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Research Paper

INTERNAL FIXATION OF LONG BONE FRACTURE IN BOVINE

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Eighteen cow calves weighing about 50-150 kg body weight were randomly divided into three groups, with six animals in each group. Fractures of metacarpal and metatarsal bone were immobilized with dynamic compression plates whereas; fractures of tibia were immobilized with interlocking nail and intramedullary pin. Bone plating of metacarpal and metatarsal took the maximum time of 80-85 minutes followed by 70-80 minutes for Interlocking nailing of tibia and 65-70 minutes for intramedullary pinning of tibia. Intramedullary pinning was found good for transverse fracture of tibia of young animals weighing 50-70 kg, while dynamic compression plating provides rigid fixation in transverse and comminuted fracture of metacarpal and metatarsal bone and the interlocking nailing effective method of internal fixation resulting in to early ambulation of limb with progressive fracture healing.

Keywords: Cow calves, Intramedullary pinning, Dynamic compression plating, Interlocking nailing

INTRODUCTION

Fractures in bovine are not as amenable to treatment as in small animals and moreover young animals are considered as better orthopedics patient. Veterinary Surgeons in developing countries have still not adapted well to the application of internal fixation techniques in large animals. However, if used according to the principle and with strict aseptic techniques, internal fixation along with some extra support of external immobilization provides much more satisfactory results than external fixation alone (Singh *et al*., 1999). The objective of the present study was to evaluate the efficacy of different techniques of internal fixation on long bone fractures (tibia-fibula, metacarpal and metatarsal bone) in 18 animals.

MATERIALS AND METHODS

Eighteen cow calves weighing about 50-150 kg

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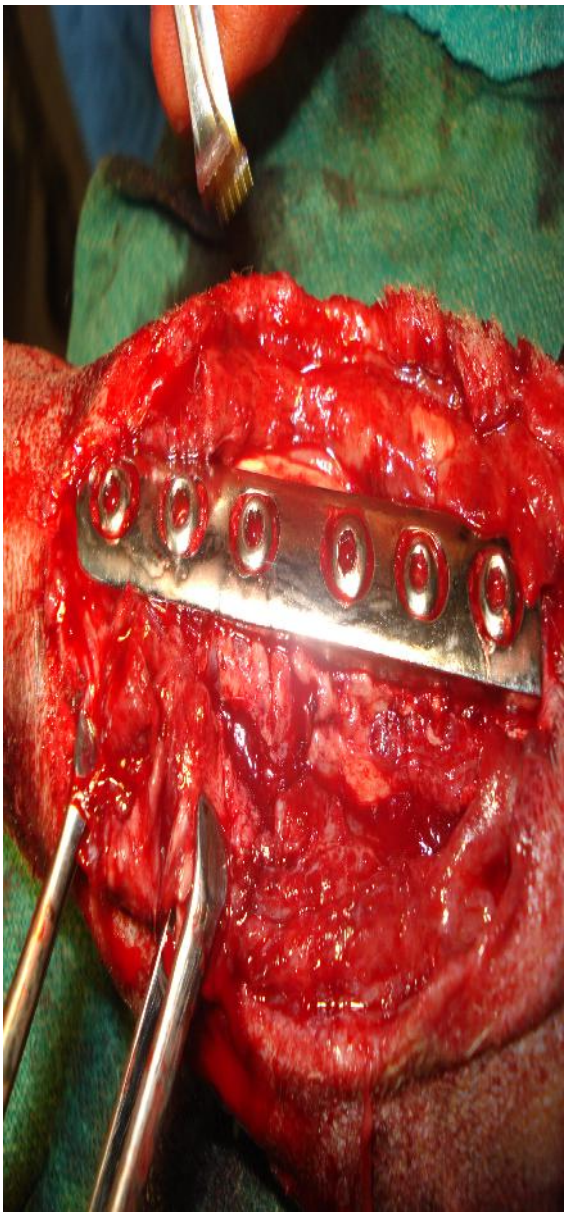
body weight, brought to TVCSC, Jabalpur for the treatment of fracture of long bones (tibia 5, metacarpal 2 and metatarsal 11) were included for the study. These calves were divided into three groups on the basis of type of fracture and bone, each group consisting of six animals. These calves were selected irrespective of their age, breed and sex. The complete physical examination of all the animals was carried out to ensure their physical status. History of each case was recorded and the radiographic examination was done to determine the type of procedure for internal fixation of fractured bone.

All the animals were fasted for 24 hours before the surgery and the fractured site was prepared for aseptic surgery. Sedation was done by using Xylazine hydrochloride @0.03 mg/kg body weight, intramuscularly 10 minutes prior to surgery followed by Intravenous regional anesthesia (IVRA) for fracture of fore limb and anterior epidural for fracture of hind limb by using 2% lignocaine hydrochloride. In five calves fracture were found in tibia-fibula bone, out of which multiple and oblique diaphyseal fractures of tibia were immobilized with interlocking nail in three cases whereas intramedullary pinning was performed in transverse diaphyseal tibial fracture of two animals, depending upon the suitability of internal fixation for such type of fracture.

Fractures of two metacarpal and eleven metatarsal bones were immobilized with dynamic compression plates. Oblique fractures were found in metacarpal bone of two calves whereas comminuted fractures were present in metatarsal bone of twelve calves. In all the metacarpal and metatarsal fracture, the fractured bone was reduced and suitable DCP were placed on dorsal, medial or lateral aspect as per the requirement of fracture fixation and screws were fixed after drilling and tapping of holes on both the cortices (Figure 1).

Figure 1: Fixation of DCP in Metatarsal Bone



In cases of fracture of tibia the bone was approached from the medial aspect and in two cases of tibial fracture, 7 mm diameter 22 cm long intramedullary pin were inserted in normograde manner with the help of Jacob pin chuck (Figure 2). While in three cases of tibial

Figure 2: Intramedullary Pinning in Tibia

Figure 3: ILN Fixation in Tibia

fracture interlocking nail (9, 10 and 10 mm respectively in three calves) were loaded in the zig (proximal and distal aiming device for large animal) and inserted in normograde manner. This was followed by drilling through drill sleeve, tapping and fixation of screw and locking bolt on the proximal and distal segments of bone (Figure 3). Postoperatively Streptopenicilline antibiotic @10 mg/kg body weight for 10 days and analgesic Meloxicaim @0.2 mg/kg body weight for 3 days was administered I/M in all the cases. Dressing of the wound was done by using Povidone iodine with metranidazole followed by bandaging. Skin sutures were removed by 10-12th postoperative day.

RESULTS AND DISCUSSION

Amongst the eighteen fractures the two metacarpal and eleven metatarsal fractures were immobilized by dynamic compression plating, while fractures of tibia bone were immobilized with interlocking nailing in three cases and intramedullary pinning in two cases.

Amongst the Internal fixation devices used for the management of long bone fractures in all the three groups, the bone plating of metacarpal and metatarsal took the maximum time of 80-85 minutes followed by 70-80 minutes for Interlocking nailing of tibia and 65-70 minutes for intramedullary pinning of tibia. Reduction and fixation of fractured fragment were good in all the animals.

Pinning proved to be easiest technique with least soft tissue manipulation during reduction of fracture fragments, relatively less expensive and provided satisfactory fixation of transverse diaphyseal fracture of tibia of animals having body weight up to 70-80 kg. However the rotational forces of fractured bone were the biggest problem and cannot be successful in animal having more than 100 kg b wt.

These findings indicate that intramedullary pin have several advantages in fracture treatment, including restoration of bony alignment and early recovery of weight-bearing in young, light weighted animals. These devices are intended to stabilize a fracture by acting as an internal splint, thus forming a composite structure of bone and pin, and both contribute to fracture stability. These findings were in agreement with Chawla *et al*. (1983) and Trostle *et al.* (1995) discussed that Intramedullary pin is a sound and

economical method of internal fixation and can be successfully used for repair of fractures of femur tibia and humerus in sheep, goat and young calves however success rate in bovine is depend on size and age of animals.

Fixation of metacarpal and metatarsal fracture with plates and screws provided effective stabilization of the bone ends, however the soft tissue manipulation was more and wound edges were opposed with great tension. The oval shape holes in dynamic compression plates with screws used for metacarpal and metatarsal fracture, supports the fractured bone, allows them to compress fracture fragment by passing some of the load, from the plate to bone fragments, control all the forces acting on the fracture site and preventing collapse at the fracture site.

Similar observation were also reported by Mclaughlin and Roush (1999) and Tee *et al*. (2005) applied bone plates in fracture of ulnar fracture in goat and metatarsal fracture in llama respectively and observed that the DCP has many advantages over conventional plating as they could be used near the bone ends and maintaining a normal limb length.

Interlocking nailing proved to be better technique for the multiple and oblique fracture of tibia bone in all the five animals. Rigid fixation and insertion were observed with the aid of proximal and distal aiming device or zig of large animal. However, the equipmentation was expensive but provide better fixation than any other intramedullary fixation techniques, because it could resist both bending force and rotational forces and provide stiffness. The use of both proximal and distal locking with screws helps in stabilizing fracture fragment, prevent axial displacement of the bone along the rod and provide enhanced compressive and torsional rigidity to immobilized long bone fractures. Present findings are in correlation with Raghunath and Singh (2003), Durall *et al.* (2004), Agrawal (2007) and Manjunatha *et al*. (2011), as they also used interlocking nails for various long bone fractures like humerus, femur and tibia in dogs and observed better fixation and early limb function.

The present study indicate that internal fixation with intramedullary pinning was found suitable for transverse fracture of tibia of young animals weighing 50-70 kg. Dynamic compression plating provides rigid fixation in oblique and comminuted diaphyseal fracture of metacarpal and metatarsal bone, whereas interlocking nailing were effective method of internal fixation for tibial fracture resulting in to early ambulation of limb with progressive fracture healing.

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