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Surgical management of metacarpal fracture with dowel pinning in a dog

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The prognosis for metacarpal and metatarsal fractures is generally good, provided that there is proper reduction, alignment, and fixation (Probst and Millis, 2003). These fractures can be treated either conservatively or surgically; surgical treatment through internal fixation is recommended for certain cases where more than two bones are fractured, open fractures, or where there is significant displacement (Muir and Norris, 1997; Probst and Millis, 2003; Piermattei *et al*., 2006). The dowelling technique, also known as dowel pinning, is used for intramedullary fixation of metacarpal and metatarsal fractures in cats and toy breed dogs (Zahn *et al*., 2007; Degasperi *et al*., 2007). The primary objective of this study was to evaluate the dowel pinning technique for repair of metacarpal fractures in a dog.

A one-year-old male Mudhol hound weighing 20 kg was brought to the Jijai Animal Clinic and Surgical Centre in Mumbai after jumping from a window. Upon examination, the dog showed swelling and was unable to bear weight on its right forelimb. Pain was evident upon palpation during the physical examination. Physiological and haemato-biochemical parameters were found within normal range. Radiographic examination revealed fractures in the distal third of metacarpals II, III, IV, and V (Fig. 1). The internal diameter of fractured metacarpals ranged 2.9-4.6 mm. It was decided to treat the fractures by surgical fixation.

The dog was fasted and water withheld for 8 hr prior to the procedure. The animal was premedicated with butorphanol (0.2 mg/kg body wt, i.v.), followed by dexmedetomidine (0.03 mg/kg body wt, i.v.). Anaesthesia was induced using a combination of ketamine (2 mg/kg) and midazolam (0.2 mg/kg) in a 1:4 ratio, administered intravenously till effect. Once anaesthesia was induced, endotracheal intubation was done using a No. 6 cuffed endotracheal tube. Anaesthesia was maintained with 1-3% isoflurane, while continuous rate infusion of fentanyl (5-20 mcg/kg/hr) was used to manage intraoperative pain.

The surgical site was prepared aseptically by clipping the hair, scrubbing with betadine surgical scrub solution and draping the site. A dorsal skin incision was made between the surfaces of the metacarpals, followed by dissection of subcutaneous tissues to expose the common digital veins. The extensor tendons were then elevated and retracted both medially and laterally to provide visibility. The fractured bones were stabilized using retrograde IM pinning with 1.5 mm K-wires. The pin was first inserted into the distal fragment through the fracture site and advanced distally to penetrate the dorsal aspect of the bone's head. The tip of the K-wire was manipulated until it disappeared into the medullary

Fig. 1: Pre-operative radiograph of right paw showing distal third fractures of II, III, IV and V metacarpals.

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Fig. 2: Postoperative radiograph of right paw showing fracture fixation with Dowel pinning.

canal. Once the fragments were aligned, the blunt end of the K-wire was inserted into the proximal fragment, and the distal end of the pin was shortened. These steps were repeated for the other fractured bones as well. Surgical wound was closed routinely by using absorbable suture material (PDS 2-0; Pdsynth, 2-0). Finally, Robert Jones bandage was applied at the fracture site.

Postoperatively the radiographs of the paw were taken to assess the fracture reduction and the position of the implant (Fig. 2). Tab. Toxomox 250 mg (Virbac®) was administered twice daily for 7 days and tab. Carodyl 75 mg (Savavet®) for 3 days. Additionally, a calcium and vitamin D supplement (syrup Intacal Max) was administered PO 10 mL twice daily. The animal was kept in a cage to restrict the activity and an e-collar applied for 10 days. The surgical wound was dressed (Nanosil spray and ointment Staphben) and bandage changed daily. The skin sutures were removed 10 days after surgery. The bandage support was left in place for two weeks.

To conclude, dowel pinning technique was found to be effective for internal fixation of metacarpal fractures in the dog. However, additional external support was also provided to reduce the risk of fixation failure. The improved fixation stability could be achieved by interdigitating the fracture ends, and extending the pin to the longer length of the medullary canal, and by providing external support for three weeks (Piermattei *et al*., 2006; Zahn *et al.*, 2007).

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