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Fracture Occurrence Pattern in Animals

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ABSTRACT

The overall incidence of fracture was recorded as 0.95 per cent for all species of animals. The incidence of fracture in dog was 0.76 per cent. Dog was observed as the most common species presented with a fracture followed by goat and other species. The mean age was recorded to be 26.32 ± 5.14 months. Fifteen animals (78.95%) were noticed in age group of 12-36 months. Majority of animals were non-descript (42.10%). Fracture was recorded more in male animals (77.78%). An automobile accident (42.10%) emerged to be the major cause of fracture, whereas a fall from height (31.58%) was second common cause of fracture. The femur was found to be the most common bone (47.37%) involved in the fracture, seconded by tibia-fibula (36.84%), which was followed by radius-ulna (15.79%). The radiographic examination conducted in two orthogonal views revealed that 14 (73.68%) fractures were multiple whereas, 5 (26.32%) fractures were comminuted.

Keywords: Fracture, dog, animals, age, breed, trauma, body weight

Long bones are subjected to physiological and non-physiological forces. Non-physiological forces can be imposed in unusual situations, such as automobile accidents, gunshot injuries and falls. They can be transmitted to the bone directly and may easily exceed the ultimate strength of bone, causing a fracture. Clinically, fracture may be simple low energy fracture in which the failure force can be inferred, or more commonly, the fracture pattern is more complex because of combination of loads (Hulse and Hyman, 1993).

MATERIALS AND METHODS

Animals

The study was conducted on clinical cases presented to Teaching Veterinary Clinical Complex having long bone fracture. Nineteen dogs of either sex between age group of 1-6 years were selected. Mature and apparently healthy dogs having diaphyseal fracture of long bones with bone loss were included in the present study. The animals having

infection and/ or compound fracture or with any other comorbidity were excluded. The age, sex and breed of the dogs were recorded to infer significance for the study. The history of trauma was recorded to ascertain the etiology of the fracture.

Radiographic examination

Radiographic examination in two orthogonal views of the affected limb was conducted using a 100 mA Multi-Mobil (Siemens) machine with standard exposure factors. The radiograph was prepared on a conventional radiographic film or on Computerised Radiography (CR) System.

RESULTS

Incidence

The present investigation was undertaken to study the incidence and distribution of fracture in different species of animals presented at TVCC. A total number of 9406

animals, irrespective of breed and sex were screened during the period of 12 months (June, 2014 to May, 2015). Out of these animals, 89 animals were presented with a fracture of limb, thus the overall incidence of fracture was recorded as 0.95 per cent for all species of animals.

Out of these animals, 7262 animals were dogs, out of which 55 dogs were found with fracture in various bones. Therefore, the incidence of fracture in dog was calculated to be 0.76 per cent. Dog was observed as the most common species presented with a fracture at TVCC followed by goat and other species; however, the percentage of fracture cases was higher in cattle and buffalo followed by goat and dog (Table 01).

Table 1. Incidence of fracture at TVCC

Species	Number	Fracture cases	Per cent (%)
Dog	7262	55	0.76
Goat	1305	22	1.69
Cattle and Buffalo	289	10	3.46
Other species	550	2	0.36
Total	9406	89	0.95

Age

The age of the dogs selected for the study was observed to be between 1 to 6 years. The mean age was recorded to be 26.32±5.14 months. Fifteen animals (78.95%) were noticed in age group of 12-36 months, whereas the remaining four animals (21.05%) were in age group of 37-72 months (Table 02).

Table 2. Age wise distribution of fracture

Age group (months)	Mean age (months)	Number of animals	Per cent (%)
12-36	15.33±1.27	15	78.95
37-72	67.50±2.87	4	21.05
Overall mean	26.32±5.14	19	100.00

Breed

Majority of animals were non-descript (42.10%), followed by Pomeranian (26.32%), Labrador (21.05%) and German shepherd (10.53%) (Table 03).

Table 3. Breed wise distribution of fracture

Breed	Number of animals	Per cent (%)
Nondescript	8	42.10
Pomeranian/Samoyeds	5	26.32
Labrador	4	21.05
German shepherd	2	10.53

Sex

Fracture was recorded more in male animals (14) whereas; it was less in female animals (5) among the animals included in this study (Table 04).

Table 4. Sex wise distribution of fracture

Sex	Number of animals	Per cent (%)
Male	14	73.68
Female	5	26.32

Body weight

The mean body weight (kg) for all the animals included in this study was 16.11±1.55. Further, it was calculated as 14.43±2.97, 14.17±1.40 and 20.00±2.94 in groups T1, T2 and T3, respectively (Table 05).

Table 5. Mean body weight (kg) of animals in treatment groups

S. No.	Groups	Mean body weight (kg)
1	Group T1	14.43±2.97
2	Group T2	14.17±1.40
3	Group T3	20.00±2.94
4	All animals	16.11±1.55

In present study, 42.11 per cent animals were having body weight between 11- 20 kg, followed by 31.58 per cent animals between 21-30 kg, 26.32 per cent animals of 1-10 kg, each respectively as depicted in Table 06.

Table 6. Distribution of animals based on body weight

S. No.	Body weight (kg)	Number of animals	Per cent (%)
1	1-10	5	26.32
2	11-20	8	42.11
3	21-30	6	31.58

Etiology

An automobile accident (42.10%) emerged to be the major cause of fracture, whereas a fall from height (31.58%) was second common cause of fracture. Other miscellaneous causes noticed were pig bite, hit by stick, hit by large animals, etc (Table 07).

Table 7: Etiology of fracture

Etiology	Number of animals	Per cent (%)
Automobile accident	8	42.10
Fall from height	6	31.58
Miscellaneous causes	5	26.32

Time interval between trauma and presentation

The mean duration lapsed was 9.37 ± 1.86 days for the animals included in study. It was highest i.e. 12.42 ± 4.05 days in group T1, followed by 10.17 ± 3.12 days in group T2 and 9.83 ± 1.28 days in group T3 as depicted in Table 08.

Table 8. Mean time interval (days) between trauma and presentation in treatment groups

S. No	Groups	Mean time interval (days)
1	Group T1	12.42 ± 4.05
2	Group T2	10.17 ± 3.12
3	Group T3	9.83 ± 1.28

Distribution of fracture

The femur was found to be the most common bone (47.37%) involved in the fracture, seconded by tibia-fibula (36.84%), which was followed by radius-ulna (15.79 %) (Table 09). No fracture of humerus was found suitable to

be included in the study. All the fractures were diaphyseal fractures having varying degree of bone loss at fracture site due to severe trauma.

Table 9. Distribution of fracture among long bones

Bone	Number of animals	Per cent (%)
Femur	9	47.37
Tibia-fibula	7	36.84
Radius-ulna	3	15.79

Eleven animals (57.89%) suffered from a fracture in right limb, whereas eight animals (42.11%) suffered fracture in left limb, as described in Table 10. Further, the fracture was most common in right hind limb (52.63%) followed by left hind limb (31.58%) and fore limbs (15.79%).

Table 10. Limb wise distribution of fracture

Site of fracture	Number of animals	Per cent (%)
Right limb	11	57.89
Left limb	8	42.11

Type of fracture

The radiographic examination conducted in two orthogonal views (cranio-caudal and medio-lateral) revealed that 14 (73.68%) fractures were multiple whereas, 5 (26.32%) fractures were comminuted, as mentioned in Table 11.

Table 11: Type of fracture

Type of fracture	Number of animals	Per cent (%)
Multiple	14	73.68
Comminuted	5	26.32

DISCUSSION

The incidence of fracture was found to be 0.95 per cent for all the species presented at TVCC during the study period whereas the incidence of fracture in dog was calculated to be 0.76 per cent. In an earlier study at TVCC, Desouza (2012) has also observed the same incidence of long bone fractures in dogs. However, Rajhans (2013) has reported



a little higher incidence (0.90%). This indicates that the incidence of the fracture in dogs was almost stable among animals presented at TVCC in last few years. However, a higher incidence (17.80%) has been recorded by Ben-Ali (2013) due to the calculation of incidence out of the surgical cases only (116/650).

The mean age of the animals included in present study was recorded to be 26.32 months (2.19 years). Most of the animals (78.95%) included in the study were in age group of 12-36 months, whereas rest of the animals (21.05%) were in age group of 37-72 months. According to the findings of Aithal *et al.* (1999) majority of the fractures (54.00%) in dogs were seen in animals of less than one year, whereas 35.52 per cent fractures were seen in age group of 1-3 year. Similarly, Simon *et al.* (2010) reported the incidence of fracture to be highest in young animals (46.02%) of less than six months of age. The higher mean age calculated in present study is attributed to the fact that the animals only of 1-6 years of age were included in study. Further, the animals of 1 to 3 years of age were more commonly affected than the animals of 3-6 years of age in the present study. This finding may be correlated with the fact that young ones are more active and are not learned to cope up with hazards unlike their older counterparts (Aithal *et al.*, 1999).

The majority of the animals suffering from a fracture in this study were non-descript (42.10%), followed by Pomeranian (26.32%), Labrador (21.05%) and German-shepherd (10.53%). Simon *et al.* (2010) observed pelvic limb fracture to be more common in non-descript dogs (47.48%) followed by Spitz (20.08%), German shepherd (7.11%) and Labrador (5.85%). Simon *et al.* (2011) has also reported the pelvic limb fractures more in non-descript dogs (37.76%), followed by Spitz (29.60%), Labrador (7.55%) and German shepherd (6.04%). However, according to the findings of Ben-Ali (2013) German shepherd (19.32%) was the most common breed affected with the fracture, followed by wolf (17.05%), mongrels (15.90%) and other six breeds (52.27%). The findings of the Simon *et al.* (2010), Simon *et al.* (2011) and Aithal *et al.* (1999) are almost similar with present study; whereas the observations of Ben-Ali (2013) may be attributed to different breed pattern and socio-economic status outside the country. In present study higher incidence of fracture in non-descript followed by Pomeranian may be due to more population of such dogs.

During the present study, fracture was more commonly reported in male dogs (78.95%) than female dogs (21.05%) which coincided with the study of Aithal *et al.* (1999). They reported a significantly higher ($p < 0.05$) incidence of fracture in male dogs (63.16%) than females (36.84%). Almost similar observation have also been recorded by Minar *et al.* (2013) who observed a higher incidence of fracture in male dogs (54%) than female dogs (46%). This may be attributed to the fact that males are more aggressive and tend to wander more than their female counterparts, thus more vulnerable to fracture (Aithal *et al.* 1999). Further, it is also a fact that people have a preference for a male dog due to different reasons than a female dog; this increases the share of male animals in total population, therefore more number of male dog were presented with fracture than female dogs.

The mean body weight was found to be 16.11 ± 1.55 kg for all the animals. In present study, 42.11 per cent animals were having body weight between 11- 20 kg, followed by 31.58 per cent animals between 21-30 kg, 26.32 per cent animals between 1-10 kg, respectively. Contrary to findings of this study, Minar *et al.* (2013) also reported that 76.00 per cent dogs suffering from fracture were having body weight between 1-10 kg and 24.00 per cent dogs suffering from fracture were having body weight between 10-25 kg. These reported variations in body weight may be due to differences in breed, location and nutritional status of base population.

During present study, an automobile accident was found responsible for a fracture in 42.10 per cent dogs, followed by a fall from height (31.58%) and miscellaneous causes (26.32%). According to the findings of Aithal *et al.* (1999), an automobile accident (46.86%) was major cause of fracture in dogs followed by a fall from height (39.11%) and other cases (14.03%). Similarly, Minar *et al.* (2013) also observed an automobile accident (43.00%) as the major cause of trauma for fracture, followed by falling down (28.50%), trauma (16.00%), stuck in door (5.00%) and other causes (7.50%). Similar findings have also been recorded by Desouza (2012) and Rajhans (2013). This finding may be based upon the fact that the most of the dogs included in this study were non-descript and most of such animals are usually let loose to roam outside freely thus more likely to succumb to road accidents (Maala and Celso, 1975).

Time interval between trauma and presentation ranged from 3 to 27 days. This observation reflected the concern of the owner for his/her pet; however, the distance was not only a regulating factor for presentation of the pet at TVCC. The socioeconomic status may also be a contributing factor for variation in presentation of animal for treatment at a hospital. Further, this may be attributed to carelessness of owner and treatment by the nearby veterinarians.

The femur (47.37%) was the most common bone found to be involved in fracture, followed by tibia-fibula (36.84%) and radius-ulna (15.79%). Aithal *et al.* (1999) reported highest number of fractures in femur (38.56%) followed by tibia-fibula (17.16%) and radius-ulna (16.92%) and humerus (7.71%) among four long bones. Minar *et al.* (2013) have also reported the hind limb (37.00%) as most common, followed by forelimb (30.00%), pelvis (22.00%) and facial bones (11%).

This indicates that the presence of abundant muscles do not fully protect the femur from getting fractured. However, increased forces and moments placed on proximal bones caused by physical factors, such as muscle forces used for locomotion and resistant to the forces of gravity; ground reaction forces as limbs strike the ground; and the long moment arm at the proximal aspect of the limb, compared with the distal portion of the limb probably make them more susceptible to fracture (Markel *et al.*, 1994). Moreover, Singh *et al.* (1983) opined that most of such fractures were caused by automobile accidents, where the animals were most likely to hit from behind, as the animals were slow to react from their hind quarters.

Eleven animals (57.89%) suffered from a fracture in right limb, whereas eight animals (42.11%) in left limb. Further, the fracture was most common in right hind limb (52.63%) followed by left hind limb (31.58%) and forelimbs (15.79%). Contrary to the finding of present study, Simon *et al.* (2010) observed that left femur fractures (51.54%) were more than right femur. However, Aithal *et al.* (1999) stated that left hind-limb and right fore-limb were equally affected with fracture. Further, the authors have assigned no reason for this variation. In this study also, the reason for more involvement of right hind limb in a fracture could not be explored.

In present study, multiple fractures (73.68%) were reported to be higher than comminuted fractures (26.32%). Comminuted and multiple fractures were more frequently

seen in age group of 1-3 years (Aithal *et al.*, 1999). Most of the animals (78.95%) included in this study were also in age group of 1-3 years. Secondly, the automobile accident emerged to be a major cause of fracture in this study and this type of high energy trauma may likely to result in multiple and comminuted fractures.

CONCLUSION

The overall incidence of fracture was recorded as 0.95 per cent for all species of animals. The incidence of fracture in dog was 0.76 per cent. The mean age was recorded to be 26.32 ± 5.14 months. Majority of animals were non-descript (42.10%). Fracture was recorded more in male animals (77.78%). An automobile accident (42.10%) emerged to be the major cause of fracture and the femur was found to be the most common bone (47.37%) involved in the fracture.

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