

Case 6/2011 - Decompensated Heart Failure in 65-Year-Old Man suffering from Chagas Cardiomyopathy and Coronary Artery Disease

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A 65-year-old male patient born in Jacarezinho (state of Paraná) presented Chagas cardiomyopathy and coronary artery disease. The patient admitted for decompensated heart failure and renal failure.

At 55 years of age, the patient developed fatigue and dyspnea on major exertion, which progressed to minimum exertion by the end of 2003, aged 64. The patient referred palpitations accompanied by malaise and dyspnea from the onset of this condition, but denied syncope episodes. The patient also complained of chest pain at night, lasting up to two hours.

The patient denied hypertension, diabetes, dyslipidemia, smoking or family history of coronary heart disease.

Physical examination on first visit (March 02 2004) was normal except for detection of high blood pressure (140 x 100 mmHg) and presence of systolic murmur ++/4+ in the mitral area.

ECG (February 26 2004) revealed sinus rhythm, heart rate 80 bpm, first degree AV block (PR 240 ms), QRS duration of 127 ms, low voltage, QRS in the frontal plane, overload on left chambers and polymorphic ventricular premature beats (figure 1).

Serology for Chagas' disease was positive; the hemoglobin was 12.2 g/dL; hematocrit, 37%; sodium, 139 mEq/L; potassium 5 mEq/L; and creatinine 1.5 mEq/L.

Echocardiogram revealed enlarged left atrium (45 mm), left ventricular dilatation (70 mm diastole and 56 mm systole), with an ejection fraction of 36%. Moderate diffuse hypokinesia and akinesia of the left ventricular posterior basal segment were observed. No valve dysfunction was found.

Ambulatory ECG Holter Monitoring revealed periods of 1st degree atrioventricular block with PR interval going up to

600 ms, frequent ventricular and polymorphic premature beats and multiple episodes of sustained and nonsustained ventricular tachycardia.

Due to the presence of segmental ventricular involvement on echocardiography, left cardiac catheterization and coronary arteriography was requested.

The test (March 25, 2004) revealed left ventricular pressures (start of systole/diastole/end of diastole) of 100/05/28 mmHg; and coronary arteriography revealed a single lesion of 90% in non-dominant right coronary artery.

The patient underwent angioplasty with stenting in the right coronary artery (April 20, 2004).

The patient improved dyspnea, however, in November 2004, important abnormalities were detected in laboratory tests for routine follow-up and the patient went on medical consultation.

Laboratory tests (November 25, 2004) revealed hemoglobin 10.3 g/dL, hematocrit 32%, 7000 leukocytes/mm³ (normal differential), platelets 171000/mm³, creatinine 3.1 mg/dL, urea 129 mg/dL, sodium 141 mEq/L, potassium 6.5 mEq/L, uric acid 11.7 mg/dL, glucose 129 mg/dL, glycated hemoglobin 5%, AST 13 U/L, ALT 19 U/L and TSH 0.306 microUI/mL. Total cholesterol was 131 mg/dL, HDL-C 37 mg/dL, LDL-C 78 mg/dL, triglycerides 79 mg/dL.

On that day, the patient was hypotensive (BP 86 x 70 mmHg) and the following drugs were discontinued: amiodarone, losartan and amlodipine. On a reassessment conducted five days afterwards, the patient reported improvement of "lethargy."

Abdominal, liver and biliary tract ultrasound exam (December 02, 2004), revealed no abnormalities; the spleen was of normal size, as well as the kidneys (right kidney 10 cm and left kidney 11 cm); presence of simple renal cysts in the left upper pole (3.7 x 3.4 cm) and right and middle third (3.2 x 2.5 cm) and nodular calcification in the right cortical zone.

On December 21, the patient sought medical attention due to worsening of dyspnea at rest, orthopnea and lower limb edema.

Physical examination on admission (December 21 2004) revealed: heart rate 80 bpm, blood pressure, 80 x 60 mmHg, crackles at the lung bases. Cardiac auscultation revealed the presence of 3rd heart sound and systolic mitral murmur ++/4+ in the mitral valve. The liver was palpated at 5 cm from the right costal edge; there was ++/4+ edema on the lower limbs.

Keywords

Heart failure, chagas cardiomyopathy, coronary disease.

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Laboratory tests (December 20, 2004) revealed hemoglobin 9.3 g/dL, hematocrit 29%, leukocytes $6900/\text{mm}^3$ (79% neutrophils, 2% eosinophils, 13% lymphocytes and 6% monocytes), platelets $171000/\text{mm}^3$, urea 135 mg/dL and creatinine 2.8 mg/dL. Blood pH was 7.09, bicarbonate 20 mEq/L, and base excess (-) 10.3 mEq/L.

ECG (December 20, 2004) revealed sinus rhythm, heart rate 54 bpm, PR 186 ms, QRS duration of 114 ms, QT 463ms, ventricular premature beats, low voltage QRS complexes in the frontal plane, indeterminate axis and left atrial enlargement (figure 2).

Echocardiogram revealed enlarged left atrium (54 mm), left ventricular dilatation (73 mm diastole and 64 mm systole) and ejection fraction of 25%. Marked diffuse hypokinesia of both ventricles was observed. Right ventricular systolic pressure was estimated at 50 mm Hg and no valve dysfunction was found.

The following drugs were administered: sodium bicarbonate, dobutamine, furosemide, carvedilol, hydralazine, monosorbid, acetylsalicylic acid, omeprazole and calcium polystyrene sulfonate (Sorcal®).

With these measures, heart rate went to 60 bpm, blood pressure, to 100 x 70 mmHg. Potassium levels dropped to 4.6 mEq/L.

In the early morning of December 21, 2004, the patient presented cardiac arrest in asystole unresponsive to resuscitation maneuvers and died at 5:00 a.m.

Clinical aspects:

Chagas' disease is a chronic systemic infection caused by the protozoan *Trypanosoma cruzi*. Nearly eighteen million

people are infected in Latin America, and 30% have the symptomatic form of the disease. Cardiac involvement is largely responsible for the death of these patients, ventricular arrhythmias or severe ventricular dysfunction.¹ Sudden death is the leading cause of death in patients with Chagas' disease, which accounts for two thirds of cases, followed by refractory heart failure (25%-30%) and thromboembolism (10% -15%)². The case reported here consists of a 65-year-old patient with signs and symptoms of systolic heart failure syndrome associated with serological confirmation of Chagas' disease. It is important to consider that on the first visit to the outpatient clinic, the patient was already at an advanced stage of the disease with positivity of all Rassi's scoring criteria (functional class III-IV: 5, low voltage QRS: 2, cardiomegaly: 5, ventricular dysfunction: 3, nonsustained ventricular tachycardia: 3 and male sex: 2. Total: 15 points), thus characterizing high-risk with predicted mortality rate of 63% in five years. The electrocardiogram (ECG) is compatible with the stage of the disease, because it reveals abnormalities associated with a worse prognosis, including atrioventricular and intraventricular conduction disorders and low voltage QRS. Just like in the ECG, 24-hour Holter monitoring also revealed abnormalities suggesting advanced cardiac involvement. The echocardiogram (ECHO) revealed increased left cardiac chambers in the absence of valve disease and left ventricular (LV) hypokinesia with posterobasal wall akinesia. Although the abnormality in LV wall motion is a common feature of ischemic dilated cardiomyopathy, this may be also present in Chagas' disease. In a population of patients with symptomatic Chagas' disease cardiomyopathy assessed with echocardiography, there were segmental abnormalities in LV

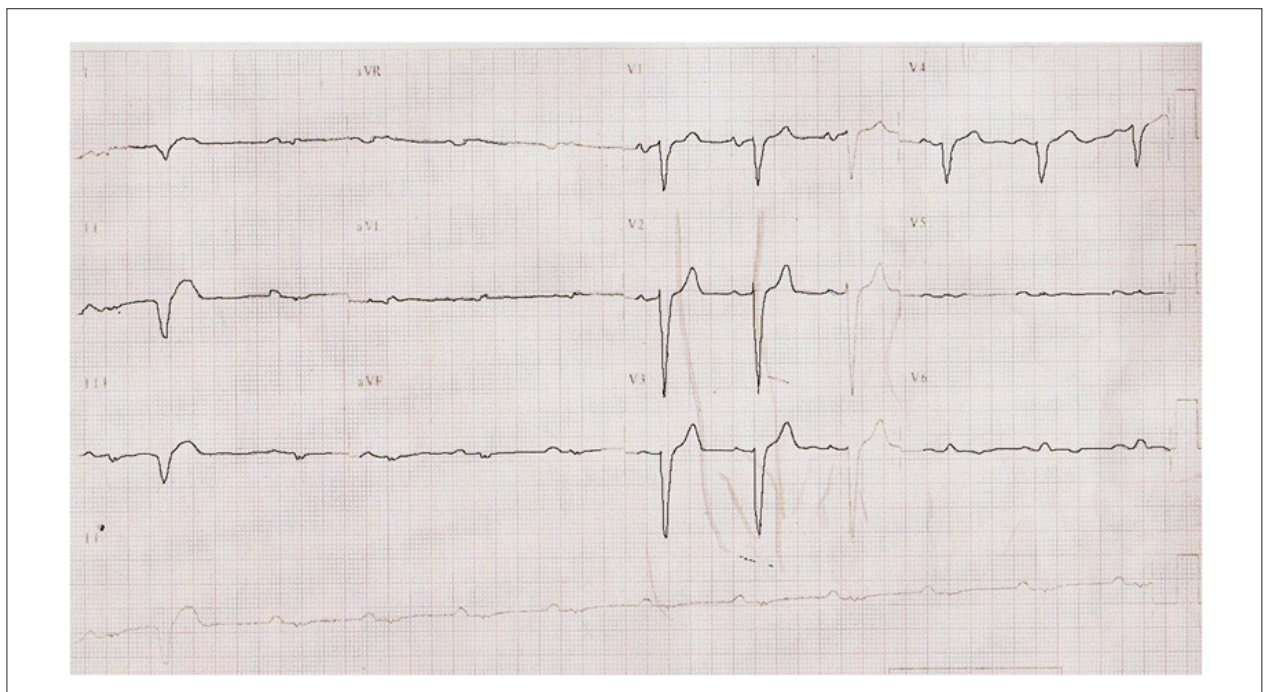


Figure 1 - ECG: Sinus rhythm, first degree AV block, intraventricular conduction disturbance of the stimulus, left bundle branch block type and left chamber overload.

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posterior wall of up to 50%. The most common segmental dysfunction was apical dyskinesia (59%).³ The diagnosis of coronary artery disease (CAD) in patients with dilated cardiomyopathy remains controversial in the literature. However, in the context of this case, the patient presented, in addition to segmental LV dysfunction, independent risk factors for CAD. The presence of hypertension, diabetes mellitus (fasting glucose > 125, though assessed in isolation) and low HDL-c are signs of high risk for CAD. Therefore, the prescription of coronary artery angiography was justified and met the current guidelines for heart failure.⁴ It is not yet clear whether chronic infection by *Trypanosoma cruzi* changes the incidence and natural evolution of atherosclerotic disease. An autopsy study revealed a similar prevalence of myocardial infarction and coronary atherosclerosis in patients with Chagas' disease and patients without Chagas' disease.⁵

In November 2004, the patient had an episode suggesting decompensated heart failure with clinical and laboratory signs of low cardiac output. Drug therapy was adjusted and early outpatient follow-up was initiated. However, after one month, the patient was admitted again with signs of low cardiac output associated with systemic and pulmonary congestion requiring the use of inotropic drugs. Laboratory tests revealed acute renal failure and acidosis probably secondary to systemic hypoperfusion.

Myocardial ischemia, as well as Chagas' disease cardiomyopathy, is an important risk factor for complex ventricular arrhythmia. However, progression to cardiac arrest in asystole leads to the conclusion that an arrhythmic etiology is less likely to be the immediate cause of death.

The main differential diagnoses for the final clinical picture are cardiac tamponade, pulmonary thromboembolism (PTE) and cardiogenic shock, which will be discussed below.

Acute renal failure and anasarca secondary to ventricular dysfunction are important risk factors for the development of pericardial effusion, which makes the diagnosis of cardiac tamponade to be quite possible in this context. The clinical presentation of cardiac tamponade generally reflects hemodynamic instability derived from restriction to ventricular filling during diastole. Hypotension is usually present, even though in early stages the compensatory mechanisms allow to maintain normal blood pressure. Presence of paradoxical pulse is the rule, but it is not always present. Tachycardia is also a common finding, unless the patient is under therapy with negative chronotropes. Physical examination can also reveal signs of right heart failure, such as increased jugular venous pulse, Kussmaul sign and hepatomegaly. The abnormalities mostly found on ECG are reduction in voltage and electrical alternation of QRS. Echocardiography is currently the standard noninvasive method for diagnosing pericardial effusion and evaluating hemodynamic involvement.⁶ In a retrospective analysis of this clinical case, we conclude that there are nonspecific clinical signs of cardiac tamponade. Compatible electrocardiographic abnormalities (low voltage QRS) had already been found since the beginning of follow-up at the outpatient clinic and may be just a consequence of Chagas' heart disease itself. Finally, the echocardiogram did not reveal any pericardial abnormality. Therefore, we consider such diagnostic probability to be low.

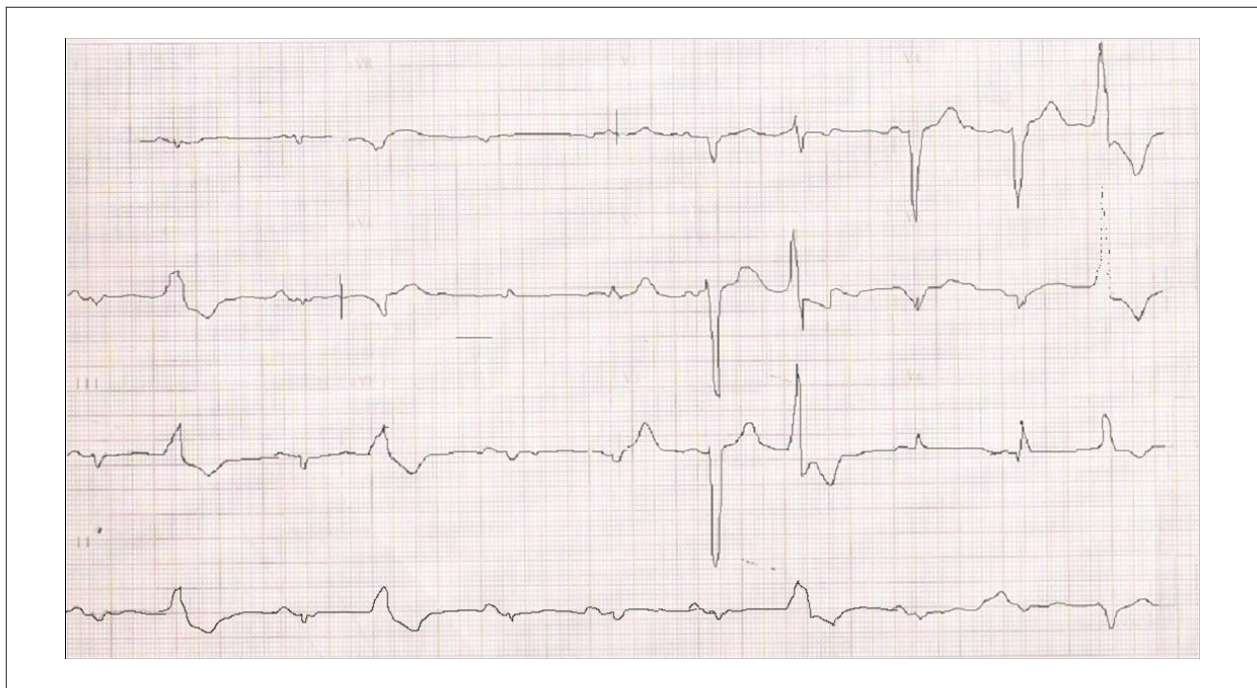


Figure 2 - ECG: Sinus bradycardia, intraventricular conduction disturbance of the stimulus, left bundle branch block type and left chamber overload.

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Pulmonary thromboembolism is a frequent complication in CHF. Its incidence is two-fold higher in patients with LV systolic dysfunction. The diagnostic evaluation is often challenging due to a myriad of signs and symptoms common to both diseases. Laboratory tests have little value because of abnormalities in CHF biomarkers such as D-dimer and BNP. The use of imaging methods is required to confirm the diagnosis. The typical clinical picture consists of dyspnea and hypoxemia inconsistent with the findings of pulmonary congestion, and worsening of the signs of right ventricular (RV) failure and lower limb edema, jugular stasis and congestive hepatomegaly. In this case, the hypothesis of PTE becomes plausible due to the presence of signs of RV dysfunction associated with pulmonary arterial hypertension on ECHO undiagnosed in previous tests. However, in addition to systemic congestion, the patient presented signs of LV failure, such as the presence of third heart sound and pulmonary edema, which could justify the dyspnea reported, as well as RV failure, probably secondary to high left ventricular filling pressures.⁷

Finally, our third hypothesis of diagnosis included among the most likely ones is cardiogenic shock. This is characterized by a state of low tissue perfusion secondary to reduced cardiac output. Along with ventricular arrhythmias, this condition is the leading cause of death in dilated cardiomyopathy. Several factors are capable of worsening chronically compensated heart failure. These factors include misuse of drugs and natural progression of cardiomyopathy. The patient concerned presented a characteristic picture of decompensated congestive heart failure with low cardiac output and biventricular systolic dysfunction. Based on these reports, one cannot infer a specific triggering factor. The hypothesis of myocardial ischemia should be considered by the established history of CAD, despite the absence of symptoms of ischemic abnormalities on electrocardiogram.

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Diagnosis hypotheses: syndromic diagnosis: congestive heart failure; etiology: Chagas' cardiomyopathy and concomitant coronary artery disease; final event, acute ischemic syndrome or, less likely, pulmonary thromboembolism.

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Necropsy

The heart weighed 680 g, had increased volume and globular shape. At opening, there were moderate dilation of all cardiac chambers and myocardial narrowing at the apex of the left ventricle without thrombus inside. The ascending aorta showed sparse and non-ulcerated yellowish plaques on the intimal surface (Figure 3), and epicardial coronary arteries were atheromatous and presented increased consistency. The lungs and liver showed signs of congestion, and there was no impairment of the digestive organs due to the Chagas' disease (absence of enteromegalies).

Histological examination of the heart revealed chronic myocarditis with marked degree of activity, diffuse interstitial fibrosis and no signs of recent myocardial ischemia (Figure 4). No parasites were found through conventional methods of histological staining.

The study of epicardial coronary arteries revealed atherosclerotic involvement of mild to moderate degree (Figure 5) (see Table 1 with percentages of occlusion by plaque). In particular, in the segment where the stent had been placed (removed to allow histological section), the percentage of occlusion was 50%.

The analysis of the lungs and liver confirmed the finding of severe chronic passive congestion.

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Anatomical-pathological diagnosis: major illness: Chagas' cardiomyopathy, **cause of death:** congestive heart failure.

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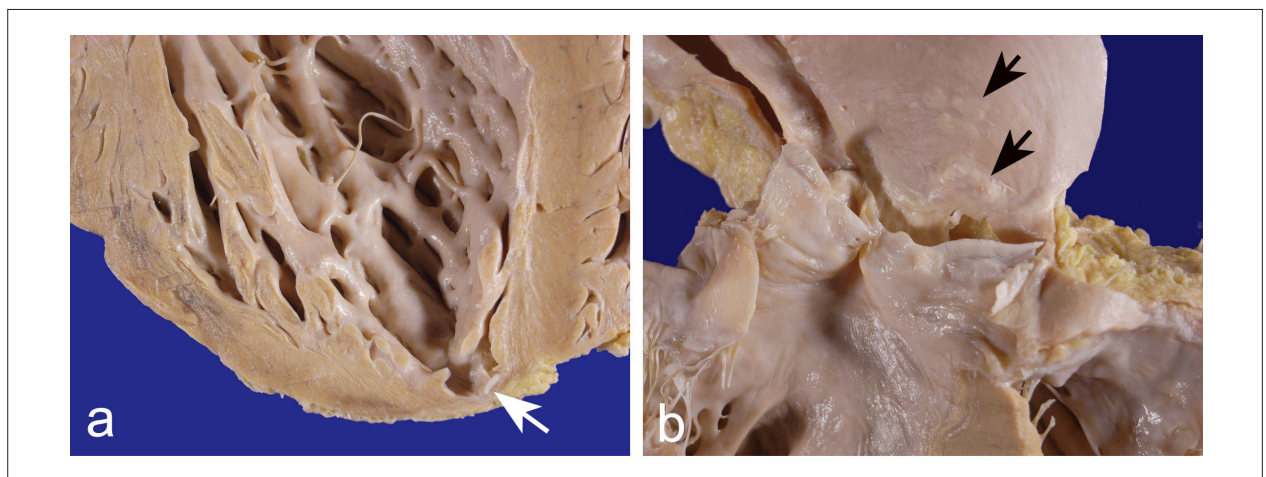


Figure 3 - Macroscopic details of the heart and aorta. In a, myocardial narrowing at the ventricular apex (white arrow); in b, uncomplicated atheromatous plaques above the aortic valve (black arrows).

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Comments

The coexistence of other cardiovascular diseases such as coronary atherosclerosis and hypertension in patients with chronic Chagas' disease has been described frequently in the literature. It should be noted that myocardial ischemic injury or injuries in other organs (brain, kidneys, spleen) in patients with Chagas' disease may result from systemic thromboembolism, since thrombi in the left cardiac chambers are very frequent.⁸

The patient described in this report had received stents in the right coronary artery, as the catheterization revealed that the right coronary was severely occluded. This percutaneous treatment of coronary artery injury took place about eight months before the death. Necropsy in the segment with the stent revealed that the maximum degree of occlusion was 50%. There were no signs of recent myocardial ischemic injury. The diffuse fibrosis found through histological study is due to the condition of chronic myocarditis, which is commonly found in patients with the chronic form of Chagas' disease.

In a study performed in series of hearts obtained from necropsies, Lopes et al⁵ showed no difference in the prevalence of coronary atherosclerosis among patients with Chagas' and patients without Chagas' disease of similar age. Ianni et al,⁹ clinically studying patients with the indeterminate form of Chagas' disease for a period of 117 months, found the development of coronary artery disease symptoms in 1.2% of them.

It is also important to note that injuries were described in the myocardial microcirculation of patients with chronic Chagas' cardiomyopathy, characterized by dilation of small coronary branches, which could be related to reduced perfusion pressure and relative ischemia. This ischemia, particularly adjoining coronary supply areas (between the

anterior and posterior branches, for example), could explain the occurrence of fibrosis and narrowing at some sites in the ventricular wall in Chagas' disease.¹⁰

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Table 1 – Obstruction (%) by atherosclerotic plaques in the major epicardial coronary branches, according to their distance from the beginning, in centimeters (cm)

cm	Percentage of coronary artery occlusion according to the location (cm from the ostium)				
	RCA	PIVB	LC	AIVB	CX
1	30	30	30	20	30
2	50	0		30	40
3	50	0		40	30
4	50 (*)	0		30	30
5	50 (*)	0		50	20
6		0		40	20
7				40	20
8				30	30
9				20	30
10				30	30
11				30	
12				20	

RCA — right coronary artery; PIVB — posterior interventricular branch; LCA — left coronary artery; AIVB — anterior interventricular branch; CX — circumflex branch of the left coronary artery; (*) — segments of the right coronary artery with stent.

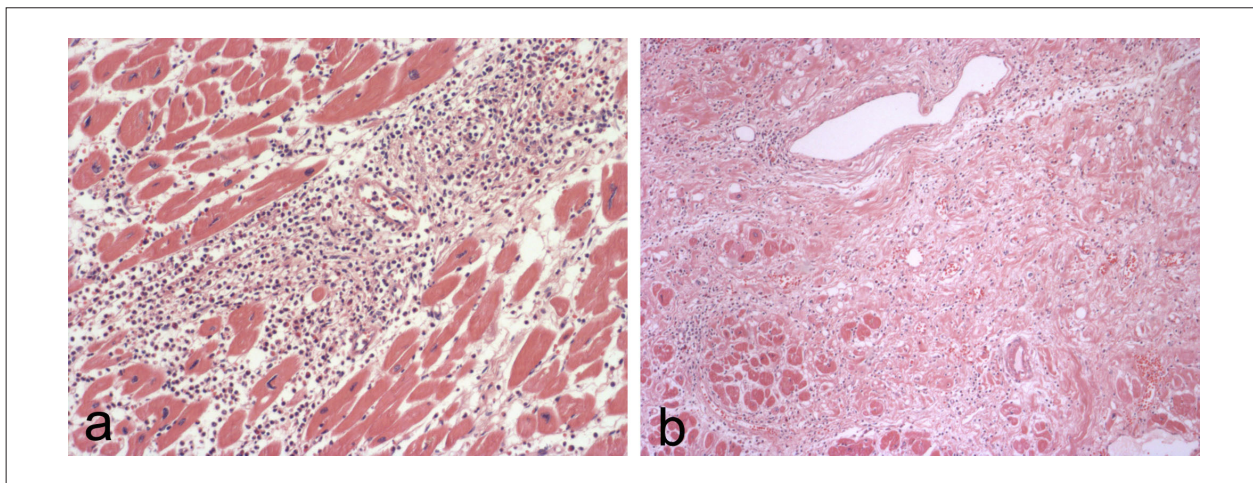


Figure 4 - Photomicrographs of the myocardium showing a) severe chronic myocarditis and in b) diffuse fibrosis. Hematoxylin-eosin staining, objective magnifications: 5X and 10X, respectively.

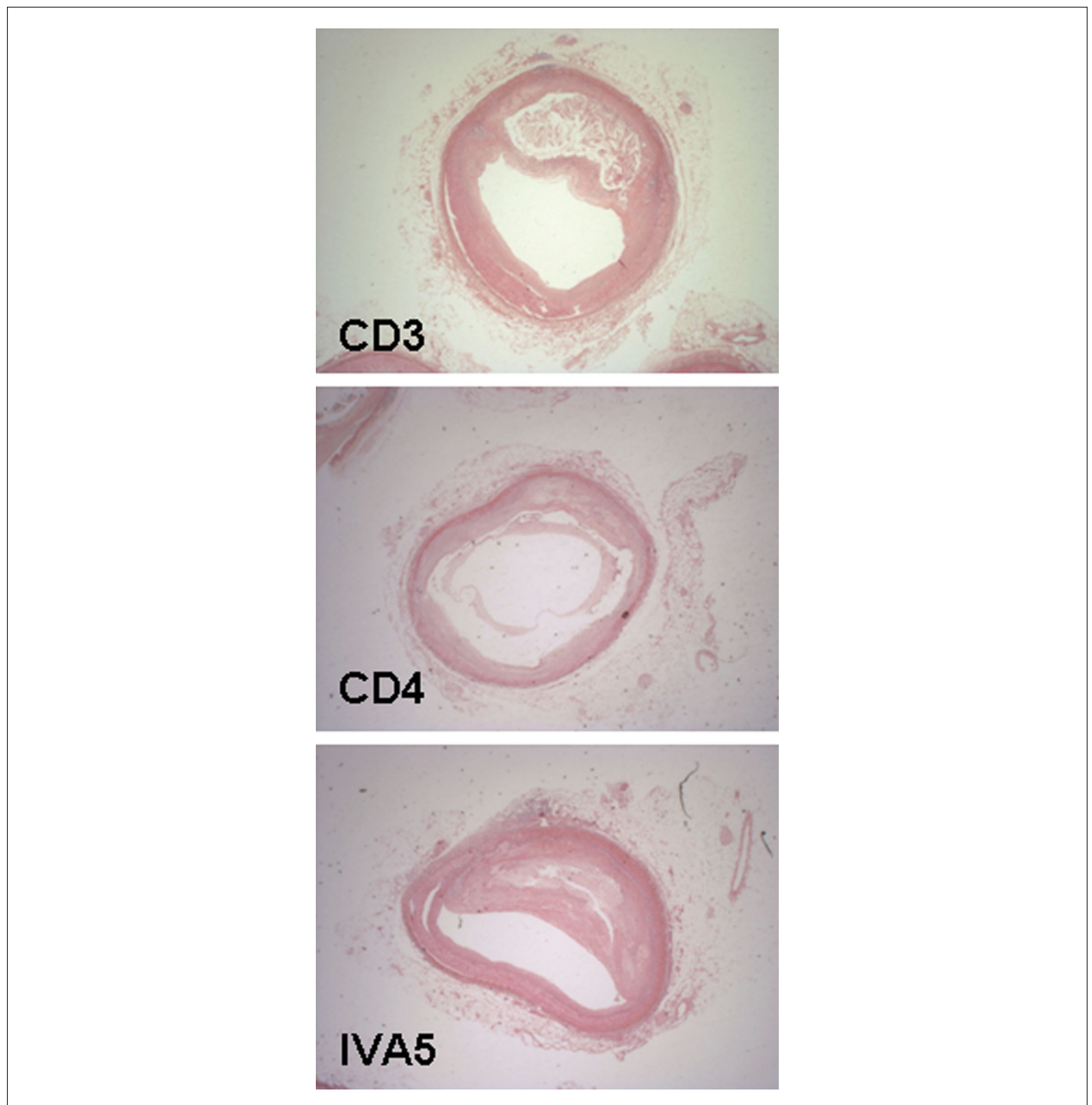


Figure 5 - Photomicrographs of segments of coronary arteries showing atherosclerotic plaques with occlusion of up to 50%. RCA3 and RCA4 — third and fourth centimeters from the right coronary artery; AIVB5 — fifth centimeter from the anterior interventricular branch of the left coronary artery. Hematoxylin-eosin staining, objective magnification:1X for the three vessels.

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