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Successful surgical management of femur fracture in dog using external skeletal fixator

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Abstract
The ten-month-old, 28 kg female Great Dane dog was brought to the Orthopaedic Unit at Madras Veterinary College with a history of non-weight-bearing lameness in the right hind limb following an automobile trauma. Radiography confirmed a comminuted femur fracture, which was then stabilized using Type 1 external skeletal fixator (ESF) with tie-in configuration. The animal exhibited an uneventful recovery thereafter.

Keywords: Femur fracture, external skeletal fixator, dog

Introduction
Fractures of the dog's femur commonly result from motor vehicle accidents, constituting over 40% of long bone fractures (Piermattei and Decamp, 2006) [5]. Various treatment options have been reported for femoral fractures, such as intramedullary pins combined with cerclage wires, bone plates, interlocking nails, combinations of tie-in intramedullary pins and external fixators, plate rod combination, hybrid external fixators combining linear and circular elements, as well as the use of acrylic external fixators independently (Farese *et al*., 2002) [1]. Due to the hindrance posed by thigh muscles, closed reduction is challenging in femoral fractures (Kraus *et al*., 2003) [3].

Case study
A ten months old, 28 kgs female Grate Dane dog was presented to Madras Veterinary College Orthopaedic Unit with the history of non weight bearing lameness in right hind limb following an automobile trauma. Upon general examination, the animal appeared bright, alert, and responsive, with vital signs within normal ranges. Physical examination revealed diffuse swelling and crepitus in the thigh region, raising suspicion of a femur fracture. Radiographic imaging confirmed the diagnosis, revealing a comminuted femur fracture on both lateral and cranio-caudal views. Blood samples were collected for haemato-biochemical analysis, which returned within normal parameters.

The animal was planned for surgery, to stabilize the fracture fragments in biological osteosynthesis using Type 1 external skeletal fixator with a tie in configuration. Fasting protocols were adhered, the animal was premedicated with Inj. Butorphanol @ 0.2 mg/kg i/v and Diazepam @ 0.25 mg/kg i/v, anaesthesia was induced with Inj. Propofol @ 4 mg/kg i/v and maintained with 1.5% Isoflurane in 100% oxygen. Pre-operative antibiotics, Amoxicillin-cloxacillin at 12 mg/kg, and analgesic Meloxicam at 0.2 mg/kg were administered intravenously. The surgical site was prepared aseptically, animal was placed in lateral recumbancy with the right limb on dorsal side.

Femur was approached via cranio-lateral skin incision, followed by incision on fascia lata and then retracton of vastus lateralis cranially and biceps femoris muscle caudally. To achieve axial alignment, a 3.5 mm diameter Steinmann pin was inserted into the medullary cavity of both the proximal and distal fragments in a normograde manner. Subsequently, two 3 mm diameter end-threaded positive profile half pins were inserted bicortically into both the proximal and distal fragments in a diverging fashion.

All these positive profile pins were then connected to a connecting rod using Kirschner clamps, and the proximal aspect of the intramedullary pin was connected to this connecting rod in a tie-in manner (Fig:1).

Fig 1: External skeletal fixator with tie -in configuration

Fascia lata was apposed using PGA 1-0 followed by subcutaneous tissue in a continuous manner and skin in cruciate pattern using 2-0 polyamide. The animal was advised, Elizabethan collar round the clock oral Amoxicillin-clavulanic acid at 12 mg/kg twice daily for 5 days, along with Meloxicam at 0.2 mg/kg for 3 days. The pin tract skin interface was cleaned using nanosil spray every alternate day and ex-fix was secured using bandage. The sutures were removed on 12th post-operative day. Grade 3 lameness was noted until 15 days after that followed by a reduction to grade 1 lameness. By 45 days radiography, bridging callus was noticed with satisfactory weight bearing on that limb. The ex-fix was removed after 4 months of fixation.

Discussion

The primary focus of fracture treatment should be on restoring the bone's original anatomical shape, improving the functionality of injured soft tissues, and promoting the animal's mobility for walking. Complete pins cannot be utilized proximally due to the nearby abdominal wall, necessitating the use of half pin setups in external skeletal fixation (ESF) for femoral fracture management (Kraus *et al*., 2003) [3]. However, half pin configurations alone do not offer sufficient stabilization. Therefore, they are typically combined with an intramedullary pin to ensure proper axial alignment and resistance against bending which in correspondence with (Ozak *et al*., 2009) [4]. External skeletal fixation (ESF) is associated with certain complications, such as infections in the pin tracts, fixator failures, and possible impingement or injury to the muscle or neurovascular tissues and serous discharge and inflammation at pin skin interface which were not noted in this case (Gemmill *et al*., 2004) [2].

Conclusion

The effective utilization of Type 1 external skeletal fixation with tie-in configuration stabilized the comminuted femur fracture in the ten-month-old female Great Dane dog, resulting in successful restoration of limb function and alleviation of the animal's discomfort following the traumatic injury.

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