Case Report

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Treatment of Proximal Tibial Fracture of a Calf by Using Linear External Fixator

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ABSTRACT

In this case report, treatment of the proximal tibial fracture of a calf with a linear external fixator (orthofix) system was presented. Oblique fracture was diagnosed proximal to left tibia regarding the clinical and radiological findings. Following the routine preparatory steps for the operation, the extremity was suspended and the fracture was reduced with orthofix from the lateral side of the tibia under general anesthesia. After the operation, it was observed that the calf could functionally use the related extremity from the first day. The consolidation was completed on the 41st day, and the fixator was removed on 47th day. In conclusion, it was considered that the proximal tibial fractures of calves could be successfully treated with a linear external fixator.

Keywords: *Calf, Fracture, Treatment, Linear external fixator*

INTRODUCTION

Long bone fractures in calves can occur as the result of traumatic causes such as erroneous interventions during the arduous birth attempts, mother's stepping on the calf, falling down, and kicks (Ferguson, 1994; Moll et al., 1995; Bilgili et al., 1999; Görgül et al., 2004).

In the treatment of fractures of the calves, different methods are used depending on the weight of the animal, and localization and type of the fracture (Olcay, 1999). While the most commonly used method is reinforced bandage (with fiber wrap and PVC support); intramedullary pin, plate, and screw or external fixator applications are among the other methods used (Guy, 1991; Martens, 1998; Öztaş and Avki, 2015). However, complications such as frequently encountering the problems of intramedullary pin treatment due to the fact that the distal and proximal fractures of the tibia are not large enough to apply pins and/or plates; and not being able to provide complete reduction and enough stability with the reinforced bandages. These complication risks lead to the usage of external fixators that; are usable for the entire extremities; provide early initiation of movements of the joints; provide sufficient stability; allow the treatment of the possible open wound that may subsequently develop in the area (Bilgili et al., 1999; Havıtçıoğlu, 1999; Gülşen, 2010).

In this case, it was aimed to research the effectiveness of the orthofix external fixator's ability of fracture stability and early initiation of movements of the joints, and to determine the complications that may occur.

CASE HISTORY

In this presentation, 3-days old, 35 kg weighted Holstein calf with severe lameness problem, was evaluated. According to clinical and radiological examinations, the closed oblique fracture was diagnosed at the ¼ proximity to left tibia.

Because the proximal fragment of the fracture line is very close and dislocated, it was decided that the most appropriate treatment was to apply a linear external fixator (Orthofix external fixator). In the preoperative period, a linear external fixator was prepared according to the fracture position. Following routine asepsis antisepsis phases, the operation was performed with 0.1 mg/kg sedation, intramuscular xylazine HCL (Alfazyne® 2%, Egevet), 2 mg/kg Ketamine HCL induction (Alfamine® 10%, Egevet). Maintenance of anesthesia was performed with 2% isofluorane (Isoflurane®, Adeka).

Tibia was reached with a routine medial approach. Following the reduction of the fractured fragments, the extremity was suspended, then external fixator surgery according to the method of lateral exremite one Schanz pin (6 mm) was delivered primarily to the proximal and then afterward to the distal fragments from the tibia lateral, in a way that they are adjacent to the joints; and the fracture reduction was achieved with a linear fixator. Then, the fixation is provided by sending 2 Schanz pins to distal and 1 to proximal, where the pins are at the same diameter; and the operation was concluded by closing the incision line.

During the postoperative period, amoxicillin / clavulanic acid (Synulox®, Pfizer) was applied intramuscularly at a dose of 8.75 mg/kg for 15 days. On a daily basis, pin-bases were cleaned by using batticon solution (Povideks®, Kenpa). Following the operation, the related extremity of the calf was followed in terms of fracture healing, control of the reduction, control of the fixator, fracture and loosening of the pins, callus formation, callus development and consolidation by A/P and M/L radiographs in every 10 days until the fracture was completely healed.

Figure 1. Post-operative, 1st day, stepping position

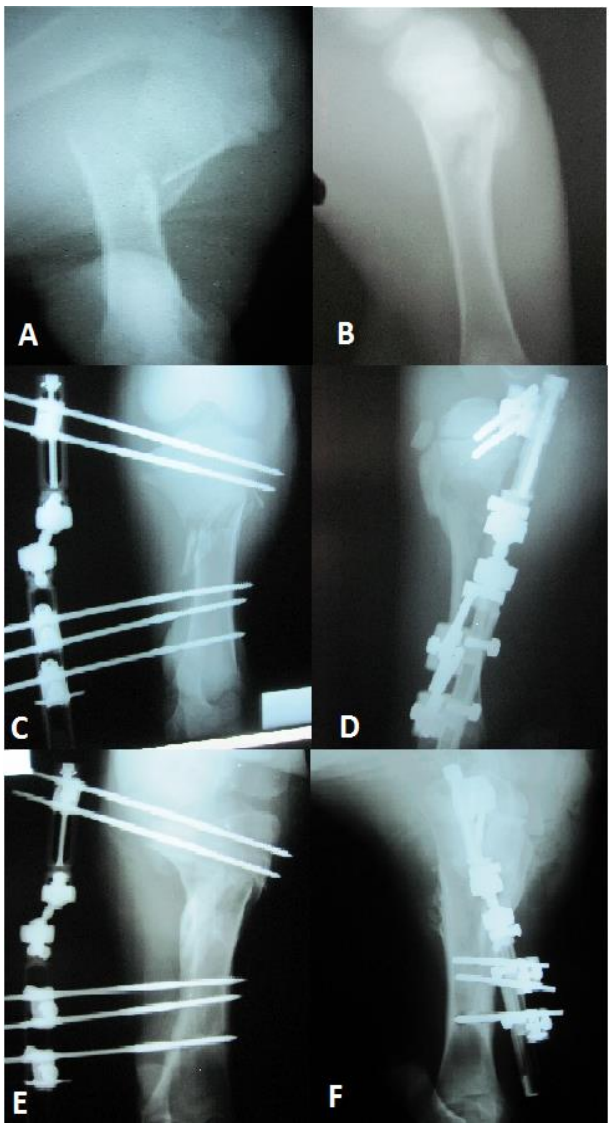

Figure 2. A- preoperative A/P radiograph, B- preoperative M/L radiograph, C- postoperative A/P radiograph, D-postoperative M/L radiograph E- A/P radiograph the consolidation on the fracture line was completed, F- M/L radiograph the consolidation on the fracture line was completed

After the operation, it was observed that from the first day the calf could functionally use the respective extremity (Figure 1). In the radiographic examinations, it was observed that; the formation of callus was started at the fracture line and the fracture reduction was stabilized on the 10th day, the callus continued its development and the reduction was not disrupted on the 20th and 30th days, the consolidation on the fracture line was completed on the 41st day and the fixator was removed under the anesthesia on the 47th day (Figure 2). During the course of the treatment, it was observed that the orthofix external fixator system was well tolerated by the calf, and no complications such as pin

loosening and fracture, pin base infection were encountered.

DISCUSSION

Long bone fractures in the calves can occur in any part of any bone with erroneous interventions during the arduous birth attempts and various traumatic causes (Ferguson, 1994; Moll et al., 1995; Bilgili et al., 1999; Görgül et al., 2004). In this case, we detected a tibia fracture, which was the result of the mother's stepping on the calf.

Linear external fixator is used for the cases such as; the treatment of all closed/open metaphyseal, diaphyseal, and especially epiphyseal fractures; treatment of unstabilized closed fractures that cannot be immobilized by internal fixation, traction and bandage; treatment of periarticular fractures extending to the diaphysis, and treatment of long bone fractures (closed, open, infected) in cattle (Aithal et al., 2007; Rovesti et al., 2007; Singh et al., 2007; Mattern and Lewis, 2008; Aransohn and Burk, 2009; De Godoy et al., 2009). Due to the fact that the proximal fragment was very short and dislocated in our case, it was decided to treat it with a linear external fixator because it was considered that the intramedullary pin or plate or PVC bandage application would not be able to achieve the desired success.

In external fixator applications, it is recommended that fracture fragments can be fixed to the system from at least two locations (Çakmak ve Bilen, 1999) and we also fixed the distal fragment with 3 pins and the proximal fragment with 2 pins to the orthofix fixator in our case. We had no problems with stability and fixation from the first day of the postoperative period until the day that the fixation was removed.

In two different studies, where using Ilizarov external fixator in the calves was published by Aithal et al (2004 and 2007), although 4 mg/kg of enrofloxacin was used daily, pin base infections were reported in some cases. It was reported that no complication has been formed related to infection. In our case, amoxicillin clavulonic acid (Synulox®, Pfizer) was used at 8.75 mg/kg for 15 days after the operative procedure. In general, when the applications in the literatures were evaluated, it was found that 0.9% NaCl and povidone iodine, 2% hydrogen peroxide or 0.05% chlorhexidine were used (Behrens, 1989). When the studies done on the calves are examined, it has been seen that; Aithal et al. (2004) used 0.9% NaCl and povidone iodine (Poviodeks®, Kenpa) with antibiotics, and Bilgili et al. (1999) placed rifamycin and nitrofurazone-impregnated buffer on the pin bases and wrapped the entire appliance with bandage to protect them from the external environment. Our patient was hospitalized and after the operation the pin-bases were cleaned daily using batticon solution (Povideks®, Kenpa). Hence, no pin base infection was observed.

Other advantages of using an external fixator are that the mobilization of the patient is earlier; and rigid fixation allows the extremity to move without loss of position in the fragments and carry weight, thus minimizes dysfunctions in joints, muscles and bones resulting from prolonged inactivity (Havıtçıoğlu, 1999; Singh et al., 2007; Gülşen, 2010). In our study, the calf could use the extremity precisely by putting weight on it on the post-operative fist day. It was reported by several investigators that this was longer when other treatment methods used. For example, it took 1-2 weeks to load a partial weight after pin application (Piermattei et al., 2006; Sande, 1999). Fracture healing can be evaluated radiologically according to the reduction of the sharpness of the fracture edges, the disappearance of the fracture line and the callus structure (Piermattei et al., 2006; Sande, 1999). Sande (1999) reported that the edges of the fractures were fused during postoperative 5-7 days; and bone callus started to be seen between 10-12 days; and Piermattei et al. (2006) stated that the fracture margins were prominent in the first week and they decreased in the second week. Radiological fracture healing has been reported at 40th day in a study using an acrylic pin external fixation system for femoral metacarpus fractures (Öztaş and Avki, 2015). In a study carried out with intramedullary pin applied to the calf, it was reported that there was no radiographic improvement in fracture on the 15th day, however, on the 30th day the fracture line was covered with a callus covering the fracture line and the fracture line disappeared on the 60th day (Patel et al., 2012). In the radiographic examinations in our case, on the 10th day of fracture, the formation of callus started and the fracture reduction was stabilized between the 20th and 30th days. The callus continued to develop and the reduction did not deteriorate on the 41st day. The consolidation on the fracture line was completed and the fixator was removed under anesthesia on the 47th day.

As a result, in this case report, it was concluded that proximal tibial fracture in a calf was successfully

treated with linear external fixator and also that further studies should be performed in more cases.

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