

Case Report

Deep Septic Arthritis of the Fetlock Joint in two Dairy Cows: Clinical, Radiographic and Pathomorphologic Findings

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Abstract

The case included two Holstein cows presenting chronic septic arthritis of the fetlock joint. There were considerable oval swelling in the fetlock region, presence of pain, severe lameness, and involvement of one hind foot, absence of pastern swelling and interdigital space involvement. In one of cows, early bovine digital dermatitis lesions were found incidentally during examination. Radiographic images depicted a quite wide range of radiographic signs such as soft tissue swelling, new bone formation and osteolysis. Gross necropsy revealed tendovaginitis and the consistent purulent discharge was confined to the fetlock zone. After necropsy, the sample was selected for further procedures by putrefaction. The naked bone showed considerable bone changes.

High standards of building design and monitoring seems to have prevented premature culling in cows with severe digital lesion. The chances of restoring the productivity of the animal depend largely on accurate diagnosis and appropriate treatment.

Key words: cull, deep sepsis, fetlock, lameness, swelling, tendovaginitis

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Introduction

Lameness is a costly and widespread health problem in dairy cows. Economic losses associated with lameness include decreased milk production, weight loss, reduced fertility, treatment costs, and premature culling (Green et al., 2002; Hernandez et al., 2002; Booth et al., 2004). Ninety per cent of all limb disorders in cattle result from digital lesions (Clarkson et al., 1996; Hernandez et al., 2002; Van Amstel and Shearer, 2006). Lameness is often chronic, causes pain (Green et al., 2002; Van Amstel and Shearer, 2006) and is a welfare concern (O'Callaghan, 2002).

Early detection and treatment of lameness is essential to reduce its prevalence and economic costs (Clarkson et al., 1996; Nordlund et al., 2004; Nouri et al., 2008, 2011), but research has shown that, on average, dairy producers are aware of only 25 to 50% of the cows that are lame (Wells et al., 1993; Whay et al., 2003) and appropriate treatment is often delayed or not provided at all because the problem is not recognized by owners and veterinarians lacking expertise in this field (O'Callaghan, 2002; Nouri et al., 2008).

In bovine, the fetlock joint or proximal interphalangeal joint (PIJ) is extremely mobile and the joint capsule is a large capsule (Greenough et al., 1981; Ferguson, 1997). Infection of synovial cavities of distal limbs is a common cause of lameness in cattle (Bailey, 1985; Stanek, 1997; Weaver, 1997). Reported evidence has identified arthritis of the PIJ in 2-27% of cattle (Greenough et al., 1981; Meier, 1997; Starke et al., 2006). Septic arthritis of the PIJ is more common in adult cattle in stall than in mature animals (Greenough et al., 1981; Ferguson, 1997; Weaver, 1997) and the hind limbs are more exposed to injury (Greenough et al., 1981). Infection of the PIJ usually results from localised purulent processes that spread to the deeper structures (Greenough et al., 1981; Ferguson, 1997; Kofler and Martinek, 2005; Heppelmann et al., 2009), where located proximal or distal to the dew claw are responsible for septic inflammation of the digital tendon sheath (Kofler and Martinek, 2005).

Chronic septic arthritis of the PIJ is an exceedingly rare condition with reports in the literature limited to many cases in bovine (Greenough et al., 1981; Ferguson, 1997). In Iran, there is no published report on deep septic arthritis of the fetlock joint in dairy cows to the authors' knowledge. This report describes clinical, pathomorphological and radiographic appearance of the deep septic arthritis of the fetlock joint in two culling dairy cows.

Case Description

Cow 1- A 4.7 year old, Holstein cow was presented with signs of severe lameness in the winter of the year 2006 at an abattoir in the vicinity of Tehran (Meysam Slaughterhouse). This case was observed standing and walking (on a concrete surface whenever possible) using the Sprecher et al. (1997) scoring system. The cow showed a grade 5 lameness on the left hindlimb, a marked oval swelling of the whole fetlock region from the pastern to the mid-metatarsus such as honeydew melon

(Fig. 1a). Examination of the foot revealed a firm, partly warm, oedematous swelling sensitive to palpation. Additionally, the early bovine digital dermatitis (BDD) lesion was demonstrated as a raised, almost circular, encrusted lesion on the plantar aspect of the pastern, which was dry and dark brown. The lesion was moderately painful when touched and was located in the midline skin above the heel bulbs. A small puncture wound on the laterocaudal aspect of the metatarsus above the dew claw was found.

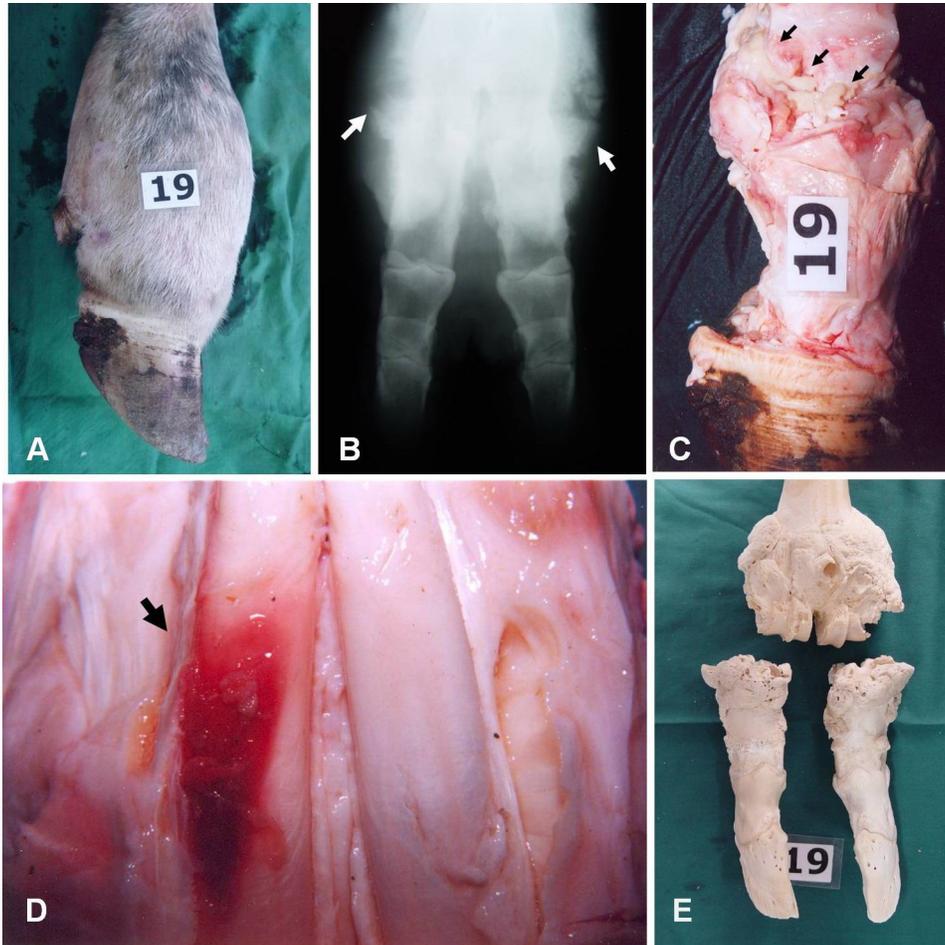


Fig 1: **A:** lateral view of septic arthritis in a culling dairy cow with typical oval swelling around the fetlock joint. **B:** Dorsoplantar radiograph view of septic arthritis showing considerable periosteal new bone formation at the metatarsus and the proximal phalanx (white arrows). Marked soft tissue swelling around the digital region is seen. **C:** lateral view of chronic arthritis, abscessation surrounding fetlock joint and consistent purulent osteomyelitis of joint was seen (black arrows). **D:** plantar view of digital flexor tendon sheath showing severe hemorrhage (black arrow). **E:** Bone specimen of fetlock joint of cow which was affected with septic arthritis.

The hind leg was amputated at the tarsus, immediately after slaughter. In this case, four radiographs of lateromedial or mediolateral, dorsopalmar/dorsoplantar and two oblique views were taken using exposure factors of 25 mA, 85-95 KV in 0.04 or 0.02 seconds. Radiographic images taken from the involved digits of the affected case depicted significant soft tissue swelling, new bone formation and osteolysis (Fig. 1b).

The necropsy procedure revealed tendovaginitis and the consistent purulent discharge was confined to the fetlock zone (Fig. 1c,d). After necropsy, the sample was selected for further procedures by putrefaction (bacterial maceration and bleaching) (Nouri et al., 2007). The naked bone showed considerable bone changes such as excessive new bone formation at the distal part of metatarsus and the proximal part of the proximal phalanx (P1) and osteolysis of the PIJ (Fig. 1e).

Cow 2- In May 2010, a 4-year-old Holstein cow presented with signs of abnormal weight bearing in the right hind limb in a commercial dairy farm with 1000 milking cows in AkhtarAbad, Karaj. The cow preferred to lie in lateral recumbency and had to be stimulated to rise. The cow was 7 months-pregnant. The animal had been bred by artificial insemination and was dried-off either at 7 months of pregnancy. The large dairy herd of origin had no other incidents of chronic septic arthritis of the PIJ. Foreign bodies such as pointed rocks, hollow on the old concrete and broken lid of the sewage gutter were considerable on the passageways of the farm.

Examination of the foot revealed an oval swelling such as honeydew melon and hypotrichosis on the fetlock region (Fig. 2). The region was painful when touched. There was no swelling of the pastern and no involvement of the interdigital space. An infected puncture wound was present on the lateral aspect of the metatarsus above the dew claw, which was covered with granulation tissue (Fig 2). Apart from arthritis of the PIJ of a hindlimb, no other diseases were found. The animal was severely lame and the opposite forelimb was becoming hyperextended at the PIJ due to overload. The claws and other palpable joints appeared to be normal. The cow culled 2 weeks after clinical examination because of abortion and chronic lameness.



Fig 2: Septic arthritis of fetlock joint in a dairy cow with typical oval swelling around the fetlock joint and hypotrichosis. Note the fistula of the purulent abscess at above the level of the lateral dewclaw of the right hind limb (white arrow).

Discussion

The high incidence of severe or long lasting lameness is not only a welfare issue, but currently also one of the major causes of culling in the dairy herd (Clarkson et al., 1996; Whitaker et al., 2000; Booth et al., 2004; Nouri et al., 2008, 2011). Therefore, even severe digital disorders, such as chronic septic arthritis of the PIJ, can be a reason for premature culling.

In dairy cows, the PIJ is extremely mobile, the joint capsule is a large capsule and although not coming in direct contact with the ground, is still vulnerable than those of the interphalangeal joints and often involved traumatically. Penetrating wounds located proximal or distal to the dew claw are responsible for septic inflammation of the digital tendon sheath, involvement of the proximal interphalangeal joint (Kofler and Martinek, 2005). In this case, sepsis of the digital flexor tendon sheath (septic tendovaginitis) occurred as a result of extension of local sepsis.

Kofler and Martinek (2005) found the weakest part of the plantar pouch of the joint capsule, corresponding with the small gap between the proximal sesamoid bones and the proximal phalanx which covered with a very thin capsule. This route of infection of the fetlock and other digital joints via the digital flexor tendon sheath has been rarely reported in literature (Kofler and Martinek, 2005). Greenough et al. (1981) suggested that the most vulnerable and easily accessible areas of the PIJ are the dorsolateral and the dorsomedial aspects. In both cows, the infection of the PIJ of the hindlimb was caused by a penetrating wound. In the first case, the puncture wound at the laterocaudal aspect of the metatarsus above the dew claw had penetrated. This was confirmed in necropsy. In the second cow, an infected puncture wound was present on the lateral aspect of the metatarsus above the dew claw.

Septic arthritis can result from a periarticular wound infection, inoculation of the joint by a puncture wound and by hematogenous or lymphogenous inoculation (Kofler and Martinek, 2005; Hardy, 2006; Heppelmann et al., 2009). In bovine, ascending infection with septic tenosynovitis, pyaemia and tuberculosis are other predisposing factors (Greenough et al., 1981). Establishment of infection depends on several factors including size of inoculum, host defense, virulence of the organisms, and local joint factors (Hardy, 2006).

In this study, fetlock lesions observed in cattle housed under low standards of building design. Factors such as rough flooring (e.g., concrete or grooved) and uncomfortable bedding areas have an adverse effect on digital skin health (Berry, 2001). On the other hand, the natural environment of the bovine foot may play a major role in these skin infections. The large number of micro-organisms found in slurry and faeces, in housing accommodation, is always likely to pose a threat to the digit should there be any prior damage that allows secondary bacterial infection to enter the skin (Demirkan et al., 2000).

Pyogenic infection in the joint can only escape through an artificial opening or fistula, and as the joint space is not distensible, fistula formation rapidly develops. Simultaneously the septic process leads to a destruction of the cartilage and, often more rapidly, of the underlying bone (Greenough et al., 1981). Although bone inoculation can occur simultaneously to synovial inoculation, identification of bone involvement can be delayed because of a delay in radiographic identification of lesions (Hardy, 2006). Radiographic examinations of this joint are common procedure for diagnosis and assessment of joint disease. Radiographic analysis will include location, appearance, duration of infection, and size of these lesions and the extent of associated secondary joint disease (Greenough et al., 1981; Meier, 1997; Nouri et al., 2011).

The samples of synovial fluid were not examined bacteriologically because negative findings can be expected in animals previously treated intensively with antibiotics (Bailey, 1985).

In the past, calves with septic arthritis of the fetlock were treated medically using antibiotics when the condition was diagnosed early in its course (Ferguson, 1997). In a preliminary study Fraipont et al., (2002) evaluated the efficacy of cefquinome (Cobactan 2.5%) in the treatment of septic arthritis in calves; Cefquinome alone permitted clinical and bacteriological recovery of calves affected with arthritis.

Different approaches of arthrotomy (Bailey, 1985; Ferguson, 1997; Kofler and Martinek, 2005; Starke et al., 2006) and arthroscopy (Butson et al., 1996; Trostle et al., 1996; Hirsbrunner and Steiner, 1998; Starke et al., 2006) have been described for cases of fibrinous and fibrino-purulent infections of the PIJ. There is very little information provided about the efficacy of accompanying measures, such as wound dressings, local and systemic antibiotic treatment and microbial resistance, tipping claw prophylaxis, short and long-term post-surgical aftercare, post-surgical housing conditions, and pain management protocols (Heppelmann et al., 2009). However, it appears likely that these aspects also have substantial impact on the final outcome, well-being and productivity.

Digital amputation through the P1 can be used for the conditions described earlier as well as for purulent arthritis of the PIJ with bone infection of the distal part of P1 (Heppelmann et al., 2009). The surgical options are dictated by the extent (Heppelmann et al., 2009), anatomic location and severity of inflammatory and necrotic alterations of the affected digit. Thus, digital amputation is not the treatment of choice for severe purulent necrotizing arthritis of the PIJ and severe osteolysis and osteomyelitis of P1 and metatarsus, because of involvement of both digits. The prognosis of the chronic osteoarthritis is poor (Greenough et al., 1981; Ferguson, 1997; Starke et al., 2006) and septic arthritis must be considered an emergency (Starke et al., 2006).

Other surgeons have successfully employed gentamycin-impregnated collagen sponges or gentamycin-impregnated polymethylmethacrylate beads in the treatment of chronic septic arthritis in cattle after debridement and lavage of the joint using an arthroscope (Butson et al., 1996; Trostle et al., 1996; Hirsbrunner and Steiner, 1998) or arthrotomy (Zulauf et al., 2001). However, the use of this method is expensive and rarely used in cows (Kofler and Martinek, 2005).

In conclusion, high standards of building design and monitoring seems to have prevented premature culling in cows with severe digital lesion. The chances of restoring the productivity of the animal depend largely on accurate diagnosis and appropriate treatment.

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