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Surgical management of bilateral diaphyseal femoral fracture in a dog: A case report

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Abstract

A Doberman pup of age 4 months was presented with history of automobile accident. The dog was unable to stand on both the hindlimbs with pain and crepitus at both the thigh regions. Radiographic examination revealed bilateral oblique and displaced femoral fractures. Open reduction and internal fixation was done with simple intramedullary pinning for both the hindlimbs. Postoperatively, both the limbs were externally supported by applying Robert Jones bandaging. The dog started complete weight bearing in the 2nd postoperative week and complete radiographic union was noticed by 8th week. Haemato-biochemical parameters viz. haemoglobin (Hb), total erythrocyte count (TEC), total leukocyte count (TLC) and differential leukocyte count (DLC) and serum calcium, phosphorus, alkaline phosphatase, C-reactive protein (CRP) and creatine kinase (CK) were analysed. The clinical outcome was excellent with normal limb function.

Keywords: Bilateral, diaphyseal, femur fracture, simple intramedullary pinning

Introduction

The incidence of unilateral femur fracture and its surgical management with varying type of fracture fixation have been widely reported [1]. Bilateral femur fractures are not uncommon [2]. The impact of very high energy resulting from automobile injury results in trauma of varying intensity leading to multiple injuries. They are difficult to repair due to the fact that such dogs are recumbent and need early rehabilitation to establish speedy recovery. Due to closeness of abdominal wall to proximal femur and surrounding heavy muscles limit the use of coaptation and external skeletal fixation for femoral fractures. Open reduction and internal fixation is recommended which may lead to good to excellent clinical outcome. The present paper reports management of bilateral femur fracture with simple intramedullary pinning in a 4 month old pup.

Materials and Methods

A 4 month old female Doberman pup was diagnosed with bilateral femur fracture which was caused due to automobile accident. Palpation of both the hindlimbs showed symptoms of pain, varying degree of soft tissue swelling and crepitus indicating fracture. Confirmatory diagnosis by radiography revealed oblique, overriding angularly displaced proximal third diaphyseal femoral fracture of the right limb and oblique, overriding angularly displaced midshaft diaphyseal fracture of left femur (Fig. 1). The dog was stabilized with modified Robert Jones bandaging till the day of surgery. Prior to surgery, blood collection was done for haemato-biochemical parameters estimation. The dog was pre-anaesthetized using atropine sulphate @ 0.02mg/kg given subcutaneously and anaesthesia was induced using ketamine hydrochloride @ 5mg/kg and midazolam @ 0.2mg/kg mixed in a single syringe given intravenously. The anaesthesia was maintained using isoflurane (1-2%) inhalation anaesthetic. Cranio-lateral skin incision was made, the superficial leaf of fascia lata along the cranial border of biceps femoris muscle was incised and was retracted caudally to expose the vastus lateralis muscle and was reflected to expose the shaft of femur. The site was cleaned with normal saline and dead necrotic tissue was removed. Intramedullary pins of appropriate size were inserted by normograde fashion after the reduction of fracture fragments. Fascial layers were opposed using polyglactin 910, No. 1.0 and skin suturing was done with nylon suture material. Postoperatively, the dog was administered with cefotaxime @ 25 mg/kg and meloxicam @ 0.2 mg/kg for 7 and 3 days respectively. Both the limbs were given external support by modified Robert Jones bandaging for 14 days. The owner was instructed to restrict the movement of the dog for 2 weeks and thereafter leash walking was advised till complete healing of the fracture.

Skin sutures were removed 12 days after surgery.

Results and Discussion

Among all the long bones femur is reported to be the most frequently fractured bone [3]. Intramedullary pinning presents a more popular form of internal fixation for femoral fractures but the instability caused after intramedullary pinning can lead to non-union and predisposes to osteomyelitis and implant migration [4]. The pin selected for introduction should fill at least 60-70% of the medullary cavity at the isthmus of the diaphysis [5]. In this case, 3.5 mm diameter simple intramedullary pin was used for fracture fixation in normograde fashion for both the femur bones. Immediate postoperative radiograph showed near normal anatomical reduction of the fracture fragments and snugly fitting of the pins at distal physis (Fig. 2). The pup started weight bearing by 12th postoperative day and normal limb function was noticed by 1 month postoperatively on both the hindlimbs. Radiographic evaluation of 15th postoperative day revealed intact fracture fragments and exuberant callus formation at both cranial and caudal aspect of the fracture site of both the limbs (Fig. 3). 60th postoperative day radiograph showed complete fracture union with cortical and medullary continuity of both the femur bones (Fig. 4). Earlier reports by Mohindroo *et al.*, (2006) [6] who repaired bilateral femur fracture using intramedullary pinning for left femur and end threaded pin along with 2 K- wires for right femur recorded complete weight bearing within one month of surgery and radiographically callus formation and remodelling was evident by 2 months after surgery. Singh *et al.*, (2007) [7] repaired bilateral femur fracture with static intramedullary interlocking nailing and reported weight bearing by 20th postoperative day. Das *et al.*, (2012) [8] repaired bilateral femur and tibia fracture in a pup using intramedullary pinning and modified Thomas splint application and reported normal mobility after one month. Similarly, Ramesh *et al.*, (2015) [9] also repaired bilateral femur fracture using 3 mm size simple intramedullary pin for left femur and plate rod on right femur using 2.5 mm Steinmann pin and 2.7 mm linear locking compression plate and recorded normal weight bearing on both legs on 45th postoperative day. The early weight bearing in this case might be due to stability provided by simple intramedullary pinning as early callus formation was noticed and care taken by the owner.

The preoperative Hb and TEC levels were below the normal range which gradually increased to normal range by 60th postoperative day. The progressive increase of Hb and TEC indicates erythropoiesis. The TLC values were higher on preoperative day when compared to postoperative days. Similar finding was observed by Patil *et al.*, (2017) [10]. The neutrophil count was higher on 15th postoperative day and were within normal range during other postoperative periods. The lymphocyte, eosinophils and monocyte count fluctuated within the normal physiological limits. Similar findings were observed by Chaurasia *et al.*, (2019) [11]. The calcium levels were higher on 15th postoperative day compared to other examination periods but were within the normal physiological limits. Similar findings were noted by Kumar *et al.*, (2018) [12]. There was no significant variation in phosphorus levels postoperatively. The alkaline phosphatase levels were higher on 15th postoperative day and reached normal level by 60th postoperative day which indicates dissemination of chondroblast during fracture healing. The CRP and CK values were higher on preoperative day compared to postoperative

days. Similar findings were recorded by Phaneendra *et al.*, (2016) [13].

The clinical outcome was excellent with normal weight bearing and limb function. It can be concluded that the use of simple intramedullary pinning for repair of bilateral femur fracture in young dog resulted in satisfactory outcome without any implant migration due to early callus formation at the fracture site.

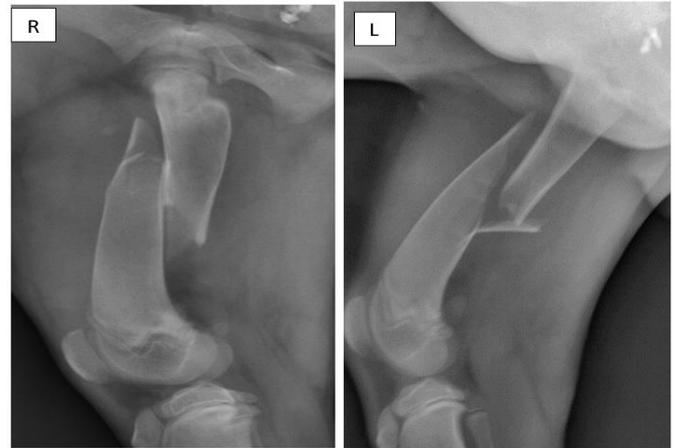


Fig 1: Preoperative radiograph showing oblique overriding femur fracture of both the hindlimbs.



Fig 2: a and b: Immediate postoperative radiograph after fracture reduction and internal fixation with simple intramedullary pins of right and left femur bone respectively.

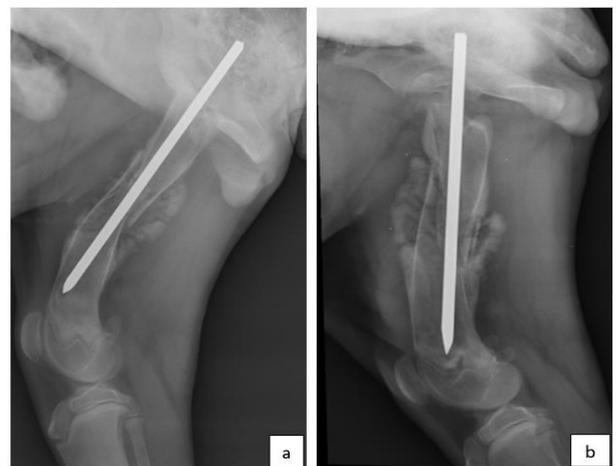


Fig 3: a and b. 15th day medio-lateral postoperative radiograph showing periosteal reaction at the fracture site in right and left femur bone respectively



Fig 4: a and b. 60th day medio-lateral postoperative radiograph showing complete fracture union and progression of remodelling phase in right and left femur bones respectively.



Fig 5: Complete weight bearing of the dog with bilateral femur fracture on 15th (a) and 60th postoperative days respectively (b).

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