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RADIOGRAPHIC RETROSPECTIVE STUDY OF THORACIC CAVITY ALTERATIONS IN DOGS AND CATS WITH RESPIRATORY DISEASES

Alexandru Gabriel NEAGU[1], Mihai SĂVESCU[1], Giovanni ANGELI[2], Niculae TUDOR[1], Constantin VLĂGIOIU[1]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania
[2]University of Perugia, Faculty of Veterinary Medicine, Perugia, Italy

Corresponding author email: neagualex29@yahoo.ro

Abstract

The objective of this study was to identify disorders at the level of the thoracic wall as a determining factor in modified respiratory function in dogs and cats.
A number of 130 cases (79 dogs and 51 cats) with respiratory diseases and showed changes in the thoracic wall were examined. The cases were examined by clinical and paraclinical methods in the Faculty of Veterinary Medicine from Bucharest and Perugia clinics. At the thoracic wall bone tissue were recorded: 15 cases (13 dogs and 2 cats) with changes in the spine, 5 cases (3 dogs and 2 cats) with changes in the sternum and 12 cases (7 dogs and 5 cats) with changes at the ribs level. The soft tissues of the thoracic wall were affected by neoplastic processes in 26 cases (21 dogs and 5 cats) and post-traumatic injuries in 46 cases (24 dogs and 22 cats). Additionally, 26 cases (11 dogs and 15 cats) were identified with diaphragmatic disorders. The assessment found that post-traumatic injuries had the highest prevalence and the imaging examination allowed the localization of lesions.

Key words*: cat, dog, radiographic study, respiratory diseases, thorax.*

INTRODUCTION

Changes in respiratory function may result from disorders in the thoracic wall, which may be traumatic, neoplastic or congenital (Thrall, 2018). Thoracic changes include a wide variety of lesions, many of them being difficult to diagnose and manage. Car accidents, height falls, biting or shooting are the main causes of post-traumatic injury of the thoracic wall in dogs and cats. These lesions may be of interest in both thoracic soft tissues (skin, fat, muscles) and thoracic bone structures (ribs, sternum, spine) (Parry A. and Lamb C., 2010). Neoplastic processes of the thoracic wall can be found frequently in companion animals, raising great problems in diagnosis and treatment (Olsen et al., 2002).
In addition, congenital changes that may affect the spine, sternum and/or the ribs may be encountered at the thorax wall but not always accompanied by respiratory dysfunction, which causes these congenital abnormalities to be accidentally detected following the radiological examination. Sometimes severe sternum changes, such as those found in pectus excavatum, can produce compressions on the internal organs inside the thorax, followed by changes in the respiratory function (Singh et al., 2013; Charlesworth Tim, 2017).
The purpose of this paper was to perform a retrospective imaging study on localized thoracic wall disorder in dogs and cats as a determining factor in modified respiratory function.

MATERIALS AND METHODS

The medical records of 130 cases presented in FMV Bucharest and FMV Perugia clinics, of which 79 dogs and 51 cats showing respiratory changes were examined by clinical and paraclinical methods.
For the collection of signs/symptoms, the general examination methods (inspection, palpation, percussion, listening of body noise and assessment of body temperatures) and complementary methods (radiography, CT scan, aspiration puncture and cytology) were used as previously described in the specialized works (Vlăgioiu C. and Tudor N., 2012).

The radiographic examination was performed from the latero-lateral, ventro/dorsal and dorso/ventral incidence with a Bucky Diagnost digital device from Philips and the images were taken with a 100 cm source-picture distance. The films were developed using a PCR ELEVA S apparatus. The CT scanner (Siemens Somatom Volume Zoom, with 4 slices) was performed only in cases where classical imaging methods did not have diagnostic value. The aspirational puncture was performed to detect the type of neoplastic process. The harvested sample was introduced into sterile containers and dispatched to the clinical laboratory. Microscope slides of harvested samples were made using the May-Grumwald-Giemsa (MGG) method, and subsequently examined under a microscope with objectives of different sizes.

RESULTS AND DISCUSSIONS

There were evaluated 79 dogs aged between 1 and 15 years, as well as 51 cats aged between 10 months and 13 years. Thoracic changes were represented by post-traumatic lesions, congenital anomalies and neoplastic processes, localized in the bone tissue (sternum and rib) and soft tissues (skin, fat, muscles, pleura and diaphragm). It should be noted that on the same animal it has been identified one or more lesion types.

At the bone tissue level were registered 15 cases (13 dogs and 2 cats) with changes in the spine (3 post-traumatic, 1 neoplastic process, 11 congenital anomalies), 5 cases (3 dogs and 2 cats) with changes in the sternum (1 post-traumatic and 4 abnormalities) and 12 cases (7 dogs and 5 cats) with changes in the ribs (2 post-traumatic, 3 neoplastic and 7 congenital abnormalities). Regarding the soft tissues of the thoracic wall, neoplastic processes were recorded in 26 cases (21 dogs and 5 cats) and post-traumatic injuries in 46 cases (24 dogs and 22 cats) represented by subcutaneous emphysema (17), hematomas (21) and contusions (23). In addition, in 26 cases (11 dogs and 15 cats) diaphragm changes were identified, representing congenital anomalies (2) and post-traumatic lesions (24).

Clinical and paraclinical assessments found that post-traumatic injuries had the highest prevalence (76 cases), followed by neoplastic processes (30 cases) and congenital changes (24 cases).

Post-traumatic lesions recorded a wide range of changes, of which diaphragmatic rupture, contusions, haematomas of the soft tissue were predominant. In the study by Cabon et al. (2015) thoracic cavity disorders were represented by pulmonary contusions in 26 cases (23 dogs, 3 cats), followed by simple or multiple fractures at the rib level in 23 cases (21 dogs, 2 cats), pneumothorax in 17 cases (13 dogs , 4 cats) and liquid collections in 8 cases (7 dogs, 1 cat).

In the present study, post-traumatic injuries to the dog were caused by bite wounds (22 cases) or car accidents (17 cases), while in cats the most frequent cause was falling from height (37 cases). Thoracic wall injuries were represented by: haematomas, subcutaneous emphysema, rib fractures, to which were added gaseous pleural collections and pulmonary atelectasis (Figure 1). Our results were somewhat similar to those reported by Shaw et al. (2003), but found a more wider range of causes, identifying 36 cases (26 dogs and 10 cats) with trauma, of which 18 cases were produced by bite wounds, 13 cases following car accidents, 1 case by a trauma produced by hitting with the hoof by a horse and 4 cases with an unknown cause.

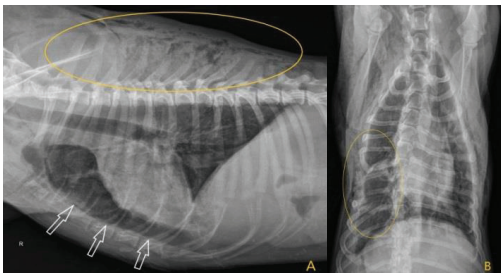

Figure 1 - Dog, 5 years, lateral incidence (A) and dorsoventral (B) - costal fractures, subcutaneous emphysema and pneumothorax following a car accident

Were recorded 4 cases (3 dogs and 1 cat) with neoplastic processes of the thoracic bone tissues, and 26 cases (21 dogs and 5 cats) were recorded at the level of thoracic soft tissues. Typically, on the radiographic image, were revealed outbreaks of lesions at the level of the bone structure in the thoracic wall, while in soft tissue were observed soft tissues densities with

variable dimensions (Figure 2). For accurate localization of thoracic skeletal masses, CT scan was performed in 4 cases. It allowed to determine the degree of involvement of both the bone tissue and the soft tissues in the disease lesions, revealing different degrees of bone lyses, as well as the involvement of adjacent soft tissues (Figure 3).

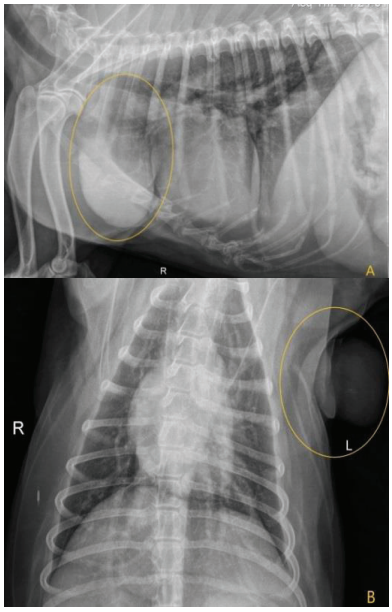

Figure 2 - Dog, 13 years old, right side view (A) and dorso-ventral view (B) – mass with soft tissue density localized at the thoracic soft tissue in the axillary area

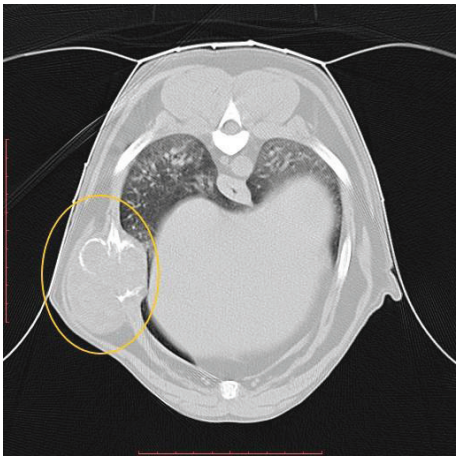

Figure 3 - Transversal, CT scan of a 10 years of dog at the level of 9 rib in a bone window. The lesion originates at the distal extremity of the ninth rib, observing bone lysis and a soft tissue mass associated with bone lysis

The cytological examination allowed the determination of the neoplastic type, revealing the presence of carcinomas and sarcomas (Figure 3) in 19 cases (located at thoracic mammary chains), lipoma in 5 cases, osteosarcoma in 4 cases (Figure 4), while 2 cases were metastases of primary neoplastic processes (soft tissues).

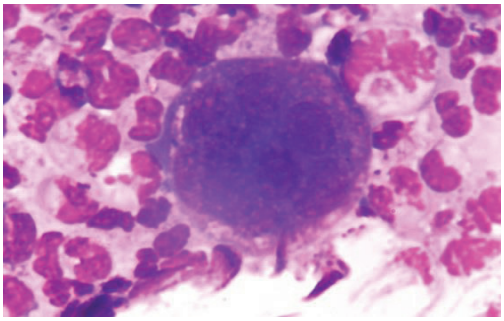

Figure 4 - Dog, 10 years, neoplastic cellularity (mammary histiocytic sarcoma), MGG staining, x1000

Previous studies indicate that subcutaneous lipomas are the most common neoplastic processes of thoracic soft tissue, may also be present fibrosarcomas, often localized in the interscapular area caused by vaccination (Thrall, 2018). In our study lipoma was identified in 5 of the evaluated cases, and most of the neoplastic processes (18 cases) were represented by mammary carcinomas. Sun and col. (2011) found that 41 evaluated females presented different morphological types of carcinoma in the thoracic wall, and Otoni et al. (2010) found that 13 cases were mammary carcinoma and 6 cases were mixt neoplastic processes.

Congenital abnormalities are encountered accidentally in dogs and cats, as a consequence of poor development of the ribs, sternum and/or spine. Most of the time these congenital anomalies do not affect respiratory function, but in individuals with severe changes in sternal conformation, respiratory dysfunctions have also been reported (Charlesworth Tim, 2017, Singh et al., 2013). In the present study, 4 cases of pectus excavatum (2 dogs and 2 cats) showed a moderate respiratory symptomatology (Figure 5). According to previous studies, if congenital anomalies do not put the animal's life at risk, surgical intervention is not necessary (Thrall, 2018).

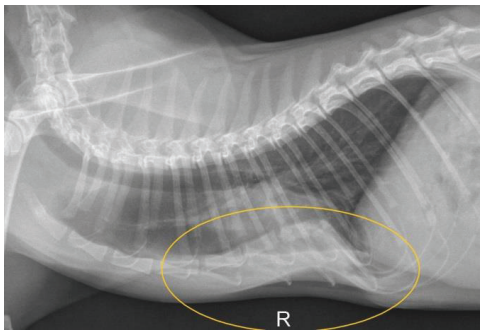

Figure 5 - Cat, 10 months, right lateral view - dorsal detachment of the sternum, masking the cardiac silhouette following the overlapping of the sternal structures and reduction of the size of the thoracic cavity

CONCLUSIONS

In conclusion, changes in the thoracic wall may be represented by a wide range of lesions, and the radiographic examination is an essential tool in the evaluation of patients who have had thoracic injuries or have developed neoplastic and congenital processes, and advanced imaging methods (such as CT scan) may allow a more detailed assessment of lesions that are radiographically identified.

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