

USING OF MODIFIED EXTERNAL FIXATOR IN EXTREMITIES LONG BONE FRACTURES IN CATS

Mehmet SAĞLAM and Mehmet YEŞİLÖREN

*Ankara University, Faculty of Veterinary Medicine, Department of Surgery, 06110 Diskapi, Ankara-Türkiye
msaglam@ankara.edu.tr; saglam45@gmail.com*

ABSTRACT

In this study, diaphyseal fractures on extremity long bones of cats clinical and radiological evaluation of the results of the treatment by using modified external fixator. The material for this study was composed of 20 cats in total with different races, ages and genders. According to the postoperative clinical and radiological evaluations; the results were very good in 16 cases, good in 1 cases and average in 1 case. 2 cases could not follow up. As a result; it was concluded that the use of modified external fixator alone or pin and cerclage wire together, extremities long bone fractures like humerus, antebrachium, femur and tibia constitutes succesful results.

Key Words: Cats, external fixator, extremity, fracture, trauma, treatment.

Introduction

Long bones fractures of cats, usually consists by falls from height, traffic crash and guns injury. General open or closed fracture or comminuted fracture shaped. Long bone fracture created percent of 50% fractures in cats (5).

When the bone fracture, immediately repair and gain the functions of bones and tissue. Selected fixation system was not built trauma and the implant can be remove when necessary (13).

When selecting external fixation necessarily pay attention to cases, gender, age, nature, fracture version and radiographic signs. External fixation block the shearing, compression, distraction and torsional. External fixator selection for so many fracture (1).

External fixators; unilateral (Type I, half pin), bilateral (Type II, fullpin), trilateral (Type III, multipin) ve circular (Ilizarov) divided into four (2, 3).

Steinmann and Schanz pin used in external fixation. If the implant number increases, fixation rigidity increases. External fixation put the craniolaterals of humerus. If the distal segment short, distal pin apply the transcondyler position. Then proximal pin apply and clamps hang out (12).

All external fixation system used in antebrachium. Unilateral external fixation easy apply and a little complication in major cases (4, 12).

Only type I external fixation used in femur. But this type unprotected to trauma and the infection can be consist. External fixation combined the intramedullar pin ant it is called the "Tie-in". This system to control the rotational and torsional force (12).

External fixation used to diaphyseal tibia fractures. Type Ia external fixation apply to medial aspect of tibia. This method will not interfere to walk (12).

External fixation practices consist the complication like loosening the pin, infection or non-union bones (2, 3, 5).

In this study diaphyseal fractures on extremities long bones of cats, used by modified external fixation and inferred that the result.

Material and Method

The material for this study was composed of 20 cats in total with different races, ages and genders, referred to Ankara University Faculty of Veterinary Medicine Department of Surgery with complaints of inability to use front or rear extremities between December 2010-June 2011 and diagnosed with fractures on their extremity long bones as a result of clinical and radiological examinations.

After clinical examination; lameness pain in the region, heat, deformation and crepitation evaluated. Then animals were sedated and antero-posterior and latero-lateral radiography was taken.

In cases, first xylazin HCl 2% (Rompun[®], Bayer, 23.32 mg/ml) 0.1 ml/kg im for sedation then, ketamin HCl 10% (Ketasol[®], Richterpharma, 100 mg/ml) 0.1 ml/kg im for general anesthesia.

For fixation, 4-5 bolt aluminium and steel alloy modified implant, hollow bolt and 2 mm Steinmann pin used. Open or closed reduction apply when necessary.

After fracture reduction, upper and lower pin apply transversal the bone cortex and fixed the modified implant. 2 mm Steinmann pin and hollow bolt used for fixation. Some cases modified external fixation combine to Steinmann pin (cases no. 1,2,3,4,6) and fixed to fixation to Tie-in method (cases no. 13,16) cerclage wire used when necessary (cases no. 3,6,7,8,9)

In all cases radiographic examinations performed in antero-posterior and latero-lateral positions after the operations. Oral antibiotics applied 7 days postoperatively. On the postoperative 10th bandage renewed. On the postoperative 10th, 21st and 45th days radiographic examinations were repeated. All surgical implants were removed postoperative between 45th and 60th days.

Symptoms

In 20 cases fractures consist of 3 humerus (cases no. 15,16,19), 3 antebrachium (cases no. 5,17,18), 6 femur (cases no. 1,4,6,13,14,20) and 8 tibia (cases no. 2,3,7,8,9,10,11,12).

Falling from height consist 15 cases. Two of them (cases no. 16,19) diaphyseal humerus fracture, 3 of them (cases no. 5,17,18) diaphyseal radius and ulna fractures, 5 of them (cases no. 1,4,6,13,14) diaphyseal femur fractures, 5 of them (case no. 2,3,9,11,12) diaphyseal tibia fracture.

Traffic accident statics; totaly 5 cases; 1 case (case no. 15) diaphyseal humerus fractures, 1 cases (case no. 20) diaphyseal femur fractures, 3 cases (case no. 7,8,10) diaphyseal tibia fractures. Cases 20 was not brought to post operative controls.

Protective dressing renewed day 10. Control X-rays 10, 21 and 45. days repeated. Implant 45-60. days removed when see the union of bone.

Postoperative time cases 9 break the home and consist the infection. So, remove the external fixation day 30. Apply the splint bandage for 15 days.

Postoperative time cases 13 remove the external fixation in 25. days. External fixation remove from the bones but intramedullar Steinmann pin were left in place. Apply the splint bandage for 20 days.

Used external fixation figure and implementation presented figure 1-2, some cases x-rays presented figure 3-5 and cases statics presented table 1.

Discussion and Result

According to the literature, the variance of the long bone fractures that occur in extremities of cats, are found like; humerus 5-10%, antebrachium 15-18%, femur 20-25%, tibia 20-23% (5,8,14,16). In our study cases, that variance has found like; humerus 15%, antebrachium 15%, femur 30%, tibia 40%.

Unilateral Type Ia external fixation is a fixation method that is applied to only one side of the bone with the transfixation pins, which are immobilized on a bar. The classical one sided form of this method, is biomechanically weakest of all the external fixation methods and it brought up the need to develop different strategies (Type Ib and Type I tie-in) (15). The half-pins which are used for tibia, femur and humerus are biomechanically weak so engaging the intramedullary pins with the external fixator might strengthen up the stabilization. That system is called "Type I tie-in" (10). In cases which we have applied Type Ia fixation method (case number 1,4,6,13,14,15,16,19,20) had no problems from the biomechanical aspect. When it got necessary to strengthen up the equipment biomechanically (case number 13,16), Type I tie-in method has been used. Although the external fixator can be used by itself, it can also be used with intramedullary pin, lag screw or cerclage wire (4). In our study, we needed to use intramedullary pin and/or cerclage wire with external fixator, in 11 cases (case number 1,2,3,4,6,7,8,9,13,16).

Formerly, diaphyseal fractures of long bones in cats have been treated with only intramedullary pin. But providing a better stabilization, the combination of intramedullary pins and external fixation has been started to use. That method is especially better for the multi fragmental, open or infected fractures (11). Anatomical reduction can be very hard or impossible for some comminative fractures. For that, we need different strategies. Practically, Type I external fixation method has its advantages against other methods of external fixation and bone plates (9). In a study, the conclusion has been found that the degree of stability and power of external fixator systems can be increased if necessary (7). The external fixator system that has been used in the study, is modified to increase the degree of stability and power. This model, has been minimised by the body to make it easier for the cats to tolerate it and by using aluminum-steel alloy, it has been lighter and more resistant. But since it has a fixed range between the holes in the lateral bar, there should be a preparation for the bone and fracture form.

When intramedullary pin and external fixator are used together, the fixator can be removed in 4-6 weeks after the formation of callus has been detected and the intramedullary pin can be removed when the union between the fragments occur and be detected radiographically (14). The modified external fixator which we used in this study, has been removed in 6-8. weeks when the union between fragments have been detected radiographically. When it has been used with intramedullary pin or cerclage wire, the fixator has been removed in 3-5. weeks, intramedullary pin has been removed in 6-9. weeks, cerclage wire has been left in place.

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Table 1. Cases race, age, gender, etiology, lesion localization, treatment and result table.

Cases no.	Race	Age	Gender	Etiology	Lesion localization	Treatment	Results
1	Mix	7 month	♂	Fall from height	Left femur diaphyseal fractures	Unilateral external fixation and intramedullar pin	Healed.
2	Mix	1,5 age	♂	Fall from height	Right tibia diaphyseal fractures	Unilateral external fixation and intramedullar pin	Healed.
3	Mix	1 age	♂	Fall from height	Right tibia distal diaphyseal communitif fractures	Unilateral external fixation, intramedullar pin and serklaj wire	Healed.
4	Tabby	1,5 age	♂	Fall from height	Right femur distal diaphyseal fractures	Unilateral external fixation and intramedullar pin	Cases not follow but he healed..
5	Tabby	1 age	♂	Fall from height	Left radius-ulna diyafizer transversal fracture	Bilateral external fixation and intramedullar pin	Healed.
6	Tabby	2 age	♂	Fall from height	Left femur diyafizer oblic fracture	Unilateral external fixation, intramedullar pin and serklaj wire	Healed.
7	Mix	1 age	♂	Traffic accident	Left tibia diyafizer oblic fracture	Bilateral external fixation and serklaj wire	Healed.
8	Tabby	2 age	♂	Traffic accident	Left tibia diyafizer oblic fracture	Bilateral external fixation and serklaj wire	Healed in.
9	Mix	1 age	♂	Fall from height	Right tibia diyafizer oblik fracture	Bilateral external fixation and serklaj wire	In postoperative period infection formed but later healed in.
10	Tabby	1 age	♀	Traffic accident	Left tibia diyafizer açık fracture	Bilateral external fixation and serklaj wire	Healed.
11	Mix	1,5 age	♂	Fall from height	Right tibia diaphyseal communitif fractures	Bilateral external fixation	Healed.
12	Mix	9 month	♂	Fall from height	Right tibia diaphyseal communitif fractures	Bilateral external fixation	Healed.
13	Mix	7 month	♂	Fall from height	Left femur diaphyseal fractures	Unilateral external fixation and Tie-in	External fixation removed from cats later he healed .
14	Tabby	7 month	♀	Fall from height	Right femur diaphyseal fractures	Unilateral External fixation	Healed.
15	Tabby	1 age	♂	Traffic accident	Left humerus diaphyseal fractures	Unilateral external fixation	Cases not follow.
16	Mix	1 age	♂	Fall from height	Left humerus diaphyseal communitif fractures	Unilateral eksternal fiksasyon and Tie-in	Healed.
17	Tabby	3 age	♂	Fall from height	Right radius-ulna diaphyseal communitif fractures	Bilateral external fixation	Healed.
18	Tabby	1.5 age	♂	Fall from height	Right radius-ulna diaphyseal communitif fractures	Bilateral external fixation	Healed.
19	Tabby	6 month	♀	Fall from height	Right humerus diaphyseal fractures	Unilateral external fixation	Cases not follow but he healed.
20	Mix	1,5 age	♀	Traffic accident	Left femur diaphyseal fractures	Unilateral external fixation	Cases not come postoperative controls

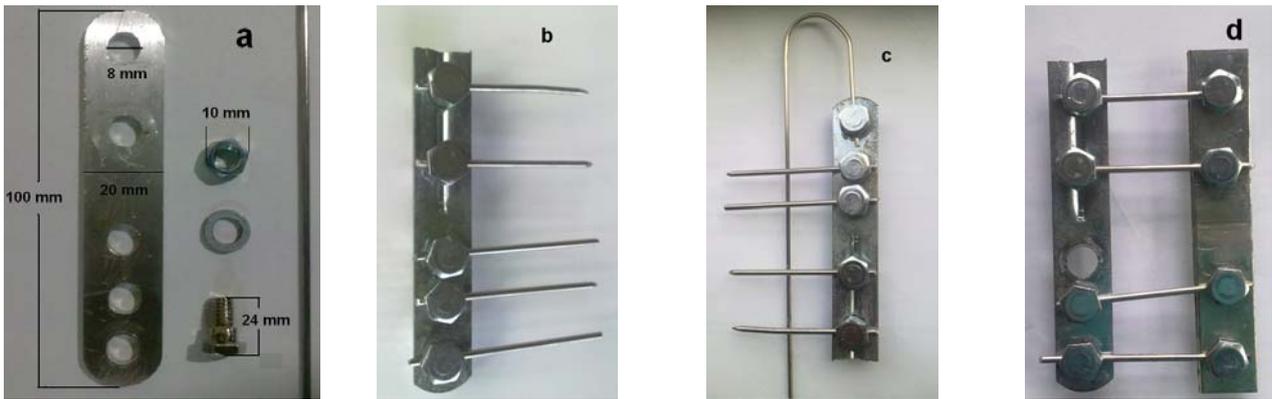


Figure 1. Modified external fixators measurements (a) form of use modified external fixators (b,c,d)

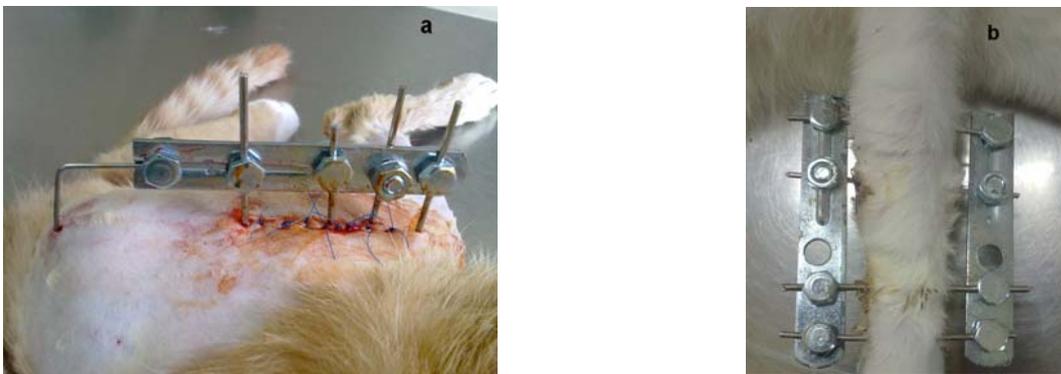


Figure 2. Modified external fixators applications Tibia Tip I Tie-in (a) Radius-ulna Tip II (b)

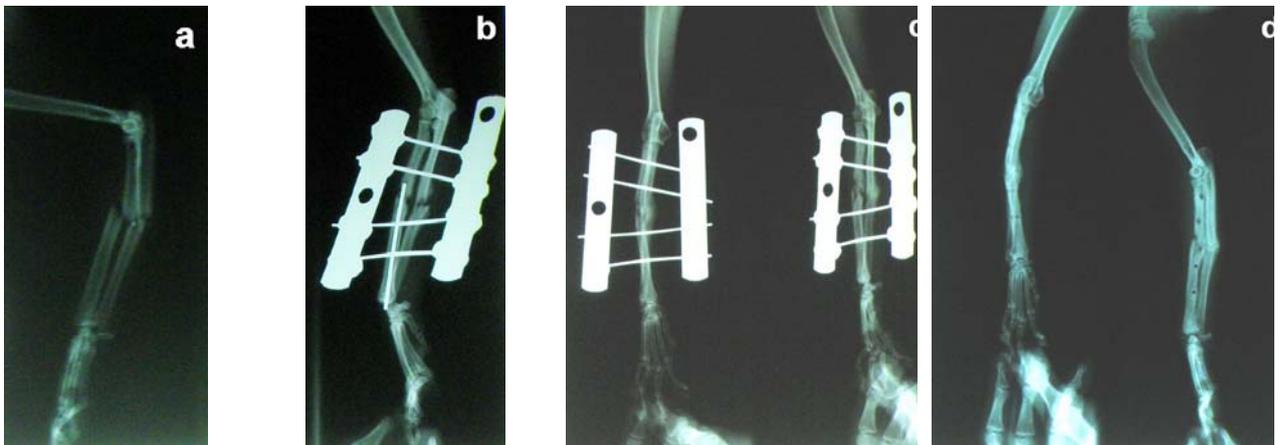


Figure 3. Preoperative (a) and postoperative (b,c,d) x-rays of case no: 5

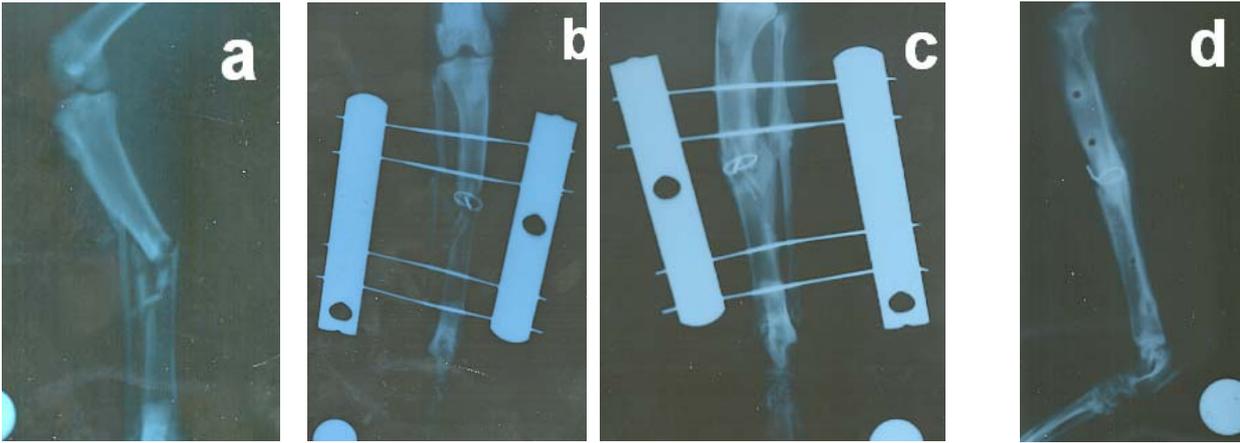


Figure 4. Preoperative (a) and postoperative (b,c,d) x-rays of case no: 12

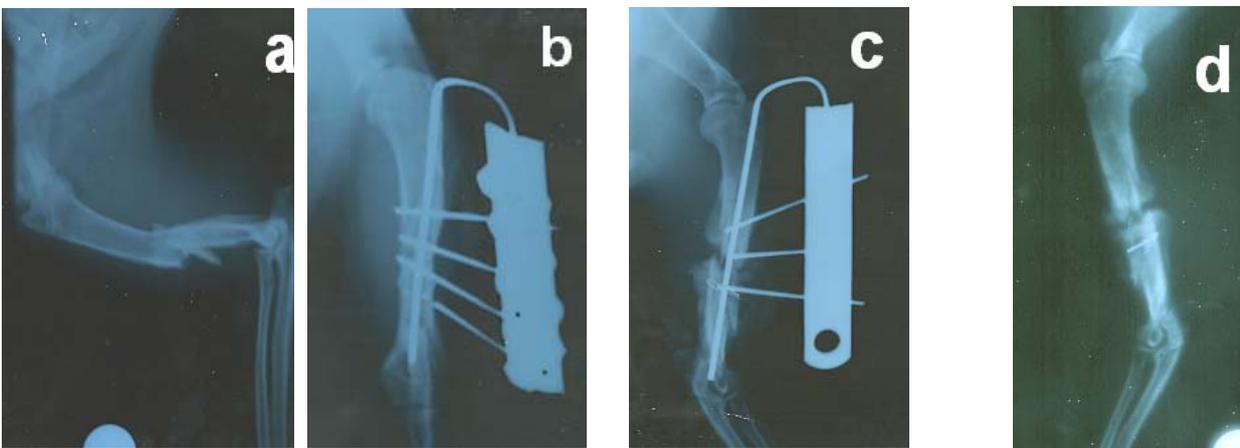


Figure 5. Preoperative (a) and postoperative (b,c,d) x-rays of case no: 16