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Case report

Successful surgical management of diaphyseal radio-ulnar fracture in a goat using normograde intramedullary pinning and interfragmentary wiring: A case report

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ABSTRACT

Fractures of the radius and ulna are among the most frequently reported long bone fractures in goats, especially in young and active animals. In most cases, such fractures are overriding in nature, and corrections are very difficult by external fixation method. Different techniques are used for correction of radius and ulnar fracture in goats. Mostly plating technique is used for radius and ulnar fracture management which is comparatively expensive. However, intramedullary pinning technique is less commonly used for radius and ulnar fracture correction. This case report describes the successful surgical management of radial–ulnar fracture in a 3-month-old, 14 kg, male castrated, Jamunapari goat. The case was referred to SAQ Teaching Veterinary Hospital with a history of non-weight bearing limping due to trauma. Clinical and radiographical examination revealed a closed complete, overriding, mid-diaphyseal radius and ulnar fracture. Based on diagnosis and availability of facilities, the decision was made to correct the fracture using the normograde intramedullary pinning (IMP) with interfragmentary wiring. The surgery was performed with diazepam and ketamine anaesthesia. A 3.0mm Steinmann pin and 22-gauze stainless steel wire were used for this technique. Post-operatively broad-spectrum antibiotic, antihistaminic, pain killer and modified Robert Jones bandage were used. The patient was evaluated clinically and radiographically. The goat demonstrated progressive clinical improvement, with gradual return to weight-bearing and radiographic evidence of callus formation at 30th postoperative day. The outcome indicates that intramedullary pinning with wiring provides sufficient stability against bending and rotational forces, resulting in uneventful recovery. This case highlights the clinical utility of intramedullary pinning and wiring as a practical and effective technique for managing diaphyseal radius–ulna fractures in goats. However, as this is a single case report, the findings cannot be generalized, and further controlled studies are required to validate this technique in larger populations of goats.

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1. INTRODUCTION

Fracture of long bones is one of the most common orthopaedic condition encountered in

goats and other small ruminants (Singh et al., 2015).The incidence of radius–ulna fracture in goats is 11.50%, with a higher occurrence in the Jamunapari breed and falling from height being the leading cause of long bone fractures (Farooq et al., 2024; Das et al., 2020). In relation to age, highest number of long bones fractures are recorded in goat aged below 1 year and male (83%) are more susceptible than female (17%). The most common type of fracture in goat is short oblique (41.6%) followed by transverse (33.4%) fracture (Rani et al., 2025). In most cases, the clinical signs associated with fractures are lameness, pain, local swelling, abnormal posture, and crepitating sound on palpation, abnormal mobility of involved bone, fever, anemia, shock, and neurological deficit. Although all the above signs do not always occur in all fractures, combinations of these signs are always present (Abdulrahman et al., 2006). Clinical examination should be performed correctly for diagnosis of the fracture. For correct diagnosis, more appropriate diagnostic method is needed such as magnetic resonance imaging and computed tomography (Fossum, 2007).

Repair of radio-ulnar fractures remains a challenge for veterinary orthopaedic surgeons and mainly external coaptation, external skeletal fixation and internal fixation devices are used for fracture repair. Internal fixation helps to return to function earlier and reduces the incidence of improper healing. Internal fixation can be achieved by intramedullary devices (Steinmann pins, Rush pins, Kuntshner nails, interlocking nails), screws (cancellous, cortical and lag screws), plates and orthopaedic wire (Newtonand Nunamaker, 1985).To the best of the authors' knowledge, the use of the normograde intramedullary pinning technique for the repair of radial bone fractures has not yet been reported in goats.This report describes the use of normograde intramedullary pinning combined with interfragmentary wiring for the management of a complete, overriding diaphyseal fracture of the radius and ulna in a goat, highlighting it as a potentially more economical alternative to bone plating while achieving comparable clinical outcomes.

2. MATERIALS AND METHODS

Case Description

Clinical History, Examination and Diagnosis

A 3-month-old, 14 kg, male, Jamunapari, castrated goat was presented to SAQ Teaching Veterinary Hospital (SAQTVH) for better treatment with a history of traumatic wound in the left forelimb since one day. Traumatic wound was caused by the goat's left forelimb became trapped between a porch railing and wire net while it was jumping and playing. Since then, the animal has been unable to bear weight on the affected limb and has been ambulating with noticeable lameness. Findings on clinical examination included a temperature of 102.3°F, a heart rate of 82 bpm and respiratory rate of 35 bpm, non-weight bearing on the left thoracic limb, swelling of the affected bone. Pain and crepitus sound were identified when the shoulder was manipulated through its range of motion. Pain was also appreciated on full extension and full flexion on the left thoracic limb. For confirmative diagnosis, orthogonal radiography of the left thoracic limb was performed, identifying a complete over riding mid-diaphyseal fracture of the radius and ulna (Figure 1). Based on clinical examination, radiographic picture and Fracture Patient Assessment Score (FPAS), availability of facilities and surgeon experience, the case was selected for correction by normograde intramedullary pinning with interfragmentary wiring.

Surgical Technique

Animal preparation and anesthesia

Diazepam (inj. Sedil®; Square pharmaceuticals) at a dose rate of 0.4 mg/kg, intravenously was administered as sedation. The left thoracic limb was aseptically prepared by shaving and scrubbing the surgical site with savlon, 10% povidone-iodine, and 70% alcohol, and the patient was positioned in left lateral recumbency. General anesthesia was induced with Ketamine Hydrochloride (inj. Ketalar®; Popular Pharmaceuticals Ltd.) and maintenance was also performed by same induction agent.

Figure 1. Preoperative lateral radiograph showed a complete overriding radius and ulna fracture of left thoracic limb

Surgical Procedure

A linear cranio-medial 4-5 cm linear skin incision was given to expose the fracture. The fascia was separated by blunt dissection. The flexor carpi radialis and flexor carpi ulnaris muscles were retracted caudally, and the extensor carpi radialis muscle was retracted cranially. The fracture fragments were then exposed using Hohmann retractor. Normograde intramedullary pinning technique was followed in this case. Intramedullary pin (Steinmann pin 3.0 mm) of 70–80% of the medullary diameter was inserted at the styloid process, continued up through proximally in the marrow cavity to pass at the level of radial tuberosity (Piermattei et al., 1997). During insertion of the pin into the proximal segments, the two segments were hold firmly in the reduced position with two self-locking bone holding forceps. A 22-gauge stainless steel wire was used as an interfragmentary wiring for immobilizing the fracture fragments. The pin is usually cut as close to the bone as possible at the distal end and exposed pin was pushed into the soft tissue using a rat-tooth forceps. Then skin was closed. An external modified Robert Jones bandage was applied to provide additional support.

Postoperative Management

The patient was discharged from the hospital at same operative day with broad spectrum antibiotic Strepto-penicillin (Inj. SP Vet®, ACME laboratories LTD) 2ml intramuscularly and antihistaminic (1.1mg/kg; Inj. Histavet®; ACI animal health) intramusculary both for 7 days postoperatively and NSAID Meloxicam (0.5mg/kg; Inj. Melvet®; ACME laboratories LTD) for 3 days subcutaneously. Clinically and radiographically, the case was monitored postoperatively at different intervals.

3. RESULTSAND DISCUSSION

On day-1, immediate after operation, radiographs revealed implant in situ and proper bony alignment (Figure 2). On day 3, the surgical site was dry with no discharge from the wound on digital pressure and mild pain on manipulation of the radius. On 10th post-operative day, the goat showed mild weight-bearing lameness on affected limb and stitches were removed without any complications. On 30th post-operative day, improved weight-bearing was observed (Figure 3) and radiograph shown implant in position and periosteal callus formation (Figure 4). Post-operative day 65, hard callus and clinical union were observed, and pin was removed at same day (Figure 5).

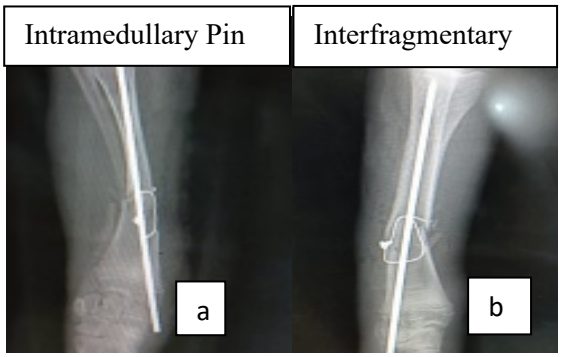

Figure 2. Day1, immediate after operation lateral (a) and craniocaudal (b) x-rays showed implant in position and correct bony alignment

Fractures of the radius and ulna are among the most common long bone fractures in goats, especially in young and active animals (Das et al., 2020; Farooq et al., 2024).

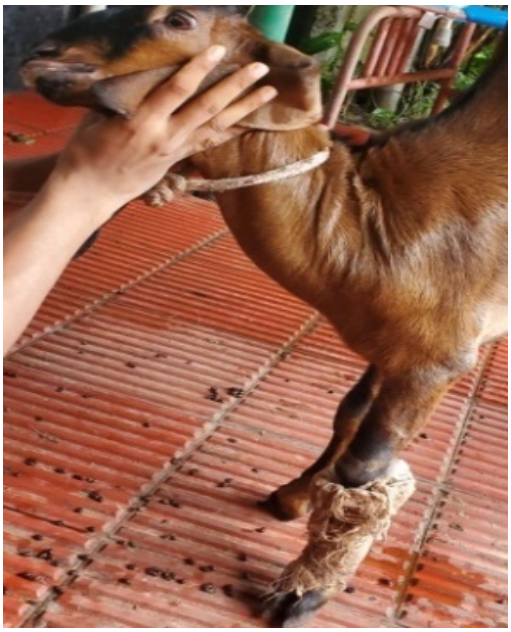

Figure 3. Day 30, Improved weight bearing on affected limb

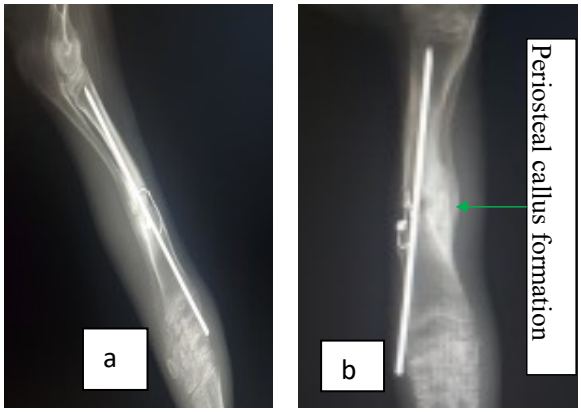

Figure 4. Day 30, lateral (a) and craniocaudal (b) radiographic views showed periosteal callus formation

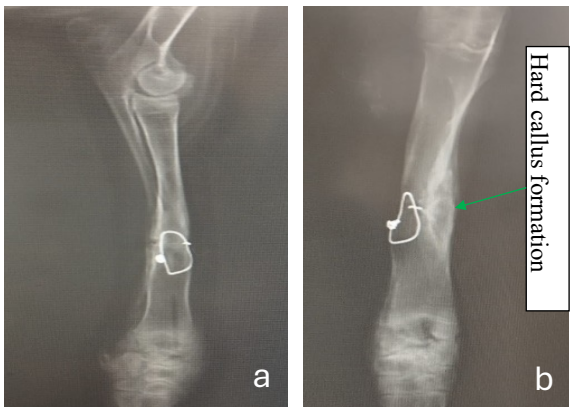

Figure 5. Day 65, lateral (a) and craniocaudal (b) radiographic views after pin removed

The present case was a 3-month-old Jamunapari goat with a complete overriding fracture which did not corresponds with previous findings that transverse and short-oblique fractures predominate in goats (Rani et al., 2025). Clinical signs including lameness, swelling, and crepitus were typical of long-bone fractures (Abdulrahman et al., 2006), and radiography remained the diagnostic tool of choice (Fossum, 2007).

Although external coaptation methods such as splints, bandages, and casts are economical and easy to apply, they frequently result in mal-union, delayed or non-union, excessive callus formation, muscle atrophy, and interference with radiographic evaluation (Jahangirbasha et al., 2019). Cast slippage, wetting, and soft-tissue injuries further delay recovery, making these techniques less suitable for active small ruminants (Doijode, 2018). Bone plating provides the most rigid fixation and excellent anatomical alignment by neutralizing all mechanical forces acting on the bone (Mohiuddin et al., 2018). However, despite its proven success, plating requires specialized equipment, longer surgical time and higher cost—factors that make it economically impractical for most small ruminant owners (Doijode, 2018).

In contrast, intramedullary pinning (IMP) offers a simpler and more economical alternative with comparable clinical outcomes (Kumar et al., 2019). In the present case, normograde IMP with interfragmentary wiring provided sufficient stability, resulting inperiosteal callus formation by day 30. Similar reports where fracture union occurred by 45–60 days with plate fixation (Aithal et al., 2019).

4. CONCLUSION

The study concluded that the intramedullary pinning and interfragmentary wiring technique can be used as stable fixation methods for the correction of diaphyseal radius and ulnar fracture in goats which is very cost effective for ruminants owners compared to the plating technique. Further clinical evaluations are warranted to confirm its broader application in small ruminant orthopaedics.

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