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# Comparative evaluation of dynamic compression plate and horn plate for the repair of long bone fractures in dogs

N THAKUR[1], K SINGH[2], J MOHINDROO[3] and A GOPINATHAN[4]

*Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab 141004 India*

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ABSTRACT

The present study was conducted on 19 clinical cases of dogs with long bone transverse fractures to compare the clinical and radiographic healing with the use of dynamic compression plate and horn plate. The animals were divided into 2 groups. In group A (12), long bone fractures were stabilized using dynamic compression plate. In group B (7), long bone fracture were stabilized using horn plates, prepared from horns collected from cadaver of cattle. Both the techniques provided satisfactory fractures reduction and effective stability, except in 1 case of horn plate, in which horn plate developed tear and led to implant failure. Return to normal weight bearing was comparable in both the groups. Horn plates could be cheap alternative to dynamic compression plates, but not superior to them.

**Key words**: Bone fractures, Dynamic compression plate, Horn plate

Fracture of long bone is a common orthopaedic condition encountered in dogs. Several workers (Sardinas and Montavon 1997, Ramani *et al.* 2002, Bolt and Burba 2003) have recommended the use of stainless steel bone plates for fracture repair. The use of rigid internal fixation is disfavored because of resultant osteopenia, underneath the bone plate (Tonino *et al.* 1976). Use of these implants in young growing dogs can lead to high incidence of pin migration, delayed or non union and osteoporosis. To overcome these drawbacks of rigid fixation, semi-rigid fixation of fractured fragments was advocated for rapid bony union (Mckibbin 1978). Horn plate were used successfully in experimental and clinical cases of fracture repair in both large and small animals (Gahlot *et al.* 1991, Pattanaik *et al.* 1996, Aithal *et al.* 1998). Horn plates prepared out of bovine horn have come up as a reliable and cheap alternative to conventional bone plating (Kumar 2003). The main advantages of bovine horn plate are inert, non-immunogenic, semi-rigid, radio-lucent, lightweight and sufficiently strong (Kumar 2003). The present study was therefore designed to compare the efficiency of horn plate (semi-rigid) and dynamic compression plates (rigid) fixation for the repair of long bone fracture in canines.

Present address: [1]Rural Veterinary Officer (nipun2008.vet @gmail.com), CVH, Ramgarh, Hoshiarpur,Punjab, India.

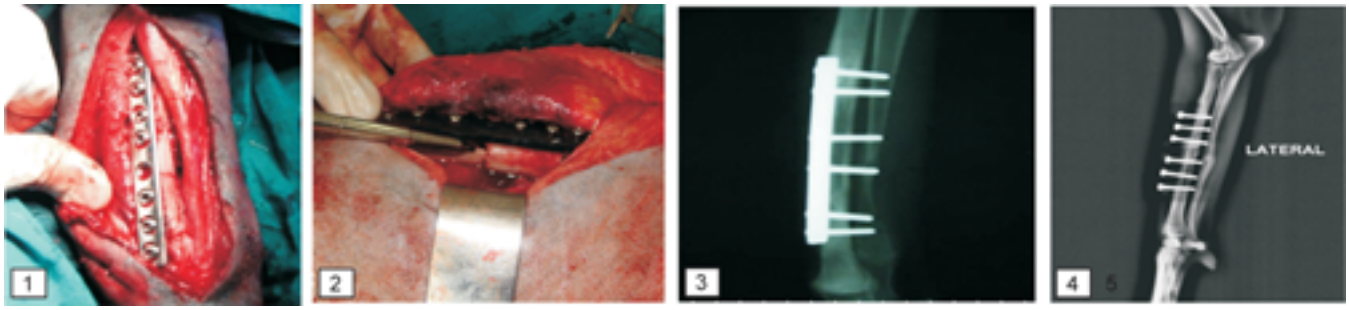
[2]Assistant Scientist, (ksuppli@yahoomail.co.in); [3]Associate Professor (jmohindroo@yahoo.co.in) Department of Surgery and Radiology.

[4]Scientist (aswathykiran77@gmail.com), Division of Surgery, IVRI, Izatnagar, Bareilly Uttar Pradesh 243122.

## MATERIALS AND METHODS

The study was conducted on 19 clinical cases of dogs with fractures of radius-ulna, femur and tibia which were presented at the Small Animal Clinics, College of Veterinary Sciences, Guru Angad Dev Veterinary and Animal Science University, Ludhiana during April 2009 to March 2010. The dogs with these long bone fractures were randomly divided into groups A and B. In group A, standard commercially available dynamic compression plates of appropriate length and size and corresponding cortical screws were utilized to immobilize the fracture fragments (Fig. 1) whereas in group B (Fig.2), specially designed plates prepared from cattle horn were used. For this purpose, cattle horn collected from the cadavers were bisected longitudinally with the help of heck saw and the horn core was separated from the cornual process. The upper two-third thick and solid horn was used for the preparation of the plates. The horn plates of desired sizes and shape (decided after taking the lateral radiograph of the affected bone before surgery) were prepared using a bench grinder (Singh 1986). Five to six screw holes at appropriate distance from each other were drilled with a bone drill. The plates so prepared were sterilized in autoclave along with the surgical pack, just before the surgery.

The bones were exposed through standard approaches (Piermattei and Johnson 2004). After exposing the bone, both proximal and distal fragments were reduced to their near normal anatomical position and along with plate, these were




Figs. 1–4. **1.** Operative procedure for dynamic compression plating (group A). **2.** Operative procedure for horn plates (group B). **3.** A post operative radiograph on complete healing. **4.** Post operative radiograph before implant removal.

secured using plate holding forceps. The holes were drilled using corresponding drill bit. Simultaneously, sterile normal saline solution (0.9%) was poured while drilling the hole to avoid the thermal injuries to the bone. Bone tapping was done using corresponding tap and screws were fixed using appropriate size hexagonal screw driver. Thorough lavaging of operative site was done with sterile normal saline solution (0.9%) to clear debris, if any. Once the fracture fixation was done the wound was closed in standard manner.

Animals were monitored at different intervals for surgical wound healing, weight bearing and fracture healing. Radiographs were taken pre-operatively and post-operatively at different intervals when animals were presented for follow ups to see the radiographic union.

## RESULTS AND DISCUSSION

In intraoperative observations the soft tissue damage was moderate in all the cases of radius ulna and tibia fractures, but in femur fractures the soft tissue damage was extensive as heavy musculature was present there. Slight difficulty was observed in application of horn plates as these have tendency to develop cracks while doing bone tapping, otherwise there was no technical difficulty in application of the horn plates. Clinically all the animals showed more or less similar observations, post-operatively. Inflammatory swelling was observed for 2–5 post-operative days in all the animals. Immediate weight bearing was seen in majority of the cases, though slight lameness was there in initial post-operative days. In one case of dynamic compression plating and in 1 case repaired with horn plating, there was no weight bearing because of wound dehiscence. Wounds of these animals were treated with antiseptic dressing on every alternate day till the healing. After healing of the wound animals, started bearing weight on the operated limb. The immediate weight bearing in majority of cases indicated that both the techniques provided sufficiently rigid fixation for respective fracture repair. Plates were removed in both groups after complete healing of the fracture, except in 1 case of group B. Owner of this animal was not interested in getting the plate removed.

Immediate post-operative radiographs revealed satisfactory reduction, alignment and immobilization in all the cases of all the animals of both the groups. However in 1 case of femur fracture of group B, on 15$^{th}$ post operative day radiograph, the fracture fragments were found to be displaced. On plapation, crepitation was found at the fracture site. Animal was reoperated and it was found that horn plate developed tear at its centre. This may be result of unrestricted movement of the animal due to negligence of the owner. The fracture was again repaired by intramedullary pin. In rest of the cases, satisfactory and complete healing of fracture was obtained. Good alignment and reduction of fractures was evident from radiographs taken immediately, after complete healing and implant removal in both the groups (Figs 3, 4). It indicated that fracture repair technique was satisfactory and it worked equally well with both types of plates. The findings indicated that dynamic compression plating provided rigid fixation and good fracture healing (Tayton and Bradley 1983). Also, that horn plates were radiolucent and provided better evaluation of the fracture site (Fig. 4) (Singh and Singh 1990, Kumar 2003). Several studies showed that horn plates prepared from bovine horn are inert, biocompatible and provided stable fracture fixation both in small and large animals (Singh 1986,Singh 1988, Dubey *et al.* 1999, Pattanaik *et al.* 1996, Aithal and Singh 1998, Kumar 2003). Unlike stainless steel plates, bovine horn is easily available and economical semi-rigid implant for fracture repair.

From our results it could be concluded that both dynamic compression plating and horn plating were almost equally effective for the repair of transverse long bone fracture in canines. So, horn plates can be considered as a cheap substitute to metallic plates for fracture repair in dogs.

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