

Successful Management of Metatarsal Fracture in a Goat Using External Skeletal Fixation

Bini Joy^{1*}, Syam K Venugopal²

¹MVSc Student and Corresponding Author

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala, India, 680 651

²Associate Professor, Department of Veterinary Surgery and Radiology

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala, India, 680 651

Abstract: *The External skeletal fixation is one of the novel techniques used for fracture management in animals. It can be used in any type of fractures like open, closed, simple or comminuted with least invasiveness and it offers much stability to fracture by preventing the fracture forces. In this case a metatarsal fracture in a goat was successfully managed with bilateral external skeletal fixation.*

Keywords: Fracture, goats, external skeletal fixation, metatarsus, radiography.

1. Introduction

Fracture of long bones is one of the major common orthopaedic condition encountered in goats and other small ruminants. Frightened or weary goat can be got captured by the limb leading to serious fractures or dislocations. (Smith and Sherman, 2009). The curiosity and climbing instincts of goats fracture secondary to struggling, trauma from dog attacks are common causes of limb bone fractures in goats. External skeletal fixation can be used in small ruminants as a successful, economic, and alternative to internal fixation. It is an external coaptation technique used to stabilize bone fragments or joints with percutaneous wires or pins held together by an external frame. It will help to stabilize bone fragments or joints with percutaneous pins or wires held together by an external frame, otherwise method of treating skeletal injuries by attaching bone to an external device. On scanning the available literature, reports on the study of long bone fractures in goats using external skeletal fixation is absent.

2. Review of Literature

External skeletal fixation (ESF) works on biologic method of fracture repair, or bridging osteosynthesis, which disturbs the fracture minimally, thus turning the orthopedic surgeon into as much a gardener as a carpenter. (Harasen, 2002). It is composed of stainless steel pins placed percutaneously and attached to external clamps. (Canapp, 2004).

Krauss in 1998 advised the use of Esf in articular fractures, fractures located near joints, arthrodesis, and adjunctive support of tendon repair, comminuted, infected, and nonunion fractures, bone lengthening, as well as to correct angular and rotational deformities.

External skeletal Fixation (ESF) devices had been widely used for treatment of long bone fractures and limb lengthening procedures. ESF provided a sustainable and comfortable means of weight-bearing immediately after surgery, maintained normal joint mobility, and provided an optimal environment for osteosynthesis and wound healing

without need for an implant at the fracture site. (Singh *et al.*, 2007)

Denny and Butterworth (2000) stated the advantages of ESF like minimal instrumentations, minimal soft tissue damage during application, adaptability, staged load transferring capacity to the healing bone, suitability to use in open wounds, avoidance of implants at the fracture site, relatively cheap.

According to Hulse (2002) the most important considerations in managing infected / open contaminated bone were fracture stability and the presence of implants. Butterworth and Denny stated that infected open fractures were best managed using external skeletal fixator. (ESF).

Clinical union defined as sufficient bridging callus that allowed weight bearing without additional support to the limb and radiographic union defined as bone union with resolution of the fracture line (Singh *et al.*, 2007).

Aronsohn (2009) reported that the use of Unilateral Uniplanar External Skeletal Fixation for Isolated Diaphyseal Tibial Fractures in Skeletally Immature Dogs. Limb function, muscle mass, and comfort level remained very good to excellent throughout healing. Bony union was confirmed radiographically and the ESF removed by 4 weeks after surgery.

3. Materials and Methods (Case Description)

About three months old Attappadi –Malabari cross breed kid was presented to the Surgery unit of Veterinary Hospital in Mannuthy with lameness of right hindlimb. The strangulation of limb with rope was narrated by the owner. On examination oblique fracture of the midshaft of metatarsal was noticed. It was subjected to detailed clinical examination and fracture of long bone was confirmed by radiography. Surgical management was decided. Animal was fasted overnight. The site was surgically prepared after scrubbing with suphalon and painting tincture iodine over the site.

3.1 Anesthesia and Control

Induction of anesthesia was done with xylazine hydrochloride¹ at the rate of 0.02 mg/kg. Then the animal was given intravenously diazepam² to effect to maintain sedation.

3.2 Surgical Procedure

In this case the external skeletal fixator was applied by closed approach to the bone. The fracture was reduced to normal alignment and apposition by external manipulation. The pins were drilled percutaneously through the safe corridors of each bone using an orthopedic drill with less than 300rpm. In closed approach to the bone, fixation pins were introduced by hand through the soft tissue to the level of bone and then drilled. Pins were drilled from craniomedial to caudolateral aspect. Two 3 mm pins were inserted to both proximal and distal fragments, which were connected to two 3.5mm connecting bars on either side using stainless steel clamps. The most proximal and distal pins were full pins and pins closer to the fracture site were half pins. The most proximal and most distal pins were placed first. Then the clamps, corresponding in number to the number of pins to be used in the framework, were connected to the connecting bars. This frame was then applied to the bone by connecting the clamps at either end of connecting bar to the pins at either end of the bone already drilled. These clamps were tightened taking care that the fractured fragments were in correct alignment and apposition. Fracture stability was ensured.

3.3 Postoperative Care

The excess length of the pins projecting above from the stainless steel connecting bars were cut and removed. The tips of the pins were covered with cotton. The pin tracts were covered with cotton soaked in Tincture Benzoin. The suture line and pin entry points were covered with sterile cotton gauze pads and a bandage was applied with thick cotton padding.

¹Xylaxin, Indian Immunologicals Ltd, (20 mg/ml), Guntur District, Andhra Pradesh, 2 ml vial

²Calmpose, Ranbaxy laboratories Ltd, (5mg/ml), Mumbai, 2 ml ampoule

Postoperatively antibiotic was administered for five days with ceftriaxone sodium¹ at a rate of 20 mg/kg body weight intravenously on the day of surgery and by intramuscular route for the next four days. Owners were advised to restrict the movement of the animal for two weeks after surgery and then to allow on leash walking. Restricted activity for next two months was advised. Post operative evaluation was carried out on the second, fourth days and whenever possible and then at two weeks interval, up to six weeks or until healing was completed and implant was removed. Suture lines as well as pin entry points were cleaned at two weeks interval depending on the severity of discharge. In this case exudates were minimum and the bandage was intact. So they required least dressing. The implant was removed on the sixth week after surgery.

4. Results and Discussion

There was good apposition and alignment between the segments on immediate postoperative Xray. Implant positioning was satisfactory. At two weeks slight movement of fragments at the fracture site. Slight osteolysis at the fracture site noticed. Periosteal Callus formation started. At fourth week periosteal and endosteal callus formation bridging the fracture gap noticed. At sixth week Thick callus formation completely filling the fracture gap noticed. Implants were removed. At eighth week callus present and implant was removed. Osteolytic areas of pin tracts noticed on radiograph. The healing was evaluated by assessing also serum Calcium, Phosphorus and alkaline phosphatase. Decrease in serum calcium concentration from second week was noticed. There was a significant decrease in phosphorus concentration during the second and fourth week of observation and after that a slight increase noticed. There was a significant increase in alkaline phosphatase concentration during the second and fourth week of observation and after that a slight decrease noticed. Clinical union was noticed by sixth week and implant was removed after six weeks. Animal made uneventful recovery.

5. Conclusion

External skeletal fixation has wide application in the fracture management in animals. It can be successfully used in treating long bone like metatarsal. Routine clinical evaluation facilitated the proper timely healing. The healing period was about six weeks in this case.

6. Future Scope of Study

This technique of fracture management can be modified again considering economic aspect.

Reference

- [1] Canapp, O.S. 2004. External Fracture Fixation. *Clin. Tech. Small Anim. Practice* 19:114-119
- [2] Harasen, G. 2002. Biologic repair of fractures. *Can. Vet. J.* 43: 299-301
- [3] Kraus, H. K., Wotton, M.H. and Rand, M. W. 1998. Mechanical Comparison of Two External Fixator Clamp Designs. *Vet. Surg.* 27: 224-230
- [4] Hulse, D. A. 2002. Fundamentals of orthopaedic surgery and fracture management. In: Fossum, T.W. (ed.), *Small Animal Surgery*. (2nd Ed.). Mosby, St Louis, MO, USA. pp 826-827
- [5] Aronsohn, G.M. and Burk, R.L. 2009. Unilateral Uniplanar External Skeletal Fixation for Isolated Diaphyseal Tibial Fractures in Skeletally Immature Dogs. *Vet. Surg.* 38:654-658
- [6] Denny, H. R. and Butterworth, S.J. 2000. A Guide to Canine and Feline Orthopaedic Surgery. (4th Ed.). Blackwell Science Ltd, Oxford, 629p
- [7] Singh, R.G., Aithal, H.P., Amarpal, and Kinjavdekar, P. 2007. Evaluation of Two Dynamic Axial Fixators for Large Ruminants. *Vet. Surg.* 36:88-97

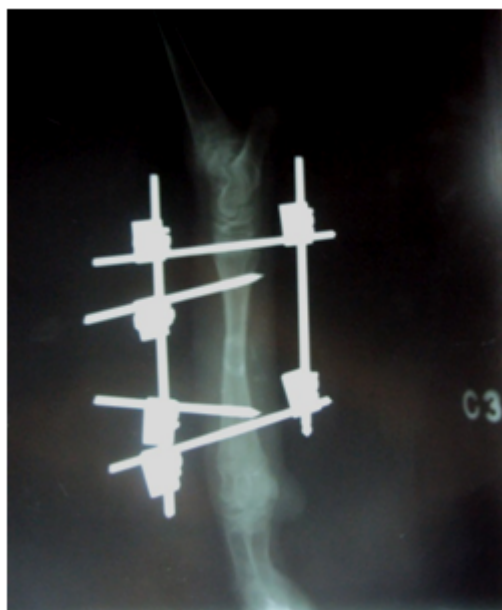
[8] Smith, C.M. and Sherman,D.M. 2009. Goat Medicine (2nd Ed.). Wiley-Blackwell, p 870



Preoperative radiograph



6 Weeks later- after pin removal



Immediate Postoperative radiograph



After implant removal