

## DIAPHYSEAL FEMORAL FRACTURE IN CANINES: SURGICAL MANAGEMENT AND IMPLICATIONS IN A 2-YEAR-OLD GERMAN SHEPHERD DOG

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### ABSTRACT

Diaphyseal femoral fractures in canines, often resulting from traumatic events, require timely and effective management to ensure optimal recovery and mobility. In this case, a 2-year-old female German shepherd dog was presented to the Small Animal Clinic at Ahmadu Bello University with non-weight-bearing lameness in the right hind limb following an automobile accident. Physical examination revealed swelling and pain upon palpation of the right thigh. Vital signs were within normal range, and a radiographic assessment confirmed an oblique diaphyseal fracture of the femur. Surgical intervention was selected as the treatment approach, and this involved open reduction and internal fixation. The procedure included intramedullary (IM) pinning and cerclage wiring to stabilize the fracture. Post-operative care included administration of antibiotics and anti-inflammatory medication, as well as strict recommendations for isolation and limited mobility to ensure proper healing. The client was advised to return for a follow-up radiograph in four weeks. This case highlights the importance of prompt diagnosis and surgical intervention for managing of femoral fractures in canines. Although conservative management may be suitable for certain fractures, oblique diaphyseal fractures often require surgical fixation for optimal outcomes. This report emphasizes the role of advanced surgical techniques and client education in achieving successful orthopaedic outcomes in veterinary medicine.

**Keywords:** Diaphyseal fracture, femur, internal fixation, German shepherd, canine orthopaedics

### INTRODUCTION

Diaphyseal femoral fractures are relatively common in canine orthopaedic cases, and these often result from trauma such as automobile accidents. These fractures pose a challenge due to the high degree of instability and the considerable stress placed on the femur during weight-bearing activities (Abo-Soliman *et al.*, 2020; Gaddam, 2024). The immediate and appropriate intervention is crucial to minimize complications and facilitate effective healing. Although closed reduction and external fixation methods can be employed, surgical intervention remains the preferred

approach for managing oblique diaphyseal fractures (Lazarus *et al.*, 2021; Bleakley, 2024).

Several surgical techniques have been developed for managing femoral fracture including intramedullary (IM) pinning, plating, and the use of cerclage wires. Each of these methods offers distinctive advantages depending on the fracture type and location. In the case of oblique diaphyseal fractures, the combination of IM pinning with cerclage wiring provides enhanced stability, thus, allowing for proper alignment and improved healing potential.

Hence, the application of these techniques requires a sound understanding of canine anatomy and precision in execution,

to ensure minimal disruption to surrounding tissues and vascular structures (Lazarus *et al.*, 2021; Aithal *et al.*, 2023; Förchet *et al.*, 2023; Bleakley, 2024).

This report presents a case involving a young German shepherd dog with a diaphyseal femoral fracture managed successfully through open reduction and internal fixation. The case highlighted the surgical approach, postoperative care, and challenges in client compliance, all crucial aspects of orthopaedic treatment outcomes. This case emphasizes the importance of client education and the need for structured postoperative monitoring in veterinary orthopaedic cases.

### CASE DESCRIPTION

A 2-year-old female German shepherd dog weighing 19kg was presented to the Small Animal Clinic of the Veterinary Teaching Hospital Ahmadu Bello University, Zaria. History revealed that the bitch was involved in an automobile accident, after which it exhibited, non-weight bearing lameness of the right hind limb prior to presentation. On presentation, a thorough physical examination was conducted blood sample was sent to the clinical pathology laboratory, a radiograph of the thigh was taken, and management was carried out accordingly.

### CLINICAL OBSERVATIONS

The parameters (normal range) recorded were temperature of 38.6°C (38.0 – 39.2°C), pulse rate of 92 beats/minute (60 – 90 beats/minute and respiratory rate of 15 cycles/minute (10 – 35 cycles/minute). The clinical signs observed were swelling and crepitus of the right thigh, which was painful on palpation. Also, the haemogram was normal. Following radiography, a diagnosis of oblique diaphyseal femoral fracture was made (Figure IA).

### SURGICAL MANAGEMENT

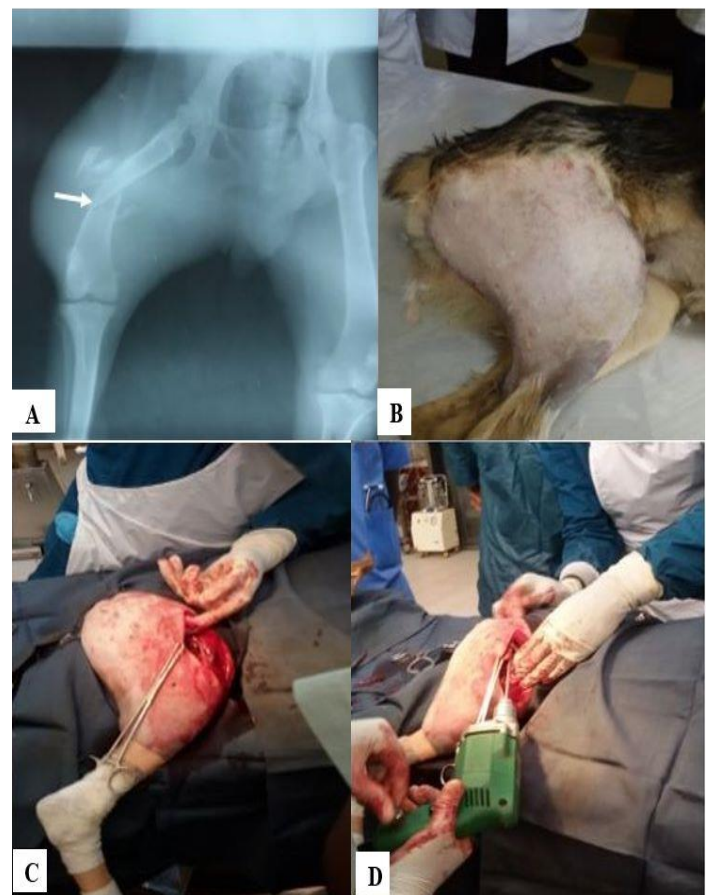
The management procedure carried was open reduction of the fracture with internal fixation. The hair on the right-lateral femoral area wash shaved, cleaned and disinfected (Figure IB). Thereafter, the dog was administered atropine sulphate and anaesthesia was induced using thiopental sodium. Surgical incision was made on the skin using surgical blade, followed by separation of the muscles using scissors and exposure of the fractured femur (Figure IC). The fracture was reduced and intramedullary (IM) pin was applied in a retrograde manner (Figure ID). The tissue retractor was used to further expose the surgical site before a cerclage wire was applied to hold the fracture (Figures IIA & B).

The muscles were apposed using absorbable suture material size 2-0 (chromic cat gut), (Anhui Kangnin Co. China) likewise the subcutaneous tissue. The skin was later closed

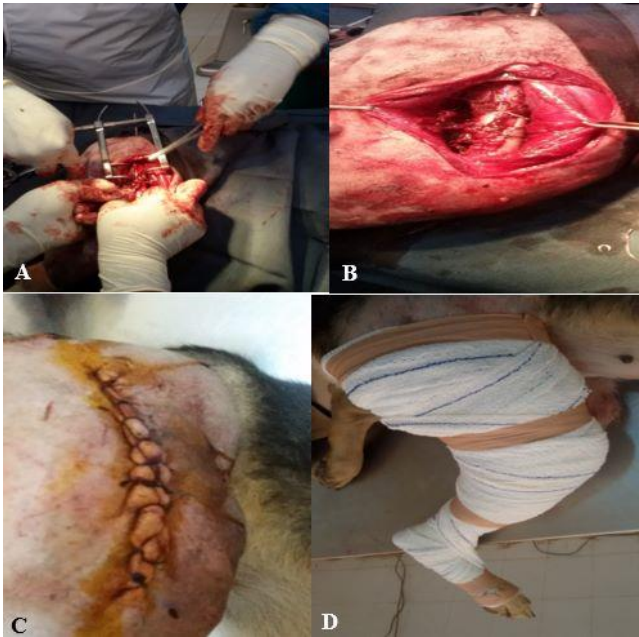
using Nylon size 2-0 (Anhui Kangnin Co. China), (Figure IIC) and bandage was applied (Figure IID).

### POST-OPERATIVE CARE AND RECOMMENDATIONS

The dog was administered Ceftriaxone sodium (Anhui Chengshi Pharmaceutical Co China) at 2 mg/kg (Total dose of 90 mg) I.M 5/7, Diclofenac at 2.5 mg/kg (Shanxi Zhongboa Shuguaing Pharmaceutical, China), (Total dose of 142.5 mg) I.M. 3/7, and Povidine Iodine (Silverline Chemicals India) was applied on the surgical before bandaging. In addition, the client was advised to isolate the dog until recovery, report any abnormality noticed, and re-present the patient in 4 weeks for radiographic evaluation of the fracture.



**Figure I.** Oblique diaphyseal fracture of the right femur (arrow) (A); shaved and scrubbed surgical site (B); surgical incision into the fractured femur (C); application of intramedullary pin (IM) in a retrograde manner (D).



**Figure II.** Application of cerclage wire (A & B); closure of the surgical site (C); application of bandage after surgery (D)

## DISCUSSION

Femoral fractures in dogs are frequently encountered in clinical practice, and successful outcomes depend significantly on timely and appropriate intervention (Lovrić *et al.*, 2020; Pozzi *et al.*, 2021). The management of oblique fractures, particularly in high-energy breeds like German Shepherds, requires a solid surgical approach to counteract the forces acting on the fracture site during ambulation (Vardanega & Wilson, 2024). The surgical approach for diaphyseal femoral fractures, as demonstrated in this case, relies on precise mechanical alignment and stabilization to facilitate bone healing and restore function. Intramedullary (IM) pinning was used as a primary fixation method, based on its ability to provide axial stability along the length of the femur by occupying the medullary canal. This minimizes longitudinal displacement and helps maintain the correct bone position during healing.

The use of intramedullary pins is widely adopted due to the minimal invasiveness and strong axial support they provide. However, IM pins alone may not adequately address rotational and shear forces, especially in oblique fractures (Scott *et al.*, 2022; Webb, 2024). To counteract rotational and shear forces, especially critical in oblique fractures, cerclage wires were applied around the fracture site. These wires act by encircling the bone, compressing the fracture fragments, and providing additional stability against forces that could cause malalignment.

By using this combination of IM pinning and cerclage wiring, the approach capitalized on the strengths of both techniques – axial support from the pin and circumferential compression from the wire – creating a solid fixation that optimizes conditions for bone regeneration and minimizes the risk of complications such as malunion or implant failure. (Aithal *et al.*, 2023; Bleakley, 2024).

Post-operative care is critical in ensuring the success of surgical interventions for fractures, particularly those requiring internal fixation like IM pinning and cerclage wiring. In the present case, the dog received antibiotic therapy and anti-inflammatory medication to prevent infection at the surgical site and to manage pain, both of which are crucial for promoting initial healing. The regular application of antiseptic solution and re-bandaging were also recommended to maintain wound hygiene and to support the surgical site during the early recovery period. These measures would help to minimize post-operative complications, such as infection or inflammation, which could compromise the surgical outcome (Rosselló *et al.*, 2022). In addition, restricted movement was advised to protect the repaired fracture from stress that could displace the pins or wires, allowing for a controlled healing environment (Bleakley, 2024).

The education of the client played an essential role in this case to ensure adherence to the prescribed post-operative care routine, as client compliance would significantly impact recovery (Filliquist *et al.*, 2022). The client was advised to isolate the dog from high-impact activities and limit its movement to prevent any premature stress on the fracture site. Instructions were also given to monitor for any signs of infection or distress, as early identification and intervention in response to such signs prevent further complications (Rosselló *et al.*, 2022). A follow-up radiograph was recommended four weeks post-surgery to assess the bone healing process and confirm the stability of the fixation. Through the empowerment of client with knowledge on post-operative care requirements and potential signs of complications, the likelihood of a successful recovery increases, thus, supporting long-term functional restoration and mobility for the dog.

## CONCLUSION

The successful outcome in this case reflects the efficacy of the combination of IM pinning with cerclage wiring for the management of diaphyseal femoral fractures. This approach is recommended for veterinarians dealing with similar cases, as it provides a balance between structural integrity in invasive techniques. Also, there is need for further studies that compare this method with alternative fixation techniques to provide deeper insights into optimizing fracture management in canines.

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