

*Case Report***Retrograde intramedullary pinning for femur fracture management in a Labrador dog- a case report***Bhajan Chandra Das<sup>\*1</sup>, Chanchal Kumar Roy<sup>1</sup>, Sreekanta Biswas<sup>1</sup>, Tuli Dey<sup>1</sup>, Paritosh Kumar Biswas<sup>1</sup> and Bibek Chandra Sutradhar<sup>1</sup>*<sup>1</sup>Chattogram Veterinary and Animal Sciences University, Chattogram- 4225, Bangladesh

ARTICLE INFO	ABSTRACT
Article history: Received: 16/11/2019 Accepted: 12/02/2020 <hr/> <i>Keywords:</i> Retrograde intramedullary pinning, Fracture management techniques, Functional limb outcome, Lameness grade, Radiographic evaluation <hr/> <i>*Corresponding author:</i> Cell: +88 Email: bcdas2002@gmail.com	Long bone fractures are very common in pet and domestic animals as well as femur fractures are major lameness problem of all long bone fractures. Now-a-days, there are lots of fracture management techniques performed for different fractures correction based on their nature. The present case report describes the outcome of retrograde intramedullary pinning in a dog. A three month old male, 9.65kg body weight Labrador dog was brought to SAQTVH for better treatment with the history of limping in right hind limb past 3 days. Radiographic examination confirmed that the dog was suffering from distal third diaphyseal transverse overriding femur fracture in right hind limb. Based on fracture patient assessment score (FPAS), the case was decided to do internal fixation by retrograde intramedullary pinning for femur fracture correction. Complete blood count (CBC), serum biochemistry was performed before fracture management to evaluate the patient condition. The patient was prepared aseptically and surgery was performed as standard surgical procedure with xylazine and ketamine anaesthesia. Postoperatively the patient was checked at different interval to evaluate the lameness grade, functional limb outcome and bone healing of the affected limb. Weight bearing and secondary callus formation was noticed at 2nd to 3rd week of post operatively and functional limb was observed at 7th week postoperatively. Follow up checking by clinically and radiographically was perform until six month of age of the patient. After six month, implant in position and bone remodeling was observed in radiographic examination. Finally surgical efficacy of the patient was evaluated by phone conversation until 15th month of age which revealed playful life of the dog. Serum alkaline phosphatase level was increased during the time of bone healing process especially 2nd to 3rd week postoperatively. So, the present case study suggested that the retrograde intramedullary pinning was an effective method of femur fracture correction for dog and pin remove was not necessary if it does not cause any complication.

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**1. INTRODUCTION**

Femoral fractures are very common both in adult and immature dog due to different kinds of trauma. Automobile accident is one the major cause of femoral fractures in dogs (Tercanlioglu and Sarierler, 2009). Among the different types of femoral fractures, metaphyseal and diaphyseal fractures are frequently reported in mature dogs whereas proximal and distal physeal fractures are more commonly recorded in juvenile dogs (Simon et al., 2011) and most of the femur fractures are found as closed fractures due to the heavy overlying muscle ((Beale, 2004). The goal of fracture correction is to return its anatomical alignment and reduction of fracture bone and simultaneously applied a stable fixation to allow the patient early mobilization and to maintain the

normal life. Recently different techniques are applied for correction of femur fractures as internal fixation technique in dogs around the world (Tercanlioglu and Sarierler, 2009). Conventional bandage techniques are not suitable for femur fracture correction therefore a few form of internal fixation is generally required (Beale, 2004). Retrograde intramedullary pinning is an easy and economic internal fixation technique that acts generally as internal splint of medullary canal of long bone that shares loading with bones retain axial alignment of the fracture and averts bending forces in all directions applied to the bone (Beale, 2004). Some important factors are taken into consideration in repair of femur fracture and early healing of bone include appropriate surgical technique, preservation of regional soft tissues and their attachments to bone fragments, either

anatomic or indirect reduction, enough stabilization, and implant device right hind limb before surgery (Stiffler, 2004). The objective of the present case study is to evaluate the outcome of retrograde intramedullary pinning for femur fracture in a dog.

## 2. CASE HISTORY AND OBSERVATION

The study was conducted at Surgery Unit, S. A. Quadery Teaching Veterinary Hospital (SAQTVH) in Chittagong Veterinary and Animal Sciences University (CVASU), Chittagong. A three month old intact male Labrador dog weighing 9.65kg was carried to SAQ TVH for better treatment with the history of fallen from 2nd floor and limping in right hind limb for past 3 days. No conservative treatment was done. The dog was active, alert and reduced appetite during clinical examination and orthopaedic examination revealed non weight bearing (Fig.1), pain on palpation, swelling and crepitation. Neurological examination shown positive conscious proprioception and deep pain reflex. Radiographic examination confirmed the closed distal third diaphyseal transverse overriding femur fracture in right hind limb (Fig.2). On the basis of overall patient condition, the case was decided for open reduction internal fixation (ORIF) by intramedullary pinning. Before surgery, blood and serum biochemical parameters were analyzed.

## 3. ANAESTHESIA AND OPERATIVE TECHNIQUE

Under physical restraining, clipping and shaving were done and the patient prepared by using 7% povidone iodine and 70% alcohol. The dog was sedated by xylazine hydrochloride (Xylaxin®, Indian Immunological Ltd., Telangana, India) @ dose rate 1.0 mg/kg body weight intramuscularly and general anaesthesia was performed by ketamine hydrochloride (G-Ketamine®, Gonoshasthaya Pharmaceutical Ltd., Dhaka) @ dose rate 10.0mg/kg body weight intravenously. The patient was positioned in lateral recumbency and the affected limb dorsally. Through craniolateral approach (Fig.3) exposed the fractured bone and reduced the fractured bone anatomically by removing the soft tissue attachment near the fractured ends and toggling technique. Fracture fixation was done by retrograde intramedullary pinning (Fig.3) by 3.5mm Steinmann pin. Surgical wound was closed as standard procedure and covered by soft cotton bandage (Fig.4).



Fig-1: Non weight bearing the affected right hind limb before surgery

## 4. POSTOPERATIVE CARE AND ADVICE

Postoperatively, antibiotic- Ceftriaxone (Renacefvet®, Renata Ltd, Mirpur, Dhaka) used for five days intramuscularly, pain killer- Meloxicam (Melvet®, Acme Ltd, Savar, Dhaka) used for three days subcutaneously and antihistaminic- Pheniramine maleate (Alerin®, SK+FLtd, Tongi, Dhaka) used for five days intramuscularly. Advice were given to apply cold application in the affected area for three days and restricted movement for two weeks, keep the surgical area dry, neat and clean until wound healing and follow up checkup specially for radiographic evaluation of bone healing. To evaluate the surgical outcome of the dog, the following parameters were analyzed at regular interval- lameness grade, functional limb outcome, fracture healing, blood (total RBC, WBC, PCV, Hb) and serum biochemical parameters (Total protein, alkaline phosphatase, calcium and phosphorus).

## 5. RESULTS AND DISCUSSIONS

Postoperative Day-1, the results revealed on the basis of radiographic examination, the implant (Steinmann pin) was in position and fracture ends were in opposition (Fig.5) but postoperative Day-7, there was malalignment of fracture fragment and non-weight bearing of the fractured limb on posture. Mild weight bearing and secondary callus formation was noticed at 2nd to 3rd week post operatively (Fig.6) and functional limb outcome was observed at 7th week postoperatively (Fig.7). Follow up checking until six month of age was done by clinically and radiographically. After six month, implant in position and bone remodeling was noticed (Fig.8). Until 15th of age, the dog was passing very joyful life that information was collected from the owner through phone. So, the present case study suggested that the intramedullary pinning was an effective method of femur fracture correction for dog and pin remove was not necessary if it does not cause any complication. Total RBC and WBC were within the normal range but Hb and PCV were slightly reduced before the surgery but after surgery total RBC was in lower limit at 7th, 15th and 28th day but WBC was gradually increased upto 28th post-operative day. Serum alkaline phosphatase was slightly higher before surgery but after surgery it gradually increased upto 15th postoperative day and again reduced at day 28.



Fig-2: Distal third diaphyseal overriding femur fracture



Fig. 3: Cranio-lateral approach and retrograde intramedullary pinning



Fig. 4: Closed the surgical wound and applied soft cotton bandage



Fig. 5: Postoperative 1st day-implant in situ



Fig. 6: Mild weight bearing and periosteal callus formation at 18th Postoperative day



Fig. 7: Full weight bearing at 7th week postoperative day



Fig. 8: Bone remodeling at 6th month post operatively

**Table 1. CBC and biochemical parameters values pre and postoperative at different interval**

Parameters	Pre and post operative value				Normal value
	Pre operative	Post operative Day-7	Post operative Day-15	Post operative Day-28	
Total RBC	5.9	5.2	5.5	5.3	5.5-8.5 million/cum
Total WBC	13.8	14.2	10.7	10.9	6-17 thousand/cum
Hb	10.1	10.4	10.9	10.7	12-18 gm%
PCV	32.0	32.0	33.3	30.9	37-55%
Total Protein	45.3	45.3	58	61.5	54-71 mg/dl
Alkaline Phosphatase	178.6	487.0	479.3	230.8	1-114 U/L
Calcium	11.86	9.1	11.2	10.8	9.1-11.3 mg/dl
Phosphorus	6.7	7.8	9.3	8.7	2.6-6.2 mg/dl

In dogs, the femur fracture is the most common (Beale, 2004). The injury was occurred frequently caused by trauma, road accident and jumping from top places. In present case study, dog fallen from the 2nd floor was the cause of fracture in femur. In young dogs below 6 months are most commonly affected (46.02%) reported by Simon et al. (2010). This is because young dog is very active, playful and learn to cope with the dangers of their environment through experience (Kolata et al., 1974). Young dogs get skeletal maturity between 5 months (toy breeds) and 18 months (giant breeds) through a very rapid biphasic growth rate. During the growing stage, structural and biochemical properties of immature bone are considerably different from those of adult bone and are characterized by lower strength and stiffness (Torzilli et al., 1981). This result revealed that fracture of femur was most common

in young dog than adult. In present case study, fracture fixation was performed by 3.5mm Steinmann pin. Selection of the appropriate pin depends on the size of the intramedullary cavity, the bone being repaired, the fracture configuration and whether ancillary methods of fixation are to be used. Pin diameters should be big enough to fill at least 60 to 70% of the medullary cavity at its narrowest point. Larger pins provide greater resistance to bending forces and are preferred in straighter bone (Scott and McLaughlin, 2007). In present case study, femoral fracture repaired by intramedullary pinning, dog showed gradual weight bearing and secondary callus formation (periosteal callus) at the 2nd to 3rd week and functional limb outcome was observed at 7th week postoperatively. Pin migration and non-union are common complications in intramedullary pinning.

Nolte et al. (2005) reported the incidence of non-union in intramedullary pinning is 5.2 % and McCartney and MacDonald (2006) also observed a very low 0.85% incidence of non-union but in present case study there was no non-union complication in intramedullary pinning . Pin migration was not noticed in present case that indicated proper pin selection and good stabilization of fracture fragments.

There is a relation between bone healing and serum alkaline phosphatase. During bone healing when callus formation ceases, serum ALP concentrations return to normal. In the present case study, the total alkaline phosphatase increased as early as the 1st and 2nd week of postoperatively and then gradually decreased. Similar finding was recorded by Komnenou et al. (2005).

## **CONCLUSION**

The present study concluded that retrograde intramedullary pinning is an easy and effective method for long bone fracture management in dog. Post operative morbidity depends on the appropriate pin selection and post operative care.

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