

POLY METHYL METHACRYLATE (PMMA) BONE PLATES FOR THE MANAGEMENT OF RADIAL FRACTURES IN TWO DOGS

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The study was conducted in two clinical cases of radial diaphyseal fracture in dogs presented for treatment. Plates made of polymethyl methacrylate (PMMA) were used for bone plating in buttress mode. Clinical and radiological evaluations were made preoperatively and post operatively at two week interval up to the eighth week of surgery. Primary healing was achieved in both the cases.

Keywords: Polymethyl methacrylate (PMMA), Fracture, Internal fixation.

Polymethyl methacrylate (PMMA) is a non metallic acrylic polymer, used for preparation of orthopaedics implants (Mahendra *et al.*, 2006). The PMMA implant is radiolucent, non-carcinogenic, strong and biocompatible. Moreover, unlike most other implants, it does not interfere with computed tomography or magnetic resonance imaging studies (Bandyopadhyay *et al.*, 2005). The present study was conducted with the aim of evaluating the efficacy of acrylic bone plate for the treatment of radial fractures in dogs.

Materials and Methods

Two dogs were presented to the Surgery Units of Veterinary College Hospital, Mannuthy, with history of lameness of the right fore limb.

Case No. 1, was a six month old, female, Spitz puppy weighing six kilograms, which had injured its limb one and a half months back in an automobile accident. A plaster of Paris cast was applied then, which had come off the previous day. The functional limb usage at the time of presentation was 10 (unable to place foot on ground) as per the scale of grading lameness.

Case No. 2, was a one and a half year old female Spitz, weighing eight kilogram, which fractured its limb three and a half weeks back

due to a dog bite. The open wounds had healed when presented. The functional limb usage was 10.

Pre operative radiograph of case no.1 revealed simple, complete, transverse radius ulna fracture with signs of malunion. In case no. 2 it was a compound, complete, short oblique fracture of radius ulna. After detailed clinical and radiographic examination, open reduction followed by internal fixation and stabilization of fracture fragments by plate osteosynthesis was recommended. A fracture plan was made in each case to prepare appropriate mould and to fabricate PMMA bone plate of desired dimensions. The approximate size, length and number of screws required were also judged from the fracture plan. Plates were fabricated using DPI-RR Cold Cure, dental grade acrylic. A mould of the required length, width and thickness were first made with a sheet of aluminium. PMMA powder polymer and liquid monomer were mixed in the ratio (2:1) to form a gel. The mixture was poured into the mould and allowed to polymerize and cool to room temperature. The plate was removed from the mould and the required numbers of holes were drilled at one centimetre apart one centimetre apart into it using a 3.5 mm size drill bit. A five and a four holed plates were made for cases no. 1 and 2 respectively.

On the day of surgery, the patients were prepared for aseptic surgery. In both cases the right fore limb was clipped, shaved and scrubbed well above the elbow to below the knee region. Craniomedial approach to the fracture site was chosen. Povidone iodine solution was painted at the surgical site in a centripetal manner starting from the incision site of surgery to the periphery. The dogs were premedicated with atropine sulphate at the dose rate of 0.045mg/kg body weight given intramuscularly, followed by xylazine hydrochloride administered at the dose rate of 2.0 mg/kg body weight intramuscularly.

Anaesthesia was induced by intramuscular administration of ketamine hydrochloride at the dose rate of 5.0 mg/kg body weight. Maintenance of anaesthesia was done by intravenous administration of a mixture of equal volumes of xylazine and ketamine in small increments of 0.2 ml to effect, followed by intravenous administration of diazepam at the dose rate of 0.2 mg/kg body weight. Plate osteosynthesis with acrylic plates were performed in a buttress plating fashion. Clinical and radiological evaluations were made post operatively on the 2nd, 4th, 6th and 8th weeks.



After 48 Days

Results and Discussion

The radiographs immediate post operative taken in both the cases revealed

adequate reduction and alignment of fractured ends. The PMMA plates were not visible radiographically, since they were radiolucent

they were. Primary healing was achieved in Case No. 1. When fracture was accurately reduced and rigidly fixed, healing progressed without significant periosteal callus formation as also reported by Brinker *et al.*, 1984 and Devnani, 2001. Slight callus formation was seen in Case No. 2 on the 2nd post operative week with increased fracture gap in the 4th week followed by gradual reduction of fracture gaps suggesting normal bone healing (Kumar *et al.* 2007).

The weight bearing on the fractured limb improved gradually to full weight bearing on the limbs by the 6th week postoperatively. Functional limb usage in Case No.s 1 and 2 improved to 0 (sound) as observed on the 8th post operative week.

Minimal callus development from each fragment met and fused to form a union between the fracture fragments. No systemic or local reaction near the fracture site was found which indicated that the material was highly biocompatible.

The study showed that the use of acrylic plate was technically feasible and clinically successful for plate osteosynthesis of radial fractures in dogs. It proved ideal in light weight breeds and pups with body weight less than 15 kilograms.

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