

Radiographic Management of Impacted Fracture of the Left Distal Metatarsal Bone in a 7-Month-Old Ram (Case Report)

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ABSTRACT

Fracture is the act of breaking or dissolution in the continuity of a bone, with or without displacement of bone fragments. A 7-month-old Balami-Ouda cross Ram was presented at the Large Animal Clinic of the Veterinary Teaching Hospital of Usmanu Danfodiyo University Sokoto with a complaint of lameness on the left hind limb which was noticed 3 days prior to presentation. Radiography of the limb, revealed a swollen left metatarsophalangeal joint with an impacted fracture at the distal end of the metatarsus and a valgus deviation of the phalanges. History further disclosed that the ram might be a victim of stampede by some cows in the farm, as it was managed semi-intensively with other animals (8 ewes, 6 rams and 5 cattle). The fracture was managed by closed reduction and external fixation using Plaster of Paris (POP) and a splint to redirect the valgus deviated limb back to its original position. This POP was removed on the 6th week after complete healing was ascertained on a radiograph and complete weight bearing was achieved. The ram was fully discharged at week 7. The fracture healed successfully without any form of complication.

Keywords: fracture, impacted, metatarsus, radiography, ram.

1.0 INTRODUCTION

The importance of radiography in fracture management cannot be overlooked, as it plays a significant role in the diagnosis and management of fractures. It can be used to ascertain the best management option to apply when managing fractures (Roberts & Meeson, 2022). A post-operative radiograph is important in knowing the degree of reduction, alignment and adequacy of implant type, size and placement. The congruency (lack of entry of implants) can easily be ascertained using radiography (Nabholz *et al.*, 2019). Common radiographic views of the limbs and extremities include mediolateral or lateromedial (lateral) view (Oviawe *et al.*, 2018), craniocaudal or caudocranial views, dorsoplantar and plantarodorsal views as reported by Duncan *et al.* (2012).

When the force of the injury presses the fractured ends of the bone together, it results in an impacted fracture. It is not as common as other types of fracture. Fracture occurs when there is a breakdown of bone continuity, either with or without fragment displacement (Fernei *et al.*, 2021). Bone fractures frequently cause severe impairments, functional restrictions, and disability. There are usually variable degrees of soft tissue damage, along with torn arteries, bruising, lacerated periosteum, and contused nerves (Keosengthong *et al.*, 2019). During fracture healing, the first stage is the hematoma/inflammatory phase, which is marked by clot formation, leucocyte infiltration, and the presence of megakaryocytes. This is

followed by the creation of fibrocartilage and angiogenesis, which result in the hard callus phase, a stage of calcification of the cartilage and bone formation where osteoblasts populate the fracture sites. The fourth phase is eventually bone remodeling characterized by the presence of osteoclasts and a decrease in the size of callus. It was observed in this study that callus formation at the fractured site was higher at week 4 than week 6 (Mana *et al.*, 2022).

The various techniques employed in fracture management are: closed reduction using a splint or cast as an external fixation; reduction kept in a cast or splint using open reduction without internal fixation. External skeletal fixation, in which sidebars, clamps, and pins are used to maintain the immobility of the bone throughout either an open or closed reduction. Open reduction using internal fixation, such as plates and screws or intramedullary pins. Closed reduction with internal fixation: instead of opening the fracture site, a skin incision is made to allow the internal fixation device, such as Kuntscher nailing or closed intramedullary pinning, to be inserted (Mana *et al.*, 2022). Nutritional supplements can be included as adjunct therapy during the period of fracture management to accelerate the rate of bone healing (Oviawe *et al.*, 2022; Oviawe *et al.*, 2023). This case offers insightful information about the suitability of using closed reduction and external fixation methods in managing fractures of the extremity,

especially that involves valgus deviation as seen in this case, or varus deviation.

1.2 Case Presentation

A 7-month-old Balami-Ouda cross Ram was presented at the Large Animal Clinic of the Veterinary Teaching Hospital Usmanu Danfodiyo University Sokoto with a complaint of lameness on the left hind limb, which was noticed 3 days before presentation. History further revealed that the Ram might be a victim of a stampede by some cows on the farm. The patient was managed semi-intensively with other animals (8 ewes, 6 rams and 5 cattle). They were fed on wheat and soya beans bran, fodder and food remnants. There was neither history of medication nor that of vaccination.

1.3 Physical Examination of the Patient

The patient was dull, with non-weight bearing lameness on the left hind limb and a swollen fetlock joint was also observed (Figure 1A). Bruxism, a rough hair coat and

unilateral enlargement of the inguinal lymph node were observed. Temperature, pulse rate and respiratory rate were 39.5 °C, 80 bpm and 28 cpm respectively. The patient weighed 14 kg.

1.4 Case Management Plan

The ram was sent to the x-ray unit for a radiograph after which the bones were assessed to see the possibility of managing the fracture through closed reduction and external fixation.

1.5 Radiographic Presentation

The radiograph taken on the day of presentation was a dorsoplantar view of the distal metatarsal bone of the ram, showing soft tissue swelling around the left metatarsophalangeal joint with an impacted fracture at the distal end of the metatarsal bones as radiopaque areas (white arrows) seen on the radiograph with a valgus deviation of the phalanges (Figure 1 B).

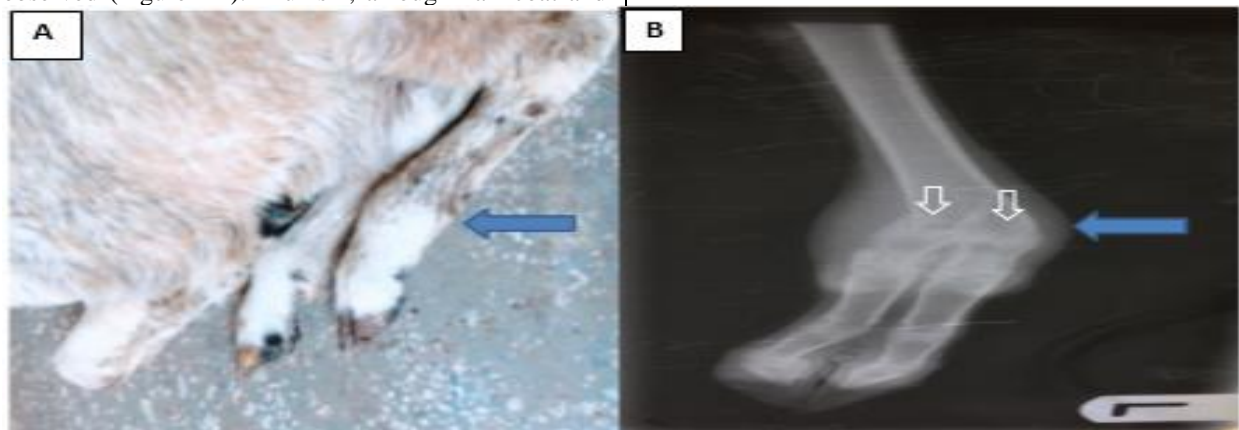


Figure 1: Preoperative assessment of the fracture. The ram on presentation (A) and radiograph on the day of presentation (B)

1.6 Surgical Management

The ram was placed on its left lateral recumbency with manual restraint and the fracture was managed using closed reduction and external fixation. The fracture was reduced via manual traction, where a gauze bandage was applied to the affected limb distally and proximal to the fractured site. The distal end was then pulled backward to allow the fractured bones to align while at the same time extending the relaxed muscles that surround the bones. The affected region was covered with cotton wool and four rulers were used as stents on the four sides of the affected limb, the stent were held in place with a gauze (Figure 2) before finally applying Plaster of Paris (POP) to cover the cotton wool while traction was still applied to return the valgus deviation to its normal position while still immobilizing the proximal and distal segments of the fracture. The (POP) was allowed to dry and the animal was dropped down from the surgical table.



Figure 2: Surgical management of the fracture using POP

1.7 Post-operative Management

The ram was admitted for a week and the area was observed for edematous swelling around the POP. Restrictions of movement were encouraged by confinement in a small pen in order to avoid any movements that could disrupt the fixation.

2.0 RESULT

2.1 Follow up

After one week, the ram was discharged and the client was advised to come for follow-up at a 2-week interval for radiography. Gradually progress from non-weight-bearing to partial and eventually to full weight-bearing was observed, after which the POP was removed. At week 6, complete healing was observed on the radiograph (Figure 3C). No post-surgical complications such as delayed union, malunion or non-union were observed, and the ram recovered successfully.

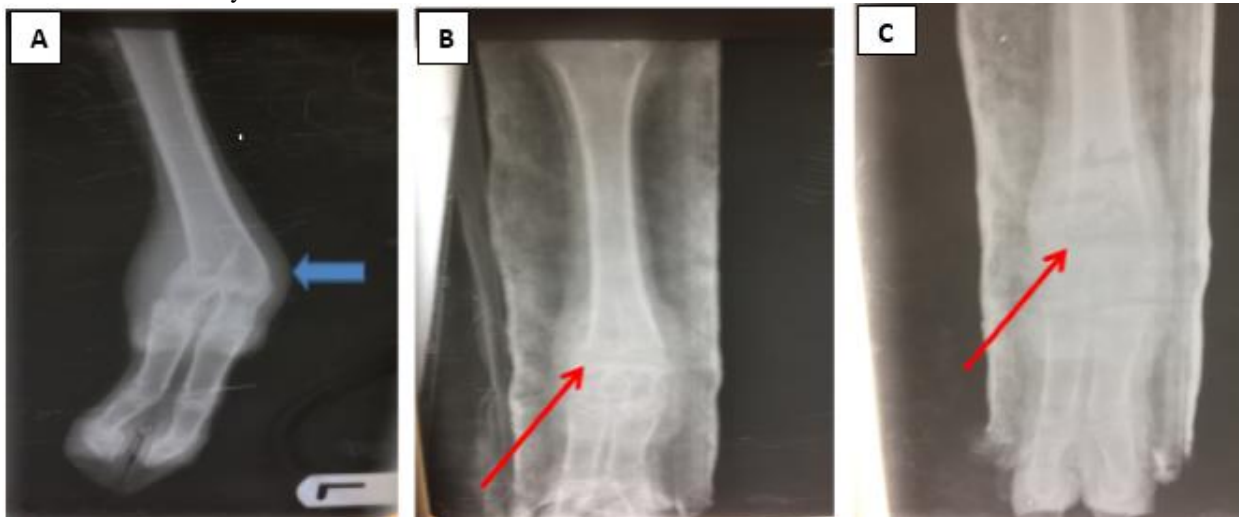


Figure 3: Radiograph of the dorsoplantar view of the distal left hind limb at weeks 4 (A) and 6 (B), showing the progress of bone healing

3.0 DISCUSSION

Radiography was the main method deployed in the diagnosis and monitoring of the fracture healing process. The fracture observed in this case was an impacted fracture of the distal metatarsal bone, which manifested as an area of increased density (Figure 3A). The fracture and valgus deviation were successfully managed using

closed reduction. A radiograph taken at week 4 showed progress in healing, although the fractured line manifested as areas of increased density was still present (Figure 3B) because it was an impacted fracture, but at week 6, the fractured line had completely disappeared (Figure 3C). Complete non-weight bearing lameness was achieved at week 8, and the animal was discharged.

The most frequent kinds of fractures that ruminants typically experience are fractures of the appendicular bone. This is because of the small muscles covering this area, making it vulnerable to fractures of varying degrees. A closed reduction and external fixation used in this study is a non-operative treatment in which the fractured ends were manipulated back into their correct position and aligned. This method of management is similar to that reported by Feist *et al.* (2019) who wrote on the management of long bone fractures in cattle. This is because the callus had been absorbed as healing progressed, this agrees with the work reported by Oryan *et al.* (2015) who states that the callus index is usually lower at week 2 and reaches a maximum level at weeks 3 and 4 before decreasing at week 6.

In this case, the ram was unable to bear weight on the affected limb at week 2, while at week 4, non-weight-bearing lameness was observed. However, the ram started bearing weight on the affected limb at week 6. This is similar to the findings reported by Mana *et al.* (2022), who observed weight bearing at week 6 following the use of POP in the management of radius and ulna bone fractures in Nigerian indigenous breeds of dogs. This is because healing was in its early stages at week 2, but at week 4 a bridging callus was formed, connecting the fractured ends together. The callus was absorbed at week 6 resulting in the union of the fractured ends. The management method used in this case is similar to that used by Mena *et al.* (2020), who used POP and a splint in the management of fractures of the radius and ulna in a dog, as the method is affordable and less traumatic to the patient. The rationale behind choosing the specific treatment modality is because most closed fractures of the extremities have little muscle mass surrounding the limb, and the POP can comfortably go round the fractured limb at 360°. This statement is in line with the work reported by Fubini and Ducharme (2004) and O'Connor (2005), who documented that among external applications, POP is commonly employed for fractures below the knee and hock joint. They also stated that it is most suitable for large animals.

4.0 CONCLUSION

Closed reduction and external fixation are effective methods for managing fractures in rams, offering advantages such as minimal invasiveness and adjustability. Successful outcomes are usually higher if the fractured ends are properly immobilized and radiographic monitoring for the progress of healing is observed with minimal complications especially osteomyelitis associated with open reduction.

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