

TRAUMATIC ELBOW LESIONS IN CATS

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Abstract:

The study was performed in 31 cats of various breed, age and gender that brought to Ankara University Faculty of Veterinary Medicine, Surgery Clinic with inability to use their forelimbs and diagnosed with traumatic lesions in the elbow joint after clinical and radiological examination. 32 lesions determined by evaluation of 31 cases were consisted of 23 fractures at the distal humerus (7 distal diaphyseal, 5 supracondylar, 2 condylar, 2 separation in the medial condylus, 1 separation in the lateral condylus, 5 intercondylar “Y” shaped fractures, 1 intercondylar “T” shaped fracture), 1 fracture at the proximal of radius (in the radial head), 4 fractures at the proximal of ulna (in the olecranon), 2 lateral luxations, 1 Monteggia lesion and 1 ankylosis in the elbow joint. Among these cases the following procedures have been performed: closed reduction in 1 case, conservative treatment in 2 cases, intramedullary nailing in 7 cases, transcondylar nailing in 5 cases, cross-nailing in 3 cases, parallel nail application in 1 case, transcondylar interfragmentary compression screw application in 1 case, stretching band application in 3 cases and amputation in 4 cases. While one of the patients died as a result of the contusion in lungs, in 3 other cases the owners refused the operation recommended. Clinical and radiographic controls of the patients were done on the 10th, 21st, 30th and 45th days. During this period 14 of the cases recovered functionally while narrowing in extension angle in the elbow joint with joint stiffness in 2 cases, functional loss in 1 case, nonunion in 1 case, paralysis of plexus brachialis in 3 cases were determined. 5 of the cases could not be surveyed.

Keywords: *Cat, elbow joint, trauma, treatment*

Introduction

Traumatic lesions of the area can be classified as joint injuries, ligament lesions, joint dislocations, close-to-joint fractures and intraarticular fractures (15). Articular lesions should be treated immediately in order to prevent the permanent damage. Erosions depending on disturbances in the joint surfaces and pathological stress should be reduced to minimum level. This can be achieved by the complete repair of the intraarticular fractures, reduction of dislocations, providing joint instability and performing arthrodesis when needed. Treatment should be planned carefully to prevent iatrogenic muscle, tendo or ligament lesions that can occur during surgical approaches to the joints (18).

Traumatic elbow lesions occur most commonly as a result of traffic accidents, falling from high places or hanged of the forelimbs while jumnailed (4,6,8). Growing animals tend to suffer from physeal fractures rather than luxations (7). Anatomical structure of the elbow joint makes this joint very resistant. Fractures of distal humerus and proximal radius and ulna occur more by depending on mechanism of traumatic effect. Sometimes fracture and luxation are seen together like in Monteggia lesion (3). For luxation without fracture formation, flexion angle of the joint should be less than 45° during trauma. When this angle is more than 45°, processus anconeus of ulnae cannot come out of fossa olecrani (4,6,20). Diagnose is confirmed by radiographical examination. Radiographs taken in antero-posterior direction are important. Lateral radiographs may be misleading due to incorrect perspective or superposition (7).

In the treatment interventions of elbow luxations within a few days, mostly closed reduction is performed (7). Open reduction is indicated in avulsion fractures originated from collateral ligaments, articular fractures, failure of closed reduction, reluxation and in case of chronic luxation. Arthrodesis can be considered depending on the lesions of intraarticular structures (20).

Fractures of distal humerus are the most common fractures associated with the elbow joint and followed by olecranon fractures (15). In a study on this object, it was detected that the half of the humerus fractures that diagnosed in cats and dogs are seen in the distal of

humerus and emphasized 74% of them are associated with the elbow (19,20). Fractures of proximal radius are seen less (7). Although caput radii fractures are rare, they generally occur as intraarticular fractures (14). In the distal of elbow, fractures of proximal of ulna alone are uncommon. Proximal metaphyseal fractures of ulna are located in the distal of lig. annulare radii and mostly seen with proximal radius fractures or together with dislocation of caput radii “Monteggia lesion” (15).

Other possible lesions associated with trauma, as a result of high falls and traffic accidents, have vital importance. Detailed examination of cardiovascular, respiratory and neurological systems are crucial (20).

In the treatment of the supracondylar fractures, open reduction and internal fixation is recommended in terms of providing early joint movements. Bone plates, intramedullary nails or external fixators can be used in animals of which the growth plates are closed. In young animals, intramedullary nails are preferred instead of bone plates and external fixators which cause to irregular bone lengthening by leading to premature closure of growth plate in the epiphyseal region (10). In the fixation method indicated according to the configuration of the fracture line and comminuted or complicated fracture; Steinmann nail which has two pointed spikes, Steinmann nail in small diameter or Kirschner wire, Rush nail, interfragmentary compression screw, one or more cerclage wires, neutralization or buttress plate, external fixator or intramedullary nail with tie-in configuration can be applied (11,15,18). The most frequent cause of failure in treatment in studies is inadequate fixation (18).

Movement restriction in the postoperative period is needed until the bone healing is seen radiographically. In order to avoid to loss of function, passive flexion and extension exercises can be suggested (7).

In this study, it is aimed that to describe the elbow luxations in cats which caused by trauma, to identify the fractures of distal humerus and close-to-joint and intraarticular fractures of proximal antebrachium, etiology, localizations and to evaluate clinically and radiographically results of indicated treatment approaches in the clinical cases and to guide for clinicians that work about this subject and contribute for similar studies.

Material and Method

The study material consisted of 31 cats of various breed, age and gender that brought to Ankara University, Faculty of Veterinary Medicine, Department of Surgery, Orthopedics and Traumatology Clinic between August 2008 and April 2010 because of complaint about inability to use forelimbs and determined traumatic elbow luxation after clinical and radiographical examinations. Detailed anamnesis was taken from the patient owners before the clinical examination. Systematic examinations of the cases with 24 hour trauma history were done and evaluated the general conditions. Localization and type of lesions were determined by taking antero-posterior (A/P) and medio-lateral (M/L) radiographies of well conditioned cases under sedation, conservative or operative treatment method and implants to be used were assessed.

General anesthesia was provided by using ketamine HCl %10 (Ketamidol[®], Richterpharma, 100 mg/ml) intramuscularly at a dose of 0.1 mg/kg after premedication with xylazine HCl %2 (Alfazyne[®], Alfasan, 20 mg/ml) at a 0.1 ml/kg dose. Maintenance dose was administered during the operation when needed.

In the operations, additional to the routine soft and ortopedic surgery sets Kirschner wires in various diameter, Steinman nails, cerclage wires and cortical screws were applied. Aluminium splint was used for conservative care or as a supportive bandage to the included extremity postoperatively.

After operation control radiographs were taken in the A/P and M/L directions. Oral antibiotics was administered during 7 days postoperatively. Skin stitches were taken on the

10th day, renewed supportive bandages were removed on the 21st day. Control radiographies in the A/P and M/L directions and clinical examinations were repeated on the 9th, 21st and 45th days.

Fracture healing was evaluated radiographically in terms of disappearing of fracture line and sharp bone ends, cortical continuity, presence of callus, primary or secondary reduction loss, delayed union, malunion, nonunion and osteomyelitis. The implants used were removed on the 35-45th days, but the screws and cerclage wires were left in place.

Findings

By the anamnesis fall from high in 10 cases, traffic accident in 3 cases, blunt trauma in 2 cases, spontaneous activity in 1 case resulted with lesion, in 15 cases etiology was unknown. 32 lesions determined by the evaluation of 31 cases were considered of 23 fractures at the distal humerus (7 distal diaphyseal, 5 supracondylar, 2 condylar, 2 separation in the medial condylus, 1 separation in the lateral condylus, 5 intercondylar “Y” shaped fractures, 1 intercondylar “T” shaped fracture, 1 fracture at the proximal of radius (in the radial head), 4 fractures at the proximal of ulna (in the olecranon), 2 lateral luxations, 1 Monteggia lesion and 1 ankylosis in the elbow joint. In 2 cases paralysis of plexus brachialis was detected with fracture.

The cause of lesion, detected lesion and its localization, treatment applied and the results of cases are reported in Table 1. Radiographs of some cases are presented in Figure 1-5.

Table 1. Outcomes, cause of lesions, localizations, treatment techniques of cases.

Case no.	Age	Breed	Gender	Cause	Localization and shape of lesion	Treatment	Result
1	7 months	Tabby	♀	Traffic accident	Supracondylar fracture of humerus	Because of the delay of the case, paralysis of plexus brachialis was detected with exuberant callus and angular union, and extremity amputation was performed.	No complication
2	7 Months	Tabby	♂	Unknown	Olecranon fracture	intramedullary Steinmann nail with 2mm diameter + stretching band and supported bandage were applied.	Functional healing was provided.
3	1,5 years	Orange tabby	♂	Unknown	Y” shaped intercondylar humerus fracture	intramedullary Kirschner wire with a diameter of 1 mm was directed to the condylus medialis. + 2 mm diameter transcondylary Steinmann nail was placed + cerclage and supported bandage was applied.	Joint stiffness was determined in Articulatio cubiti. Functional healing was achieved.
4	2 years	Tabby	♂	Unknown	Supracondylar fracture of humerus	2 Kirschner wires with 1 mm diameter crossed + supportive bandage.	Fixation deteriorated and nonunion was detected when the case was brought too late for postoperative control.
5	1 yaşlı	Tabby	♂	Unknown	“Y” shaped intercondylar humerus fracture	intramedullary Kirschner wire with a diameter of 1 mm was directed to the condylus medialis. + transcondylary 2 mm diameter lag screw was placed + hemicerclage and supported bandage was applied.	Full anatomic reduction and functional healing were achieved.
6	5 Months	Tabby	♂	Fall from high	“Y” shaped intercondylar humerus fracture	Steinmann nail with a diameter of 3 mm was directed to the distal medullary canal +1 mm diameter transcondylar Kirschner wire was placed + cerclage and supported bandage was applied.	Functional healing was achieved with joint stiffness and mild angular union in the elbow joint.

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7	1 yaşlı	Tabby	♂	Unknown	“T” shaped intercondylar humerus fracture	intramedullary Kirschner wire with a diameter of 1 mm was directed to the condylus medialis +1 mm diameter transcondylar Kirschner wire was placed + cerclage and supported bandage was applied	Decrease in joint extension angle due to nail penetration into the joint and in joint degeneration.
8	11 Months	Tabby	♀	Unknown	Supracondylar fracture of humerus	Intramedullary Steinmann nail with a diameter of 2 mm was directed to the distal medullary canal and supported bandage was applied.	The case could not be followed.
9	2 years	Cross breed	♂	Fall from high	“Y” shaped intercondylar humerus fracture	Intramedullary Steinmann nail with a diameter of 2 mm was directed proximal to tuberculum majus from condylus lateralis + transcondylar 2 mm diameter of Steinmann nail was placed + cerclage and supported bandage was applied	The case could not be followed.
10	4 Months	Tabby	♂	Fall from high	Lateral luxation	Closed reduction and supportive bandage was applied.	Functional healing was achieved.
11	1 year	Tabby	♀	Fall from high	Distal diaphyseal fracture of humerus	Intramedullary Steinmann nail 3 mm in diameter + 3 cerclage wires and supportive bandage were applied.	Functional healing was achieved.
12	1 year	Tabby	♀	Unknown	Distal diaphyseal fracture of humerus	Intramedullary Steinmann nail 2 mm in diameter + cerclage and supported bandage was applied	Functional improvement was achieved with normal extension angle + limited flexion angle.
13	10 Months	Cross breed	♀	Unknown	Olecranon fracture	intramedullary Kirschner wire 1 mm in diameter + stretching band and supportive bandage was applied.	Functional healing was achieved.
14	1 year	Tabby	♂	Unknown	Separation of lateral condylus	Intramedullary Steinmann nail with a diameter of 3 mm was directed to the distal medullary canal + transcondylar 1 mm in diameter Kirschner wire was placed + hemicerclage and supported bandage was applied.	Joint stiffness was determined in Articulatio cubiti. Functional healing was achieved by time.
15	2 Months	Cross breed	♂	Unknown	Distal diaphyseal fracture of humerus	1mm diameter Kirschner wires were placed crossly and supported bandage was applied.	Functional healing was achieved.
16	2,5 Months	Tabby	♂	Blunt trauma (Impact)	Supracondylar fracture of humerus	Intramedullary Steinmann nail of 2 mm in diameter + cerclage and supported bandage was applied.	Functional healing was achieved.
17	1 year	Cross breed	♂	Fall from high	Distal diaphyseal fracture of humerus	Owner refused surgery.	The result is unknown.
18	3 Months	Tabby	♂	Blunt trauma (Stone)	Separation of medial condylus	Supported bandage was applied.	Joint stiffness determined in Articulatio cubiti decreased with time and functional improvement was achieved.
19	4 Months	Tabby	♂	Fall from high	Distal diaphyseal fracture of humerus	Intramedullary Steinmann nail 2 mm in diameter + cerclage and supported bandage was applied	The case could not be followed (According to the knowledge, the cat has escaped but sometimes it has been seen and the lameness has disappeared).
20	1 year	Cross breed	♀	Unknown	Olecranon fracture	Intramedullary Steinmann nail 1 mm in diameter + stretching band and supportive bandage was applied.	Functional healing was achieved.

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21	5 Months	Cross breed	♂	Fall from high	Subperiosteal fracture at the proximal of radius	Supported bandage was applied.	Functional healing was achieved.
22	4 Months	Tabby	♀	Unknown	“Y” shaped bilateral intercondylar humerus fracture	Transcondylar 2 Kirschner wires were applied parallel to each other.	Joint stiffness determined in Articulatio cubiti decreased with time and functional improvement was achieved..
23	2,5 Months	Tabby	♀	Unknown	Epiphysiolysis at the distal of humerus	Extremity amputated because of plexus brachialis paralysis.	After 6 months, bone formation in the region was identified and revision was performed. The result is unknown.
24	4 Months	Cross breed	♂	Unknown	Supracondylar fracture of humerus	Owner refused the surgery.	No complications
25	4 Months	Tabby	♂	Traffic accident	Lateral luxation	Extremity amputated because of plexus brachialis paralysis.	The case could not be followed.
26	1 Months	Tabby	♀	Spontaneous activity	Distal diaphyseal fracture of humerus	Intramedullary Steinmann nail with a diameter of 2 mm was directed to the distal medullary canal, cerclage and supported bandage was applied.	It was stated by the patient's owner that the behavior of the cat was better than before. The result is unknown.
27	1 year	Tabby	♀	Unknown	Ankylosis in the carpal joint and the elbow joint	Ankylosis in art cubiti and contracture on art.carpi because of an old condylar fracture cause ulcus on dorsal of phalanx so extremity amputated.	The case could not be followed.
28	6 Months	Orange tabby	♂	Traffic accident	Olecranon fracture	Old fracture was detected in Olecranon, patient owner did not accept operative treatment proposal	The case could not be followed.
29	2 years	Cross breed	♂	Fall from high	Monteggia lesion	Intramedullary steinmann nail 1 mm in diameter + cerclage wire and supportive bandage applied.	Case was death due to lung contusion.
30	2 years	Tabby	♀	Fall from high	Distal diaphyseal fracture of humerus	Traumatic shock was determined and treatment was applied in this direction.	Functional healing was achieved.
31	5 Months	Cross breed	♂	Fall from high	Separation of condylus medialis	2Steinmann nails 2 mm in diameter crossly+ supportive bandage was applied	



Figure 1. Preoperative and postoperative A/P and M/L radiographies of Case no. 2



Figure 2. Preoperative and postoperative A/P and M/L radiographies of Case no. 3

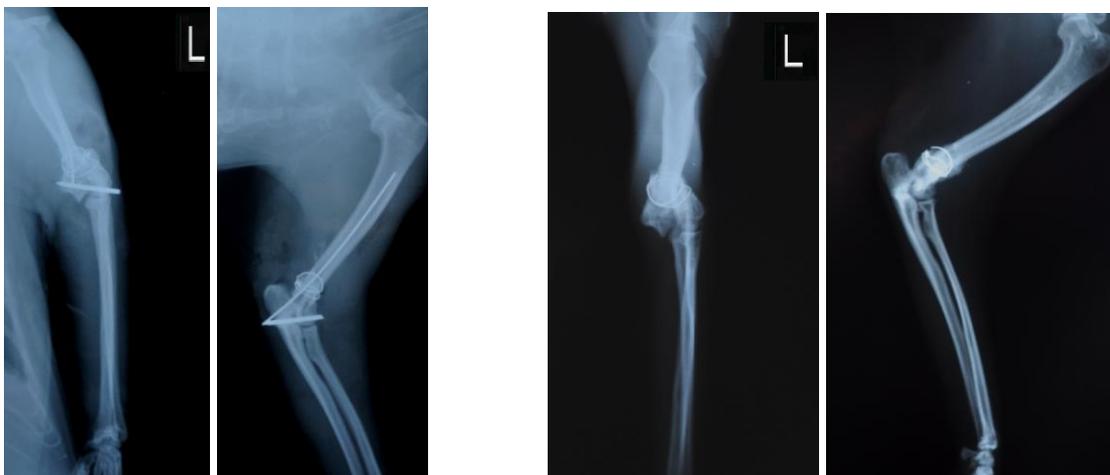


Figure 3. Preoperative and postoperative A/P and M/L radiographies on 21st day and after nail removal on the 45th day of Case no. 3



Figure 4. Non-operative pre-reduction and post-reduction A/P and M/L radiographies on the 10th day of Case no. 10



Figure 5. A/P and M/L radiographies preoperative and postoperative 21st day and after nail removal on the 45th day of Case no. 15

Discussion and Conclusion

Pulmonary contusion, pneumothorax and rupture in the bladder are common in traumatized cats (9). Pulmonary lesions were detected in 42-33% of the patients with fracture (5). In the study, a case (Case no. 29) that was diagnosed fracture in the distal humerus because of fall from high resulted with death due to lung contusion. In any case, pneumothorax and rupture in bladder were not observed.

In a study conducted, it was reported that exposure to trauma may be related to gender and traumatic lesions are more common in males than females (17). In this study, it was observed that 64.5 % of cases (20 cases) were male and 35.5 % (11 cases) were female when the distribution of traumatic lesions according to the gender was analyzed. It was found the results consistent to the literature data.

According to a research result; fractures were found more common than luxations in the lesion distribution in the elbow joint because of trauma (16). In only two cases among 31 cases in the study, luxation was detected.

It was determined that half of the humerus fractures in cats and dogs located in the distal humerus, and emphasized that 74% of them included the elbow joint (19). In the study, among the 23 distal humerus fractures determined in 22 patients, 52.2 % (12 cases) had extra articular, 30.4 % (7 cases) complicated articular, 13 % (3 cases) partial articular fracture and 4.4 % (1 case) epiphysiolysis.

The fractures of the distal humerus are the most common fractures associated with the elbow joint and followed by olecranon fractures (15). 79.3 % (23 cases) of occurred fractures were found at the distal humerus, 13.7% (4 cases) in the olecranon, 3.5% (1 case) at the proximal radius and 3.5 % (1 case) Type I Monteggia lesion as similarly in the literature.

Lateral luxations occur more commonly than medial luxations because of the medial condyle having a wider structure than the lateral condyle of humerus and structure of ligamentum obliquum and ligamentum olecrani (2). Traumatic elbow dislocation usually takes place laterally (5). In the study, cases in which the luxation was determined were both lateral luxation.

Prognosis is excellent for early-stage closed reduction and stabilized luxations (1). In the study, after closed reduction spica splint was applied for 10 days and healing was provided by suggesting restricted movement for 1 week in one of the cases.

Nerve lesions such as spinal traumas, plexus brachialis ruptures and radial paralysis are possible lesions with humeral fractures (12). In a case of this study, plexus brachialis paralysis along with the condylar humerus fracture, urinary incontinence due to spinal trauma, and

paresis in the right hind limb were determined.

Cross placement of Kirschner wires has a less negative effect on both bone and soft tissue than plate usage (13). In a case of study, Kirschner wires were applied with cross-nail technique in distal diaphyseal fracture treatment and successful results were obtained.

Prognosis of bicondylar humerus fractures are suspected. Fixation failure, refracture and posttraumatic osteoarthritis are frequent complications. In a study, it was reported that in only 52 % of operative treatment of bicondylar humerus fractures determined in cats and dogs the result was satisfying (13). In the study, complete anatomic reduction and functional healing in one of 5 ‘‘Y’’ shaped fractures, in two cases functional healing was achieved with joint stiffness of articulatio cubiti. In one of these cases, because of penetrating nail into the joint, degeneration and decreasing in the extension angle of joint was observed, one of the cases could not be followed.

Distal diaphyseal and supracondylar fractures of humerus occurs frequently in cats (19). In cases of this study, 23 humerus fractures having a distribution like 30.4 % distal diaphyseal, 21.8% supracondylar, 13% unicondylar, 30.4% bicondylar was similar to the literature.

It is recommended that cross-nail and plate applications for distal diaphyseal and supracondylar fractures, interfragmentary compression screw and Kirschner wires applications for unicondylar fractures. In the treatment of bicondylar fractures, interfragmentary compression screw together with plate application or interfragmentary compression screw with cross-nailing is recommended (19). Functional healing was achieved by cross-nailing of two Kirschner wires in a case that diagnosed distal diaphyseal fracture for treatment. Fixation provided by cross-application of two Kirschner wires for supracondylar fracture in one case resulted with nonunion due to failure of fixation in the postoperative period. In another case of diagnosed ‘‘Y’’ shaped fracture, functional recovery was improved with full anatomic reduction and fixation provided by transcondylar screwing.

Very rare caput radii fractures usually occur as secondary to trauma (14). It was observed that the proximal radius fracture determined in only 1 case out of 31 cases constituting the study was a subperiosteal fracture.

As a result, by evaluating traumatized cats for pulmonary contusion, pneumothorax and ruptured bladder, indicated conservative and operative treatment should be performed as soon as possible to avoid permanent functional disturbances in traumatic elbow lesions. In terms of preventing possible the joint related complications, choice of proper treatment option depending on the case, providing full anatomic reduction, importance of postoperative care and monitorization should not be forgotten.

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