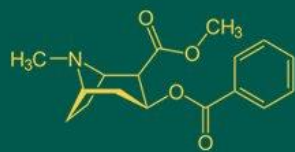


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Surgical management of tibiotarsus fracture in a parrot: A case report

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Abstract

The present case report describes the successful surgical management of a closed mid-diaphyseal simple transverse fracture of the left tibiotarsus in a 13-month-old psittacine (parrot) weighing 150 g. The bird was presented with a history of ceiling fan injury two days prior to presentation. Clinical examination revealed pain on palpation with definitive crepitus in the left tibiotarsus region along with inflammation and bruising. Radiographic examination in cranio-caudal and medio-lateral views confirmed a closed mid-diaphyseal simple transverse fracture of the left tibiotarsus. Haemato-biochemical parameters were within the normal physiological range except for a mild increase in total WBC count and heterophil count. Surgical correction was performed under general anaesthesia using inhalant isoflurane, employing intramedullary pinning with a 1 mm Kirschner wire (K-wire) introduced in a normograde manner. The fracture was reduced and alignment was confirmed intraoperatively under a C-arm image intensifier. Post-operative external coaptation was achieved using soft bandaging and splints. The bird commenced weight bearing on the affected limb by day 10 post-surgery. Follow-up radiographs at four weeks revealed complete union of the diaphyseal fracture with minimal callus formation. The bird recovered uneventfully with full functional restoration of the affected limb. This case report highlights the efficacy of intramedullary pinning combined with external coaptation for the management of tibiotarsal fractures in psittacine birds.

Keywords: Tibiotarsus, fracture, parrot, intramedullary pinning, K-wire, psittacine, avian surgery

Introduction

Fractures in avian species represent a significant proportion of orthopaedic emergencies encountered in veterinary clinical practice. Birds are particularly susceptible to traumatic injuries due to their lightweight skeletal framework, pneumatic bones, and exposure to various environmental hazards including ceiling fans, glass windows, predator attacks and vehicular collisions (Redig, 1986) [8]. Among companion birds, psittacines (parrots) are one of the most commonly kept species and are frequently presented with traumatic musculoskeletal injuries.

The avian skeletal system differs considerably from that of mammals in several key aspects. Avian bones are characterised by thin cortices, a relative paucity of cancellous bone, and the presence of pneumatisation in certain long bones (Orosz, 2002) [6]. The tibiotarsus, a major weight-bearing bone of the avian hindlimb, is a non-pneumatic bone that extends from the stifle (knee) to the intertarsal joint and plays a critical role in locomotion, perching and overall functional ability of the bird (Bennett and Kuzma, 1992) [1].

The management of long bone fractures in birds is challenging owing to their unique anatomical and physiological characteristics, including a rapid metabolic rate necessitating swift fracture repair, fragile bones with thin cortices that are susceptible to iatrogenic damage, and the critical requirement for early return to function (Harcourt-Brown, 1996) [4]. Various techniques have been employed for fracture fixation in avian species, including external coaptation (splints and bandages), intramedullary (IM) pinning, external skeletal fixation (ESF), and combinations thereof (Redig, 1986) [8]. Among these, intramedullary pinning remains one of the most widely used and effective methods for managing diaphyseal fractures of long bones in small birds, as it provides adequate stabilisation with minimal

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implant size and tissue disruption (Gahlot, 2005) [3].

The present case report describes the successful surgical management of a mid-diaphyseal transverse fracture of the left tibiotarsus in a psittacine bird using intramedullary pinning with a Kirschner wire, supplemented by external coaptation, and documents the clinical outcome and recovery.

Case history and clinical examination

A 13-month-old psittacine (parrot) weighing 150 g was presented to the Department of Veterinary Surgery and Radiology, Dr G.C. Negi College of Veterinary and Animal Sciences, CSKHPKV, Palampur, with a wound on the chest and left hindlimb. According to the pet owner, the bird had been struck by a ceiling fan while flying approximately two days prior to presentation. On general examination, the bird was alert and responsive but was not bearing weight on the left hindlimb.

Physical examination revealed a minor skin abrasion on the chest region. Palpation of the left hindlimb elicited a marked pain response along with definitive crepitus localised to the tibiotarsus region. The affected limb exhibited pronounced soft tissue inflammation and bruising. Neurological assessment of the affected limb demonstrated positive pedal and proprioception reflexes, indicating the integrity of peripheral nerve function distal to the fracture site.

Haemato-biochemical examination

A blood sample was collected from the wing vein (basilic/ulnar vein) for haemato-biochemical analysis. Haematological evaluation revealed a mild leucocytosis with an elevated total white blood cell (WBC) count of $67 \times 10^3/\mu\text{L}$ and an increased heterophil count of $59.1 \times 10^3/\mu\text{L}$, suggestive of an acute inflammatory response secondary to trauma. All other haematological parameters, including packed cell volume (PCV), total red blood cell (RBC) count and haemoglobin concentration, were within the normal physiological range for psittacine species. Serum biochemical parameters, including total protein, albumin, blood glucose, aspartate aminotransferase (AST), calcium and phosphorus levels, were within the established reference ranges, indicating the absence of significant metabolic derangement or organ dysfunction.

Radiographic diagnosis

Radiographic examination of the left hindlimb was performed in two standard orthogonal projections: cranio-caudal (anteroposterior) and medio-lateral (lateral) views. The radiographs revealed a closed mid-diaphyseal simple transverse fracture of the left tibiotarsus bone with minimal displacement of the fracture fragments (Fig. 1a and 1b). There was no evidence of comminution, bone fragmentation, or involvement of the articular surfaces. The surrounding soft tissues appeared mildly swollen, consistent with the traumatic aetiology. Based on the fracture configuration, location and the size of the bird, internal fixation with intramedullary pinning was determined to be the most suitable surgical approach for fracture stabilisation.



Fig 1a: Cranio-caudal radiograph showing mid-diaphyseal transverse fracture of left tibiotarsus



Fig 1b: Medio-lateral radiograph of left tibiotarsus fracture

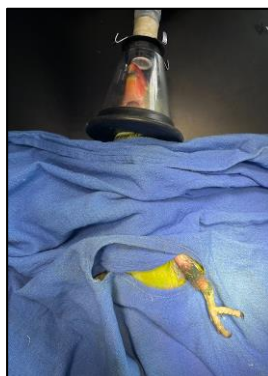


Fig 2: Mask induction with isoflurane anaesthesia

Pre-operative management

Prior to surgical intervention, the affected limb was immobilised using a Robert Jones bandage with a medio-caudal splint to provide temporary stabilisation, reduce pain and minimise further soft tissue damage. A pre-operative

therapeutic regimen consisting of a broad-spectrum antibiotic, a non-steroidal anti-inflammatory drug (NSAID), and a calcium supplement (Bird Calcium®) was administered for three days prior to surgery to control infection, manage pain and inflammation, and support skeletal health.

Anaesthesia

General anaesthesia was induced and maintained using inhalant isoflurane, which is the preferred anaesthetic agent in avian species owing to its rapid induction, smooth recovery, minimal cardiopulmonary depression and ease of depth regulation (Degernes, 1997) [2]. Mask induction was performed using 3-5% isoflurane delivered in 100% oxygen at a flow rate of 2-3 L/min. The plane of anaesthesia was continuously monitored throughout the surgical procedure by evaluating the palpebral reflex, muscle tone and respiratory rate. No pre-anaesthetic medications or sedatives were used, in accordance with the recommendation that pre-anaesthetic agents should generally be avoided in avian patients except for analgesics (Degernes, 1997) [2].

Surgical technique

The bird was positioned in dorsal recumbency. The medial aspect of the left hindlimb was aseptically prepared by plucking the feathers from the surgical site, followed by scrubbing with chlorhexidine-cetrimide solution and application of povidone-iodine paint. The surgical site was draped in a standard aseptic manner.

A skin incision was made on the caudo-medial aspect of the left tibiotarsus using a No. 22 BP blade. The incision was deepened through the subcutaneous tissue using sharp microsurgical scissors. The underlying musculature was carefully separated by blunt dissection to expose the fracture site. Any intraoperative haemorrhage was controlled using gauze compression and digital pressure.

A 1 mm Kirschner wire (K-wire) was introduced in a normograde (antegrade) fashion using a Jacob chuck. The pin was inserted into the medullary canal from the proximal fragment of the tibiotarsus at the level of the proximal metaphysis and advanced distally across the fracture site into the distal fragment to achieve stable fixation (Fig. 3). Following pin placement, the fracture reduction and axial alignment were verified intraoperatively using a C-arm fluoroscopic image intensifier (Fig. 4). Satisfactory anatomical reduction was confirmed in both cranio-caudal and lateral views.

The surgical wound was closed in layers. The musculature and deep fascia were sutured using polyglactin 910 (Vicryl®, 3/0) in a simple continuous suture pattern. The skin was closed using polyamide (Nylon, 2/0) in a simple interrupted suture pattern. Following closure, post-operative radiographs were obtained to confirm appropriate reduction of fracture fragments and pin placement. External immobilisation was applied using soft padding bandage and a rigid splint wrapped in Vetwrap® cohesive bandage to provide additional rotational stability and protect the surgical site (Fig. 5).



Fig 3: Normograde insertion of 1 mm K-wire using Jacob chuck



Fig 4: Intraoperative C-arm verification of fracture reduction and pin placement



Fig 5: Post-operative external coaptation with soft bandage and Vetwrap®

Post-operative management

A comprehensive post-operative therapeutic regimen was instituted as follows:

Table 1. Post-operative therapeutic regimen

Drug	Dose	Route	Frequency	Duration
Meloxicam (NSAID)	0.2 mg/kg	Oral	Once daily	5 days
Amoxicillin + Clavulanate	20 mg/kg	Oral	Once daily	5 days
Bird Calcium®	0.2 mL/100 g	Oral	Thrice weekly	4 weeks

Antiseptic wound dressing was performed daily for 14 days postoperatively. The external splint and bandage were changed periodically to maintain adequate immobilisation and to monitor the surgical site for any signs of infection, swelling or suture dehiscence. The skin sutures were removed on the 14th day postoperatively upon satisfactory wound healing.

Results and follow-up

The post-operative recovery was uneventful. The bird showed progressive improvement in limb function, with initial weight bearing on the affected limb observed on the 10th day postoperatively. The bird was able to perch and grip with the affected foot by the end of the second week. A follow-up radiographic examination was performed at four weeks postoperatively (Fig. 6a and 6b). The radiographs revealed complete union of the diaphyseal fracture with minimal periosteal callus formation, indicating primary bone healing. The intramedullary pin was noted to be in situ with maintained alignment. No evidence of implant migration, pin loosening, osteomyelitis, or malunion was observed.

The bird achieved full functional recovery with complete weight bearing on the affected limb (Fig. 7). Normal locomotion, perching ability and grip strength were restored. The overall clinical outcome was graded as excellent based on the complete restoration of limb function and the absence of any post-operative complications.



Fig 6a: Post-operative cranio-caudal radiograph at 4 weeks showing complete fracture union



Fig 6b: Post-operative medio-lateral radiograph at 4 weeks with minimal callus

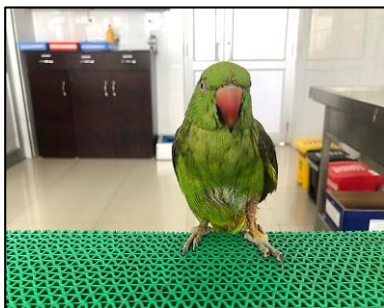


Fig 7: Bird with full weight bearing on the affected limb after recovery

Discussion

Management of fractures in avian species presents a significant challenge to veterinary surgeons owing to the unique anatomical, physiological and biomechanical characteristics of avian bones. The thin cortices, limited cancellous bone, rapid metabolic rate and the imperative for early return to function necessitate careful selection of the fixation technique and meticulous surgical execution (Harcourt-Brown, 1996)^[4].

In the present case, intramedullary pinning with a 1 mm K-wire was selected as the primary method of internal fixation for the mid-diaphyseal transverse fracture of the tibiotarsus. This technique was chosen based on the fracture configuration (simple transverse), the location (mid-diaphysis), the size of the bone, and the availability of appropriately sized implants. Intramedullary pinning is considered the most practical and widely applicable fixation method for diaphyseal fractures in small birds, as it provides

axial alignment and acts as an internal splint while occupying minimal space within the medullary canal (Redig, 1986)^[8]. Jalilpour *et al.* (2020)^[5] compared intramedullary pinning with tape splinting for fixation of tibiotarsal fractures in small cage birds and concluded that intramedullary pinning resulted in superior bone healing outcomes both radiographically, histopathologically and biomechanically, which corroborates the approach employed in the present case.

The normograde (antegrade) technique of pin insertion was employed in this case, wherein the K-wire was introduced from the proximal end of the tibiotarsus and advanced distally. This technique offers the advantage of direct visualisation of the fracture site, accurate reduction, and controlled pin advancement (Bennett and Kuzma, 1992)^[1]. The use of intraoperative fluoroscopy (C-arm image intensifier) facilitated real-time assessment of fracture reduction and pin placement, which is essential for ensuring anatomical alignment and preventing complications such as pin migration, cortical perforation, or joint penetration.

Tibial fracture repair in a peacock using intramedullary pinning has been previously reported by Gahlot (2005)^[3], who documented a successful outcome, further supporting the applicability of this technique for tibiotarsal fractures across various avian species. Similarly, Peter and Patrick (2013)^[7] emphasised that internal fixation should be supplemented with external coaptation in avian fracture management to control rotational forces, as intramedullary pins alone do not provide rotational stability. In the present case, post-operative external immobilisation using soft bandaging and splints wrapped in Vetwrap® provided the necessary rotational stability and protected the surgical site during the healing period.

The choice of isoflurane as the sole anaesthetic agent proved advantageous in this case. Degernes (1997)^[2] recommended that pre-anaesthetic sedatives and other drugs should generally be avoided in avian patients, as birds are highly sensitive to the cardiopulmonary depressant effects of many sedative and anaesthetic agents. Isoflurane provides rapid induction, precise control of anaesthetic depth, minimal cardiovascular depression, and swift recovery, making it the preferred inhalant anaesthetic for avian surgical procedures. In the present case, the bird demonstrated immediate post-operative recovery from anaesthesia without any complications.

The mild leucocytosis and heterophilia observed in the pre-operative haematological examination were consistent with an acute stress and inflammatory response secondary to the traumatic injury. The normal serum biochemical profile indicated the absence of significant systemic involvement, confirming the bird's suitability for surgical intervention under general anaesthesia.

The rapid commencement of weight bearing by the 10th postoperative day and the complete fracture union with minimal callus formation observed at four weeks are indicative of the rapid bone healing capacity of avian species. West (1996)^[9] reported that bone healing in avian species progresses through similar stages as in mammals but at an accelerated rate due to the higher metabolic rate and body temperature of birds. The minimal callus formation observed in the present case suggests that primary cortical healing occurred, which is indicative of adequate fracture stability achieved by the combination of intramedullary fixation and external coaptation.

Conclusion

The present case report demonstrates that intramedullary pinning using a Kirschner wire, supplemented with external coaptation, is an effective, practical and minimally invasive technique for the management of mid-diaphyseal transverse fractures of the tibiotarsus in psittacine birds. The combination of internal fixation with external immobilisation provided adequate fracture stability, facilitated rapid bone healing and enabled early return to function. Isoflurane anaesthesia proved safe and effective for avian surgical procedures. Intraoperative fluoroscopic guidance is recommended for ensuring accurate fracture reduction and optimal pin placement. This approach can be recommended for similar fracture configurations in small companion birds.

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