Prevalence of pelvic fractures in cat and dogs: A retrospective study in 183 cases (2016-2020)

ABSTRACT
This study aims to classify radiographically diagnosed pelvic fractures in cats (n = 103) and dogs (n = 80). The pelvic bone resembles a box structurally, and as a result of the trauma of this bone, multiple fractures usually occur. Radiographs of cats and dogs exposed to various traumas were evaluated and classified as ilium, ischium, pubis, acetabulum, sacroiliac luxations and symphysis pubis fractures. The mean age of the cases included in the study was 16.9 months in cats and 19.2 months in dogs. Pelvic fractures were more common in females than males (♀ = 57.9%, ♂ = 42.1%). In this context, it was constituted 18.7% ilium fractures, 12.6% pubis fractures, 18.9% ischial fractures, 11.3% acetabulum fractures, 29.2% sacroiliac luxation and 9% symphysis pelvis fractures of pelvic fractures. As a result, it was revealed that multiple fractures could be seen in traumas taken to the pelvic area and their rates.

Keywords: Cat, Dog, Pelvic fractures, Prevalence, Trauma

INTRODUCTION
Pelvis consists of the ilium, ischia, pubis, sacrum and first coccygeal vertebra. The junction of each pelvic bone is called the symphysis pelvis. Pelvic fractures are usually caused by falling from a height, traffic accidents, kicking, gunshot and bite injuries, and tumoral causes (Altunatmaz et al., 2004; Mesquita et al. 2009, Witte and Scott 2012; Bourbos et al. 2020). Pelvic fractures are common injuries in cats and dogs and constitute 20-30% of all fractures caused by trauma (Altunatmaz et al., 2004; Draffan et al. 2009; Mesquita et al. 2009; Stieger-Vanegas et al. 2015; Sadan et al. 2016). Pelvic fractures are generally classified as sacroiliac luxations, iliac wing, iliac body, acetabular, ischial and pelvic floor fractures. In pelvic fractures, the ilium is most affected (18-46%) (Altunatmaz et al., 2004; Harasen 2007; Stieger-Vanegas et al., 2015). In untreated cases, the degenerative joint disease develops because joint compliance will be impaired (Mesquita et al. 2009). On the other hand, dogs have difficulty in carrying body weight due to coxofemoral luxations and sacroiliac separations, which is considered a common cause of morbidity (Draffan et al. 2009). Concomitant injuries to other body systems, including life-threatening injuries, are also common and should be detected and treated in a timely manner. Soft tissue and organ damage are common in multiple pelvic fractures. Lower urinary and gastrointestinal system organs and peripheral nerves are mostly affected due to pelvic fractures (Ünsaldu 1995; Sadan et al. 2016).

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Prevalence of pelvic fractures in cat and dogs

Radiographic examination of the pelvic is a standard diagnostic test to evaluate cases with suspected trauma. Shots are typically done in laterolateral, ventrodorsal, and oblique positions (Altunatmaz et al., 2004; Mesquita et al., 2009; Sadan et al. 2016). The pelvic is similar to a box in terms of its structure, so it is very likely that more than one bone will be affected during trauma; that is, only one bone may be affected or more than one pelvic bone may be affected (Denny 1978; Altunatmaz et al., 2004; Mesquita et al., 2009). However, the displacement of the fracture parts is generally not formed without 2 or 3 fractures due to the pelvic structure (Bourbos et al. 2020). The most important complications in pelvic fractures are damage to the pelvic structures and nerves, especially the sciatic nerve (Ünsaldı 1995; Meeson and Geddes 2017). When the damage takes shape, it should be treated conservatively or surgically (Houlton and Dyce 1994; Ünsaldı 1995; Mesquita et al. 2009).

This study aims to retrospectively evaluate pelvic fractures in cats and dogs admitted to our clinic with pelvic trauma.

MATERIAL and METHOD
The material of the study consisted of a total of 183 cases, including 103 cats and 80 dogs of different ages, breeds and sex, brought to the Hatay Mustafa Kemal University Veterinary Health, Practice and Research Hospital between 2016-2020. In a total of 183 cases included in the study, 475 fractures were evaluated. In the first stage, radiographs of the cases were taken in ventrodorsal and laterolateral positions. After radiographic examining, pelvic fractures; ilium, ischia, pubis, acetabulum, sacroiliac separations and as symphysis pelvic fractures were categorized. All fractures except symphysis pelvic fractures were classified as right and left sides. Also, unilateral and bilateral incidence rates for bilateral pelvic bones were also presented. Fractures were named as traffic accidents, falling from a height, dog attack and the cause of unknown trauma.

RESULTS
A total of 183 cases, including 103 cats and 80 dogs, were included in the study. Seventy-seven of the animals affected by the trauma were male, and 106 of them were female. 39 (37.8%) of the cats were male, 64 (62.2%) of them were female, while 38 (47.5%) of the dogs were male, and 42 (52.5%) of them were recorded as female. The average age of cats was 16.9 months, and dogs were 19.2 months. Of the pelvic fractures were evaluated as 135 (73.7%) from traffic accidents, 34 (18.5%) from falling from a height, 1 (0.5%) from a dog attack, and 13 (7.1%) of unknown.

Table 1. Information on 183 cases that are taken into evaluation

<table>
<thead>
<tr>
<th>Species</th>
<th>Cases</th>
<th>The average age</th>
<th>Sex*</th>
<th>Etiology*</th>
<th>Ilium fracture left/right</th>
<th>Ischii fracture left/right</th>
<th>Pubic fracture left/right</th>
<th>Acetabula r fracture left/right</th>
<th>Sakroiliac separation left/right</th>
<th>Symphysi s pelvis fracture</th>
<th>Fractures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat</td>
<td>103</td>
<td>16.9</td>
<td>39/64</td>
<td>TA/FH/DA/U</td>
<td>17/26</td>
<td>21/26</td>
<td>16/18</td>
<td>9/15</td>
<td>51/42</td>
<td>28</td>
<td>269</td>
</tr>
<tr>
<td>Dog</td>
<td>80</td>
<td>19.2</td>
<td>38/42</td>
<td>TA/FH/DA/U</td>
<td>17/26</td>
<td>18/25</td>
<td>12/14</td>
<td>14/16</td>
<td>23/23</td>
<td>15</td>
<td>206</td>
</tr>
<tr>
<td>Total</td>
<td>183</td>
<td>18.05</td>
<td>77/10</td>
<td>TA/FH/DA/U</td>
<td>35/52</td>
<td>39/51</td>
<td>28/32</td>
<td>23/31</td>
<td>74/65</td>
<td>43</td>
<td>475</td>
</tr>
</tbody>
</table>

*: M: Male, F: Female
**: TA: Traffic accident, FH: Falling from high, DA: Dog attack, U: Unknown
60 of the pelvic fractures in cats were caused by a traffic accident, 31 from falling from a height, 1 from a dog bite, and 11 from an unknown reason. In dogs, 75 of the cases were caused by a traffic accident, 3 as a result of a fall from a height, and 2 as a result of an unknown trauma. In 183 cases included in the study, 475 fractures were detected, 269 in cats and 206 in dogs. These; 35 left ilium fractures, 54 right ilium fractures; 39 left ischial fractures, 51 right ischial fractures; 28 left pubis fractures, 32 right pubis fractures; 23 fractures of the left acetabulum, 31 fractures of the right acetabulum; 74 were left sacroiliac separations, 65 were right sacroiliac separations, and 43 were symphysis pelvis fractures (Table 1). Of cats; left ilium fracture in 17, right ilium fracture in 26 (Figure 1a); 21 left ischial fracture, 26 right ischial fracture; 16 left pubis fracture, 18 right pubis fracture; 9 had left acetabulum fracture, 15 had right acetabulum fracture (Figure 1a);

51 left sacroiliac separations, 42 had right sacroiliac separations, and 28 had symphysis pelvis fracture (Figure 1b); If the dogs; left ilium fracture in 18, right ilium fracture in 28; 18 left ischial fracture, 25 right ischial fracture; 12 had left pubis fracture, 14 had a right pubis fracture; 14 had left acetabulum fracture, 16 had right acetabulum fracture; 23 had left sacroiliac separations, 23 had right sacroiliac separations, and 15 had symphysis pelvic fractures.

Figure 1a. Radiography of a cat with a fracture of the right ilium and right acetabulum in the pelvic b) Radiography of a cat with a symphysis pelvic separation in the pelvic

Figure 2a. Radiography of a cat with a single pelvic fracture (left ischial bone) b) Radiography of a cat with multiple pelvic fractures (right ischial bone and bilateral sacroiliac separation)

More than one pelvic bone was fractured in 136 of the 183 cases in cats and dogs. Of the 103 cases in total, 25 (24.2%) of the cats had a single pelvic bone (Figure 2a), and 78 (75.8%) had more than one pelvic bone (Figure 2b). In dogs, 22 of 80 cases (27.5%) had a single pelvic bone (Figure 3a), and 58 (72.5%) had multiple pelvic fractures (Figure 3b).

Figure 3a. Radiography of a dog with a single pelvic fracture (right os pubis) b) Radiography of a dog with multiple pelvic fractures (right ischial bone and right os pubis)

Bilateral fracture of the ilium in 1 (0.9%) of the cats, bilateral ischial fracture in 6 (5.8%) (Figure 4a),

Figure 4a. Radiography of a cat with bilateral ischial fracture of the pelvic b) Radiography of a cat with bilateral sacroiliac separation in the pelvic
bilateral pubic fracture in 8 (7.7%), bilateral acetabular fracture in 1 (0.9%) and bilateral sacroiliac separations in 29 (28.1%) (Figure 4b); In dogs, bilateral ilium fracture in 7 (8.7%), bilateral ischial fracture in 5 (6.2%), bilateral pubic fracture in 5 (6.2%), bilateral acetabular fracture in 3 (3.7%) and 12 bilateral sacroiliac separations (15%) were detected (Table 2).

Table 2. Unilateral and bilateral fractures in cats and dogs

<table>
<thead>
<tr>
<th>Species</th>
<th>Ilium fracture</th>
<th>Ischial fracture</th>
<th>Pubic fracture</th>
<th>Acetabular fracture</th>
<th>Sakroiliac separation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U/B ***</td>
<td>U/B</td>
<td>U/B</td>
<td>U/B</td>
<td>U/B</td>
</tr>
<tr>
<td>Cat</td>
<td>42/1</td>
<td>35/6</td>
<td>18/8</td>
<td>22/1</td>
<td>35/29</td>
</tr>
<tr>
<td>Dog</td>
<td>31/7</td>
<td>33/5</td>
<td>16/5</td>
<td>24/3</td>
<td>22/12</td>
</tr>
</tbody>
</table>

***: U; Unilateral, B; Bilateral

DISCUSSION

Pelvic fractures, which are common in small animals, constitute 16% of all fractures in dogs and 25% in cats (Bourbos et al., 2020; Cinti et al., 2020). Mesquita et al., (2009) reported that traffic accidents were the most common cause of pelvic fractures. Meeson and Geddes (2017) unveiled that motor vehicle accidents are the most common cause of trauma, and they argued that the geographical region inhabited has also an effect on this condition. The same researchers stated that this rate might be high in settlements close to the metropolis, especially in stray dogs. In parallel with these determinations, the reason for 73.7% of the cases evaluated in our current study is traffic accidents. Most of the fractures in cats and dogs are caused by traffic accidents. Falling from a height is the second reason for fractures in cats.

Sadan et al., (2016) stated that most pelvic fractures are seen in healthy animals under the age of three. Moreover, Bourbos et al., (2020) also revealed that pelvic fractures are mostly seen in young animals and associated with the walking habits of the animals. On the other hand, Bennet (1975) and Ünsaldi (1995) reported that the animals with pelvic fractures were between the ages of 1-3. In our study, the average age of pelvic fractures was observed as 16.9 months in cats and 19.2 months in dogs, consistent with the studies mentioned above.

Johnson and Hulse (2005) emphasized that there is no race, age or gender predisposition in pelvic fractures which occur in small animals. Bennet (1975) stated that pelvic fractures are detected more in male cats compared to female cats. On the contrary, Ünsaldi (1995) suggested that pelvic fractures are more common in females. In our study, a diagnosis of pelvic fracture was made in many races rather than specific races. In other words, no racial predisposition has been determined. It has been found that the ages of affected animals are close to each other in cats and dogs. In terms of gender, it was noted that fractures were more common in females than males in both dogs and cats (Table 1).

Ünsaldi (1995) reported that 80% of cases with pelvic fractures had multiple fractures. Similarly, the incidence of such fractures is 75.8% in cats and 72.5% in dogs, consistent with Ünsaldi's results (1995).

Bookbinder and Flanders (1992) stated that the most common pelvic fracture in cats is pelvic floor fractures, and these fractures accounted for 90% of cases. Sadan et al., (2016) unveiled in their study that 54.5% of cats and 59.6% of dogs had unilateral pubic fractures. In our study, unilateral pubic fractures were detected in 17.4% of cats and 20% of dogs.

DeCamp (2005) stated that the most common fracture is the ilium fracture. Furthermore, Bouabdallah et al., (2020) reported in their study that the rate of ilium fractures among pelvic fractures was 35.7%. In the present study, we found that the rate of ilium fractures among
pelvic fractures was 20.8%. Bouabdallah et al., (2020) reported that the rate of sacroiliac separation among pelvic fractures was 59.5%.

Johnson and Hulse (2005) suggested that sacroiliac separations should be surgically treated. In contrast, there are also studies suggesting conservative treatment for sacroiliac separations (Mesquita et al., 2009). On the other hand, DeCamp (2016) emphasized that there could be neurological deficits in sacroiliac separations. In the current study, sacroiliac separation was mostly diagnosed in cats (34.5%). In dogs, this rate remained at 22.3%. It has been reported that sacroiliac separations are mostly unilateral (Aksoy et al., 2005). In the present study, 29 of sacroiliac separations were bilateral (28.1%) in cats, 35 unilateral (33.9%), 12 bilateral (15%) in dogs, 22 unilateral (27.5%). These results are compatible with the literature mentioned above.

The incidence of acetabular fractures varies between 14% and 43% (Hardie et al., 1999; Boswell et al., 2001; Mesquita et al. 2009). Bouabdallah et al. (2020) reported the incidence of acetabulum and pubis fractures to be 21.4% in their study. In our study, these rates are 11.3% and 12.6%, respectively. The rate of formation of ischial fractures is 18.9% (Bouabdallah et al., 2020). Sadan et al., (2016) revealed that the incidence of unilateral ischial fractures is 67.9% in dogs and 64.3% in cats. In our study, unilateral ischial fractures between the pelvic bones were observed as 13.1% in cats and 16.0% in dogs.

Bourbos et al., (2020) unveiled that symphyses pelvic fractures are rarely occurred. Sadan et al., (2016) emphasized in their study that symphyses pelvic separations are more common in cats than in dogs (15.3% in cats; 5.4% in dogs). Among the cases included in our study, symphyses pelvic fracture occurred in 27.1% in cats and 18.7% in dogs. The incidence of pelvic fractures is only 9%.

Most veterinary orthopedic surgeons recommend that most pelvic fractures in cats and dogs need surgery. However, surgical interventions may be disrupted due to financial constraints, chronic fractures, or veterinarians not having enough experience in orthopedics (Bouabdallah et al., 2020). In addition to these, radiographic evaluations in pelvic fractures are of great importance in planning the treatments to be applied.

CONCLUSION

In cats and dogs, multiple fractures are encountered in the pelvic bone, especially as a result of motor vehicle accidents and falls from height. In addition to protecting the digestive and excretory system organs with its box-like structure, it should be kept in mind that this bone may be damaged due to its neighbourhood with the sciatic and femoral nerve, especially in sacroiliac joint separations. As a result, of pelvic fractures were observed to cause 18.7% ilium fractures, 18.9% ischial fractures, 12.6% pubis fractures, 11.3% acetabulum fractures, 29.2% sacroiliac separations, and 9% symphyses pelvic fractures.

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Conflict of interest: There is no conflict of interest between the authors.

REFERENCES


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