

## ABSTRACT

The PhD entitled "Clinical and imaging investigations of cardiac disease in the cat" aimed to present the means of diagnosing cardiovascular pathologies in cat, highlight the importance of each individual exam, and perform a statistic analysis of the prevalence of cardiac disease in cat in the region of Moldavia, as well as of the results obtained during the studies.

The novel elements of this paper are provided by the detailed study from a cardiovascular perspective of the cat for the first time in Romania, the descriptive iconography of cardiac pathologies in cat, the description and detailed characterization of the electrocardiographic trace and measurements obtained subsequently to the arterial monitoring of this species. Another original characteristic is represented by the analysis of correlations and statistical differences in values obtained during complementary exams (imaging, electrocardiography, tensiometry).

The PhD thesis is structured in two parts, the first one containing data from the field literature gathered from 218 bibliographical sources and the second part comprising data resulted from personal research; the thesis contains a total of 12 tables, 39 figures and 34 graphs.

The first part of the thesis consists of 3 chapters focusing on the current knowledge of the anatomy and physiology of the heart in cat, the clinical and paraclinical diagnosis of cardiac disease as well as the brief description of the main cardiac pathologies in cat (cardiomyopathies, congenital cardiac diseases, pericardial disease).

The second part of the thesis consists of personal investigations, including the goal and objectives of the paper, the work material and methods, obtained results and the discussions and general conclusions, structured into 6 chapters.

Within Chapter 4 are described the goal and objectives of the paper, as well as the research carried on in order to achieve those.

Chapter 5 entitled "Material and method" starts with the description of the institutional frame where the research has been performed, followed by the presentation of the biological material as well as equipment and methods used. The inclusion criteria for the patients taken into study are also detailed in the respective chapter.

The investigations were performed within the Radiology service of the Faculty of Veterinary Medicine of Iași in close collaboration with the Medical Clinic within the same institution, over a period of 4 years, between October 2014 and March 2018, respectively. A practice internship was also served within the Cardiology Service of the faculty of Veterinary Medicine of Naples (Italy).

Cardiovascular medical advice was given to 98 patients of which 37 females (37.8%) and 61 males (62.2%), of varied ages ranging between 3 months and 21 years, of the following breeds: European, Persian, Burmese, Scottish Fold, British

Shorthair, Siamese, Russian Blue, Turkish Angora, Ragdoll, Sphinx, Norwegian Forest and crossbred Maine Coon.

Each individual patient was consulted based on a cardiovascular clinical examination sheet, complementary examination methods being subsequently selected (imaging, electrocardiography, tensiometry).

Work methods were represented by the clinical exam, which took place according to the semiological exam protocol using general methods, followed by imaging examination, meaning radiological and echocardiographic examination, electrocardiographic exam and tensiometry. The statistical methods used for result interpretation were described at the end of Chapter 5.

Chapter 6 is the vastest chapter, entitled "Results and discussions" and is divided into 3 chapters in which the results obtained during clinical, imaging and paraclinical examination are specified and detailed (electrocardiography, blood tests).

Clinical signs derived from both medical history and clinical investigations of patients are described (statistics included) in subchapter 6.1. entitled "Clinical exam results". Patients were divided into two groups, represented by patients in the asymptomatic stage and patients with symptoms. The preclinical stage of cardiac disease included 56.9% of the patients, and 43.1% presented typical signs of cardiac failure. Clinical signs noticed in patients displaying symptoms consisted of: dyspnea (36.9%), aortic thromboembolism (6.2%), abdominal dilation consequent to ascitis (6.2%), exercise intolerance (29%), weight loss (44%), modified appetite (32.2%) and cough (15.4%). The cough was the cause of respiratory pathologies overlapping with cardiac disease, being of a cardiac nature in dog, unlike in cat; exercise intolerance, weight loss and modified appetite were clinical signs also common for diseases other than cardiac pathologies. In addition in this chapter are described data obtained during the physical exam of the heart (inspection of mucosal surfaces, cardiac shock palpation, femoral pulse palpation and cardiac auscultation). Pathological cardiac noises noted upon auscultation consisted of murmurs (29.2%) and galloping noises (21.3%). Murmurs were categorized according to intensity into III<sup>d</sup> degree (15.4%), IV<sup>th</sup> degree (12.3%) and V<sup>th</sup> degree (4.6%) murmurs. All resulted data are exemplified in graphs and tables.

Subchapter 6.2. entitled "Imaging exam results" is divided into two parts, namely "Radiological exam results" and "Echocardiographic exam results". The cardio-vertebral score had values over the normal limit in 61.9% of patients, ranging from 7.9 to 16.1 vertebrae. Using the quadrant method, 20 radiological images were identified with left atriomegaly, 14 with left ventriculomegaly, 11 with right atriomegaly, 7 with right ventriculomegaly and 4 with aortic base dilation. Pulmonary patterns specific to pulmonary edema were identified in 16.9% of patients and pleural effusion was identified in 6.2% of them. Four types of cardiac pathologies were detected during the ultrasonographic examination of the heart: hypertrophic cardiomyopathy (58.7%), unclassified cardiomyopathies (4.2%), congenital cardiac diseases (2%) and pericardial pathologies (2%). The biggest amount is constituted

by cardiomyopathies (myocardial disease) with a prevalence of 93.9% out of the total diagnosed cardiac diseases. A higher amount was recorded in males, with a number of 33 patients (57.9%) in the case of hypertrophic cardiomyopathy, greater than in the case of females with only 24 patients (42.1%). The imaging exam results were expressed in graphs, tables and correlations and compared to those in the literature.

Subchapter 6.3. "Paraclinical exam results" comprises briefly described electrocardiography exam results (details provided in chapter 7) and blood tests results.

Chapter 6 ends with a series of partial conclusions with regard to the results obtained consequently to the clinical, imaging, electrocardiographic and blood exams.

Chapter 7 entitled "Study of the diagnostic value of electrocardiography in some cardiac diseases in cat" describes rhythm changes and morphological modifications of the electrocardiographic trace for patients with cardiac diseases. The study included 51 patients with cardiac pathologies; the electrocardiogram was recorded using the Polyspectrum 8E/8V device, trace examination being subsequently performed using the dedicated software. Sinusal rhythm was noticed in most patients with cardiac pathologies and the non-sinusal (supraventricular) rhythm was detected in only one patient. Cardiac frequency had a rather wide range, between 100 and 260 bpm with an average of 167 bpm.

Arrhythmias encountered in the patients taken into study were represented by sinusal tachycardia, sinusal bradycardia, supraventricular tachycardia, premature ventricular complexes, atrio-ventricular blocks (1<sup>st</sup> degree, 2<sup>nd</sup> degree) and left anterior fascicular block. The biggest amount of all morphological deflexion disorders was encountered in mitral P (increase in duration of the P wave), in relation to which, following the statistical analysis, a positive correlation resulted between the values of the duration of the P wave and the values of the LA/Ao ( $r^2=0.713$ ,  $p<0.01$ ) ratio. Other identified changes in morphology consisted of the increase in duration and amplitude of the QRS complex and the crochetaje of the R wave which is compatible with myocardic hypoxia.

The results of rhythm and morphology disorders are represented in tables and graphs, after which each of them are discussed and compared to the literature.

Chapter 8 entitled "Study of the diagnostic value of tensiometry in cardiac disease in cat" included a study on 57 cats of varying ages (1-21 years) with varied pathologies (renal and cardiac disease, hyperthyroidism) or healthy ones.

In order to monitor arterial pressure, the oscillometric method was implemented using the HDO Vet device and the graph of pulsatile waves was assessed using the dedicated software VET HDO 2.2.4.0. In most of the cats, the cuff was applied around the tail over the coccygeal artery and the measurements were carried out in a quiet room without any stress factors.

Greater values of systolic arterial pressure were recorded within the patient group aged over 10 years, compared to those under 10 years, with a statistical difference between groups ( $p<0.05$ ). Systemic arterial hypertension was diagnosed

in 47.4% of patients, with the target organs being affected in most of them (75%). The age average for cats with arterial hypertension was 11 years. The tensiometry measurement results and the statistical differences were expressed through graphs and tables on patient groups; the chapter ends with a number of partial conclusions.

Chapter 9 is the last chapter of the PhD thesis and is constituted by general conclusions.