

## Tibiotarsal and Ulnar Fracture Repair in a Great Horned Owl (*Bubo virginianus*)

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**Abstract :** A 1.4 kg adult great horned owl was presented to the University of Missouri-Columbia Veterinary Teaching Hospital after being found by the side of the highway. Physical examination revealed soft tissue injuries to the left wing and leg, and good body condition (body score 4/5). The radiographs revealed comminuted fracture of the diaphysis of the left tibiotarsus (severe) and ulna (mild). Closed reduction of the fracture was performed to the left tibiotarsus and ulna. System combining an intramedullary (IM) Kirschner pin, IM Kirschner pin for external skeletal fixation, and polymethylmethacrylate was used for fracture repair. At 13 weeks, radiographs revealed that bridging callus was well formed over cortices of the fracture area. No physical, behavioral, or other assessable impairment was found during the rehabilitation period.

**Key words :** tibiotarsal and ulnar fracture, surgical repair, great horned owl.

### Introduction

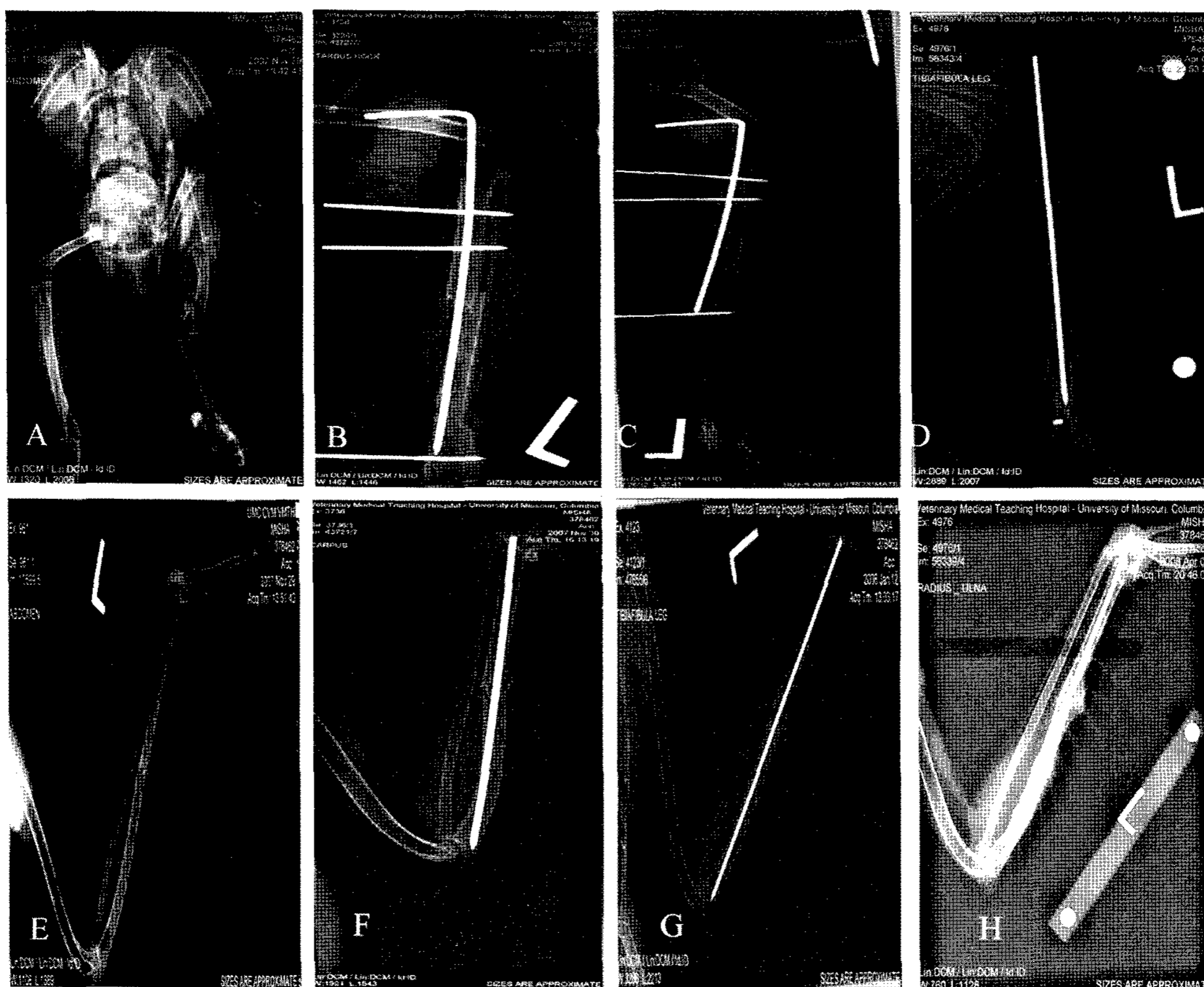
Raptors often experience trauma to the wings and legs due to missing their prey, misjudging obstacles such as fences, gunshot, or hit-by-car. Trauma can result in long bone fracture, commonly of radius and ulna (1-3). Fracture is the most common cause of raptors rehabilitation, occurring in approximately 50% of causes of raptor rehabilitation, followed by soft tissue trauma (11%), head trauma (7%), starvation (5%), and suspected toxicosis (3%) (2,4). This case report describes the successful surgical repair of tibiotarsal and ulnar fractures in a wild, adult great horned owl (*Bubo virginianus*) using a system combining an intramedullary (IM) Kirschner pin, IM Kirschner pin for external skeletal fixation, and polymethylmethacrylate (PMMA).

### Case

A 1.4 kg adult great horned owl was presented to the University of Missouri-Columbia Veterinary Medical Teaching Hospital after being found by the side of the highway. It was presumed that the bird had been hit by a car. On presentation, the bird was depressed but still responsive. Physical examination revealed soft tissue injuries to the left wing and leg and good body condition (body score 4/5). The bird was induced with isoflurane (Isoflurane<sup>®</sup>, Hospira Inc, USA) by

mask, intubated, and maintained on 2% isoflurane for radiographs and surgery. During the procedure, the bird received fluids (5 ml/kg per hour IV; Normosol<sup>®</sup>, Abbott Laboratories, USA) through a 22 gauge intravenous catheter placed in the brachialis vein. The radiographs revealed comminuted fracture of the diaphysis of the left tibiotarsus (severe) and ulna (mild) (Fig 1). The bird received cefazolin (50 mg/kg IV; Cefazolin<sup>®</sup>, West Pharmaceutical Corp, USA) at the time of anesthetic induction. The left wing and leg were prepped and draped routinely. Closed reduction of the fracture was performed to the left tibiotarsus and ulna. The 3.0-mm-diameter IM Kirschner pin was normograded under fluoroscopic guidance with the stifle joint in 90° flexion from the non-articular portion of the medial tibial plateau until it was seated in the distal tibia. Proximal portion of the IM Kirschner pin was bent in 90° for external skeletal fixation (Fig 1). Three additional (two: the proximal tibia; one: the distal tibia) 2.7-mm-diameter IM Kirschner pin were inserted through both inner and far cortices of the tibia for external skeletal fixation. A silicone tube was placed parallel to the tibiotarsus and four IM Kirschner pin were inserted into the silicone tube. Then, PMMA was injected into the silicone tube. For ulnar fracture repair, the 3.0-mm-diameter IM Kirschner pin was normograded under fluoroscopic guidance with the metacarpal joint in 90° flexion from the non-articular portion of the distal ulna until it was seated in the proximal ulna. Postoperative radiographs showed good apposition and alignment of the fractures. The bird had uneventful recovery from anesthesia and was weight bearing in the affected leg after the surgery.

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**Fig 1.** Radiographs show comminuted fracture of the diaphysis of the left tibiotarsus (A) and ulna (E). Immediate postoperative radiographs of the left tibiotarsus (B) and ulna (F) illustrate restoration of limb alignment. Smooth callus formation is visualized on ends of the fracture line and along the cortices of the left tibiotarsus (C) and ulna (G) at 6 weeks after surgery. Bridging callus was well formed over cortices of fracture area of the left tibiotarsus (D) and ulna (H) at 13 weeks after surgery.

Radiographs were obtained at 6 and 13 weeks postoperatively (Fig 1). At 6 weeks, smooth callus formation was visualized on ends of the fracture line and along the lateral tibiotarsus and ulna. At 13 weeks, bridging callus was well formed over cortices of fracture area. No physical, behavioral, or other assessable impairment was found during the rehabilitation period.

### Discussion

Fractures of the long bones in raptors present many challenges. Common problems include the hollow character of the long bones, the use of relatively heavy orthopedic appliances, the often poor nutritional status of injured raptors by the time they are presented for treatment, and postoperative evaluation of fractious or stressed raptors (9). The most common issue to surgeons should be weight of orthopedic appliances among aforementioned factors that result in the failure of surgical repair of the long bone fracture (5). The orthopedic appliances that are lighter and the technique that is less invasive would provide the most successful repair of the long bone fracture. In previous studies, four types of systems of con-

necting bars for external skeletal fixation have been described in birds: fixateur Externe du Service de Santé des Armées (FESSA) weighing 6 g (5); Kirschner system with six clamps weighing 44 g (7); Menard system with six clamps weighing 47 g (7); and PMMA weighing 2 g (5). External skeletal fixation can provide fracture reduction with little or no trauma to the vascularity of the bones and surrounding soft tissue. In addition, no implants are applied to the fracture site itself, which results in no impairment of the vascularisation of the fracture site (5). In the raptor reported here, using the lightest connecting bar, PMMA, and performing external skeletal fixation provided the raptor with good conditions for recovery from fracture.

Placement of an IM Kirschner pin must not interfere with normal joint function because the pin exiting within the stifle joint can cause severe joint damage. In the raptor reported here, normograde insertion of an IM pin was performed from non-articular portion of the medial tibial plateau that is similar to the spot, the medial side of the proximal tibia at a point halfway between the tibial tuberosity and the medial collateral ligament, for normograde insertion of an IM pin in dogs (8).

Intramedullary normograde pinning of the ulna from the

metacarpal joint is not recommended in dogs because access for pin insertion is difficult to obtain without damaging joint surfaces; however, intramedullary normograde pinning of the ulna from the metacarpal joint is recommended in birds because the non-articular portion of the ulna is not located on the elbow joint but on the metacarpal joint.

Technique of inserting pin includes normograde and retrograde (6). Retrograde pin insertion from the fracture site should not be performed in the tibiotarsus and ulna because the pin easily exits within the joint, which can cause severe joint damage.

A study of a large case series with long-term follow-up is warranted to better determine the overall success and complication rates of fracture repair using a system combining an IM Kirschner pin, IM Kirschner pin for external skeletal fixation, and PMMA.

### Conclusion

In this case report, using a system combining an IM Kirschner pin, IM Kirschner pin for external skeletal fixation, and PMMA was effective technique in a wild, adult great horned owl.

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