Introduction

Long bone fracture is one of the most common orthopedic problems occur in cats due to different kinds of trauma. The femur is, by far, the bone that is fractured most often in cat. Automobile injury, falling from height, bite and capturing the animal by limb are common causes of fractures in animals (O'Conner, 2005; Denny, 1993, Hosgood and Hoskins, 1998). The clinical signs associated with fractures include lameness, pain, local swelling, abnormal posture, crepitating sound on palpation, abnormal mobility of involved bone, and neurological deficit. Not all but combination of signs may be seen in fractures. Tentative diagnosis can be made based on clinical signs but reliable diagnostic techniques should be applied to make the diagnosis confirm (Denny, 1993) which include orthopedic test, neurologic test, radiography, and computed tomography (Fossum et al., 2007).

Reduction, retention, and immobilization are the basic principles of fracture management. The primary aim of fracture treatment is to achieve the fastest possible healing and the anatomical reconstruction of the structure to enable the patient to function normally by allowing early walking (Aron, 1998; Shahar, 2000). Reduction of long bone fractures can be achieved by closed and open methods.

Important factors considered in repair of femur fractures include, appropriate surgical approach, preservation of regional soft tissues and their attachments to bone fragments. Many techniques have been used to repair fractures that involve devices like the lag screw, intramedullary pin, bone plate and screw, interlocking and cross pin, dynamic compression plate and cerclage wire (Perren, 2002; Horstman et al., 2004). Among them, intramedullary pinning is one of the most frequently used devices for repairing of long bone fractures. It acts primarily as internal splint of medullary canal of long bone that shares loading with bones which maintain axial alignment of the fracture and resists bending forces in all directions applied to the bone (Beale, 2004). The rationale of this case report is to describe the clinical and radiographic examination of femoral fracture in a cat and successful fixation of the fracture by intramedullary pinning.

Case History

A 2 years old male Dashi cat weighting 3.5 kg, named Simba belonging to Mr. Vishal were admitted to the Teaching and Training Pet Hospital and Research Centre, Purbachal, Dhaka with a history of injury in the left hind limb. The owner complained that the cat was fallen down from height. The cat was unable to bear weight on its hind limbs.

Clinical examination and Radiography:

The cat felt severe pain when the femoral area was palpated. Palpation of the area revealed crepitation and swelling on the right hind limb. Physiological parameters (temperature, heart rate and respiratory rate) were within the normal range. Preoperative radiograph was taken to determine the accurate location of fracture. In X-ray, showed complete oblique fracture of femur. According to radiographic examination it was suggested for surgical correction of fracture based on history and clinical signs.

Figure 1: Initial observation

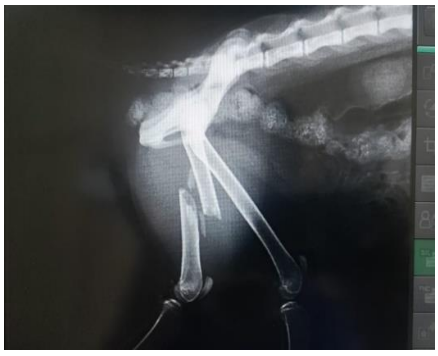

Figure 2: Lateral view of affected limb

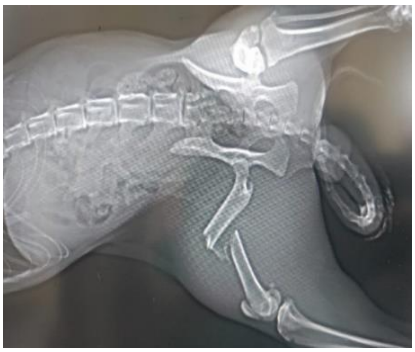

Figure 3: Dorso-ventral view of affected limb

Control and Anesthesia:

Animal was positioned in lateral recumbency with the affected limb up and general anesthesia was administered after proper premedication. Atropine sulphate (0.02 mg/kg body weight intramuscularly) was given as premedication followed by Xylazine hydrochloride (1mg/kg body weight intramuscularly). Clipping and shaving of the affected hind limb. General anesthesia (Ketamine hydrochloride 5.5 mg/kg + Diazepam 0.3 mg/kg body weight intravenously) was administered during surgery. Fluid was administered as 10 ml/kg/min during surgery. The femoral area was prepared for aseptic surgery.

Surgical Procedure:

The cat was placed on the table in Operation Theater. The entire hind limb was prepared for aseptic surgery by shaving and mopping using alcohol and povicep on the skin. A draper was placed over the area of the site of surgery. The femoral bone was covered and supported by the two major muscles, vastus lateralis and biceps femoris. The superficial fascia and the tensor fascia lata covers these two muscles. An incision along the skin of the affected area was made & separated from subcutaneous layer. The muscle was then incised taking care to avoid major blood vessels. Following separation of the muscle by blunt dissection, the layer of muscle was incised and then guided a cut by a finger placing under the bone fracture. Then the partial of broken bone was removed by bone curette and bone cutting forceps. The bone was placed in its normal position by Hohman retractor bone holding forceps. The proximal and distal bone fragments are aligned and pin was then inserted by electric driller machine within the distal fragmented and anchored the distal extremity thus immobilizing the fracture. The surgery site was irrigated using sterile saline solution then muscle and subcutaneous tissue were sutured by catgut in simple continuous pattern. Lastly, the skin was apposed using silk by cross mattress suture. The suture line was mopped by povidone iodine. After surgery, the extra pin was cut by the pin cutter then a bandage was applied in the leg to immobilize the affected area. The average time for setting up an intramedullary pinning fixation was 1 hour 30 minutes.

Figure 4: Preparation for operation

Figure 5: Separation of muscle

Figure 6: Exposing the bone

Figure 7: Intramedullary drilling

Figure 8: Bone immobilization

Figure 9: Suturing in muscle

Figure 10: Suturing in skin

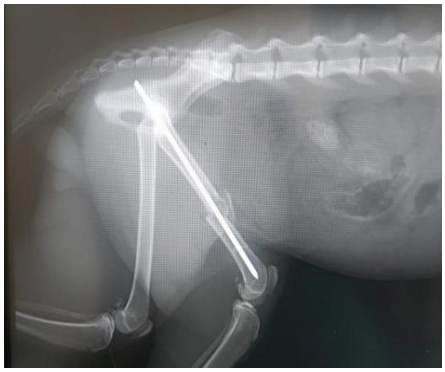

Figure 11: X-ray (after surgery)

Figure 12: Bandaging

Figure showing the technique of surgical management of fractured femur in Cat

Post-operative Care:

A course of antibiotics (Ceftriaxone 25mg/kg), antihistaminic (Pheniramine maleate 1mg/kg) and analgesics (Meloxicam 0.3mg/kg) body weight were administered for 7 days. The wound was cleaned daily by antiseptic solution. Calcium supplement (Cabo-D) and Vitamin B2 (Neuro-B) were given orally for 15 days. Movement and vigorous activity were restricted. The skin sutures were removed after 10 days and the pin was removed after complete healing of bone that evaluated by radiological examination.

Follow up:

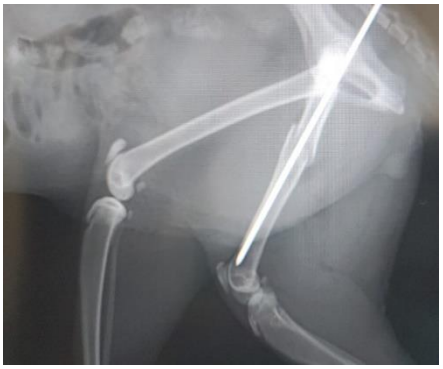

Figure 13: 13 days after surgery.

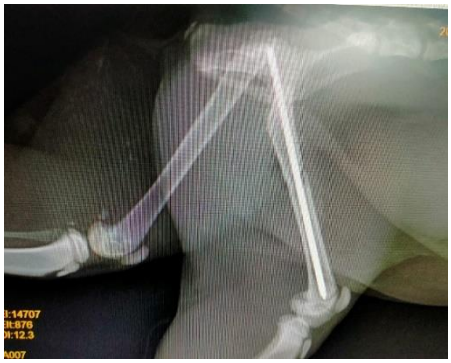

Figure 14: 18 days after surgery

Figure 15: 30 days after surgery

Figure 16: Mild weight bearing 18th days after surgery

Results and Discussion

After surgery, the cat was recovered smoothly from pre and post anesthetics. The cat tolerated the intramedullary pin well. Surgical wound was healed and stitches were removed on the .post-operative day 10 without any complication. Secondary bone healing was noticed on PO day 18 and 30 which was ensured by clinical and radiological examination. Finally, the cat regained ability to touch the limb on the ground after post-operative day 18 and weight bearing capacity after a month. There was no evidence of deformity due to excess weight bearing and no evidence of damage to nerves or blood vessels. The patient is now in normal condition.

The femur is the most commonly fractured bone in cats and shaft of the femur is the most common site of the femur fracture. Classically, the methods of internal fracture fixation involve the use of pins, wires, screws, and plates to rigidly stabilize fractures that have been anatomically reduced. Techniques that involve intramedullary pins have been devised for use of the femur. Generally, an intramedullary pin should occupy 60-70% of the diameter of the medullary cavity. Intramedullary pin application is faster and more easily applicable, removal of the osteosynthesis material subsequent healing is easy and it is a more cost effective technique (Altunatmaz et al., 2017). Appropriate pin selection is very important to pin loosening and pin migration. Selection of appropriate pin depends on the size of the intramedullary pinning cavity, the bone to be repaired, the fracture configuration and application of ancillary methods of fixation. Pin diameters of 1.6 mm to 4.8mm are suitable for use for most cats.

Post-operative management is very important to check complications. Pin loosening and pin migrations and seroma formation are very common complications in intramedullary pinning technique (Arun et al, 2011). However, infection may also be common in open fracture.

Limitations

This report is based on a follow up of the patient about 30 days after surgery where owner was not interested to check up the cat properly. Furthermore, the cat was not kept properly in resting condition so the pin slightly migrated from the expected location of the bone. However, complications of the surgery like slightly migration of the pin did not impair the normal locomotion and weight bearing of the cat.

Conclusion

The study reveals that the fixation of femoral fractures with intramedullary pinning was a beneficial and proficient method and provides good durability with minimal complications. The intramedullary pinning offers a perfect alignment and firm fixation of the fractured bone. Finally, it can be concluded that applications of intramedullary pins are safe, remunerative and successful treatment method if basic principles of repair are used.

References

Altunatmaz K, Karabağli M, Gydin D, Güzel O, Yalin EE, Uğurlu U, Sadalak DJ, Ekici H (2017). The treatment of supracondylar and diaphyseal femoral fractures in cat using intramedullary two-way stacked Kirschner wire application: Turkish Journal of Veterinary and Animal Sciences; 41(2):282-7.

Aron DN (1998). Practical techniques for fractures. In: Bojrab M.J. (ed.): Current Techniques in Small Animal Surgery. 4th ed. Philadelphia; 934–941

Beale B (2004). Orthopedic clinical techniques femur fracture repair. Clinical Technique in Small Animal Practices; 134-150

Denny HR (1993). A guide to canine and feline orthopedic surgery. Blackwell scientific Publication, Oxford

Horstman CL, Beale BS, Conzemius MG, Evans R R. (2004). Biological osteosynthesis versus traditional anatomic reconstruction of 20 long-bone fractures using an interlocking nail: 1994-2001. Veterinary Surgery 33(3):232-7

Johnson AL, Hoalton JF and Vannini R (2005). A principle of fracture management in Dog and cat, *Journal of Veterinary Emergency and Critical case,* pp:450-460.

Johnston AL and Decamp CE (1999). External skeletal fixation: Vet Clinical North American Small Animal Practices; 1135-1152.

O'Conner JJD (Ed) (2005). Dollars veterinary surgery. General, operative and regional. Satish kumar jain, Dariya ganj. New Delhi, 110002 India; 813-818

Perren SM (2002). Evolution of the internal fixation of long bone fractures. The scientific basis of biological internal fixation: choosing a new balance between stability and biology. Journal of Bone Joint Surgery; 1093-1110.

Shahar R. (2000). Relative stiffness and stress of type I and type II external fixators: Acrylic versus stainless-steel connecting bars-a theoretical approach. Veterinary Surgery; 29, 59–69.

William, TA, Cartrey MC and Bryanj MC (2008). Incidence of Non-union in long bone fracture and bone pinning, *Veterinary World*, pp: s7-33.

Acknowledgement

At first I am really thankful to almighty Allah who has given me strength and opportunity to complete the report.

Completion of any work or responsibility gives nice feelings but the accomplishment of this work as the partial fulfillment of the requirements for the degree of Doctor of Veterinary Medicine (DVM) in CVASU, not only has given me the pleasure but also has given me the confidence to move ahead and showed me a new opening to knowledge. Standing at this opening, it is an honor to revoke the names of the person and the organization I am grateful to.

I would like to extend my gratitude to my supervisor **Dr. Subrata Kumar Shil**, Associate Professor, Department of Anatomy and Histology, CVASU for his support and scholastic directions. The author extends his gratefulness to **Dr. Afzal Hossain**, Veterinary Surgeon, Teaching and Training Pet Hospital and Research Centre of CVASU, Purbachal, Dhaka for his guidance, inspiration during the study period and also for preparing of this production report.

I also feel much proud to convey my profound thanks to my friends and all well-wishers who have seriously encouraged me to run this study work. The author also feels much proud to convey his profound thanks to his friends and all well-wishers who have seriously encouraged him to run this study work.

The Author