Radial fracture in bat: a case report

E. Sayahi¹, M. Salaran¹, S. Dehghani², A. Raayat Jahromi³, H. Savadkouhi¹, P. Memarian¹

¹Resident of Veterinary Surgery, Department of Surgery, School of Veterinary Medicine, Shiraz University, Shiraz, Iran.
²Professor of Veterinary Surgery, Department of Surgery, School of Veterinary Medicine, Shiraz University, Shiraz, Iran.
³Assistant Professor of Veterinary Surgery, Department of Surgery, School of Veterinary Medicine, Shiraz University, Shiraz, Iran.

Abstract

Bats are the only mammals capable of sustained flight. Many fractures in this species will be open fractures, usually of the humerus or radius. The purpose of this study was to present a bat with fractured radius and report its handling, surgical technique, fracture reduction and fixation protocol. Anesthesia was induced by Ketamine (40 mg/kg), the fractured fragments of the radius were reduced, a straight stainless suture needle of appropriate size employed as intramedullary pin which was inserted into the medulla by retrograde technique. The bat was cage confined for three weeks and antibiotic was prescribed for 5 days. The follow up evaluation at three weeks post operation showed good union and callus formation at the fractured site.

Key words: Bat, Fracture, Radius, Intramedullary fixation
Introduction

Bats are the only mammals capable of sustained flight. The wings of a bat extends to an elongated hand with a flexible membrane of skin stretched from the body to the tips of the fingers and tail. The thumb or first finger is exposed with a sharp claw that enables the bat to cling to or climb trees, walls and roof linings (Fig. 1). They are one of the few mammals to hibernate fully. Bats are generally long lived with records of 20 years or more. Any fractures suffered by a bat will usually be of the wing bones. Many fractures, will be open fractures, usually of the humerus or radius. The purpose of this study was to present a wild bat with fractured radius and report its handling, surgical technique, fracture reduction and fixation protocol.

Materials and Methods

An adult wild indigenous, male bat, weighing 200.00gm was found unable to fly and brought without clear history to Veterinary teaching hospital of the Shiraz University. There was an open oblique fracture in radius without infectious discharges. The fracture ends were viable and clean and no significant hemorrhage was noted. The bat's general condition was good and Dorso-Ventral radiograph showed an oblique fracture in the distal 3\textsuperscript{rd} of the radius (Fig. 1).

The fractured site was rinsed and washed by diluted povidone-iodine 10% and scrubbed by 7.5% solution. A warm water bag placed on healthy wing and warm light directed toward the broken one pre and post operation, in order to keep the bat's normal body temperature. Anesthesia was induced by Ketamine (40 mg/kg), IM in the thigh muscles. The area was prepared and draped. Since the skin was already traumatized the fractured fragments of the radius were reduced and hold by bone forceps. A straight stainless suture needle of appropriate size employed as intramedullary pin and inserted into the medulla by retrograde technique. Initially the pin was passed through the distal fracture fragment, then the pin was driven up in to the proximal part using some rotational force. The total length of pin was adjusted to the total length of the bone, achieving a good rigid intra medullar pin fixation. The surgical site was washed by saline and the skin sutured by simple continuous pattern in one layer using Vicryl no. 2/0.

Figure 1. Dorso-ventral Radiograph of bat with distal radial fracture.
Results

Immediately after surgery cefazolin attack dose was injected (22mg/kg IM) and was continued for five days. Post operation radiographic images revealed that the fracture alignment was very good with adequate fragment apposition and rigid internal fixation (Fig. 2) and the wing was folded and bandaged to the body. For recovery the bat was wrapped in a towel and left in a quiet small box to prevent struggling. The bat was cage confined for three weeks. A follow up evaluation at three weeks post operation showed good clinical union and callus formation at the fractured site palpable by hand.

Discussion

Rodents and bats are the most diverse and widely distributed mammal group (Wilson et al., 2005). They are also the most abundant and form the biggest mammalian aggregations known (Nowak, 1999). Bats inhabit most of the temperature in tropical areas of the world, except for some remote oceanic islands and beyond the tree growth line in the colder parts of either hemisphere. Skeletal adaptations for flight include a keeled sternum and elongated second to fifth metacarpals that form long rigid spokes for wing membrane. The first digit is a grasping tool, and the only digit with a functional claw. The blood volume of active bats is approximately 9.0 to 11.0 ml/100g.

Inhalation anesthesia is preferred in bats. However there are circumstances in which it is not appropriate to the situation. A fracture in a bat’s wing is going to be painful. Holding the bat up to a light source and extending each wing will highlight most fractures as well as any bleeding into the tissues. Many fractures, will be open fractures, usually of the humerus or radius. Open fractures can be thoroughly cleaned with sterile saline. The skin sheath can usually be withdrawn to allow the exposed bone to be reduced and covered. Stabilization of fractures in a bat’s wing requires a large degree of innovation including: splinting, tissue glue stabilization, intramedullar pinning, external fixation and amputation. The intramedullary cavity of both the humerus and radius is very limited. However, intramedullary pins have been fashioned out of fine-gauge hypodermic needles or the inserts from spinal needles.

![Figure 2](image.png)

**Figure 2.** Post operative Dorso-ventral radiograph of the Bat showing intramedullary pin in radius bone.
Their success is varied, but most fail through osteomyelitis or an inadequate blood circulation and healing capability. To prevent hypothermia after surgery, the wings may folded to the body and the animal placed on a warm surface like a circulating water blanket. Alternatively, a commercial forced air warmer developed for human surgery can be used. Electric and chemical heating pads must be avoided because of severe burns to the wing membranes (West et al., 2007). Mega chiropterans aggressively lick and chew sutures, bandages and external fixations. Where possible suture are buried. Light weight Elizabethan collars will prevent access to surgical wound and external fixations (Fowler and Miller, 1999).

The open wound in this bat was not complicated; therefore the early reduction of the fractured bone did not induce any problem. It is recommended to use prophylactic antibiotics prior to surgical intervention although in this case it was used immediately following operation. Since proper size Krishner nail was not available for an urgent operation, surgical needle was found appropriate for this purpose showing no complication post operation. The wing bones are not weight bearing and the wing was folded to the body and bandaged, therefore there shouldn’t be any chance of pin migration as was observed in this case after three weeks. Any way it is better to insert pins proximally and then distally to avoid pin migration. Folding of the wing prevented the bat from self-injuries. Proper post-operative management was necessary for bone healing and animal recovery. It is recommended to bandage the injured wing to the body to reduce self-injury and keep the wing in sort of external fixation for more support. During the process of preparing the wild bat for radiological evaluation at three weeks the bat got chance to fly away from the radiology theater proving good clinical union.

Reference