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Short Communication

Compound tibiotarsus fractures and their management by intramedullary pinning in four rose-ringed parrots (*Psittacula Krameri*)

R. Kumar[1*], Aakanksha[1], D. Kumar[2], M. K. Singh[3] and Bhavna[4]

[1]Department of Veterinary Surgery and Radiology, Bihar Veterinary College, Bihar Animal Sciences University, Patna - 800 014, Bihar, India; [2]Department of Veterinary Pathology, Bihar Veterinary College, Bihar Animal Sciences University, Patna - 800 014, Bihar, India; [3]Department of Veterinary Anatomy, Bihar Veterinary College, Bihar Animal Sciences University, Patna - 800 014, Bihar, India; [4]Department of Veterinary Gynaecology, Bihar Veterinary College, Bihar Animal Sciences University, Patna - 800 014, Bihar, India

Abstract

Four clinical cases of tibiotarsus fracture in rose-ringed parrots (*Psittacula krameri*) were presented to the Department of Veterinary Surgery. Bihar Veterinary College, Patna. Based on physical, clinical and radiographic examinations, internal fixation through intramedullary pinning was considered for the management of fractured tibiotarsal bone in these birds. Intramedullary pinning was performed under a combination of xylazine (1 mg/kg IM) and 25 mg/kg ketamine anaesthesia. Postoperatively, birds were treated with broad spectrum antibiotic Cefpodoxime proxetil (Syr. Cefstar CV, 40 mg/kg once daily for 7 days) and Meloxicam (Syr. Melonex 2 mg/kg orally once daily for 3 days) along with antiseptic wound dressing for 10 days. All birds started to bear weight on the affected limb within 7th postoperative day. Follow-up radiographs revealed complete healing of the fractured bone within 4 weeks.

Keywords: Cefpodoxime proxetil, Intramedullary pinning, Ketamine, Tibiotarsus fracture, Xylazine

Highlights

- Tibiotarsus fractures are common in small birds due to thin cortical bones and large medullary cavities.
- Fracture management in birds is an emergency because they are highly susceptible to pain and shock
- Intramedullary pinning under Ketamine-Xylazine anesthesia effectively stabilizes tibiotarsus fractures in parrots.
- Pin removal after 4 weeks restored normal limb function without complications.

The avian skeletal system is significantly and fundamentally different from that of mammals and other domestic animal species. Most skeletal adaptations in birds are specialized to facilitate flight by reducing body weight while maintaining adequate structural strength. Avian bones are generally thin-walled, lightweight, and possess large medullary cavities, many of which are associated with pneumatic spaces connected to the respiratory system. Although lightweight, these bones are relatively brittle because of their high mineral content, predisposing birds to fractures following traumatic injuries. Recent studies have reported that fractures are among the most common orthopedic conditions encountered in avian practice, particularly in companion and wild birds (Doneley, 2021; Bennett & Kuzma, 2020).

Among long bones, the tibiotarsus is considered the most frequently fractured bone in small companion birds due to its anatomical location and exposure to external trauma. Previous reports in canaries indicated that more than 95% of fractures involved the tibiotarsus (De Matos & Morrisey, 2005), and recent clinical observations continue to support the high prevalence of tibiotarsal fractures in avian orthopedic cases (Kummrow et al., 2021). The comparatively high mineral density of avian bones often results in open and comminuted fractures with sharp bone fragments causing extensive soft tissue damage. Fractures in birds may occur because of natural causes such as collisions, territorial fights, and predator attacks, or due to anthropogenic factors including cage injuries, gunshot wounds, automobile collisions, entanglement in traps, and attacks by domestic dogs and cats (Speer, 2020; Doneley, 2021).

Bone fracture is an emergency in birds. They are also susceptible to pain and shock, which can be life-threatening because of blood loss through the fractured bone. The fracture management principles in birds are similar to those established for other species. If a fractured bone is left unstable or lacks blood supply, it can result in non-union (Eltorai et al., 2015). Avian

*Corresponding Author, E-mail: vetrajeshkumar@rediffmail.com

fracture management is very challenging due to the anatomic peculiarity of large bones. However, different methods have been successfully used for management of fracture in avian species like splint and cage rest (Mshelia et al., 2014), intramedullary pin (Verma et al., 2018), interlocking nail, (Stejskal et al., 2011), plates (Bennert et al., 2016), ESF (Arias et al., 2015; Tunio et al., 2015) and combination of external skeletal fixation (ESF) with intramedullary pinning (Bueno et al., 2015). Considering limitations like their small size, fracture management has its unique problems regarding the choice of a suitable fracture repair method, pre and postoperative care and anaesthesia. Intra-medullary pinning is a very simple technique which provides immediate fracture stabilization and potentially shorter recovery time (Jalalipour et al., 2020). Therefore, the present study describes a surgical management of compound tibiotarsus fracture in four rose-ringed parrots (*Psittacula krameri*) through intramedullary pinning.

Four rose-ringed parrots (*P. krameri*) were presented to the Department of Veterinary Surgery. Bihar Veterinary College, Patna (BASU, Patna), with the history of an open wound after trauma on the right hind limb in parrots that had right hind limb fractures, and two parrots had left hind limb fractures. Clinical examination revealed compound mid-tibiotarsus bone (Fig. 1) fracture in all four birds. Lateral radiograph of the fractured hind limb showed a complete mid-shaft transverse fracture of the tibiotarsus (Fig. 2) in three birds and an oblique fracture in one bird. Careful physical examination revealed that the bird was alert, inactive, but unable to the fly. The physiological parameters like rectal temperature, respiration rate and heart rate were within the normal physiological range. Based on the physical, clinical and radiographic examination, internal fixation through intramedullary pinning was considered the best option for the management of fractured tibiotarsal bone in these birds. All birds were treated with Melonex 2.0 mg/kg as pre-emptive analgesia and broad spectrum antibiotic Cefpodoxime proxetil 40 mg/kg orally to control infection. After that, they were anesthetized by intramuscular injection of a mixture of Xylazine (1 mg/kg) and Ketamine (25 mg). After proper induction, the birds were restrained in lateral recumbency with the affected limb on upper side. The fracture site was cleaned with normal saline and prepared for aseptic surgery by plucking the feathers and antiseptic application. The lower part of the limb was wrapped with sterilised gauze before applying sterile drapes. A skin incision was made on the caudo-medial aspect of the tibiotarsus using a scalpel, and the fracture site was exposed following careful separation of the muscles. With the help of Jacob's chuck, an appropriate size of K-wire (1.5 mm) was inserted in a retrograde manner (Fig. 3). After insertion of the pin, the fracture ends were reduced in proper apposition. Reduction of bone followed by suture of muscle with the help of absorbable suture material (Vicryl no. 3/0) in simple continuous pattern and skin with the help of non-absorbable suture material (polyamide no.2/0) in horizontal mattress pattern. After confirming satisfactory fracture fragment alignment on post-operative radiographs, the protruding portion of the extra pin was trimmed flush with the skin using a pin cutter (Fig. 4). The bird was recovered from anaesthesia smoothly within 30 minutes after surgery. External immobilisation was done by applying splints made up of ice-cream stick properly wrapped in paper tape with soft light weightbandaging. Owner was advised to keep bird in proper cage rest for minimum 20 days to restrict movement. Postoperatively, birds were treated with broad spectrum antibiotic syr. Cefpodoxime proxetil (40 mg/kg once daily orally for 7 days) and Syr. Meloxicam (2.0 mg/kg once daily) orally for 3 days along with antiseptic wound dressing for 10 days.

Three birds started to bear weight on the affected limb within the 7th postoperative day, and one bird started weight bearing after 21 days. The fracture site was palpably stable, observed on day 15 post-surgery. The postoperative follow-up radiograph revealed complete healing of the fractured bone in 4 weeks (Fig. 5). All birds recovered without significant complications and showed complete weight bearing on the affected limb. After complete healing, the pin was removed on 6 weeks postoperatively (Fig. 6).

Surgical management of fractures in avian species poses considerable challenges due to their unique anatomical and physiological characteristics (Kumar et al., 2012). Fracture immobilization aims to achieve anatomical alignment with rigid stabilization, while minimizing disturbance of the surrounding soft tissue and any callus formation at the fracture site (Bennett & Kuzma, 1992). Stabilization of a fracture implies neutralization of the forces of shear, compression, rotation, and bending, which is what allows appropriate fixation (Rubin et al., 2016). Intra-medullary pinning can be easilyperformed in birds and is considered an appropriate internal fixation technique, as an intramedullary pin is very firm, strong, provide good bone alignment. It can be used in a number of long bones and inserted either normograde

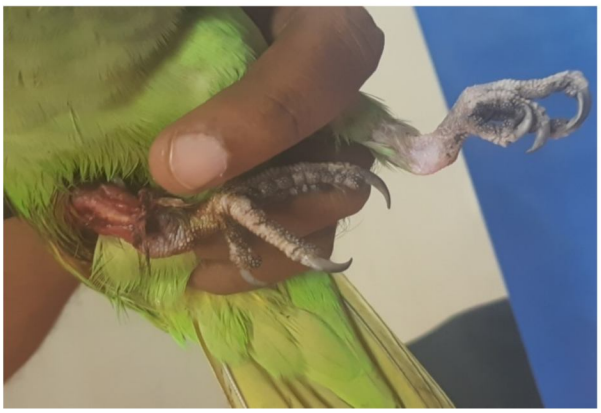


Fig. 1. Clinical case of compound tibiotarsus fracture

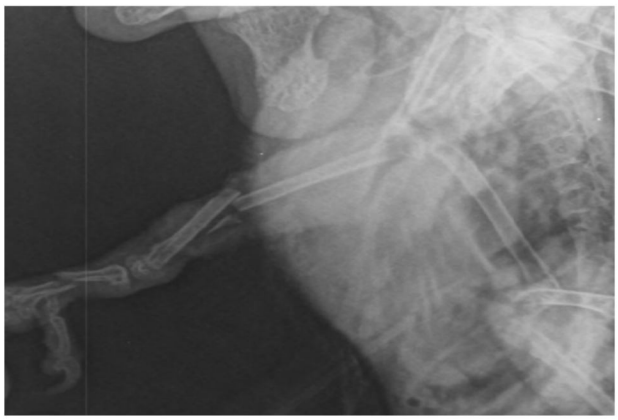


Fig. 2. Radiograph of tibiotarsus fracture



Fig 3. Intramedullary pinning bone

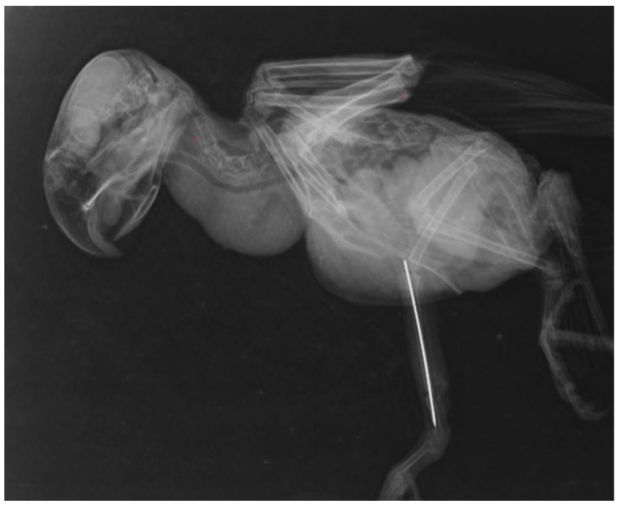


Fig. 4. Post-operative radiograph of tibiotarsus

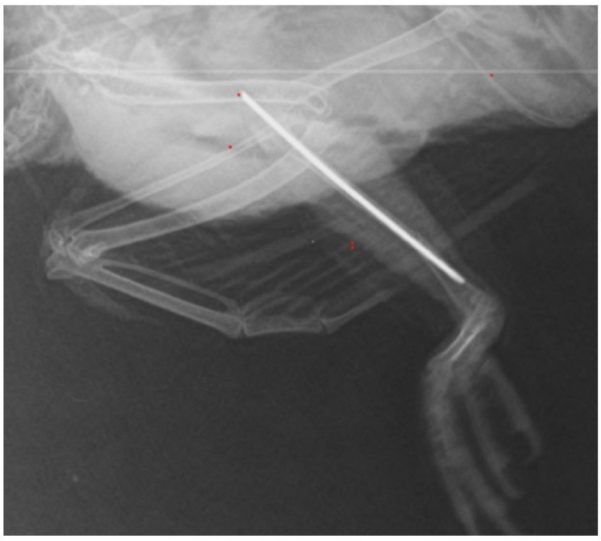


Fig. 5. Radiograph showing callus formation



Fig. 6. Complete recovery of bird

or retrograde. Stainless steel intramedullary pins can disrupt a bird's flight balance, making their removal necessary after healing. Management of tibiotarsal fractures in avian patients can involve various techniques such as splinting, casting, external fixation, intramedullary pinning, cerclage wiring, or a combination of these methods, with the choice depending on fracture type, bone condition, and the overall health of the bird. Splints are difficult to apply and manage in the proximal third of the tibial bone because of soft tissue and heavy musculature (Siqueira et al., 2009; Duerr, 2010). Management of external fixators in ratites is challenging, as the birds often peck at the device during the course of fracture healing.

Cefpodoxime proxetil is a third-generation cephalosporin antibacterial drug used in the treatment of infections due to susceptible gram-positive and gram-negative bacteria, including infections of the digestive tract, respiratory tract, urinary tract, bone and skin. It can be administered orally, as the proxetil ester undergoes hydrolysis during the absorption of cefpodoxime. However, ketamine hydrochloride alone provides inadequate analgesia during surgical procedures. Ketamine alone may also cause excitement during recovery in avian species, as it does not ensure relaxation in muscles. Therefore, ketamine was used in combination with an alpha-2 agonist in the present study (Lierz & Korbel, 2012). Administration of alpha-2 agonist produces analgesia by stimulating receptors at various sites at the spinal and supraspinal level and decreases injectable and inhalant anaesthetic requirements in several species (Kumar et al., 2020).

Compound fracture of tibiotarsal bone in parrots can be managed by intramedullary pinning safely under xylazine and ketamine anaesthesia, as this technique is very simple and provides good fracture stability.

Conflict of interest: Authors have no conflict of interest in the present study of clinical cases.

Author's contribution: RK: Preparation of the technical programme, surgical intervention and postoperative observation of clinical cases and evaluation of data; A: Assisting during surgical intervention of clinical cases and evaluation of data; DK: Assisting during surgical intervention; MKS: Collection of postoperative data; B: Monitoring anaesthesia during surgery.

Data availability statement: The datasets generated during the current study are available from the corresponding author on reasonable request.

Ethical approval: The study was conducted on clinical cases with written consent obtained from each owner. Institutional ethical guidelines were followed throughout the study.

Use of artificial intelligence tools: The author(s) used AI only for language editing. All content was reviewed, revised, and approved, and the author(s) take full responsibility for the final manuscript.

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