

**CASE REPORT: INTERNAL FIXATION OF AN OBLIQUE FEMORAL FRACTURE  
USING CERCLAGE WIRES AND BONE PLATE**

Case report submitted in partial fulfillment of the Masters of Veterinary Surgery of the University of Nairobi.

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## **Summary**

A 6 months old German sharphard dog was presented with a history of leg carrying lameness following motor vehicle accident. Palpation of the right femur revealed crepitation while radiography confirmed an oblique femoral fracture of the right hind limb. The fracture was treated by internal stabilization using Cerclage wire and a bone plate fixed laterally. Bone healing occurred without complications and the dog discharged one month after surgery bearing weight on the limb.

## **Introduction**

Femoral fractures commonly occur in dogs following different kind of trauma. Traffic accident is the major cause of femoral fractures in dogs (Tercanlioglu and Sarierler, 2009). Whereas metaphyseal and diaphyseal fractures are more common in mature dogs, proximal or distal physeal fractures are more common in puppies (Shiju et al. 2010). Most femur fractures are observed as closed fractures because of the heavy overlying muscle (Beale, 2004). The goal of fracture repair is to establish perfect alignment and rigid fixation of the bone to allow both timely and maximized return to function of the affected area. In the small animal internal fracture fixation, many improvements have been developed, including improved fixation techniques and a more diverse selection of implants (Tercanlioglu and Sarierler, 2009). Femur fractures are generally not amenable to conservative repair, and some kind of internal fixation is generally required (Beale, 2004). Important factors considered in repair of femur fracture include, appropriate surgical approach, preservation of regional soft tissues and their attachments to bone fragments, either anatomic or indirect reduction, adequate stabilization, appropriate choice and application of implant system and proper postoperative care (Stiffler, 2004). The purpose of this

report is to describe the clinical and radiographic examination of femoral fracture in a dog as well as successful reduction of the fracture using a combination of Cerclage wires and bone plate.

### **Case history**

A 8 months old male German shepherd dog weighting 15 kgs, named Alpha and belonging to Mr. Michael Mwendwa (case number 36107) was presented to the University of Nairobi Small Animal Clinic on 13<sup>th</sup> February 2012. The owner complained that the patient had leg carrying lameness after being run-over by a car two days ago.

### **Clinical signs**

Clinical examination revealed trauma on the left hind limb, indicated by dark red and swollen thigh muscles. The dog felt severe pain when the affected thigh (femoral area) was palpated. Palpation of the area revealed crepitation and an abnormal size and shape of the femur. The patient also exhibited leg carrying lameness. Physiological parameters (temperature, heart rate and respiratory rate) were within the normal range. The dog was sedated using Xylazine Hydrochloride (Bomazine 2%, Bomac Laboratories Limited, Auckland- New Zealand) 14mg intramuscularly and lateral and anteroposterior radiographic views taken. The radiograph showed an overriding, complete and oblique diaphyseal femoral fracture (Figures 1 and 2). Pre-operatively, Caprofren (Rimadyl<sup>®</sup> Chewable 75, Pfizer Laboratories Limited, Sandton-South Africa) 37.5mg was administered orally once daily to manage pain.



Figure 1: Lateral view of the left femur showing complete oblique femur fracture with overriding fracture fragments.



Figure 2: Anteroposterior radiographic view showing complete oblique femur fracture of the left distal femoral shaft with overriding fragments.

### **Surgery**

Clinical examination on the day of surgery showed that the patient was in a stable state, while the swelling on the affected limb had subsided.

The dog was sedated using Xylazine Hydrochloride (Bomazine 2%, Bomac Laboratories Limited, Auckland- New Zealand) 14mg intramuscularly and the entire left limb prepared for aseptic surgery by shaving, scrubbing using Chlorhexidine and application of Povidone iodine on the skin. General anaesthesia was induced by intravenous injection of 50mg Thiopentone Sodium (Thiopentol<sup>®</sup> Rotex Medica, Trittau-Germany 2.5%) and maintained using Isoflurane vaporized in oxygen administered using a rebreathing anaesthetic machine.

Following draping, a craniolateral approach to the femur was used to expose the fracture fragments. Fracture fragments were exteriorized held using bone holding forceps and aligned as close to normal anatomical position as possible. The fracture fragments were then stabilized using 0.062 gauge cerclage wires, placed 3cm apart (Figure 3).

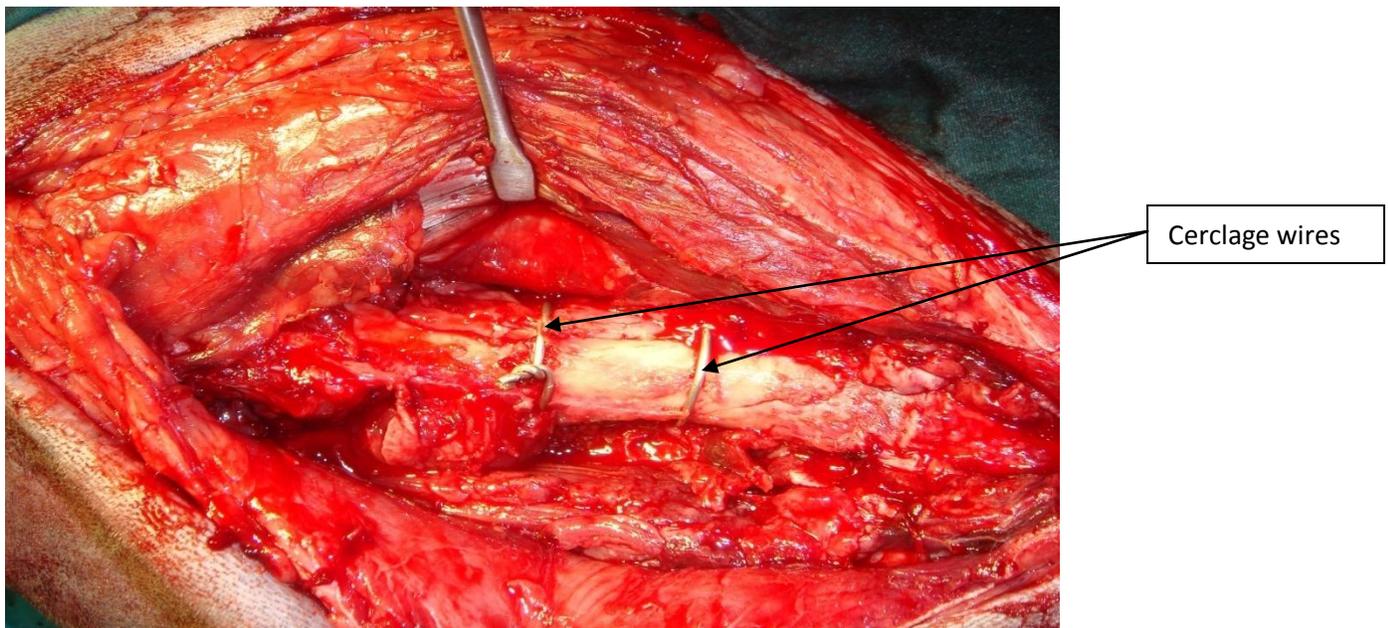


Figure 3: Photograph showing stabilized bone fragments using 0.062 gauge cerclage wires.

Further stabilization was achieved by use of a 6-hole bone plate (13.75cm) which was fixed on the lateral side of the femur by using 5-screws (2.5cm by 3mm) (Figure 4).

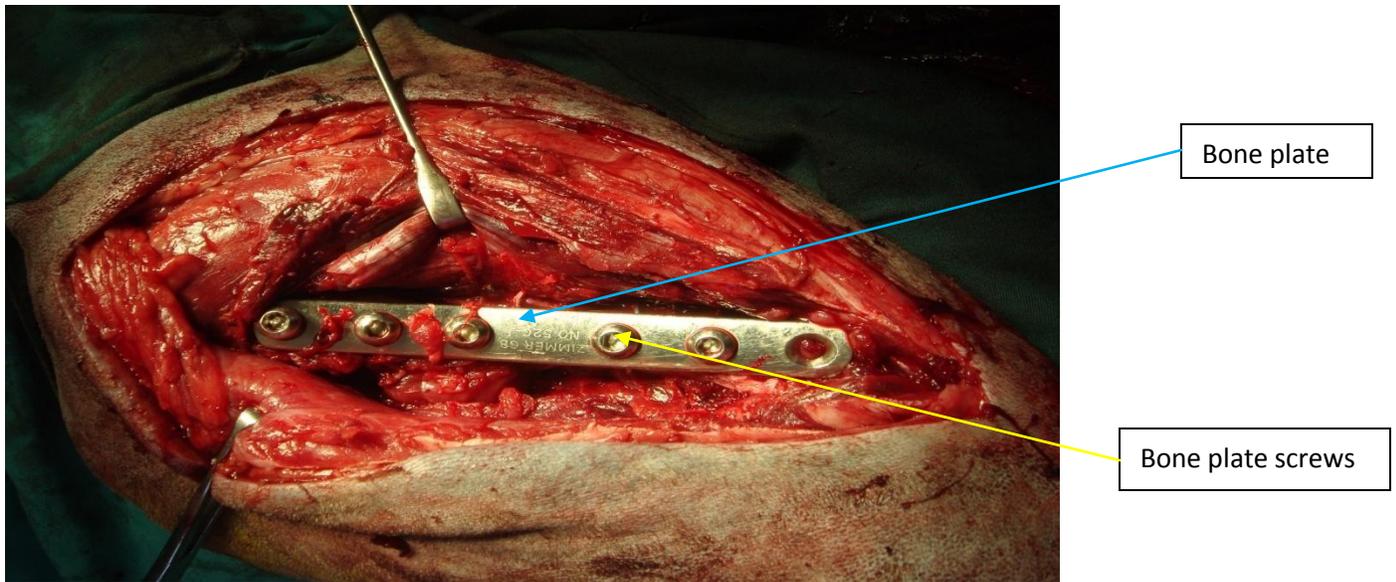


Figure 4: Photograph showing additional stabilization of bone fragments using a 6-hole bone plate (13.75cm) and 5-screws (2.5cm by 3mm).

The surgical site was irrigated using sterile saline solution and closed in 4-layers: muscles were apposed using number 0, chromic catgut in a cruciate suture pattern. The tensor fascia lata was apposed using number 2/0 chromic catgut in a simple continuous pattern. The subcutaneous tissue was apposed using number 2/0 chromic catgut in a simple continuous pattern and the skin was apposed using number 2/0 nylon in a simple interrupted pattern.

### **Postoperative Care**

Postoperative care involved light Roberts Jones bandage for three days to minimize swelling. Intramuscular injection of 150mg of Amoxicillin Trihydrate (Betamox<sup>®</sup> Norbrook veterinary Pharmaceuticals, Nairobi-Kenya). Subcutaneous injection of 3mg Meloxicam, once immediately after surgery and then Caprofen (Rimadyl<sup>®</sup> Chewable 75, Pfizer Laboratories Limited, Sandton-South Africa) 37.5mg orally once daily for 14 days. Movement was also restricted. The sutures were removed after 14 days by which time the dog had begun to bear some weight on the leg.

Examination of the radiographs after a month revealed callus formation. At four weeks, the dog was using the leg for full weight support and showed minimal clinical evidence of lameness. 120 days post-operatively the fracture had healed completely (Figure 5) and bone plate and screws were removed but the Cerclage wires were retained as they had been completely covered by callus tissue. (The client failed to return the dog in time as he had been advised and that's why removal of the bone plate was delayed).



Figure 5: radiograph showing complete healing of the fracture 120 days post-operatively.

## **Discussion**

The femur is the most commonly fractured bone in dogs (Beale, 2004) and left leg is fractured slightly more than the right (Braden et al, 1994). The most common site of the femur fracture is the shaft of the femur followed by the growth plates (Tercanlioglu and Sarierler, 2009). In this case, the fracture involved the left femoral shaft. A study by Shiju et al. (2010) on 478 dogs reported that male dogs had higher incidence of pelvic limb fractures (61.5 percent) than female dogs of all the age groups and that the occurrence of oblique/transverse fractures of the pelvic limb were more (44.8 percent) than comminuted (26.8 percent) and avulsion fractures (7.53 percent). These findings are in line with this case in which the patient was a male dog with an

oblique femoral fracture. The high incidence of fractures in male than female may be due to their aggressive nature and wandering habits that make them more prone to accidents and fractures.

The dog breeds that are more predisposed to femoral fractures are Pomeranian, Mongrel, German shepherd, Doberman, Great Dane and Boxer (Gahlod, 2007). Studies have reported that femoral fractures occur commonly in young dogs below one year of age (Braden et al, 1994). This is because young dogs are very playful and learn to cope with the dangers of their environment through experience. In addition, their bones are more fragile than those of the older dogs. Young dogs achieve skeletal maturity between 5 months (toy breeds) and 18 months (giant breeds). During that growth phase, both structural and biomechanical properties of immature bone are considerably different from those of adult bone and are characterized by lower strength and stiffness (Torzilli, 1981). This observation is in line with this case in which the patient was a German shepherd puppy, 8 months of age.

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 (Stiffler, 2004). The selection of internal fixation implant is based on multiple mechanical, biologic, and clinical parameters associated with each patient and fracture, and not just the fracture pattern itself (Aron and palmer, 1995). Orthopedic pins are used for internal fixation as a primary method of stabilization, but are used more frequently in combination with wires, bone plating, or external skeletal fixation (Tercanlioglu and Sarierler, 2009).

Bone plates exhibit both good and bad features of orthopedic implant (Sharma et al, 2006). The advantage is that plates allow anatomical reconstruction of the bone, giving a perfect reduction and early mobilization (Akeson, 1976). Early ambulation hastens fracture healing by promoting axial micromotion and also prevents disuse atrophy and muscle contractures in fracture patients

(Radke et al, 2006). However, complications associated with bone plates include: interference with periosteal blood supply, mechanical failure due to minor loads in small plates and secondary major trauma in large plates (Tonnio et al, 1976). The most common failure of plate is fatigue failure and this is inevitable if healing fails to occur. The ends of the plate also act as stress riser leading to a fresh fracture proximal or distal to the original one. Improper application of plates and poor technique are other causes of bone plate failure (Sharma et al, 2006). It has been reported that intramedullary pins are satisfactory for shaft fractures of the femur in small dogs and cats (Hill, 1977), but plates gives better results in medium and large breeds of dogs (Phillip, 1979). In this case, the patient had started bearing weight on the limb as early as the second day after surgery and complications associated with implant failure were not noted.

A study conducted by Gahlod, (2007) on radiological features of fractured femur in dogs at scheduled intervals following reduction, revealed callus formation on day 20 post treatment. The 40<sup>th</sup> day radiograph indicated reabsorption of excessive callus, reduced periosteal reaction and process of remodeling of new bone. Radiographs on day 60 revealed completion of the reparative process supported by reabsorption of excessive callus and disappearance of periosteal reaction with a good healing of bone. The study also revealed that the supplementation of anabolic steroid following fracture reduction promoted excessive periosteal callus formation. In this report, healing was confirmed by radiograph taken 120 days post-operatively that revealed complete union of the fracture as well as the use of the limb by the patient.

## **Conclusion**

Bone plate and Cerclage wires offered perfect alignment and rigid fixation of the fracture. This allowed early post-operative ambulation and hastened bone healing process. Post-operative broad spectrum antibiotic are important to combat any infection that may lead to osteomyelitis and complicate healing.

## **Acknowledgement**

The author wishes to thank Dr. J.D Mande for his invaluable supervision, Dr. Kimeli for handling anaesthesia during surgery as well as the staff at the Department of Clinical Studies, Faculty of Veterinary Medicine for there assistance.

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