

Long Bone Fractures in Raptors: 28 cases (2004-2007)

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Abstract : Medical records from the Veterinary Medical Teaching Hospital of the University of Missouri-Columbia from 2004 to 2007 were available for 28 raptors that underwent long bone fracture repair. There were 14 owls, 10 hawks, 2 vultures, 1 eagle, and 1 falcon. Mean body weight was 780 g (ranged from 150 to 1400 g) for 14 owls; 650 g (ranged from 150 to 1270 g) for 10 hawks; 1760 g (ranged from 1520 to 2000 g) for 2 vultures; 5000 g for 1 eagle; and 130 g for 1 falcon. Of all 28 fracture cases, 11 cases (39%) and 1 case (3%) were related to hit-by-car and shooting respectively. Physical examination revealed dehydration in 18 raptors (64%) and lethargy in 12 raptors (42%). Forty one long bone fractures were included in 28 cases. The radiographs revealed 13 ulnar fractures (32%), 12 humeral fractures (30%), 10 radial fractures (25%), 4 tibiotarsal fractures (9%), 1 femoral fracture (2%), and 1 fibular fracture (2%). External skeletal fixation using polymethylmethacrylate (PMMA) combined with intramedullary fixation was used in 19 long bone fractures (46%). Intramedullary fixation using intramedullary Kirschner pin was used in 16 long bone fractures (39%). No surgical treatment was performed in 6 long bone fractures (15%). This study reported that many of raptors presented dehydration and lethargy when admitted for treatment. Therefore, proper hydration and nutrition are critical pre-surgical requirements. In addition, combination of internal fixation and external skeletal fixation using PMMA might be better option to treat raptors with comminuted fracture that results from mostly trauma of hit-by-car.

Key words : long bone fracture, surgical repair, raptor.

Introduction

Fracture is one of the common causes of raptors rehabilitation, caused by hit-by-car, crashing into obstacles, or gunshot (2,3,6). Great advances have been made in the treatment of fractures in raptors (9). Materials and methods of stabilization that were previously thought not applicable to raptor fracture repair have been used successfully with modification, taking into account the delicate nature of avian bone (9). Raptor rehabilitation is gradually important in worldwide conservation of raptors; however, much of the information obtained remains unpublished. The purpose of this retrospective study was to report signalment, history, fracture location, and type of surgical repair technique in 28 raptors underwent long bone fracture repair.

Materials and Methods

Medical records from the Veterinary Medical Teaching Hospital of the University of Missouri-Columbia from 2004

to 2007 were searched to identify raptors that had long bone fracture, and 34 cases were found. Six cases were eliminated because the type of surgical technique was not described. Complete records were available for 28 raptors that underwent long bone fracture repair. Records were reviewed to record signalment, history, fracture location, and type of surgical repair technique. Follow-up information was based on physical examination by veterinarians.

Results

A total of 28 raptors, representing 9 species, underwent surgical repair of long bone fracture at the Veterinary Medical Teaching Hospital of the University of Missouri-Columbia from 2004 to 2007 (Table 1). Of these, six species (14 individual) were Falconiformes and three species (14 individual) were Strigiformes. There were 14 owls, 10 hawks, 2 vultures, 1 eagle, and 1 falcon. Mean body weight was 780 g (ranged from 150 to 1400 g) for 14 owls; 650 g (ranged from 150 to 1270 g) for 10 hawks; 1760 g (ranged from 1520 to 2000 g) for 2 vultures; 5000 g for 1 eagle; and 130 g for 1 falcon. Of all 28 fracture cases, 11 cases (39%) and 1 case (3%) were related to hit-by-car and shooting respectively.

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Table 1. Raptors with long bone fracture treated at the University of Missouri-Columbia

Species	Number
Falconiformes	
Red-tailed hawk (<i>buteo jamaicensis</i>)	4
Cooper's hawk (<i>accipiter cooperii</i>)	4
Broad-winged hawk (<i>buteo platypterus</i>)	2
Turkey vulture (<i>cathartes aura</i>)	2
Bald eagle (<i>haliaeetus leucocephalus</i>)	1
Peregrine falcon (<i>falco peregrinus</i>)	1
Strigiformes	
Barred owl (<i>strix varia</i>)	10
Great horned owl (<i>bubo virginianus</i>)	3
Western screech-owl (<i>megascops kennicottii</i>)	1
Total	28

The cause of fracture was unknown in 16 cases (58%). Physical examination revealed dehydration in 18 raptors (64%) and lethargy in 12 raptors (42%). Forty one long bone fractures were included in 28 cases. The radiographs revealed 13 ulnar fractures (32%), 12 humeral fractures (30%), 10 radial fractures (25%), 4 tibiotarsal fractures (9%), 1 femoral fracture (2%), and 1 fibular fracture (2%). External skeletal fixation using polymethylmethacrylate (PMMA) combined with intramedullary fixation was used in 19 long bone fractures (46%) including 12 humeral fractures, 4 tibiotarsal fractures, 2 ulnar fractures, and 1 femoral fracture. Intramedullary fixation using intramedullary Kirschner pin was used in 16 long bone fractures (39%) including 11 ulnar fractures and 5 radial fractures. No surgical treatment was performed in 6 long bone fractures (15%) including 5 radial fractures and 1 fibular fracture.

Discussion

Hit-by-car was the commonest cause of fractures in the raptors admitted for treatment in this study. The other author reported similar findings when surveying causes of fractures in raptors (3). In that study, other causes of fracture, related to human activity, included shooting and trapping (3). In addition, dog bite during hunting or rehabilitation elsewhere, a wire fence, or a pathologic fracture secondary to inadequate nutrition during rehabilitation would be causes of fracture, related to human activity (3). Many of raptors presented dehydration and lethargy when admitted for treatment in this study. Proper hydration and nutrition are critical pre-surgical requirements. Small pieces of kidney or heart coated with lubrication material (Nutrical®, Tomlyn products, USA) produce quick energy and protein balance (10). Fluids can be given subcutaneously in the web of the wing or leg when the raptor undergoes severe dehydration.

In previous studies in 2007 and 2004, the commonest location in fracture was radius and ulna, occurring in approximately 46% of long bone fracture cases, followed by tibiotarsal fracture (25%), humeral fracture (14%), and femoral fracture (7%) (2,7). This study reported similar findings that the commonest location of fracture was ulna; however, humerus was the second commonest location of fracture followed by tibiotarsus.

Choosing an appropriate materials and methods to treat raptors with fracture can be difficult. Presently available options include internal fixation using intramedullary Kirschner pin or interlocking nail, cross-pinning fixation using cross-pin or rush-pin, fixation using plate and screw, and external skeletal fixation (5,6,8). Aforementioned materials and methods to treat raptors with fracture have been chosen depending on size of raptor and type of fracture. In bird, pneumatic bone decreases the skeletal mass, making flight easier but increasing the risk of fragmentation during trauma (1). As a result, avian fractures are frequently severe and comminuted with loose fragments (1). The goal of accurate anatomic alignment involves restoration of the bone's original length, axial alignment, and rotational orientation (4). Rotational alignment is especially important in free-ranging birds with wing fractures, because even a slight degree of malalignment may result in a significant alteration in flight (1). Internal fixation using intramedullary Kirschner pin or fixation using plate and screw can be used simple transverse fracture; however, external skeletal fixation might be better option to treat raptors with comminuted fracture that results from mostly trauma of hit-by-car.

Long-term follow-up is warranted to better determine the overall success and complication rates of long bone fracture repair using internal fixation or combination of internal fixation and external skeletal fixation using PMMA.

Conclusion

This study reported that many of raptors presented dehydration and lethargy when admitted for treatment. Therefore, proper hydration and nutrition are critical pre-surgical requirements. In addition, combination of internal fixation and external skeletal fixation using PMMA might be better option to treat raptors with comminuted fracture that results from mostly trauma of hit-by-car.

References

1. Bennett RA. Orthopedic surgery. In: Avian Medicine and Surgery. Philadelphia: Saunders. 1997: 733-766.
2. Buttle EP. Concomitant leg injuries in raptors with wing damage. J S Afr Vet Assoc 2004; 75: 154.
3. Fix AS, Barrows SZ. Raptors rehabilitated in Iowa during 1986 and 1987: a retrospective study. J Wildl Dis 1990; 26: 18-21.
4. Gill BJ. Healed long-bone fractures in wild birds. N Z Vet J 1988; 36:95-96.
5. Grioni A. Tibiotarsal fracture and neurologic problems of a

- black-eared kite (*Milvus migrans*). *Vet Clin North Am Exot Anim Pract* 2006; 9: 533-538.
6. Guzman DS, Bubenik LJ, Lauer SK, Vasanjee S, Mitchell MA. Repair of a coracoid luxation and a tibiotarsal fracture in a bald eagle (*Haliaeetus Leucocephalus*). *J Avian Med Surg* 2007; 21: 188-195.
 7. Hatt JM, Christen C, Sandmeier P. Clinical application of an external fixator in the repair of bone fractures in 28 birds. *Vet Rec* 2007; 160: 188-194.
 8. Hollamby S, Dejardin LM, Sikarskie JG, Haeger J. Tibiotarsal fracture repair in a bald eagle (*Haliaeetus leucocephalus*) using an interlocking nail. *J Zoo Wildl Med* 2004; 35: 77-81.
 9. Redig P, Cruz L. Fractures. In: *Avian Medicine*. Philadelphia: Mosby. 2008: 215-248.
 10. Spink RR. Fracture repair in rehabilitation of raptors. *Vet Med Small Anim Clin* 1978; 73: 1451-1455.