

Feline Aortic Thromboembolism Diagnosed by Thermography

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ABSTRACT

Background: In cats, arterial thromboembolism is one of the most devastating diseases, with an acute presentation, and is often caused by undiagnosed cardiomyopathy. Defined as the obstruction of one or more arterial lumens by emboli, the arterial thromboembolism is responsible for hypoperfusion signs. As the temperature of the skin surface is directly related to tissue perfusion, thermography can be promising for the early diagnosis of thromboembolism. Therefore, this study reports the importance of thermography as a complementary examination for the diagnosis of thromboembolism in the abdominal aorta of a domestic cat.

Case: A 4-year-old mixed-breed cat weighing 2.95 kg was presented with a history of sudden onset paraplegia, apathy, and pain when handled, with greater intensity in the sacro-coccygeal region. During physical exam, it was noted that the femoral artery pulse was undetectable bilaterally during manual pulse measurement. Superficial and deep sensitivity in the pelvic limbs and proprioception were also absent and the plantar cushions and nail beds of the posterior limbs were pale to cyanotic. Thermographic images revealed that the temperature of both hind limbs was lower than that of forelimbs, with difference of 3.2°C and 2.9°C between the left and right limbs, respectively. Doppler ultrasonography revealed the absence of pulse and flow in the femoral arteries bilaterally. Electrocardiography revealed sinus tachycardia, with a heart rate of 250 bpm. Echocardiography revealed dilation of the left atrium and concentric cardiac hypertrophy. After 24 h, due to the worsening of the clinical condition and unfavorable prognosis, the animal was euthanized and sent for necropsy. Necropsy revealed that the arterial lumen of the caudal abdominal aorta and bifurcation of the iliac arteries were obliterated, with a 0.6 cm saddle thrombus adhered to the arterial wall. In addition, left ventricular thickening indicative hypertrophic cardiomyopathy was observed. In the left atrium, a thrombus was observed that filled the entire chamber.

Discussion: Thermography is a fast and non-invasive method, and therefore, it is a tool of great relevance in emergencies. Previous study showed that a minimum temperature difference of 2.4°C between the affected and unaffected limbs has excellent specificity and high sensitivity for the diagnosis of feline aortic thromboembolism. In this report, the temperature differences between the affected and unaffected limbs on the left and right sides were found to be 3.2°C and 2.9°C, respectively, corroborated this finding. Cats with cardiomyopathies are predisposed to the development of thrombi, and rarely manifest heart disease. Here, the cat was diagnosed with hypertrophic cardiomyopathy during the diagnostic investigation for arterial thromboembolism, which is consistent with the usual findings because feline hypertrophic cardiomyopathy progresses silently with few clinical manifestations in the early stages. Clinical diagnosis of arterial thromboembolism can be made based on the presence of some physical examination findings, such as pain and paralysis of the affected limbs, absence of a femoral pulse, cold extremities, and pale or cyanotic cushions. In this report, thermography proved to be an accurate, quick, and non-invasive method for the assessment of vascular alterations that affected the pelvic limbs of the cat. Complementary examinations confirmed the presence of hypertrophic cardiomyopathy and necropsy revealed the presence of thrombus.

Keywords: cyanosis, hypertrophic cardiomyopathy, ischemia, temperature.

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INTRODUCTION

Arterial thromboembolism is defined as the obstruction of one or more arterial lumens by emboli, usually thrombus-emboli, originating from a location distant to the point of obstruction [2]. It is frequently associated with hypertrophic cardiomyopathy in cats because of a greater predisposition to the formation of thrombi in the region of the left atrium [2].

The temperature of the skin surface is directly related to tissue perfusion and therefore, thermography can be promising for the early diagnosis of thromboembolism [6]. Thermography is a simple, non-invasive, and valid method for diagnosing aortic thromboembolism in cats [7]. The present report aims to emphasize the importance of thermography as a complementary examination for the diagnosis of thromboembolism in the caudal abdominal aorta secondary to hypertrophic cardiomyopathy in a domestic cat.

CASE

A 4-year-old mixed-breed cat weighing 2.95 kg was presented with a history of sudden onset paraplegia, apathy, and pain when handled, with greater intensity in the sacro-coccydian region. The animal experienced anorexia, adipsia, normoquesia, and normuria.

Physical examination revealed that the animal had a rectal temperature of 37.5°C, dehydration (7%), increased capillary filling time (4 s), and congested mucous membranes. Tachycardia with a galloping rhythm and pulmonary crackling with a respiratory rate of 56 bpm were noted on auscultation. The femoral artery pulse was undetectable bilaterally during manual pulse measurement. Superficial and deep sensitivity in the pelvic limbs and proprioception were absent. The plantar cushions and nail beds of the posterior limbs were pale to cyanotic, with apparently decreased temperature. Complete blood count, urinalysis, urinary creatinine protein ratio (UP/C), immunochromatographic tests for feline immunodeficiency virus (FIV) and feline leukemia virus (FeLV) [FIV Ac/FeLV Ag Test Kit]¹, and measurement of serum alanine transaminase, aspartate transaminase (AST), creatine phosphokinase (CK), creatinine, urea, and CK-MB levels were performed. In addition, thermography, doppler ultrasonography of femoral arteries, chest radiography, electrocardiography, and echocardiography were performed. Hemogram revealed leukocytosis (22,300 cells/mm³, ref.: 5,500-19,500

cells/mm³) with neutrophilia (20,070 cells/mm³, ref.: 2,500-12,500 cells/mm³), lymphopenia (1,338/mm³, ref.: 1,500-7,000 cells/mm³), and thrombocytopenia (140,000 platelets/mm³, ref.: 200,000-500,000 platelets/mm³). Serum biochemical measurements revealed an increase in AST (278.1 IU/L, ref.: 6.7-11 IU/L), CK (33,831.40 U/L, ref.: 7.2-28.2 U/L), and CK-MB (1,069 U/L). The immunochromatographic tests for FIV and FeLV were negative.

Thermographic images were captured using the FLIR ONE camera² and analyzed using FLIR Tool software. Image analysis revealed that the temperature of the pelvic limbs was lower than that of thoracic limbs. The difference between the average temperatures of the left thoracic and pelvic limbs was 3.2°C and that between the right thoracic and pelvic limbs was 2.9°C, with the pelvic limbs being significantly colder than the ipsilateral thoracic limbs (Figure 1). Doppler ultrasonography revealed the absence of pulse and flow in the femoral arteries bilaterally. Electrocardiography revealed sinus tachycardia, with a heart rate of 250 bpm. Echocardiography revealed dilation of the left atrium and concentric cardiac hypertrophy.

The findings were indicative of aortic thromboembolism. Treatment for pain control was instituted. However, after 24 h, due to the worsening of the clinical condition and unfavorable prognosis, the animal was euthanized and sent for necropsy. Necropsy revealed that the arterial lumen of the caudal abdominal aorta and bifurcation of the iliac arteries were obliterated,

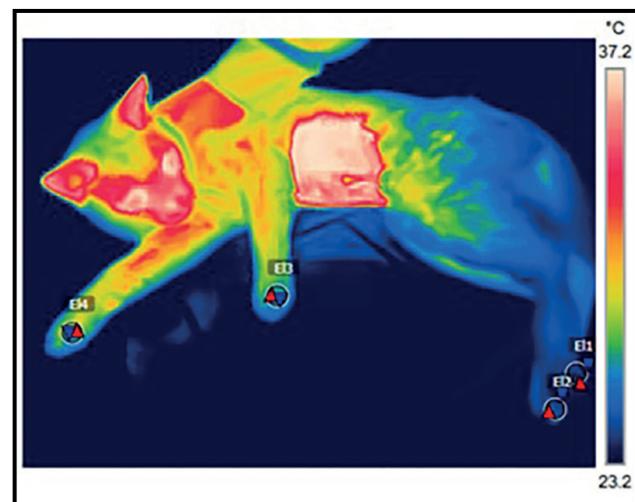


Figure 1. Thermographic image of the cat with abdominal aortic thromboembolism. Measurement of the mean temperature of distal extremities. The mean temperatures of the left (E1: 24°C) and right (E2: 24.3°C) hind limbs were markedly lower than those of the left (E3: 26.7°C) and right (E4: 27.7°C) forelimbs, respectively.

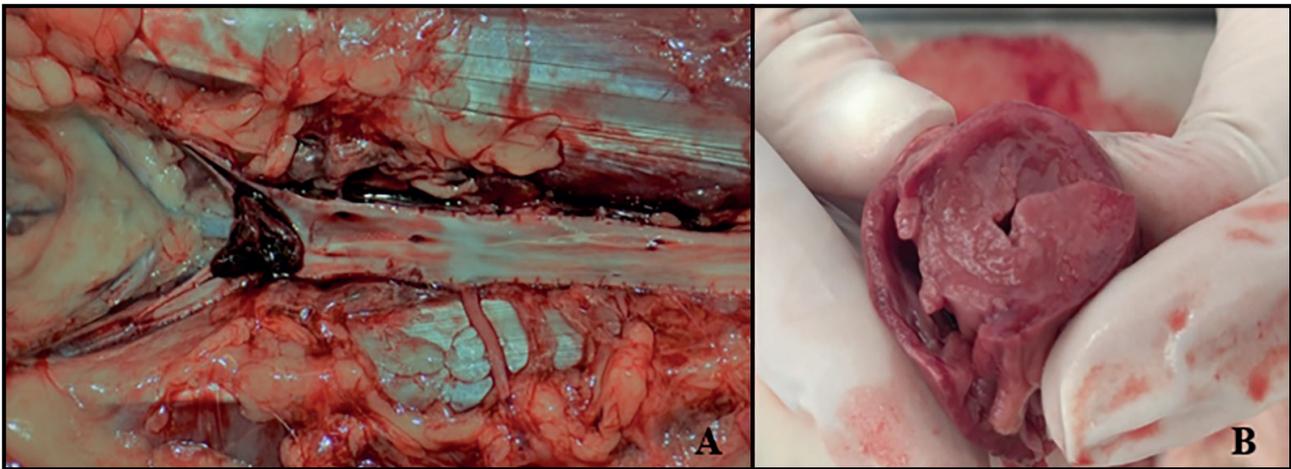


Figure 2. A- A saddle thrombus (0.6 cm) adhered to the caudal abdominal aortic artery wall and bifurcation of the iliac arteries is noted. B- Enlarged heart with thickening of the left ventricle and a marked decrease in the ventricular lumen.

with a 0.6 cm saddle thrombus adhered to the arterial wall (Figure 2). In addition, left ventricular thickening indicative of hypertrophic cardiomyopathy was observed. In the left atrium, a thrombus was observed that filled the entire chamber.

DISCUSSION

Thermography is a fast and non-invasive method, and therefore, it is a tool of great relevance in emergencies [7] and may even assist in determining a patient's prognosis [5]. The temperature differences between the affected and unaffected limbs on the left and right sides were found to be 3.2°C and 2.9°C, respectively, which corroborated the findings of a previous study [7]. According to these authors, a minimum temperature difference of 2.4°C between the affected and unaffected limbs has excellent specificity and high sensitivity for the diagnosis of feline aortic thromboembolism. Cats with cardiomyopathies are predisposed to the development of thrombi due to the presence of all aspects of the Virchow triad (blood stasis, endothelial injury, and hypercoagulability) [5]. Rarely, cats with thromboembolism have clinical manifestations of heart disease [8]. However, in the present report, the auscultated canter rhythm strengthened the suspicion of embolism secondary to cardiomyopathy because cardiac murmurs and arrhythmias are clinical findings suggestive of underlying heart disease [4]. Here, the cat was diagnosed with hypertrophic cardiomyopathy during the diagnostic investigation for arterial thromboembolism, which is consistent with the usual findings because feline hypertrophic cardiomyopathy

progresses silently with few clinical manifestations in the early stages [1].

The changes observed in laboratory findings (AST, CK, and CK-MB levels) have been described in the literature and are directly related to muscle damage resulting from an ischemic event [2,3].

The gold standard for the diagnosis of this disorder is the observation of the plunger during image examination. However, a clinical diagnosis can be made based on the presence of the following physical examination findings: pain and paralysis of the affected limbs, absence of a femoral pulse, cold extremities, and pale or cyanotic cushions [2].

In this report, thermography was considered of paramount importance for detecting vascular alterations associated with the thrombus.

Thermography proved to be an accurate, quick, and non-invasive method for the assessment of vascular alterations that affected the pelvic limbs of the cat. Complementary examinations confirmed the presence of hypertrophic cardiomyopathy and necropsy revealed the presence of thrombus.

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