Bone fractures in dogs: A retrospective study of 129 dogs

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Abstract

The aim of the present study was to evaluate 129 dogs with different breed, age and sex admitted to the clinic of Department of Surgery, Anesthesiology and Radiology, Faculty of Veterinary Medicine, Zagazig University over a 2-year period with different kinds of fractures. Thorough clinical and radiographic examinations were performed to all animals. The results revealed that German shepherd dogs (74.41%), immature dogs below 1 year of age (80.62%) and male dogs (57.36%) were the most susceptible to fractures. The percentages of fractures of the hind limb (48.06%) were the most common location of the fractures on animals followed by forelimb fractures (28.68%) then pelvic fractures (20.16%) and fractures of the mandible (3.1%). Femur fractures (27.13%) were the most common long bone fractures followed by tibia/fibula (15.5%) then radius/ulna (11.63%) and humerus (10.08%). About 79.84% of animals were treated by gypsona (42.72%), cross pins (22.33%), plate and screws (18.45%), intramedullary pins (14.56%) and wiring (1.94%). Satisfactory results were reported in 86.40% of treated animals and post-operative complications were reported in 13.60% of animals. It was concluded that immature and male dogs were more susceptible to bone fractures. Most of fixation methods are successful when basic principles of fracture repair are followed.

***Keywords*:** Dogs, Fractures, Plate, Intramedullary pins
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كسور العظام في الكلاب: دراسة على ١٢٩ من الكلاب

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الخلاصة

هدفت الدراسة الحالية إلى تقييم عدد ١٢٩ كلبًا من مختلف السلالات والأعمار والجنس التي وردت لعيادة قسم الجراحة والتخدير والأشعة، كلية الطب البيطري، جامعة الزقازيق على مدار عامين والتي تعاني من كسور مختلفة. تم إجراء الفحص الإكلينيكي والفحص الشعاعي لجميع الحيوانات. وقد كانت سلالة الراعي الألماني بنسبة ٧٤,٤١٪، والكلاب التي تراوحت أعمارها أقل من عام بنسبة ٨٠,٦٢٪ والكلاب الذكور بنسبة ٥٧,٣٦٪ الأكثر عرضة للكسور. وكانت كسور الأطراف الخلفية بنسبة ٤٨,٠٦٪ أكثر شيوعًا بين الحيوانات، تليها كسور الأطراف الأمامية بنسبة ٢٨,٦٨٪ ثم كسور عظمة الحوض بنسبة ٢٠,١٦٪ وكسور عظمة الفك بنسبة ٣,١٪. وكانت كسور عظمة الفخذ بنسبة ٢٧,١٣٪ هي الأكثر شيوعًا، يليها عظم الساق/الشظية بنسبة ١٥,٥٪ ثم عظم الساعد/الزند بنسبة ١١,٦٣٪ وعظمة العضد بنسبة ١٠,٠٨٪. تم علاج الحيوانات بنسبة ٧٩,٨٤٪ باستخدام الجبسونا الطبية وكانت نسبتها ٤٢,٧٢٪، وباستخدام مسمارين نخاعيين معاكسين لبعضهما بنسبة ٢٢,٣٣٪، وباستخدام شرائح العظم بنسبة ١٨,٤٥٪، وباستخدام المسمار النخاعي بنسبة ١٤,٥٦٪ وباستخدام سلك من الاستانلس ستيل بنسبة ١,٩٤٪. وقد كانت النتائج مرضية بنسبة ٨٦,٤٠٪ بين الحيوانات التي تم علاجها وحدثت مضاعفات بعد العلاج بنسبة ١٣,٦٠٪ من الحيوانات التي تم علاجها. وقد خلصت هذه الدراسة إلى أن الكلاب غير الناضجة والكلاب الذكور أكثر عرضة للكسور. وأن معظم الطرق المستخدمة في تثبيت الكسور تعطي نتائج إيجابية في حالة اتباع القواعد الأساسية في العلاج.

Introduction

Over the last 10 years, pet care has been progressed dramatically in our population. Despite of more care of owners with their pet animals, they are susceptible to many accidental disorders especially orthopedic disorders. In pet animals, bone fractures represent the most common major problem particularly in dogs (1). Long bone fractures particularly femur constitute the most common injury in dogs and cats (2). The most common cause of fractures in pet animals are violent trauma with fallen down from height or vehicular accident (3-5). Evaluation of the fracture is the most important point in fracture treatment. It should be assessed for location, type, involvement of the joint, fragment direction and number and whether open or closed (3).

Restoration of the normal structure and function of the fractured part is the main goal of treatment. Fixation method should neutralize the intrinsic and extrinsic forces generated on the fractured part to be restored in normal structural phase (3,6-10). Various fixation methods used to manage fractures of dogs including external cooptation, intramedullary (IM) pins, bone plates and screws, external skeletal fixation (ESF), interlocking nail (ILN) and lag screw (11,12). Many factors control the selection of proper fixation method such as animal age and size, number of involved limbs, type of fracture, location of fracture, soft tissue injuries, surgeon capabilities and facilities (8). Therefore, the aim of this study was to evaluate 129 dogs with different breed, age and sex admitted to our clinic over a 2-year period with different kinds of fractures.

Materials and methods

A total of 129 dogs were admitted to the clinic of Department of Surgery, Anesthesiology and Radiology-Faculty of Veterinary Medicine-Zagazig University over a 2-year period with a history of limb or mandible fractures. Vertebral fractures or neurogenic disorders were not investigated. Breed, age, sex of animals was recorded.

The animals were clinically examined by inspection to assess animal's gait, pasture and cardinal signs of inflammation, then by local manipulation to detect pain, abnormal motion and crepitus at the affected site. Two diagonal radiographs were taken for each animal at the affected site using X-ray machine (Pox-300 BT, Toshiba, Rotanode™, Japan) with appropriate exposure factors based on the weight and depth of the affected animal and then interpreted for treatment decision.

Different treatment techniques including Plaster of Paris, bone plate and screws, IM pins, cross pins and stainless-steel wire were performed according to type and location of the fracture and owner acceptance. Post-operative prognosis of the treated animals was reported either through bringing of the animals to the clinic when possible or by calling the owners.

Results

Distribution of breed, age and sex

The distribution of breed, age and sex was illustrated in table 1. German Shepherd dogs were the most commonly breed susceptible to fractures (74.41%), followed by Doberman Pinscher breed (19.38%), then White griffon breed (2.33%), Rottweiler (2.33%) and non-descriptive dogs (1.55%). Fractures were more common in immature dogs below 1 year of age (80.62%) than mature dogs (19.38%) and in male dogs (57.36%) than female one (42.64%).

Table 1: Distribution of breed, age and sex

Item		No. of animals	Percentage
Breed	German Shepherd	96	74.41%
	Doberman Pinscher	25	19.38%
	White Griffon	3	2.33%
	Rottweiler	3	2.33%
	Non descriptive dogs	2	1.55%
	Total	129	
Age	< 1 year	104	80.62%
	> 1 year	25	19.38%
	Total	129	
Sex	Male	74	57.36%
	Female	55	42.64%
	Total	129	

Etiology of fractures

Most of fractures caused by fall down of animals from height (80.62%) or vehicle accident (19.38%) (Table 2).

Table 2: Etiology of fractures

Item	No. of animals	Percentage
Fall down	104	80.62%
Vehicle accident	25	19.38%
Total	129	

Incidence of fracture location

The incidence of fracture location was illustrated in table 3. The fractures were located more commonly in the hind limb (48.06%), followed by forelimb fractures (28.68%), then pelvic fractures (20.16%) and fracture of the mandible (3.1%). Femur was the most commonly bone

susceptible to fracture in the body (27.13%), followed by tibia/fibula (15.5%), then radius/ulna (11.63%) and humerus (10.08%). The percentage of metacarpus/digit fractures was 6.98% while of metatarsus/digit was 5.43%. Fractures of the pelvis were composed of ilium (6.98%), ischium (3.87%), pubic (3.87%), and acetabulum (5.43%) fractures. Long bones include femur, tibia/fibula, humerus and radius/ulna. Middle portion of the long bones was the most common site susceptible to fracture (44.58%), followed by distal portion of the bones (37.35%), then the proximal portion (18.07%) (Table 4).

Table 3: The incidence of fracture location

Location of the fracture		No. of animals		Percentage	
Mandible		4		3.1%	
Forelimb	Humerus	13	37	10.08%	28.68%
	Radius/Ulna	15		11.63%	
	Metacarpus/Digit	9		6.98%	
Hind limb	Femur	35	62	27.13%	48.06%
	Tibia/Fibula	20		15.5%	
	Metatarsus/Digit	7		5.43%	
Pelvis	Ilium	9	26	6.98%	20.16%
	Ischium	5		3.87%	
	Pubis	5		3.87%	
	Acetabulum	7		5.43%	
Total		129		100%	

Methods of treatment and post-operative prognosis

One hundred and three dogs (79.84%) were treated with different fixation methods while (20.16%) of dogs with pelvic fractures their owners did not accept treatment options and forced for complete rest (Table 5). The animals were treated with Plaster of Paris (42.72%) for metacarpus and metatarsus/digit (16 case), radius/ulna (15 case) and tibia/fibula (13 case) fractures, cross pins (22.33%) for femur (12 case) and humerus (11 case)fractures, bone plate and screws (18.45%) for femur (10 cases), tibia/fibula (5 cases), humerus (2 cases) and mandible (2 cases) fractures, IM pins (14.56%) for femur (13 case) and tibia/fibula (2 cases) fractures and interdental wiring (1.94%) for mandible fractures (2 cases). The treated animals were followed up post-operatively for efficacy of treatment methods and post-operative complications. About 86.40% of treated cases were successful with good results. While 13.60% of treated cases were reported with post-operative complications including pin migration 4.86%, osteomyelitis 2.91%, bone re-fracture 0.97%, muscle atrophy 0.97%, and malunion 3.89%.

Table 4: Location of fracture on long bones

Location of fracture	Type of long bone	No. of animals	Total	Percentage
Proximal	Humerus	0	15	18.07%
	Radius/Ulna	3		
	Femur	9		
	Tibia/Fibula	3		
Middle	Humerus	3	37	44.58%
	Radius/Ulna	9		
	Femur	13		
	Tibia/Fibula	12		
Distal	Humerus	10	31	37.35%
	Radius/Ulna	3		
	Femur	13		
	Tibia/ Fibula	5		
Total			83	100%

Table 5: Treatment of affected animals and post-operative complications

Item			No. of animals	Total	Percentage	
Treatment	Treated		103	129	79.84%	
	Untreated		26		20.16%	
Methods of treatment	IM pins		15	103	14.56%	
	Plate		19		18.45%	
	Wire		2		1.94%	
	Cross pins		23		22.33%	
	Plaster of Paris		44		42.72%	
Post-operative prognosis	Good results		89	103	86.40%	13.60%
	Complications	Pin migration	5	14	4.86%	
		Osteomylitis	3		2.91%	
		Bone re-fracture	1		0.97%	
		Muscle atrophy	1		0.97%	
		Malunion	4		3.89%	

Discussion

Bone fractures in the present study were most commonly in German shepherd dogs (74.41%) followed by Doberman pinscher (19.38%), then White Griffon (2.33%), Rottweiler (2.33%) and non-descriptive dogs (1.55%). This might be due to more interest of our population to keep this dog breed. Immature dogs below one year of age (80.62%) were more susceptible to fractures; might be due to the fragility of their bones in comparison to older ones (13-15). These findings were in agreement with previously described by Aithal *et al*; Minar *et al*; Kolata *et al.* (11,16,17).

Fractures were more common in male dogs than females that might be attributed to aggressive nature, wandering habits and the high metabolic rate of males. These results were in line with previously reported Aithal *et al.*; Simon *et al.*; Kolata *et al.* (11,15,17). Violent trauma due to fall down from height and vehicle accident were the common causes of fractures as reported previously (2,18). This might be due to most people in our population keep their own dogs on the roof of the buildings and others for playing and jumping. These findings were in contrast with those reported previously Minar *et al*; Phillips; Bennour *et al.* (16,19,20) where they reported that the most common cause of fracture was traffic accident followed by fall down.

Long bone fractures including humerus, radius/ulna, femur and tibia/fibula were the most common orthopedic problem in growing dogs (15,19,21,22). Our results were in agreement with these findings where the long bone fractures represented about 64.33% from total fractures. Pelvic fractures accounted approximately 20.16% of all fractures. It was reported that pelvic fractures accounted approximately 25% of all fractures in dogs (16,23,24). Fractures of the hind limb were more commonly reported than forelimb as previously reported Minar *et al.* (16). Femur fractures were the most commonly reported among all long bone fractures and represent approximately half of all long bone fractures (27.13%) as previously reported Harasen; Aithal *et al.*; Tercanliogu and Sarierler; Piermattei and DeCamp (10,11,13,25) followed by tibia/fibula (15.5%), then radius/ulna (11.63%)and humerus (10.08%). These findings were similar to previously reported Harasen; Aithal *et al.* (11,16). Middle fractures were the most common long bone fractures (44.58%), followed by distal fractures (37.35%), then proximal fractures (18.07%). These results were in contrast with these reported previously Minar *et al.* (16) where they reported that distal fractures represented 67% of long bone fractures followed by middle then proximal fractures.

Proper reduction of fractured bone with normal alignment and using proper fixation method were important for good prognosis (25). Most of animals (79.84%) were treated with different fixation methods including Plaster of Paris (42.72%), followed by cross pins (22.33%), then plate and screws (18.45%), IM pins (14.56%) and wiring (1.94%). The aim of fracture fixation is to provide adequate fracture stability with significant reduction in local strain at the fracture area (26). The prognosis of the treated animals was satisfactory in 86.40% and post-operative complications were reported in 13.60% of the treated animals including pin migration (4.86%), followed by malunion (3.89%), then osteomyelitis (2.91%), bone re-fracture (0.97%) and muscle atrophy (0.97%).

The findings of the present study revealed that immature and male dogs were more susceptible to bone fractures. Most of fixation methods are successful when basic principles of fracture repair are followed. Many fixation methods including Plaster of Paris, IM pins, bone plates and screws, cross pins and wiring were used according to location and type of the fracture, age and size of the animals.

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