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**Treatment of humerus Salter-Harris type II fracture with double pin combination**Ali Gülaydın¹  M. Barış Akgül¹  Nihat Şındak¹ ¹ Department of Surgery, Faculty of Veterinary Medicine, Siirt University, Siirt, Turkey

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ABSTRACT

In this case report, the clinical and radiographic results of the treatment of Salter Harris Type II fracture in the left humerus of a 10-month-old female and crossbred dog with parallel pin technique was evaluated. The dog with complaining of lameness was brought to Siirt University, Faculty of Veterinary Medicine, Clinic of Surgery Department and local fracture findings were found in the distal 1/3 of the left humerus. On radiological examination, it was found that the distal physal line of the left humerus was detached. Also, it was seen that the integrity of the bone cortex was disrupted through in a line that included the metaphysis at the medial angle. In the operation, following the reduction of the fracture fragments, 2 krischner pins with 2 mm in diameter parallel to each other were applied from the medial cortex of the humerus to the lateral side of the distal condyle and fixation was achieved. After the operation, the limb was taken to a backed bandage. In the radiological examination of the case on post-op 3rd week, it was found that the formation of the collus began. On the post-op 21st day, the bandage was removed and physical therapy applications were started to apply. On the post-op 4th week, it was seen that the dog used the extremity functionally and it was discharged. As a result, it was concluded that parallel double pin applications can be used successfully in the treatment of Salter Harris Type II fractures that are formed in the distal of dog's humerus.

Keywords: Humerus, Dog, Salter-Harris fracture**INTRODUCTION**

Limb fractures in dogs can occur due to various reasons such as traffic accidents, hitting and falling from height (Aslanbey, 2002; Çağatay and Sağlam, 2013). Among these, traffic accidents take the first place with a rate of 70-80% (Aslanbey, 2002; Ermutlu et al., 2016). Shoulder fractures due to traffic accidents are less common than other extremity fractures (Deny and Butterworth 2000; Yanık, 2004). Fractures of the long extremity bones in the proximal or distal epiphyseal regions of dogs that are 3-11 months are called "Salter-Harris" fractures (Lefebvre et al., 2008; Ermutlu, 2016). It has been reported that the ratio of epiphyseal fractures to total fractures in dogs is 30%. Also, it

has been reported that distal epiphyseal fractures of the femur take the first place among epiphyseal fractures with the ratio of 37% (Sağlam et al., 1999; Yanık, 2004). Articular and epiphyseal fractures of the humerus are rarely encountered, and it has been reported that these fractures occupy 8% of all fractures (Aslanbey, 2002; Seaman and Simpson, 2004). It has been observed that Salter-Harris Type I fractures are more prevalent in cats and dogs younger than 6 months while Salter-Harris Type II fractures in those older than 6 months (Sukhiani and Holmberg, 1997; Sağlam et al., 1999; Çağatay and Sağlam, 2013). These fractures do not affect the growth mechanism significantly in the growing age, but it is known that some epiphyseal fractures

can cause serious complications such as shortness of the extremity, angular deformities and joint disharmony (Ermütlu et al., 2016).

In the treatment of fractures, it is aimed to preserve the biological potential in bone healing and to restore its anatomical function (Palmer, 1999; Altunalmaz, 2004). In order to be successful in osteosynthesis, the least traumatic operative approach, a fixation system that can minimize vascular lesion, and the least traumatic methods of fixation should be preferred. In this respect, closed reduction and immobilization are considered as the first treatment option. However, in these fractures, it has been reported that the treatment failed with closed reduction and immobilization due to the inclusion of soft tissues between the fractured hematoma and fragments (Yanık, 2004; Ermütlu et al., 2016). It is known that cross-pin, single-crossing double-pin and single-pin and tension wire applications can be used for treatment of the fractures (Aslanbey, 2002; Yanık, 2004; Hayes et al., 2011; Ermütlu et al., 2016).

In this study, it was aimed to evaluate the results of the treatment of distal humeral Salter-Harris Type II fracture using the double parallel pin technique in a large dog.

CASE HISTORY

A 10-month-old, female, crossbred dog was brought to Siirt University, Faculty of Veterinary Medicine, Clinic of Surgery Department with

complaints of lameness in the front extremity as a result of a traffic accident. No pathology was found in the routine clinical examinations of the patient. Medical treatment was started in terms of trauma and its general condition was stabilized. On inspection, it was observed that the dog could stand on three legs, but could not use its left forearm and the area was shaking with a pendulum during walking. In orthopedic examination, local fracture findings were detected in the distal 1/3 of the left humerus near the joint. In radiological examination, craniocaudal and mediolateral radiographs of the left humerus, laterolateral radiographs of the thorax and abdomen were evaluated. No pathology was found in the thorax and abdomen. However, separation in the distal physal line of the left humerus and disruption of bone integrity in a line involving the metaphysis at the medial angle were seen (Figure 1A, B). The case was evaluated as a Salter Harris Type II fracture of the left humerus and the operation was decided. Following routine asepsis and antisepsis procedures, the patient was sedated with 2 mg/kg, intramuscular xylazine HCL (Xylazine 2%, Intermed, Ankara), and intramuscular 8 mg/kg Ketamine HCL (Ketasol 10%, Interhas, Ankara) were administered. Maintenance of the anesthesia of the intubated patient was carried out with 2% sevoflurone (Sevorane Liquid Abbvie, Istanbul). Intravenous fluid therapy (0.9% isotonic saline) was provided to patient during operation.



Figure 1. A: Pre-Op A/P, B: Pre-Op M/L, C: Post-Op 1st week M/L, D: Post-Op 1st week A/P, E: Post-Op 2nd week A/P, F: Post-Op 2nd week M/L, G: Post-Op 3rd week M/L, H: Post-Op 3rd week A/P

The distal condyle of the humerus was reached with a lateral approach. Fracture fragments were reduced. Two krischner pins 2mm in diameter parallel to each other were sent out from the lateral side of the distal condyle to the medial cortex of the humerus and fixation was achieved. The operation site was closed in accordance with the technique

(Aslanbey, 2002). After the operation, the relevant extremity was taken to a bandage. The bandage was extending from the distal to the other scapula on the lateral aspect of the extremity. The bandage was in the form of a cane and made of synthetic plaster. The bandage was changed every week for post-op external stabilization of the extremity. Post-op

medical treatment with ceftriaxone disodium (Unacefin® 1000 mg, Yavuz Drug, Istanbul) was applied for 5 days. Meloxicam (0.2 mg/kg, Maxicam, Sanovel, Istanbul) was administered to reduce postoperative inflammation and pain for 3 days

Radiological examinations of the relevant extremity were evaluated after the operation weekly. It was observed that complications such as loss of reduction and pin migration were not encountered in the 1st and 2nd week of radiological examinations and that the fracture line preserved its stabilization (Figure 1C, D, E, F). On the post-op 3rd week, it was found that the callus formation had begun to take shape and the fracture line could not be followed exactly (Figure 1G, H). On the post-op 21st day, the bandage was removed and physical therapy applications were started to apply. Mild lameness was observed in the extremity. It was seen that the dog could use its extremity functionally on the post-op 4th week. In addition, light walks and cage rest were recommended to continue for 1 month.

DISCUSSION

Epiphyseal fractures are frequently encountered in dogs. These are usually Salter Harris Type I and Type II fractures. (Sukhiani and Holmberg, 1997; Çağatay and Sağlam, 2013). According to the classification made by Salter-Harris for the first time in 1963, epiphyseal region fractures were categorized in 5 five (Type I, II, III, IV and V) separately. When evaluated in this context, the type of fracture accompanied by a metaphyseal fragment that occurs along the epiphyseal line is called Salter-Harris Type II (Aslanbey, 2002; Guille et al., 2004; Yanık, 2004; Simpson, 2004). Radiographs of this case revealed that the fracture was in the form of a Salter-Harris Type II fracture in the distal humerus.

It has been reported that traffic accidents and blunt traumas affecting the region can play a role in the formation of such fractures (Sukhiani and Holmberg, 1997; Guille et al., 2004; Ermutlu et al., 2016). In this case, it was observed that the fracture was formed as a result of a motor vehicle crash.

Distal humeral fractures are divided into group as Salter-Harris Type I, Salter-Harris Type II, Type III, Type IV and Type V (Yanık, 2004; Guille et al., 2004; Lefevbre et al., 2008). In cases in which a rigid fixation is provided there is a common belief that epiphyseal splitting fractures heal is faster than other long bone fractures. In the clinical and

radiological examination performed on the post-op 4th week, it was determined that our patient could use the relevant extremity without any problem and treatment was performed in the fracture line successfully.

Anatomic reduction and rigid internal fixation are necessary for a painless, functional and ideal repair and proper recovery of physique. It has been reported that open reduction is required for anatomical reduction (Lefevbre et al., 2008; Ermutlu et al., 2016). It has been reported that in distal epiphyseal fractures of the humerus, a tension band applied with double pins and cerclage wire are sufficient for fixation. In some cases, a screw support is recommended in addition to this practice (Ermutlu et al., 2016). The case was over 1 year old and weighed 30 kg. It was decided to treat the fracture with a minimally invasive method. In this context, reduction and stabilization was achieved by applying a parallel double pin / cerclage wire to the lateral condyle and then the limb was taken to backed bandage. The fact that there is no adverse event in the postoperative period indicates a successful fixation.

Common complications in the treatment of Salter Harris fractures have been reported as loosening of the implant, seroma formation and limitation of joint movements. (Lefevbre et al., 2008). In the radiography and clinical examinations taken at the end of the 4th week, it was found that the pins preserved their integrity, and there was no migration or any reaction to the material used.

It is generally recommended to take implants after fracture healing is completed (4-8 weeks) (Deny and Butterworth, 2000). The applied pins were not removed in this case. Because the growth age of the dog in our case was about to complete and no complications were encountered until the last control.

As a result, it was concluded that the parallel double pin fixation method preferred for the treatment of Salter Harris Type II fractures in the distal of dog humerus is sufficient in terms of providing stabilization in the desired period, clinically and radiologically. Based on the results of this case, it was determined that this technique could be an alternative to other methods and it was thought that it would contribute to the literature by increasing the number of similar cases.

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