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Case Report

Evaluation of bilateral tibial fracture management by external and internal fixation technique in a calf

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A B S T R A C T

Unilateral diaphyseal tibial fractures are very common in different species of animals but the occurrence and repair of bilateral diaphyseal tibial fractures are very rare. The aim of the present study is to evaluate the efficacy of bilateral tibial fracture management in a calf. The study was performed in a 75 days old cross-bred calf weighing 42 kgs which was suffering from bilateral tibial fracture and treated by external coaptation technique on left tibia and internal fixation by retrograde intramedullary pinning on the right tibia. The patient was evaluated after treatment at different intervals by recording the lameness grade, functional limb outcome, fracture healing. Satisfactory posture (weight bearing), gait and secondary bone healing in both left and right tibia were noticed up to 93 day of post-treatment with the minor complications of swelling and stiffness of the right hock joint and hyperextension of fetlock joint of left hind limb. This technique can be used in bilateral tibial fracture management in calf in field condition with reasonable cost.

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1. INTRODUCTION

A fracture is the termination of bony continuity with or without dislocation of the fragments which is characterized by soft tissue damage of varying degrees, torn blood vessels, bruised. In addition to the effects of fracture, sometimes there are damaged internal organs and lacerated skin. This comprises a high incidence of fracture in the tibia (27.3%) in bovines (Adams and Fessler, 1983, Anderson and St Jean, 2008). Trauma is the most frequent cause of fracture (Gahlot, 2000, Mahajan et al., 2015). A tibial fracture occurs while grazing in the pasture or during the transportation of cattle (Verchooten et al., 1972). The treatment of fracture in a food animal is made by considering the cost of the treatment and the success rate of the treatment, the potential economic or genetic value of the animal, and the location and type of fracture. Each owner elects low-cost treatment for fractures with a high success rate (Anderson and St. Jean, 2008). However, in most of the cases, external cooptation in the form of the cast is commonly used as the sole method for long bone fracture treatment in cattle (Wilson and Rexvanderbax, 1995) as well as the primary treatment option for distal limb fracture in cattle as the non-surgical method (Vogel and Enderson, 2014). Tibial fractures in cattle have been reported to heal satisfactorily with stall confinement and or a modified Thomas splint or cast (Adams and Fessler, 1983, Adams, 1985). Tibial fractures more often require surgical repair, as they may not be sufficiently stabilized by cast immobilization (Anderson and

St Jean, 1996, Martens et al., 1998, Mulon, 2013). The present case study describes the outcome of the bilateral tibial fracture management in a calf which is suitable for field condition in Bangladesh.

2. CASE HISTORY AND OBSERVATION

The study was conducted at Surgery Unit, SA Quadery Teaching Veterinary Hospital (SAQTVH) at Chittagong Veterinary and Animal Sciences University (CVASU), Chittagong. A 75 days old male cross-breed calf weighing 42kg was carried to SAQ TVH for better treatment from Chandanish Upazill, Chattogram which was lateral recumbent since 24 hours due to automobile accident. The calf was subjected to detail clinical, orthopedic, and neurological examinations. On clinical examination, the calf was alert. Heart rate, respiration, and rectal temperature were normal. Orthopedic examination revealed pain on palpation, swelling, and crepitation on both affected hind limb, and there was no open wound on the fractured area. Neurological examination showed positive on deep pain reflex. The radiographic examination confirmed the comminuted fracture on the proximal third left tibial bone (Figure 1) and short oblique tibial fracture on the proximal third right tibial bone (Figure 2). On the basis of the evaluation of fracture patient assessment score (FPAS), the case was decided for external coaptation technique on a left hind limb and open reduction internal fixation (ORIF) on right tibial bone f

Figure 1: Lateral view, comminuted diaphyseal tibial fracture in left hind limb

3. SURGICAL PROCEDURE

External coaptation technique was performed in left tibial fractured bone by using modified Robert Jone's bandage with wooden splint and plaster of paries from hoof to above the stifle joint. After that the patient was positioned in right lateral recumbency. The patient was sedated by using diazepam (Inj. Sedil, Square Pharmaceuticals Limited Dhaka) at the dose rate 0.5mg/kg body weight and applied local infiltration anesthesia (Inj. 2% Lidocaine, Jayson Pharmaceuticals Ltd. Dhaka) 1ml/cm area. Through the medal approach, a linear incision was done on the skin and exposed both proximal and distal fractured end and reduced the fractured bone anatomically by manual traction and stabilized the fractured bone by retrograde intramedullary pinning technique. Pinning was performed by using a 6.0 mm Steinmann pin. The surgical wound was closed as standard procedure and then additional support was applied by using an MRJ bandage with a wooden splint.

4. POSTPERATIVE CARE AND ADVICE

Postoperatively, antibiotic (Inj. Streptopen®, Renata Ltd, Mirpur, Dhaka) at the dose rate 10mg/kg body weight used for five days intramuscularly, pain killer (Inj. Kynol ve®t, SK+F Ltd, Tongi, Dhaka) at the dose rate 2mg/kg body weight used for three days intramuscularly and antihistaminic (inj.Alar-vet®, SK+F Ltd, Tongi, Dhaka) at the dose rate 0.5mg/kg body weight used for five days intramuscularly. The instructions were given to the owner such as cold application in the surgical areas for three days, restricted movement for two weeks, keep dry, neat and clean the surgical area until wound healing and follow-up checkup specially radiographic evaluation for bone healing.

Figure 2: Lateral view, short oblique diaphyseal tibial fracture in right hind limb

5. RESULTS AND DISCUSSION

To evaluate the efficacy of surgical intervention of bilateral tibial fracture in calf, the following parameters were analyzed at regular interval-lameness grade, functional limb outcome,

fracture healing. Immediate after surgical intervention, clinically the calf was able to stand in both hind limb by manual support (Figure 3) and radiographic examination found the anatomic reduction in both the fractured bone as well as observed implant in position in right tibial fractured bone (Figure 4 and 5).

Figure 3: Immediate after surgery- lateral recumbent and then assisted standing condition of the calf

Figure 4: Left hind limb-Immediate after bandage

Figure 5: Right hind limb – immediate after surgery- implant in position

The patient was evaluated at 15 day after treatment. The calf was active, alert, and normal appetite. The bandage was intact in both hind limbs but removed the bandage from the operated right hind limb to evaluate the wound healing. The stitches were removed and the surgical wound was healed without any complications. Supportive MRJ bandage was applied again with a wooden splint.

The calf was brought to SAQTVH for re-evaluating the fracture healing condition after one month of treatment. Both bandages were intact but wet and removed both bandages. On palpation, mild swelling was noticed in both fractured areas. Joint mobility was noticed on the left hind limb. Swelling also noticed on the hock joint on the right hind limb. Radiographic examination revealed unicortical periosteal secondary callus formation in the right hind limb and bicortical periosteal secondary callous formation in the left hind limb (Figure 6).

Figure 6: Lateral view at 30 day of treatment- mild periosteal callus formation noticed

The case was evaluated again after 53 day of treatment. Clinically the calf was active, alert. Feeding, urination, and defecation were normal. The calf was able to stand and walk and more weight-bearing also noticed (Figure 7). Muscle atrophy of thigh region, swelling and reduced joint mobility of hock joint, pin migration also noticed on the operated limb (Figure 8). Hyperextension of the fetlock joint of the left hind limb also observed (Figure 9). Lateral and craniocaudal radiographic views revealed more secondary callus formation in both fractured bone than previous examination (Figure 10). Due to pin migration in the hock joint, the Steinmann pin was removed on the same day (Figure 11).

The calf was also monitored at 93 day of treatment. Clinically posture and gait of the calf were improved more than the previous condition (Figure 12). Daily activities of the calf were normal as well as the owner was also satisfied to observe the performance of the calf. Fracture is one of the common orthopedic affections as well as common lameness problems encountered in domestic animals and pets (Aithal et al., 1999; Raghunath et al., 2007). Among fracture, the long bone diaphyseal unilateral closed fracture is very common but bilateral tibial fracture is very uncommon, and appropriate fracture management information is also very scanty in both small and large animals. The present case report will encourage the new practitioners for such kind of fracture management in different species. Tibia is one of the most common bone fracture sites in cattle (Anderson and St Jean, 2008; Gangl et al., 2006 and Martens et al., 1998) and is commonly

Figure 7: 53 day of treatment- Weight bearing on both hind limb

Figure 8: 53 day of treatment: swelling of the right hock joint

Figure 9: 53 day of treatment after bandage removed (Hyperextension of fetlock joint in left hind limb)

Figure 10: Lateral and craniocaudal views at 53 day of treatment- moderate secondary periosteal callous formation in both limb and slight pin migration in right hind limb

Figure 11: Pin removed on right hind limb - at 53 day of treatment

Figure 12: 93 day of treatment- Improved gait and posture in both hind limb

encountered in every age group of fattening and breeding cattle (Tulleners, 1986). Martens et.al. (1998) shown the 83.0% tibial fractures in cattle that were found in double-muscled Belgian blue breed, ages varied between one day and three-and-a-half years, and the bodyweight varied between 35 and 800 kg.

The etiology of tibial fractures is traumatic. In very young animals they can be induced by forced extraction during the birth of malpresented calves or by a kick from the dam (St. Jean et al., 1991). In older animals, fractures can occur during transport, at pasture, in cattle sheds, or for unknown reasons (Verschooten et al., 1972). In this study, the cause of tibial fracture was a road traffic accident which was very common in Bangladesh probably due to free grazing beside the road. Tibial fractures can easily become open on the medial surface

because of the minimal supporting soft tissue structures in this area (Tulleners, 1986). However, in the present case study, both tibial fractures were closed. Closed fractures are more common in cattle than in horses because cattle have a thicker skin and are more likely to protect a fractured limb from additional trauma (Adams, 1985) but Singh et al. (2001) and Aithal et al. (2007) stated that most of the fractures are seen in the tibia, metatarsal or metacarpal bones, which have less muscle covering.

The goals or principles of fracture repair are to correct anatomical alignment and rigid stability to allow both timely and maximized return to function of the affected area (Nuss, 2014; Nuss et al., 2011). At present scanty information is available concerning the occurrence of fractures in calves and success rates of treatment and there has been no compromise on the fixator and implant that can provide the most appropriate conditions for fracture healing. Therefore, the objective of the present study was to evaluate the efficacy of bilateral tibial fractures by external and internal fixation techniques.

Management of tibial fractures is a real challenge, especially in heavy and double-muscled animals. The success rate for the conservative or surgical treatment of tibial fractures in cattle largely depends on the type and size of the fracture, the technique used, and the weight of the animal. Vogel and Anderson (2014) reported that the primary treatment option for distal limb fractures in cattle is external coaptation which is a non-surgical method for repairing fracture fragments using cast materials.

The Conservative treatment of tibial fractures usually does not result in acceptable fracture healing. A full-limb cast cannot immobilize the stifle joint and does not stabilize tibial fractures adequately. Adequate healing can be achieved with a modified Thomas splint or the combination of a Thomas splint and a cast (Adams and Fessler 1983, Adams 1985, Tulleners, 1986). But in the present case study, there was a good outcome in conservative treatment by using the combination of a modified Robert Jone's bandage with wooden splint and plaster of Paris cast.

The surgical repair of tibial fractures in cattle can provide sufficient immobilization and gives the animal freedom of movement in the adjacent joints. Vijaykumar et al. (1982) stated that the internal fixation with bone plates or intramedullary pinning is suitable for the repair of mid-diaphyseal fractures but is relatively expensive. Verschooten et al. (1972), Hamilton and Tulleners (1980), Kumar et al. (1981) and Vijaykumar et al. (1982) also reported that the fracture can be reduced surgically by using bone plates, Rush pins, Kuntscher nails, cross-pinning, and transfixation pinning. In a present case report, intramedullary pinning was applied in the right short oblique tibial fracture but the outcome was not satisfactory due to migration of pin in the carpal joint which causes swelling of the joint and reduction of joint mobility. Mohd et al. (2012) reported that the fracture healed with satisfactory weight-bearing by using indigenous wooden splints for tibial fracture management in a cow with the complication of splint implicated injury but in the present case report, there was no found such type of any complication during the study period.

6. CONCLUSIONS

The present study concluded that in field condition, the bilateral tibial fracture can be successfully managed by external fixation by using the combination of modified RJ bandage, wooden split and plaster of Paris and internal fixation by using retrograde intramedullary pinning with ancillary support by modified RJ bandage and wooden splint. In addition to external and internal immobilization, owners' co-operation especially in post-operative period is very important for a good outcome of fracture management.

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