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Case Report

Surgical Management of Penetrating Hoof Injury with Pedal Osteitis and Sinus Tract Extending to the Coffin Joint in a Mule

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Abstract

A 6-year-old mule weighing approximately 450 kg presented with a one-month history of left forelimb lameness. Clinical examination localized in the hoof, with signs of inflammation, elevated digital pulse rate, and a body temperature of 102.5 ° F. Radiographic evaluation revealed a sinus tract extending to the distal interphalangeal joint with opacity changes suggestive of pedal osteitis. Hematological analysis showed leukocytosis (13 × 103µL) and neutrophilia (9.5 × 103µL). Surgical management involved sedation with xylazine (0.5 mg/kg), regional nerve blocks with 2 % lignocaine hydrochloride, debridement of the sinus tract using a hoof knife. The tract was lavaged with saline and diluted betadine, followed by insertion of gentamicin-soaked cotton plugs. Postoperative care included flunixin meglumine (1.1 mg/kg), penicillin (20,000 IU) and diphenhydramine (0.5 mg/kg), along with regular hoof dressing and stall rest for three months. The mule recovered uneventfully and resumed work after two months. Thorough clinical examination, radiographic assessment and timely surgical intervention are critical for diagnosing and managing hoof injuries in equines. Effective postoperative care ensures favorable outcomes, even in cases complicated with pedal osteitis.

Keywords: Horse; Hoof Sinus; Mule; Nerve Blocks; Hoof Knife; Pedal Osteitis

Introduction

Hoof disorders are among the most common ailments of the equines and have been recognized since the earliest periods of human-equine interaction [13]. Puncture or penetrating wounds deeper than 1 cm depth often caused due to gravel lodgment in the corium between the shoe and the foot are one of the most common causes of hoof injuries [12]. These injuries commonly result into the formation of an abscess or a sinus tract extending up to the distal interphalangeal joint (coffin joint) progressing to the septic pedal osteitis (distal phalanx lacks a marrow cavity). Prognosis is usually guarded although few reports have suggested a good outcomes following surgical intervention [1].

The following case study describes a case of a mule with sinus tract leading upto the distal interphalangeal joint (coffin joint) leading to the signs of lameness, and its surgical treatment with outcome.

Case history and clinical findings

A 6-year-old mule as per the dentition was presented to Division of teaching veterinary clinical complex SKUAST-J, R.S Pura, Jammu weighing around 450kg which was calculated by utilizing the modified Schaffer's formula with a history of lameness in left forelimb for one month. The mule was being utilized for carrying construction materials on a steep terrain at a pilgrimage site. On clinical examination the source of pain was narrowed down to the left lower forelimb area distal to fetlock joint by employing both palpation and by observing the mule while walking both on plain surface as well as on inclined surface. The body temperature of the animal was elevated to around 102.5 °F. On examining the solar surface of the foot visually no apparent lesion was visible. Digital Pulse rate of the limb was also found to be elevated. On digital palpation of the frog region pain response was elicited near the frog of the hoof inside the lateral sulcus. Radiographs of the affected forelimb in the distal fetlock region were taken with both mediolateral and dorso-palmer projection views and radiographic factors of 80 kVp and 3.2 mAs in which a sinus tract through the hoof wall leading upto the coffin or distal interphalangeal joint below the navicular bone was noticed with radiolucent opacity along with presence of osteophyte and enthesophytes development near the tip of extensor process of the coffin bone (Figure 1). On hematological examination the total leukocytes were found to be elevated at around 13×10^3 µl and particularly neutrophils absolute count was found to be elevated i.e., 9.5×10^3 µl.

Figure 1: Hoof Sinus tract leading upto distal interphalangeal joint and distal sesamoid/navicular bone. Mild Osteophyte formation near the extensor process of coffin bone.

Surgical correction

The animal was mildly sedated by administration of xylazine at a total dose of 10 ml given at the dose rate of 0.5 mg/kg to calm down the animal and afterwards by securing the animal firmly with a palmar digital nerve block and lower four-point nerve block [2] was given with 2% lignocaine hydrochloride to desensitize the distal limb and solar hoof area (Figure 2). Afterwards with the help of a hoof knife all the debris from the solar surface was removed and the looped end of the knife was used to explore and open the sinus tract as indicated in the radiograph (Figure 3). The sinus tract opening was enlarged and the pus, cellular debris was removed by thoroughly lavaging the tract with normal saline and diluted betadine solution. Afterwards gentamicin-soaked cotton plugs were inserted in the tract (Figure 4). This was done with the animal secured in a travis with limb flexed upright and solar surface exposed with the help of rope ties. Regular antiseptic lavaging and dressing of the solar surface of the hoof atleast two times a day was prescribed with putting the animal under stall rest for atleast 3 months.

Figure 2: Low four-point Nerve block to desensitize the fore limb distal to the fetlock joint for exploration and examination of solar surface of the hoof.

Post operatively the animal was treated with flunixin meglumine at the dose rate of 1.1 mg/kg, intravenously for 5 days once a day, penicillin at the dose rate of 20,000 IU, intramuscularly for 7 days twice a day and diphenhydramine at the dose rate of 0.5 mg/kg, once daily for 3 days. With this regimen and prolonged rest (approximately two months), the animal recovered uneventfully from the hoof infection and associated pedal osteitis, and it subsequently returned to work.

Figure 3: Opening of the sinus made patent with exploration by the sharp ends of hoof knife.

Figure 4: Placement of gentamicin-soaked cotton plugs in the sinus tract for antimicrobial action by aminoglycoside agent.

Discussion

Physical examination and exploration of the solar surface of the hoof with hoof knife is necessary to look for the etiological factor in equines [5] as signs of fore limb lameness can be due to osteoperiostitis of the 3rd and 4th metacarpal bones [11], navicular syndrome [7], osteoarthritis, fracture of the humerus or scapula. This case report represents the management of a single mule and therefore the findings may not be broadly generalizable to all equine species. Factors such as species variation, workload intensity, housing conditions, and environmental hygiene can influence the recovery and prognosis of hoof injuries. Although advanced imaging modalities like MRI, CT, or contrast radiography could have provided more detailed evaluation of the sinus tract and associated osseous changes, these facilities were not available at the time the case was presented. Standard radiography, coupled with thorough clinical and surgical evaluation, provided coefficient diagnostic information for effective treatment planning. Signs of affected forelimb lameness can be due to affliction in any other limb leading to shifting of weight on the presenting lame limb thus necessitating the proper examination of the animal both in motion and in stationary position [3]. Certain signs such as head nodding present in forelimb lameness should be given proper emphasis during examination so as to focus and reduce time for arrival at diagnosis [6]. From the isolates of the horse hoof samples it has been found that *staphylococcus epidermidis* and *bacillus species* [10] to be normal inhabitants which might flare up in the break of the continuity of the hoof tissue and lead to simultaneous infection. Contrast radiography with the help of radiopaque contrast is also beneficial for the accurate and timely diagnosis of sinus tract in comparison to conventional plain radiography [8]. Placement of shoes with raised caudal end can help reduce the weight born on the bulb and caudal part of the frog such that the healing of the wound in this place can take place effectively [9]. Microbiological culture and sensitivity testing of the exudated could not be performed, which limited identification of the specific causative organisms and antibiotic sensitivity profile. Hence, antimicrobial therapy was administered empirically based on previously reported common isolated such as *Staphylococcus epidermidis* and *Bacillus species* in equine hoof infections [10]. The absence of long term follow up beyond the two months post-surgery represents another limitation; however, the animal remained clinically sound and resumed work during the monitored period. Prognosis of pedal osteitis is eguarded depending on the time of the presentation especially if bone loss and extensive remodeling changes is present [4], thus early diagnosis and long-term therapy is necessary for therapy in such cases. Further controlled studies involving larger numbers of cases with extended follow-up and comprehensive microbiological and imaging evaluation are warranted to establish standardizes diagnostic and therapeutic protocols for penetrating hoof injuries complicated by pedal osteitis. Hence, the following case highlights the utilization of radiography and prompt surgical intervention in managing complex hoof injuries.

Conclusion

Penetrating hoof injuries complicated by sinus tract formation and pedal osteitis require timely diagnosis and surgical intervention for a favorable outcome. Thorough clinical examination, radiographic evaluation, and diligent postoperative care are essential for successful recovery. Although the present case demonstrated a complete recovery in a mule, the findings may not be universally applicable across all the equines. Future studies involving larger cohorts and advanced imaging and microbiological investigations will be valuable in standardizing treatment strategies and assessing long-term prognosis

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Conflict of Interest

The authors declare that there is no conflict of interest associated with this publication.

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