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Research Article

Radiographic Evaluation of Thoracic Injuries in Traumatized Cats

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ABSTRACT

Trauma is a common health problem in cats that often leads to serious thoracic pathologies. Various imaging methods are used in the diagnosis of traumatic thoracic injuries. Thoracic radiography is the first preferred imaging method in post-traumatic emergencies due to its accessibility, speed, and cost-effectiveness. This study aims to retrospectively evaluate the pathologies observed in thoracic radiographs of trauma-affected cats. An assessment of 102 cats revealed that the leading causes of trauma were high-rise syndrome (83.3%) and motor vehicle accidents (6.86%). Prominent thoracic pathologies included pleural effusion, pulmonary edema, and pneumothorax. The findings underscore that radiography is a rapid and effective diagnostic tool for thoracic pathologies in trauma patients. The radiographic assessment facilitates the timely detection of critical conditions such as pneumothorax, hemothorax, and rib fractures, thereby expediting the initiation of appropriate treatment. Following trauma, 93% of the cats survived, while 6.8% succumbed. In conclusion, thoracic radiography should be the first-choice imaging modality for trauma-affected cats, with advanced imaging techniques serving as complementary tools when necessary.

Keywords: Cat, radiography, thorax, trauma

INTRODUCTION

Trauma is a common health problem in cats that often leads to serious thoracic pathologies. The main causes of trauma in cats are trauma mechanisms such as traffic accidents, falls from heights, and animal bites, and result in direct or indirect effects on the thoracic region. Depending on the type of trauma, lesions such as pneumothorax, hemothorax, costal fractures, lung contusions, and diaphragmatic hernia may occur. Early diagnosis of such pathologies is critical for determining appropriate treatment strategies (1,2,3).

Various imaging methods are used in the diagnosis of traumatic thoracic injuries. X-ray (radiography), computed tomography (CT), and magnetic resonance imaging (MRI) are the main methods used for this purpose. Thoracic radiography is the first preferred imaging method in post-traumatic emergencies due to its accessibility, speed, and cost-effectiveness (4,5). Radiography accelerates intervention by rapidly detecting life-threatening conditions such as pneumothorax, hemothorax, and costal fractures. However, radiography can usually be performed with minimal sedation, while anesthesia is generally required in CT and MR imaging. This condition makes radiography a safer option for critically ill patients. Recently, with the increasing frequency of use, Thoracic Focused Assessment with Sonography for Trauma (T-FAST), when compared to thoracic radiography, has demonstrated superiority in dynamic and emergency assessments. However, it remains limited in evaluating detailed anatomical structures such as pulmonary parenchymal pathologies and bony structures, and its efficacy is highly dependent on the operator's experience (6,7,8).

This study aims to retrospectively evaluate the pathologies seen in thoracic radiographs in trauma-affected cats. The study analyzed the distribution of radiographic findings according to

the type of trauma, the incidence of these findings, and their relationship with clinical outcomes. The findings are expected to guide post-traumatic diagnosis and treatment processes in cats.

MATERIAL AND METHODS

The study material comprised 102 traumatized cats of different breeds, ages, and genders brought to the Surgery Clinic of the Faculty Animal Hospital between 2023-2024. Inclusion criteria included completeness of radiographic images and accessibility of clinical data. Patients with missing or insufficient radiographic data were excluded from the study. Cats brought to the clinic due to trauma were first triaged briefly, and their vital signs were quickly assessed. Simultaneously with the physical examination, intravenous access (V. cephalica antebrachia) was opened to the trauma-affected cats, blood samples were taken, and systemic blood gas (GEM Premier 3000, USA) and hemogram (MS4e, France) analyses were performed at the Central Laboratory of the animal hospital. Fluid electrolyte replacement was performed according to blood parameters, and intravenous medications were administered this way. Oxygen treatment was provided to traumatized patients in intensive care units specially designed for veterinary use.

After stabilization of trauma-affected cats, thoracic radiography (SIEMENS X-ray, Rayence Veterinary DR Device) was taken from each case and evaluated regarding lung pathologies in line with the clinical findings obtained. Thoracic pathologies such as pneumothorax, hemothorax, lung contusions, rib fractures, and diaphragmatic hernia were examined in radiographic analyses. The severity, distribution, and relationship with the type of trauma of the lesions were analyzed retrospectively.

Thoracocentesis was performed from the 8th intercostal space with a 21-gauge butterfly catheter in patients with thoracic pathologies such as pleural effusion and pneumothorax, and the radiographs of the patients were repeated at specific intervals (9). Laminectomy and vertebral stabilization were applied to cases with thoracic vertebrae fractures. After stabilization was achieved in flail chest cases, rib fractures were corrected with an operative procedure, and the thoracic wall was closed. In diaphragmatic hernia cases, the diaphragmatic defect was closed by laparotomy. In all cases, 0.1 mg/kg butorphanol hydrogen tartrate (Butomidor®-İnterhas- Turkey) was administered intramuscularly for analgesia.

Upon initial admission, data obtained from traumatized cats were recorded in patient follow-up formulas, and treatment protocols were arranged according to the symptoms. After the trauma, the patient owners were contacted, and information about the general condition of the patients was obtained and recorded.

RESULTS

The study evaluated 102 trauma-affected cats. The gender distribution was 49 male (48%) and 53 female (51%). The breed distribution was 48 Domestic shorthair (47%), 19 Scottish fold (18.6%), 26 British shorthair (25%), 1 Bombay (0.98%), 3 Siamese (2.9%), 2 Norwegian Forest Cat (1.96%), 1 Ankara Cat (0.98%), 1 Van Cat (0.98%) and 1 Persian Cat (0.98%). The trauma distribution of the cats in the study was 85 falls from heights (83.3%), seven traffic accidents (6.86%), four bite injuries (3.92%), one gunshot wound (0.98%), one blunt force trauma (0.98%) and four unknown causes of trauma (3.92%). Thoracic pathology was found in 67 of the patients evaluated (65.68%). Pleural effusion (46.7%), pulmonary edema (28.43%), pneumothorax (24%), lung contusion (12.7%), thoracic spine fracture (2.94%), subcutaneous emphysema, atelectasis (1.96%), rib fracture (0.98%), diaphragmatic hernia (0.98%) and sternum injury (0.98%) were observed (Figure 1). More than one thoracic pathology was observed in 36 cases (35%) included in the study. In the following process, the patients' owners were contacted about their general conditions, and it was learned that 95 patients were alive (93%) and 7 patients were dead (6.8%). In this study, rib fracture, pneumothorax, subcutaneous emphysema, pleural effusion, and flail chest were observed in 1 case due to a dog attack. A pre-anesthetic evaluation of the case was performed, and the intercostal mesh was applied to the patient deemed suitable for operative intervention. In the postoperative period, the patient was oxygenated in the intensive care unit. After the patient's vital signs became stable, the patient was discharged. In the clinical examination of the patient on the 7th postoperative day, it was observed that no complications developed due to operative intervention, and the patient's general condition was stable (Figure 2).

DISCUSSION

The findings indicate that trauma mechanisms in cats vary depending on their living environments and that high-rise syndrome is more common in areas with high-rise buildings (10,11,12). In this context, High-rise syndrome was determined to be the most common type of trauma (83.3%), and this rate was found to be consistent with the 66.6% rate in the study conducted by Pınar and Arıcan (13) in the same region. However, the data suggests that falls from heights have increased proportionally. This increase is associated with rapid urbanization and the growing number of domestic cats.

When the breeds exposed to trauma in cats were evaluated, it was determined that the Domestic Shorthair (47%), British Shorthair (25%), and Scottish Fold (18.6%) breeds were in the foreground. In this respect, this study parallels the study conducted by Lee et al. (14), who reported that 90% of cats exposed to trauma were Domestic Shorthairs. Similarly, a retrospective study conducted by Cojocaru et al. (15) on 1306 trauma-affected cats stated that the European Shorthair (89.2%) was the most commonly traumatized breed. This

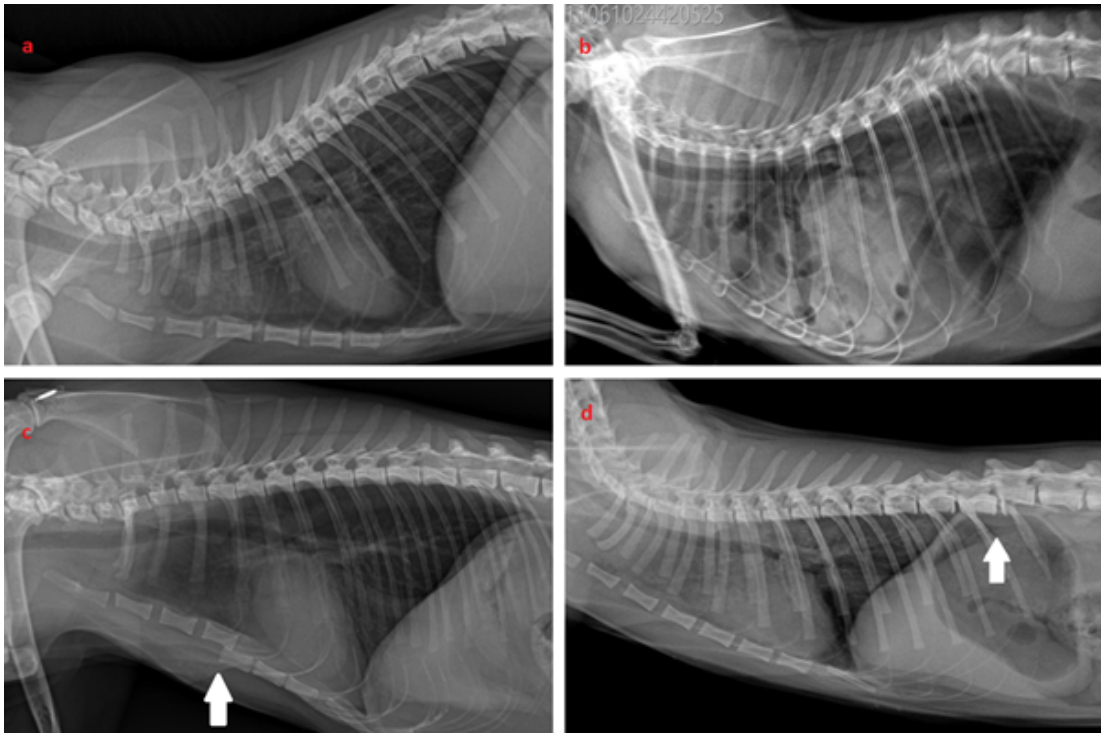

Figure 1: a) A case of pneumothorax and lung contusion in a cat with thoracic trauma due to falling from a height, b) A case of diaphragmatic hernia, lung contusion, and pneumothorax in a cat with thoracic trauma due to falling from a height, c) A case of sternum luxation and pleural effusion in a cat with thoracic trauma due to falling from a height, d) A case of T12-T13 fracture and pleural effusion in a cat with thoracic trauma due to falling from a height.

Figure 2: a) Latero-lateral thorax radiograph of a cat with thoracic trauma due to bite injury. b) Laceration image in the intercostal muscles. c) Mesh application d) Postoperative 7th day image of the patient.

suggests that the distribution between breeds may be related to regional population differences.

Life-threatening conditions such as pleural effusion, pulmonary edema, and pneumothorax are commonly observed in trauma related thoracic pathologies. Early diagnosis of such pathologies and determination of appropriate treatment protocols play a critical role in reducing mortality (16). In this study, pleural effusion (46.7%), pulmonary edema (28.43%), and pneumothorax (24%) were found to be the most common findings in the distribution of thoracic pathologies. In a retrospective study conducted by Vnuk et al. (17) on 119 cases of high-rise syndrome, pneumothorax (24%), lung contusion (13%), hemothorax (3.3%), and diaphragmatic hernia (1.6%) were reported as the most common findings. In contrast, in a study conducted by Frykfors and Halfacree (18) on 22 cats with thoracic trauma due to bite injuries, pneumothorax (61%), lung contusion (38%), and pleural effusion (33%) were the most common. These data show that the trauma mechanism has a significant effect on the distribution of thoracic pathologies.

Trauma-related mortality continues to be a significant problem in veterinary and human medicine. This study showed a 93% survival rate in traumatized cats, indicating that post-trauma management was implemented effectively. This finding is significantly higher than the 82% survival rate reported by Fisher et al. (19) on 251 patients with trauma and the 73% survival rate reported by Frykfors and Halfacree (18) in cats with bite injuries. Merbl et al. (20) reported an 83% survival rate in cats with falls from height, which is also lower than the results in this study. The success rate in this study can be attributed to the early diagnosis and optimization of treatment processes due to the rapid and effective use of thoracic radiography.

Various imaging methods, such as X-ray, CT, and MRI, are used in the diagnosis of traumatic thoracic injuries. However, radiography is often the first choice in post-traumatic emergencies due to its accessibility, speed, and cost-effectiveness (4,5). Radiography facilitates intervention by rapidly detecting life-threatening conditions such as pneumothorax, hemothorax, and costal fractures. In addition, the need for minimal sedation makes radiography a safer option, especially in critically ill patients (6,7,8). This study used radiography as a fast and secure method in all cases. It was an effective tool in detecting pathologies requiring urgent intervention, such as pleural effusion and pneumothorax.

In conclusion, this study revealed that thoracic radiography is an indispensable tool in early diagnosis and treatment management in trauma-affected cats. However, when necessary, the complementary use of advanced imaging methods may increase diagnostic accuracy in complex trauma cases. Future studies will further enhance knowledge in this area by examining the effects of different trauma mechanisms on radiographic and clinical outcomes in more detail.

DECLARATIONS

Availability of Data and Materials: The data that support the findings of this study are available on request from the corresponding author.

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Ethical Statement: The present study is a retrospective study in which clinical data were evaluated and informed consent was obtained from the owners of the patients.

Competing Interests: The authors declare that there is no competing of interest regarding the publication of this article.

Declaration of Generative Artificial Intelligence: The authors of the current study declare that the article and/or tables and figures were not written/created by AI and AI-assisted technologies.

Authors' Contributions: Motivation / Concept: KP, HE, Design: KP/HE, Control/Supervision: KP, Data Collection and / or Processing: HE, Analysis and / or Interpretation: KP, Literature Review: KP, Writing the Article: KP/HE, Critical Review: KP

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