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FELINE HYPERTROPHIC CARDIOMYOPATHY: CASE REPORT

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Abstract: In domestic felines, cardiomyopathies are identified as structural and functional diseases of the heart muscle, among them, hypertrophic cardiomyopathy is the most prevalent, characterized by thickening of the left ventricle, which can vary from mild to severe, with diastolic dysfunction. Cats as young as three months old, with no sex or breed predilection, may be affected. Mutations in contractile protein genes, generating dysfunctional sarcomeres, have already been described in some pure breeds, therefore it can be considered a primary hereditary disease. Clinical signs are usually associated with dyspnea as a result of pulmonary edema and/or pleural effusion, in addition to the possibility of paresis or quadriplegia of the limbs as a result of arterial thrombi. The diagnosis has the echocardiographic examination as the gold standard. This work aims to describe the clinical signs, diagnosis and therapeutic approach of a young feline, mixed breed, 2 years old, with Hypertrophic Cardiomyopathy, attended at the Animal Health Unit Hospital Victória in the city of Porto Alegre, RS.
Keywords: Cats. Cardiomyopathy. Hypertrophic. Heart

INTRODUCTION

In domestic felines, cardiomyopathies are identified as structural and functional diseases of the heart muscle, and can be classified through phenotypic expressions evaluated in the echocardiographic examination (PELEGRINO, 2020). Among them, hypertrophic cardiomyopathy is the most prevalent, affecting about 15% of the cat population, and is characterized by left ventricular thickening, which can range from mild to severe, with diastolic dysfunction. Mitral regurgitation occurs due to compromised ventricular filling, leading to left atrial enlargement and consequent cardiogenic pulmonary edema. (KITTLESON; COTE 2021).

Cats as young as three months old, with no sex or breed predilection, may be affected. Mutations in contractile protein genes, generating dysfunctional sarcomeres and, consequently, alterations in cardiac muscle contractility, have already been described in some pure breeds, such as Main Coon and Ragdol with hypertrophic cardiomyopathy. Therefore, it can be considered a primary hereditary disease (FUENTES et al., 2020).

Clinical signs usually appear when the already established disease causes hemodynamic disturbances, leading to a considerable increase in the left ventricle, associated with dyspnea as a result of pulmonary edema and/or pleural effusion, in addition to the possibility of limb paresis or quadriplegia in due to arterial thrombi (SILVEIRA et al., 2015).

The diagnosis has the echocardiographic examination as the gold standard, showing hypertrophy of the left ventricle and interventricular septum, causing changes in diastolic function, ejection volume and increased internal pressure of the left ventricle (SMITH et al., 2015). In the radiographic evaluation of the thoracic region, an increase in the cardiac silhouette and accumulation of fluid in the pulmonary interstitium can be observed, which may be suggestive of edema of cardiogenic origin, although these alterations may not be present even with the disease already installed (FUENTES et al., 2020). Some systemic diseases such as hyperthyroidism, arterial hypertension, acromegaly and dehydration disorders can also cause left ventricular enlargement, and investigation of these possible changes is essential (KITLLESON; COTE 2021).

This work aims to describe the clinical signs, diagnosis and therapeutic approach of a young feline, mixed breed, 2 years old, with

Hypertrophic Cardiomyopathy, attended at the Animal Health Unit Hospital Victória in the city of Porto Alegre, RS.

CASE OF REPORT

A female feline with short coat and mixed breed, approximately two years old, weighing 2.5 kg, was attended at the Animal Health Unit Hospital Victória in Porto Alegre, RS, complaining of respiratory difficulty and episodes of fainting. The tutor reported hyporexia and weight loss, in addition to being informed by the surgical team, an episode of tachycardia during the ovariohysterectomy procedure. Guided by the team, she performed an echodoplercardiogram on a Siemens Acuson P500® device, which showed diastolic dysfunction with mild mitral valve insufficiency, with a phenotype suggestive of hypertrophic cardiomyopathy in the left and right ventricles, in addition to dynamic obstruction in both outflow tracts and important hemodynamic repercussions.

On physical examination, she was alert and active, with a rectal temperature of 38.5°C, slightly cyanotic mucous membranes, normal palpable lymph nodes, low body score, synchronous and strong pulse. Chest auscultation was unchanged, cardiac auscultation showing grade V systolic murmur in the mitral and tricuspid valves, with episodes of arrhythmias. Measurement of systolic blood pressure (SBP) measured at 115 mm Hg, with a Deltalife® doppler device. The blood count showed no changes and the biochemical test showed a slight increase in urea and alt, and negative results for feline immunodeficiency virus (Fiv) and feline leukemia virus (Felv). Chest radiography was performed showing cardiomegaly and congenital malformation in ribs and vertebrae.

Antithrombotic therapy was instituted with Clopidogrel at a dose of 19mg, administered once a day (SID) for continuous use and Atenolol at a dose of 7.65 mg, administered twice a day (BID) also for continuous use. After a week, the patient was reassessed, maintaining the SBP unchanged. The tutor reported having had a notable improvement, being more active and eating with appetite, with a weight gain of 180 grams compared to the previous week, in addition to having no more episodes of fainting or breathing difficulties.

Until this moment, the patient is stable, using drug therapy, with indication of monitoring through Doppler echocardiography every six months, in addition to blood checkup and blood pressure measurement, or sooner, if the condition worsens.

DISCUSSION

Cardiomyopathies are responsible for most heart diseases in domestic felines, having an important morbidity and mortality rate in this species (PELLEGRINO, 2020). Hypertrophic cardiomyopathy is expressed by left ventricular hypertrophy, making it difficult for the heart muscle to relax in the diastolic phase and, consequently, causing an increase in filling and left atrial pressure, which may culminate in a picture of congestive heart failure (STRICKLAND, 2007).

The initial complaint reported by the tutor during the consultation was dyspnea, associated with exercise intolerance and difficulty gaining weight. Generally, cats develop clinical signs when the disease is already installed and at an advanced stage, presenting an acute condition of dyspnea or tachypnea related to heart failure, and there may be associated pulmonary edema or pleural effusion (ABBOTT, 2010). According to Atkins (2007), signs such as lethargy, pale mucous membranes, hyporexia or anorexia may be present.

During the anamnesis, it was reported that two other puppies from the same litter had

died suddenly, before reaching one year of age, but the cause of death was not defined. The tutor did not provide information on the parents of the litter. Although in some pure breeds, genetic mutations are responsible for alterations in sarcomere proteins, leading to the expression of cardiomyopathy, there are still no data and/or studies that corroborate the disease being associated with crossbred cats as well, due to its wide genetic variability, as well as gender or age (FUENTES et al., 2020).

On clinical examination, the patient had a systolic murmur in the mitral and tricuspid valves, with grade V and chest auscultation suggestive of incipient pulmonary edema (crackling sound), in addition to abnormal heart rhythm. According to Pelegrino (2020), a systolic murmur is the most common clinical sign in cats with this pathology, and its intensity may vary according to the degree of obstruction of the left ventricular outflow tract, as well as in a case of congestive heart failure, the presence of crackling lung sounds characteristic of pulmonary edema.

Chest radiography is an important tool, as through it we can observe an increase in the cardiac silhouette, presence of an alveolar pattern compatible with pulmonary edema, pulmonary vein congestion, interstitial pattern or pleural effusion (FERASIN, 2009), taking care to perform this exam only with the patient properly stabilized (FUENTES et al., 2020). At the time of consultation, this examination was previously performed and showed cardiomegaly, in addition to malformation of ribs and thoracic vertebrae, but without signs of pulmonary edema or pleural effusion.

Systolic blood pressure was measured, with the patient cooperative and comfortable at the time of measurement. The value obtained was within the normal range for the species of 105 mm Hg, through an average value of seven measurements, discarding the lowest and highest value. According to Acierno et al. (2020), a calm environment must be recommended, with the tutor present and as little restraint as possible, in order to minimize possible stressful effects on the animal that may interfere with obtaining reliable values for the condition of the animal. The choice of cuff must meet the rule that its width must match 30% to 40% of the circumference of the limb chosen for the procedure.

Previously performed echocardiography showed diastolic dysfunction with mild mitral valve insufficiency, with a phenotype suggestive of hypertrophic cardiomyopathy in the left and right ventricles, in addition to dynamic obstruction in both outflow tracts and significant hemodynamic repercussions. According to Pelegrino (2020), the definition of myocardial hypertrophy goes against the increase in the thickness of the free wall of the left ventricle during diastole (≥ 6 mm) and is often related to the increase in the shortening fraction of the left ventricle. B-mode ultrasound (two-dimensional) allows the assessment of myocardial cardiac function and the identification of the various phenotypic expressions of heart disease (FERASIN, 2009). LV hypertrophy is diagnosed when the hypertrophied segment occupies more than 50% of the ventricular area (FERASIN, 2009). The determination of the dimensions of the left atrium is obtained through the right parasternal projection of the long axis of the heart (ABBOTT; MACLEAN, 2006; REEF, 2007; MACDONALD, 2008), in addition to this measurement, the dimension of the left atrium is also expressed by the ratio between the size of the atrium and the aortic root (ABBOTT; MACLEAN, 2006). The value obtained in the patient's examination was 1.15, not being characteristic of atrial enlargement (figure 1). In the M-mode examination, measurements of the left ventricular free

wall and interventricular septum were in diastole with a value of 7.7 mm, evidencing a significant increase in both the wall and the interventricular septum, but the shortening fraction remained within of normality. The evaluation of the transmitral flow by spectral Doppler suggested diastolic dysfunction demonstrated by the E:A ratio with a value of 0.6. In hypertrophic cardiomyopathy, there is a decrease in the amplitude of the E wave and an increase in the amplitude of the A wave (E:A <1), corresponding to the compensatory increase in the contribution of the left atrium to ventricular filling at the end of diastole (FERASIN, 2009), shown in figure 2.

Echocardiographic findings suggested a reduction in ventricular filling pressures (reduced intraluminal volume in the left ventricle), showing a prolonged isovolumetric relaxation time (IVRT). Systolic function remained preserved at rest, with left ventricular hyperkinesia. The study showed turbulent systolic flow within the left atrium (mild mitral valve insufficiency), secondary to systolic anterior motion of the mitral valve (SAM) with the presence of moderate dynamic obstruction of the left ventricular outflow tract, in addition to the presence of significant obstruction dynamics in the right ventricular outflow tract. Usually, alterations in the shape and peak velocity of the wave corresponding to the aorta, with the detection of an abrupt acceleration of the onset of systole producing a wave with a concave and asymmetrical shape, are consistent with obstruction of the left ventricular outflow tract (FERASIN, 2009).

In M mode (one-dimensional movement) it is possible to detect the systolic anterior movement of the mitral valve ("systolic anterior movement" - SAM), through the abnormal movement of the mitral valve leaflets towards the interventricular septum at the beginning or during systole (FERASIN, 2009). The color Doppler echocardiogram modality is used to identify turbulences in blood flow within the heart chambers. Most often, two turbulent jets are observed, one projecting into the proximal aorta and the other returning into the left atrium, indicating mitral regurgitation (KITLLESON; COTE 2021). In cats with systolic anterior movement, there is moderate to severe obstruction of the left ventricular outflow (Figure 3), the anterior leaflet is poorly positioned during systole and these animals have mitral regurgitation (NOSWORTHY et al., 2009).

The purpose of treating hypertrophic cardiomyopathy is to support ventricular relaxation and consequently favor diastole, in addition to minimizing and controlling the risks of myocardial ischemia, arrhythmias, arterial thromboembolism and the clinical manifestations of congestive heart failure. According to the diagnostic tests performed and the patient's clinical symptoms, drug therapy with Atenolol at a dose of 7.65 mg every 12 hours of continuous use was instituted. According to the treatment indicated in the literature (BONAGURA, 2010), beta-adrenergic blockers aim to decrease the sympathetic response, promoting a reduction in heart rate, reduction in the force of contraction of the heart muscle and volume of blood pumped by the left ventricle, in addition to preventing the occurrence of tachyarrhythmias, delaying the conduction of electrical impulses through the atrioventricular node.

Antithrombotic prophylactic therapy was associated with Clopidrogrel at a dose of 17.5 mg for continuous use. Arterial thromboembolism is a common complication with high morbidity and mortality in cats with cardiomyopathies. Clopidogrel, once metabolized into an active metabolite by cytochrome P450 enzymes, irreversibly inhibits one of the platelet P2Y12 adenosine diphosphate receptors, minimizing the risk of

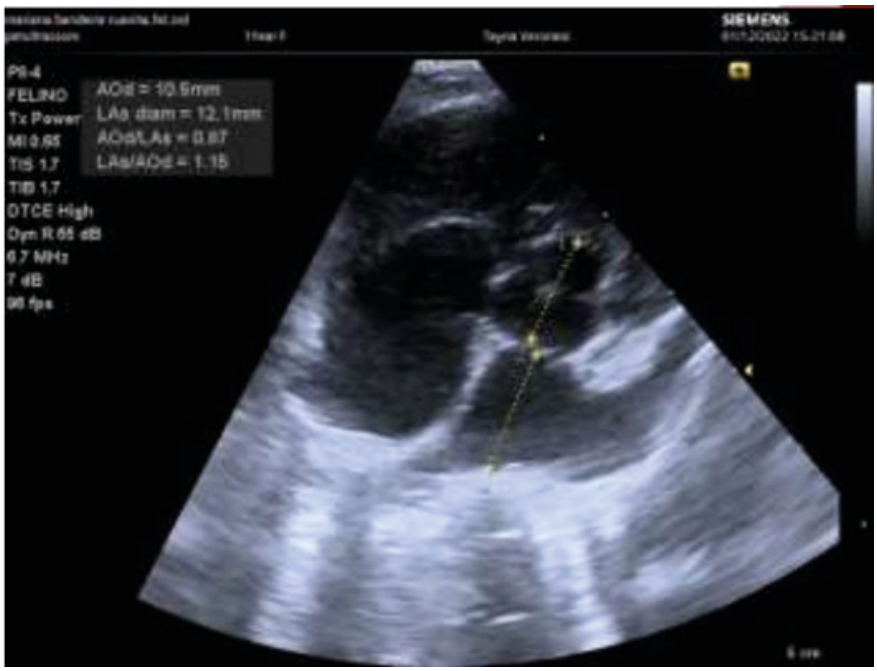

Figure 1: Two-dimensional echocardiographic image in right parasternal section of the short axis at the base of the heart.

Source: M.V. Tayná Veronezi

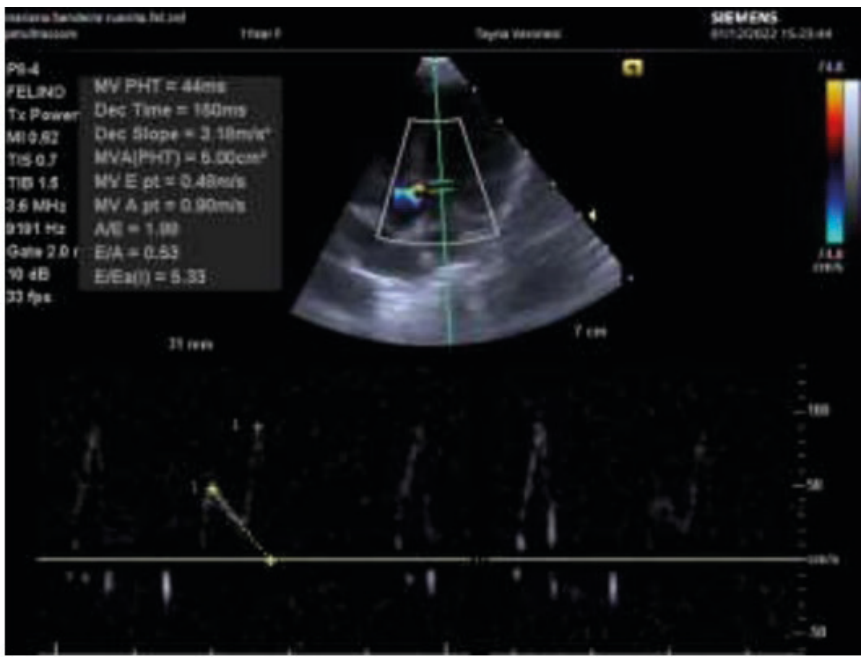

Figure 2: Pulsed Doppler echocardiography, caudal left parasternal window, apical four-chamber view, for evaluation of the transmitral flow, demonstrating an abnormal relaxation pattern, with the E wave velocity lower than the A wave.

Source: M.V. Tayná Veronezi

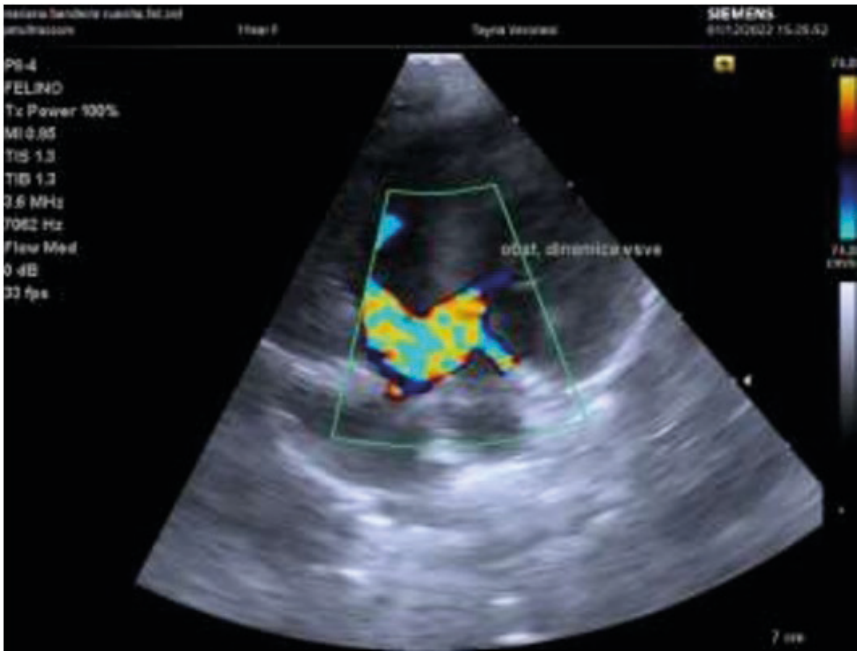

Figure 3: Two-dimensional and Doppler echocardiography (caudal left parasternal window, apical 5-chamber view) with intense systolic turbulent flow inside the left atrium and outflow from the aorta, indicating obstruction of the left ventricular outflow tract.

Source: M.V. Tayná Veronezi

thrombus formation, although the response to therapy is still variable according to the individual's response (YU; RONALD; NGHI 2021).

The patient accepted the medication administration well and the tutor was willing to maintain the treatment and periodic reviews, thus providing a better quality of life for the animal.

CONCLUSION

Hypertrophic cardiomyopathy is the most common heart condition in cats, characterized by mild to severe thickening of the left ventricular chamber combined with diastolic dysfunction. In addition to the deleterious effects that congestive heart failure causes to the body, there is an imminent risk of arterial thromboembolism, thus increasing the mortality rate among these patients. Although the etiology of the primary disease is still unknown, the diagnostic resources available and the present therapeutic protocols contribute to improving the quality of life of patients. The diagnosis must be based on a positive family history, ruling out other conditions that may be associated with secondary hypertrophy. Doppler echocardiography is currently the gold standard test for diagnosing this disease. As it is a progressive disease with a poor prognosis, the owner's commitment to the therapy used is of paramount importance for maintaining the quality of life of the affected animal.

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