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Application of Camel Metacarpal Bone as Bony Shuttle Pin Splint for Femoral Fractures in Small Animals

[1]H.M.F. Haitham, [2]Amel, O. Bakhiet and [2]S.M. Hamza
[1]Department of Surgery and Gynaecology, College of Veterinary Science,
University of Bahr El Ghazal, P.O. Box 10739 Khartoum-Sudan,
[2]Department of Clinical Studies, College of Veterinary Medicine and Animal Production,
Sudan University of Science and Technology

Abstract: Bony shuttle pin splints were obtained from slaughtered camel metacarpal bone and used successfully for repair of induced femoral fractures in small animals. Clinical and radiographic follow-up of these cases showed that this type of splints is effective for immobilization of the femoral fractures. Good alignment and healing were seen by radiological examination. There is no side effect due to application of these splints.

Key words: Fractures, camel metacarpal bone, pin splints, femoral fractures, alignment, immobilzation

INTRODUCTION

The incidence of the femoral fractures in dogs is about 80% and commonly occurs in the diaphysis of the femur as simple, transverse and oblique fractures[1]. These fractures are treated by internal splints mostly intramedullary pin splints and some of them with bone splints. Intramedullary (IM) fixation, with all of its attendant problems, is the most readily used system of internal fixation in small animals[2-5]. The devices used in veterinary medicine include only the Steinmann pin, Kirschner wire, Rush pin and Kuntscher nail[6].

Intramedullary Steinmann pins are the device traditionally used for diaphyseal fractures.

Two major potential complications to the use of IM fixation; are rotational instability and fracture shortening. Moreover, resultant motion at the fracture site predisposes to pin migration and may ultimately lead to non-union or mal-union. Additionally, should the migrating pin penetrate the skin, the fracture site may become infected, thereby introducing the serious complication of osteomyelitis.

These techniques need special surgical instruments, pins, plates, screw, pin chuck and pin cutters which are costly and most of these splints need second operation for removal of the splint.

Permanent shuttle pin is easy to apply and efficient for proper alignment and immobilization[7].

In this study bony shuttle permanent intramedullary pin splints (camel metacarpal bone) were used instead of the metallic pins. It is aimed to find out the possibility of immobilization and fixation of the femoral fracture segments and to reduce the cost of the devices and second operation for removal of the splint.

MATERIALS AND METHODS

Animals: Five local breed dogs, 10-20 kg body weight were used. All animals were examined clinically and kept for two weeks in cages (1/1/1 M in size) in the Veterinary Teaching Hospital, College of Veterinary Medicine and Animal Production, Sudan University of Science and Technology.

Splints (Bony shuttle pins): Round pins were made from metacarpal bone of healthy and fresh slaughtered camel. The bones were cleaned properly and cut with an electric saw. The materials were prepared into proper width slats, then with an electric grindstone.

Different sizes of pins were made with notch in one of its ends (Fig. 1). The bony shuttle pins were wrapped in papers and autoclaved for 30 min at 121°C. Pins of different lengths and diameters were sterilized and some of these splints re-sterilized many times and kept in a closed surgical drum ready to be used. Surgical approaches to the femur All aspects of the femoral shaft are relatively easy to expose surgically[8]. All require caudal retraction of the *biceps femoris* muscle and cranial retraction of the *vastus lateralis* muscle. As variations on this approach exist for special applications; part of the adductor muscle attached to the posterior part of the femur was separated to pass two long curved scissors

Corresponding Author: H.M.F. Haitham, Department of Surgery and Gynaecology, College of Veterinary Science, University of Bahr El Ghazal, P.O. Box 10739 Khartoum, Sudan

Fig. 1: Different sizes of bony pins

under the femur, one opposite to the other and kept open to protect the underlying structures from being injured during induction of diaphyseal partial fracture. This was started with agigli wire saw and then completed with a heavy tool to produce an uneven fracture.

After choosing the proper size and length of the bony pin reaming of the proximal and distal segments of the femur was performed.

Bony pin was hocked with no 1 nylon thread, held with an artery forceps and then introduced into the proximal segment to about a few millimetres of the bony pin appears out of the proximal segment, Then reduction and alignment of the fractured femur is done pin is pulled into distal segment to about half of its length estimated from the nylon thread which is hocked into the notch of the bony pin and signed with the artery forceps.

Procaine penicillin powder was sprayed on the fractured area, then the wound closed by simple continuous suture using absorbable suture (catgut no 2 0^{-1}), to approximate the fascialata and the skin was sutured with simple interrupted stitches using No 2 0^{-1} surgical silk.

Postoperative doses of Procaine penicillin were used intramuscularly for five days.

Immediate postoperative mobilization and weight bearing allowed as soon as it was tolerated by the operated animals.

Radiograph: Lateral view radiographs (50 Kv, 0.2 Sec) of the fractured area were made immediately after operation and then at (2, 4, 6 and 8) weeks.Then the healing and reaction to Splints monthly followed-up.

RESULTS

Clinical examinations and the follow up of the general condition of the operated animals were made to assess recovery and bone healing. Clinically there were no complications. The animals stood on the operated leg between 10 and 15 days after operation and walked on after 17-20 days without any complications.

After one month all animals started to run and jump. X-Ray taken immediately after operation confirmed the position of bony pin (Fig. 2).

Another X-Ray taken after 30 days (Fig. 3), showed the callus formation, which covered the distal and

Fig. 2: X-Ray immediately after operation

Fig. 3: X-Ray 30 days after operation

proximal segments. Progressive radiographic study indicated good callus formation and gradual resorption of the bony pin.

DISCUSSION

There are many external and internal splints which are used to immobilize fractures in small animal, but only internal splints are usually suitable for femoral fractures fixation, such as intramedullary pins and bone plates[9, 1].

The bony intramedullary pins as bovine bony shuttle pins have been used for immobilization of the mid-diaphyseal femoral fractures in dogs, but unfortunately they were not successful. Failure of that type of bony splint could be due to the strong muscular traction of the heavy muscle coating which makes the external splint not efficient[10]. Also it may possible because of the decalcification of the bony intramedullary pin at the fracture line as a result of the inflammatory reaction that decreases in the pH at this area.

According to the results of the present study this type of internal splint could be recommended for the fixation of diaphyseal femoral fractures in small animals. It is simple, easy applied, with minimal postoperative care and no need for another operation to remove them[11].

There are no side effects as those, associated with the use of the metallic devices. They also block the callus and new bone does not develop from the vascular cortical ends[12].

Cost of the bony shuttle intramedullary splint, its availability, its preparation and the simple sterilization methods should be taken into consideration.

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