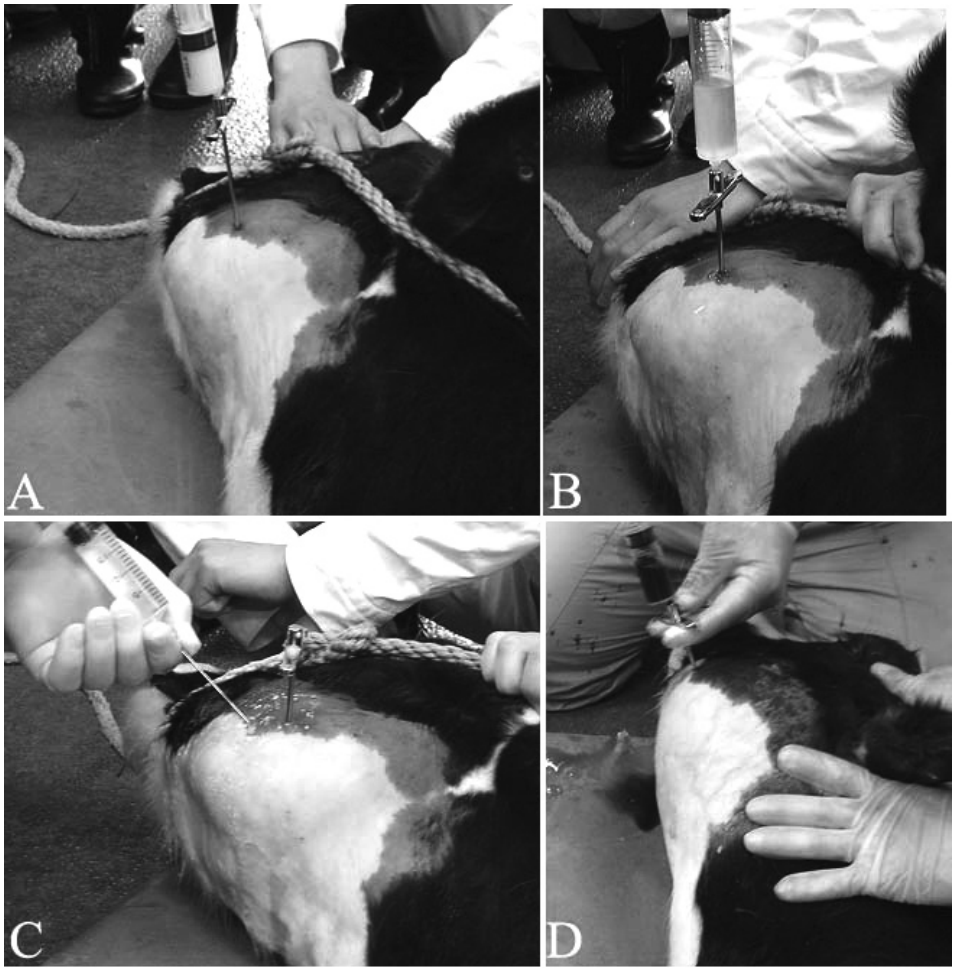

Figure 4. Lesions were aspirated with a sharp, long needle and the pus was removed (A). Lesion cavity was then washed three times with normal saline (B and C) and finally flushed with iodine solution 2% (D)

mandible were abnormal. Asymmetrical appearance of the mandible with the presence of intra-mandibular hypodense lesion was recorded (Figure 3).

Complete blood count findings included leukocytosis (16 800/l; reference value 4000–12 000 l) with neutrophilia (11 890/l; reference value 600–4000/l). Abnormalities identified from the chemistry profile included hyperproteinaemia (8.6 g/dl; reference value 6.7–7.5 g/dl), hypoalbuminaemia (2.6 g/dl; reference value 3.0–4.4 g/dl) and hypergammaglobulinaemia (3.7 g/dl; reference value 0.8–1.1 g/dl).

The diagnosis was actinomycosis and treatment consisted of injection of streptomycin at a dose rate of 15 mg/kg daily given intramuscularly for two weeks. Lesions were aspirated with a sharp, long needle and the pus was removed under deep sedation with xylazine 2% (0.1 mg/kg *i.v.*) and local anaesthesia with 2% lidocaine hydrochloride (Xylocaine, polyamp 2%, AstraZeneca, Japan). The lesion cavity was then washed three times with normal saline and finally flushed twice with iodine solution 2% (Figure 4). This procedure was repeated weekly four times. After the procedure, five-day care included

Figure 5. The calf responded to therapy and almost recovered completely four months later

administration of a parenteral antibiotic (10 mg/kg *i.m.*, oxytetracyclin, Terramycin LA®, Pfizer), a non-steroidal anti-inflammatory drug (2.2 mg/kg *i.v.*, flunixin meglumine, Finadyne®, Schering-Plough Animal Health) and glucose 10%. The calf responded to therapy and had almost completely recovered four months later (Figure 5).

DISCUSSION AND CONCLUSIONS

Actinomycotic osteomyelitis and periostitis of the mandible or maxilla are diseases of cattle caused by the Gram positive branching filamentous microorganism *Actinomyces bovis* (Militerno, 2008). Rarefying osteitis, osteoporosis interspersed with granulomatous tissue and pockets of thin pus containing yellow, sand-like granules are the main pathological changes found in bovine actinomycosis. Actinomycosis has also been described in goats, sheep, horses, pigs, dogs and humans (Palmer, 1993; Seifi et al., 2003). Diagnosis is based on the clinical signs. Absolute diagnosis requires, however, a tissue core biopsy or fluid aspirate to identify the causative organism by staining the crushed yellow granules found in the pus and demonstrating the presence of Gram positive filamentous rods. Radiographs of osteomyelitis reveal multiple radiolucent zones and proliferation of periosteal bone (Van Metre et al., 2007).

CT essentially returns cross-sectional images, with image production being a function of the absorption of X-ray photons by tissues. In contrast to radiography, individual structures can be imaged without overlap of other tissues, and internal soft tissue architecture is visible. Computer enhancement of the electronically detected image produces much greater tissue definition than is achieved with conventional radiography, and post-processing techniques allow expansion of selected areas on a gray scale in order to emphasize either soft tissue or bone detail. In particular, CT is highly sensitive for subtle bone changes. CT is increasingly being used in veterinary diagnosis due to greater accessibility of the equipment, advances in treatment options and increases in the expectations of owners. However, CT is an expensive procedure that requires careful patient selection and should be used to supplement, rather than replace, conventional diagnostic tools (Dennis, 2003; Braun et al., 2004).

In large animal practices, although radiography research is routinely performed, CT studies are seldom carried out. Although the diagnostic value of CT in production animals such as cattle may be identical, reports of the use of CT in cattle are few (Lee et al., 2009). The use of CT may enable veterinarians to diagnose disorders at an early stage, evaluate the prognosis, and assess when to slaughter cattle so that economic benefits are obtained. Furthermore, accumulation of CT data on cattle diseases including head lesions will be helpful for diagnosing diseases in production animals, which is currently difficult due to the lack of adequate imaging data. CT is the diagnostic procedure of choice for the evaluation of both bone and soft tissue structures of the head (Dennis, 2003; Braun et al., 2004). Our results of the CT examination in a calf suffering from actinomycosis enabled the making of a good prognosis, which was supported by the favourable response to treatment. Thus, CT of the mandible is a suitable technique for diagnosing lumpy jaw. By CT the extent, site and nature of the lesion could be determined at various planes of examination.

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