Clinicopathologic Session 6/2000

Case 6/2000 – Dyspnea and pain in the left lower limb in a 52-year-old male patient (Instituto do Coração of Hospital das Clínicas - FMUSP - São Paulo)

A 52-year-old male patient was admitted to the hospital complaining of dyspnea and pain in the left lower limb.

The patient reported that he sought medical care 7 years earlier due to dyspnea triggered by moderate exertion, which lasted for 3 months. He also reported at that time an episode of dizziness and an episode of nocturnal paroxysmal dyspnea.

Two months before, he was diagnosed with hypertension. He reported smoking until 10 years ago.

On physical examination, the patient was in good condition, his pulse was regular, his heart rate was 72bpm, and his blood pressure was 170/110mmHg. His lung examination revealed no abnormalities. His heart examination showed normal first and second heart sounds, and a systolic murmur (+/4) in the aortic area. His liver was palpable 2cm from the right costal margin. No edema existed in the lower limbs.

The electrocardiogram showed sinus rhythm, a heart rate of 72bpm, a QRS axis of -10° backwards, left chamber hypertrophy, and alterations of ventricular repolarization (fig. 1).

The echocardiogram (Table I) revealed diffuse left ventricular hypokinesia, calcification of the aortic valve, and double dysfunction of the aortic valve.

Serology for the diagnosis of Chagas' disease was negative.

The following diagnoses were established: hypertension, mild aortic stenosis, and ventricular dysfunction.

The continuous treadmill stress test showed a good physical capacity, a duration of exertion of 8 minutes, and initial and final velocities of 2 miles/hour and 5 miles/hour, respectively. The patient's heart rate at rest was 100bpm and on maximum exertion 143bpm; his blood pressure ranged from 160/99mmHg to 220/74mmHg.

Rest-exercise equilibrium radionuclide ventriculography with red blood cells labeled with technecium-99m revealed diffuse left ventricular hypokinesia. Left ventricular ejection fraction at rest was 0.30 and on exertion (25 W), 0.37.

The patient remained asymptomatic until 4 years ago, when he experienced severe precordial pain, which lasted for 2 hours, and he sought medical care on an emergency basis. The electrocardiogram revealed at that time elevation of the ST segment in II, III, aVF, V_1, V_2, and from V_5 to V_8. The patient was diagnosed with inferodorsal myocardial infarction, and 1,500,000 units of streptokinase were administered intravenously. Elevation of the ST segment regressed, and the maximum value of the MB fraction of creatine kinase was 131 U/L 6 hours after pain onset. The patient continued his treatment for infarction at another medical facility.

The patient evolved asymptomatically, and 4 months later he underwent hemodynamic (table II) and coronary angiographic studies, which depicted no obstruction in the coronary arteries. Left ventriculography showed diffuse hypokinesia.

The patient remained asymptomatic until 1 year and 4 months ago, when he had a cerebral stroke with motor manifestation that regressed without sequelae.

Five months ago, the patient was hospitalized in another medical facility due to non-Q-wave myocardial infarction. He was then referred to InCor for assessment of the indication for surgical treatment for probable coronary heart disease. However, after medical evaluation, we chose to continue the clinical treatment.

Three months ago, the patient returned to InCor, searching for treatment for his dyspnea.

The laboratory tests were as follows: hemogram with 5,100,000 red blood cells/mm^3; hematocrit, 45%; hemoglobin, 15g/dL; 12,000 leukocytes/mm^3 (4% band leukocytes, 68% segmented leukocytes, 21% lymphocytes, and 7% monocytes); 368,000 platelets/mm^3. The serum level of glucose was 96mg/dL; urea, 40mg/dL; creatinine, 1.1mg/dL; cholesterol, 199mg/dL; triglycerides, 136mg/dL; potassium, 4.1mEq/L; and sodium, 145mEq/L. Prothrombin time was 12.5s (observed/control ratio of 1.1), activated partial thromboplastin time was 28.2s (observed/control ratio of 0.94), and thrombin time was 10.9s (normal up to 10s).

The electrocardiogram (9/6/94) revealed sinus rhythm, a heart rate of 95bpm, QRS axis -30° backwards, left atrial and ventricular hypertrophies, and a probable inferior inactive area (fig. 2).

The echocardiogram (9/6/94) showed a diffusely hypokinetic left ventricle and a suggestive image of thrombus in the left ventricular cavity. The diagnosis of ischemic heart disease with ventricular dilation was established, and the following drugs were prescribed: 0.25mg of digoxin, 50mg of hydrochlorothiazide, 5mg of enalapril, and 100mg of acetylsalicylic acid daily.

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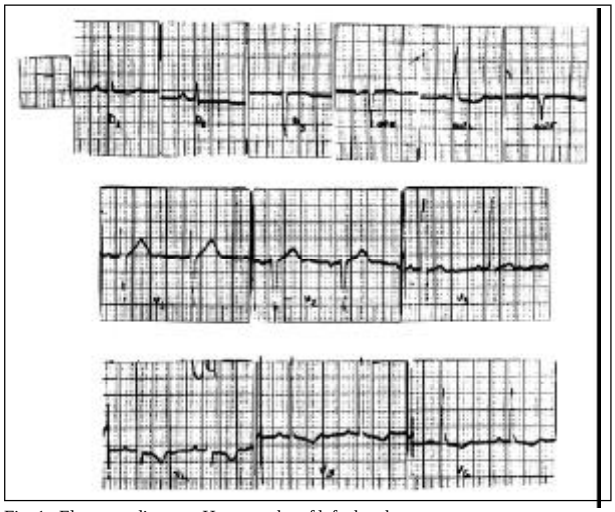

Fig. 1 - Electrocardiogram. Hypertrophy of left chambers.

Table I – Echocardiographic data

	9/8/88	9/11/88	8/93*	6/9/94
Interventricular septum (mm)	13	11	-	8
Left ventricular posterior wall (mm)	12	11	-8	
Left ventricular diastolic diameter (mm)	68	70	80	75
Left ventricular systolic diameter (mm)	-	-	-	68
Left ventricular ejection fraction	0.55	0.46	0.33	0.25
Aorta (mm)	42	40	-	35
Left atrium (mm)	26	34	-	48
Right ventricular diastolic diameter (mm)	20	19	-	25
Aortic insufficiency	Mild	Intense	Mild	Mild
Transvalvar aortic gradient (mmHg)	22	23		19
Aortic valvar area (cm^2)	1.5	1.2		
Left ventricular thrombus	-	-	Não	Sim

* transesophageal echocardiogram

Table II – Hemodynamic data

Pressures (mm Hg)	6/12/90	14/12/94	14/12/94
Vasodilator	No	No	Yes
Right atrium (mean)	14	14	5
Pulmonary trunk (systole/diastole/mean)	86/40/57	65/40/48	55/25/35
Pulmonary occlusion (mean)	42	40	20
Left ventricle (systole /initial diastole/ telediastole)	137/20/42	100/20/40	80/10/25
Aorta (systole/ diastole/mean)	130/98/109	90/70/76	65/45/52
Cardiac output (L/min)	-	3.1	4.2
Systemic vascular resistance (Wood)	-	20	11.2
Pulmonary vascular resistance (Wood)	-	2.58	3.6

One month ago the patient returned due to aggravation of the dyspnea and pain in the left lower limb with paresthesia of the left foot. On physical examination the patient was pale and sweating profusely. His pulse was regular, of low amplitude, with a frequency of 120bpm, and was not palpable distally to the popliteal fossa. The differential between systolic and diastolic pressures was reduced and audible around 100mmHg. The lung examination showed crepitant rales up to the apices of both sides of the thorax. The heart examination showed irregular rhythm and presence of the third cardiac sound in the mitral area. The abdominal examination was normal. The laboratory tests are listed in table III.

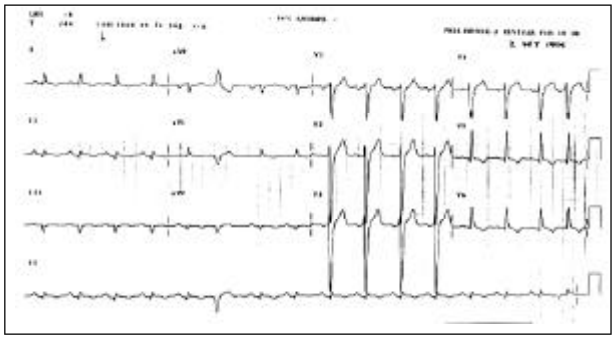

Fig. 2 - Electrocardiogram. Electrically inactive area in the inferior wall and hypertrophy of left chambers.

The patient was diagnosed with acute pulmonary edema, cardiogenic shock, and thromboembolism to the left lower limb. Left femoral embolectomy was indicated. During the surgery, however, the exploration with the Fogarty catheter failed to retrieve thromboemboli in the common, superficial, and deep left femoral arteries. The patient evolved in the postoperative period with cardiogenic shock. The fol-

Tabela III – Laboratory findings

Tests/ Dates	3/12/94	16/12/94	29/12/94
Red blood cells ($10^6/mm^3$)	-	4.2	4.2
Hemoglobin (g/dL)	12.8	12.1	11.9
Hematocrit (%)	40	37	37
Leukocytes ($10^3/mm^3$)	15	17.8	19.9
Band leukocytes (%)	-	7	16
Segmented leukocytes (%)	-	76	69
Eosinophils (%)	-	0	0
Lymphocytes (%)	-	15	11
Monocytes (%)	-	2	3
Platelets ($10^3/mm^3$)	203	284	330
Urea (mg/dL)	42	43	72
Creatinine (mg/dL)	1.2	1.3	1.3
Glucose (mg/dL)	129	141	275
Sodium (mEq/L)	140	124	149
Potassium (mEq/L)	2.9	3.7	3.8
Venous pH	7.42	7.5	7.39
Venous pCO_2 (mmHg)	41	39	50.5
Venous pO_2 (mmHg)	33,5	28	33
Venous sat O_2 (%)	66	59.5	62.7
Venous HCO_3 (mEq/L)	26.5	30.3	30.3
Venous "Excess of bases" (mEq/L)	+2.2	+6.4	+4.7
Prothrombin time (s)	14.8	14.85	16.5
INR	1.59	1.53	1.93
TTPA (s)	24.7	29.5	38.52
Patient/ healthy ratio	0.82	0.97	1.28

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lowing drugs were administered: dobutamine, furosemide, captopril, digoxin, heparin, and warfarin.

The patient once more underwent hemodynamic and coronary angiographic studies (Table II), which revealed no obstruction in the coronary arteries. Left ventriculography showed diffuse hypokinesia and a negative image suggestive of left ventricular intracavitary thrombus.

During evolution, the patient was got a pulmonary infection, and the use of 2g of imipenem/cilastatin was started. Laboratory tests are shown in table III. Blood cultures (12/23/95) were negative. The patient evolved with worsening of the consciousness status due to respiratory insufficiency, was intubated for respiratory support, but he remained in shock and died.

Discussion

Clinical features – The patient is a 52-year-old male with repetitive ischemic episodes in the cerebral, coronary, and peripheral vascular regions.

The patient's history comprises 2 myocardial infarctions, 1 cerebral stroke, and ischemia in the left lower limb. The atherosclerotic process usually leads to plaque formation, which associated or not with thrombus, results in narrowing or occlusion of the vessel involved. A reduction in blood flow causes ischemia that, when prolonged, may cause irreversible damage, such as acute myocardial infarction or necrosis of the lower limbs[1]. The patient had the following risk factors for atherosclerosis: male sex, age, smoking, and systemic hypertension. Atherosclerosis alone could explain the ischemic heart episodes. However, we could not identify the presence of arterial lesions in any of the 2 coronary angiographies performed. As we can not attribute the occurrences to an atherosclerotic cause, we will study the nonatherosclerotic causes of arterial obstructions.

Most infarctions result from coronary atherosclerosis, usually superimposed on thrombosis [1]. Nonatherogenic forms with no coronary obstruction are less frequent. In 2 to 4% of the patients with myocardial infarction the coronary arteries have no obstructive lesions on arteriography or autopsy. In individuals less than 40 years of age 20% of myocardial infarctions have coronary arteriography with no obstructive lesions. Women are more prone to myocardial infarction with no obstructive coronary lesions than men are. In a retrospective study [2], in which 48 patients with infarction and normal coronary angiography were compared with 80 patients with infarction and coronary obstructions, no difference was found regarding age, familial history of ischemic heart disease or sudden death, obesity, use of illicit drugs, contraceptive drugs, migraine, and Raynaud's phenomenon. Only smoking was more prevalent among patients with infarction and coronary arteries without obstructive lesions.

Different mechanisms may favor myocardial infarction in the absence of obstructive coronary lesions, such as spasm (with or without superimposed thrombosis); embolism; disease of the small vessels not visualized on arteriography; hematological thrombotic disorders; increase in oxygen need; hypotension due to septicemia, bleeding, and drugs; anatomic variations of the coronary arteries, and, perhaps, myocardial bridges.

Among the causes of myocardial infarction without coronary atherosclerosis, but with obstruction, we can cite the following diseases: Arteritis, such as the syphilitic arteritis, granulomatous arteritis (giant cell arteritis, and Takayasu's arteritis), polyarteritis nodosa, Kawasaki's disease, systemic lupus erythematosus, rheumatoid arthritis, ankylosing spondylitis; trauma (iatrogenic lacerations, radiation); metabolic diseases or diseases with intimal proliferation (Hurler's disease, homocystinuria, Fabry's disease, amyloidosis, intimal hyperplasia associated with oral contraception or the postpartum period, elastic pseudoxanthoma, coronary artery fibrosis due to radiation); narrowing of the arterial lumen due to other mechanisms (spasms, aortic or coronary dissection); infectious endocarditis, mitral valve prolapse, intracavitary thrombi, valvar prostheses, and left atrial myxoma; paradoxical embolism, papillary fibroelastoma of the aortic valve, thrombosis of intracavitary catheters).

Among the causes of myocardial infarction without coronary obstruction, we can cite: congenital anomalies (anomalous origin of the left coronary artery from the pulmonary artery, of the left coronary artery from the anterior Valsalva's sinus, arteriovenous or arterioluminal fistulae, coronary artery aneurysms); disproportionate myocardial need of oxygen (aortic stenosis, aortic valve dysplasia, aortic insufficiency, carbon monoxide poisoning, thyrotoxicosis, prolonged hypotension).

In regard to the causes of myocardial infarction related to altered states of coagulation we can cite those related to thromboses as follows: polycythemia vera, thrombocytosis, disseminated intravascular coagulation, hypercoagulability, and thrombocytopenic purpura.

And last but not least, among other causes of myocardial infarction, we can cite the use of cocaine, whose most common findings include intimal fibroproliferating disease, cardiac contusion, and complications on arteriography.

Now, analyzing these causes with more detail:

I- A) Arteritis – Among the forms of arteritis, we may highlight the following: luetic arteritis, granulomatous arteritis, polyarteritis nodosa (PAN), arteritis of Kawasaki's disease, lupus arteritis, arteritis of rheumatoid arthritis (RA), and arteritis of ankylosing spondylitis.

Kawasaki's disease occurs in children between 2 and 10 years of age and is accompanied by a febrile syndrome [3].

Syphilis may damage the heart in the following 4 ways: uncomplicated aortitis; aortic aneurysm; aortic valvulitis with regurgitation; and stenosis of the coronary ostium. Usually, a history of syphilis or another tertiary manifestation is present. Thirty to fifty percent of patients have a negative serology. Angiography may reveal an aortic aneurysm and allows evaluation of the degree of aortic regurgitation and the anatomy of coronary ostia [4].

One mandatory criterion for diagnosing Takayasu's arteritis is a patient under 40 years of age, which excludes

our patient, because his symptoms began after he was 40 years old [5].

Polyarteritis nodosa is a systemic necrotizing vasculitis of small- and medium-sized vessels that mainly affects middle-aged men. The cardiac lesions of polyarteritis nodosa may be primary or secondary due to systemic hypertension, renal impairment, or corticoid use. The most common cardiac complication is heart failure secondary to coronary arteritis or systemic hypertension, or both. In polyarteritis nodosa, 85% of the myocardial infarctions have alterations on arteriography. Myocarditis occurs in 3% of the individuals with polyarteritis nodosa and may be the cause of myocardial infarction. However, the myocardial infarction in patients with polyarteritis nodosa and normal coronary arteries is attributed to vasospasm [6]. Neurological involvement occurs in 60% of patients. Vasculitis of the central nervous system in polyarteritis nodosa occurs in 20 to 40% of cases and has a focal or multifocal form that may cause convulsive crises and hemorrhagic or ischemic cerebral stroke. The diagnosis of polyarteritis nodosa is based on biopsy findings [7]. However, vascular aneurysms and circulating B antigen serve as circumstantial evidence to support diagnosis. Polyarteritis nodosa is a plausible hypothesis for our patient; however, its diagnostic confirmation is difficult [8].

The basic anatomic lesion of lupus is diffuse vasculitis of the microvessels. Cardiovascular lupus is characterized by pericarditis. Reports of rare cases of myocardial infarction probably due to coronary arteritis have been published. Lupus is a disease of women of childbearing age, and it hardly fits our patient's characteristics [9,10].

Cardiac causes accounted for 17% of the deaths of patients with rheumatoid arthritis, which may cause coronaritis with inflammation and intimal edema that may even occlude the arterial lumen. However, myocardial infarction secondary to this arteritis is rare. Cerebrovascular events in rheumatoid arteritis result from vasculitis [11,12].

In ankylosing spondylitis, the most common cardiac lesions are aortic regurgitation, blocks, and disorders of heart conduction. Myocardial lesions consist of fibrosis, perivascular lymphocytic inflammation, and increases in mucinous substances [13,14].

B) Trauma: no iatrogenic actions or radiotherapy were reported in the patient's history.

C) Metabolic diseases: among all metabolic diseases, we will analyze Hurler's disease, homocystinuria, Fabry's disease, and amyloidosis.

The most common form of homocystinuria results in a deficiency of cystathionine beta-synthase. More than 80% of the homozygous individuals have dislocation of the ocular lens. Mental retardation occurs in 50% of the cases. The major causes of morbidity and mortality are vascular complications. Occlusion of coronary, cerebral, and renal arteries may occur during the first decade of life. Twenty-five percent of patients die before 30 years of age. Vascular complications are due to accelerated atherogenesis [15].

Hurler's disease is a deficiency of iduronidase. In this disease, hydrocephalus and cardiovascular disease with coronary occlusion occur, and death takes place in the first decade [16,17].

Fabry's disease is an X-linked recessive disorder due to deficiency of alpha-galactosidase. It usually manifests during adulthood. Corneal dystrophy, progressive renal disorder, vascular thromboses, and painful neuropathy are particularities of this disease. From the cardiac point of view, pseudohypertrophy and systemic hypertension occur and may result in left ventricular dysfunction. Myocardial infarction is caused by narrowing of the arterial lumen. Medium-sized arteries are involved in this disease, and cerebral stroke may happen. Fabry's disease could explain the clinical findings of the case being discussed, but renal impairment in Fabry's disease is marked and death usually is due to renal failure [18,19].

Cases of primary or secondary amyloidosis may affect the heart. The symptoms usually comprise heart failure, hypotension, arrhythmias, and disorders of conduction. The echocardiographic findings in amyloidosis are characterized by the following: thickening of the left and right ventricles, which have a shinning granular and refringent appearance, different from the echocardiographic findings in our patient [20].

D) Narrowing of the arterial lumen – Aortic and coronary artery dissections were not observed on the arteriographies and echocardiographies of the patient.

Spasm is undoubtedly a great hypothesis for the ischemic findings of the patient. Spasms may produce endothelial damage and generate a local thrombotic process that may or may not undergo spontaneous lysis. In addition, smoking is known to be closely related to vascular spasm [21].

II) Coronary embolisms – Clinical and echocardiographic evidence gathered in this case do not support mitral valve prolapse, myxoma, or endocarditis as causes of disease in our patient.

Intracavitary thrombi are worthy of note. The presence of a thrombus in the left ventricle was detected during clinical evolution, and it may have originated from embolic phenomena and may have been the cause of the left lower limb ischemia. However, no emboli were found on exploration with the Fogarty catheter.

We could assume the existence of intracavitary thrombi that would disseminate emboli to the coronary arteries, the brain, and left lower limb. These intracavitary thrombi could undergo spontaneous lysis and not be visualized on echocardiography. Thrombi may exist in the left atrium and not be detected on transthoracic echocardiography, but the transesophageal method has an 80% sensitivity. On the other hand, left ventricular thrombi would rarely not be visualized on echocardiography.

III) Congenital anomalies – No data suggesting a congenital cause exist.

IV) Disproportionate myocardial oxygen need – Here we will limit our evaluation to the possibility of aortic stenosis and systemic hypertension with left ventricular hypertrophy.

Marked aortic valve stenosis may cause angina pectoris as a result of a reduction in coronary reserve. Myocar-

dial infarctions in patients with aortic valve stenosis were described in the presence of left ventricular hypertrophy [22]. The patient being discussed, despite the mild left ventricular dysfunction, had mild aortic stenosis. This aortic stenosis may be masked by left ventricular dysfunction; however, the valvar area (1.5-1.2cm^2) and the gradient (22-23mmHg) suggest mild aortic valve stenosis.

Systemic hypertension increases tension in the left ventricular wall, leads to hypertrophy, and accelerates the development of coronary atherosclerosis. Studies in animals have shown the effects of left ventricular hypertrophy on coronary circulation. Autoregulation is abnormal in the subendocardium of animals with systemic hypertension and ventricular hypertrophy. A marked increase in mortality and extension of myocardial infarction occurs with systemic hypertension and left ventricular hypertrophy [23,24].

V) Hematologic causes – Thromboses.

Polycythemia vera is a myeloproliferative disease characterized by splenomegaly and an increase in hemoglobin concentration. Symptoms depend on the increase in red blood cells and in blood volume. Angina, intermittent claudication, and systemic hypertension frequently occur. Thromboses may affect coronary, cerebral, and peripheral arteries. Red blood cells, platelets, and leukocytes of the patient, however, remained normal, except for during the septic period [25,26].

Disseminated intravascular coagulation manifests with the consumption of clotting factors resulting from intravascular activation of the clotting process with secondary activation of fibrinolysis. Disseminated intravascular coagulation may cause thromboses or hemorrhage. In acute disseminated intravascular coagulation, the following events occur: thrombocytopenia; an increase in the prothrombin time and in the activated partial thromboplastin time; a reduction in fibrinogen, and in factors V and VIII; and an increase in the products of fibrin degradation. In chronic disseminated intravascular coagulation, the levels of fibrinogen, factors V and VIII, and platelets are normal, while the prothrombin and the activated partial thromboplastin times are normal or even decreased. If our patient had disseminated intravascular coagulation, it would probably have been chronic, and the clinical findings involving chronic disseminated intravascular coagulation are malignant neoplasia, great arteriovenous malformations, toxemia, retention of a dead fetus, malignant hypertension, and severe hepatic cirrhosis, which do not fit the patient's clinical history.

Among the hypercoagulable disorders, the following are worth noting: a deficiency in proteins C and S, a deficiency in antithrombin III, and antiphospholipid antibody syndrome.

Antithrombin III deficiency is associated with venous thrombosis in adults under 40 years of age, and the deficiencies of proteins C and S, both vitamin K-dependent, are characterized by venous thromboembolism.

Another cause of thrombosis is the antiphospholipid antibody syndrome, which comprise anticardiolipin and lupus anticoagulant antibodies.

Antiphospholipid antibody syndrome may be primary or secondary (lupus, infections, drugs). It is characterized by thrombocytopenia, levedo reticular, neurologic symptoms, and repetitive abortions. The pathophysiology of the antiphospholipid antibody syndrome seems to comprise an endothelial lesion superimposed on thrombocytopenia and exposure of phosphodiesterase, leading to platelet abnormality. Lupus anticoagulant is the most common cause of the increase in activated partial thromboplastin time in asymptomatic individuals [27-30].

Even though no significant alterations in the coagulation tests and platelets were found in our patient, deficiencies in antithrombin III, proteins C and S, and antiphospholipid antibody syndrome are very plausible hypotheses for the ischemic findings, which in our case would be secondary to thromboses with spontaneous lysis.

VI) Other causes - We have no data in the patient's history in regard to cocaine use, myocardial contusion, and complications from catheterization.

(Dr. Glaura Souza Alvarenga)

Diagnostic hypotheses – 1) Polyarteritis nodosa; 2) Hypercoagulable syndromes.

Autopsy

The heart weighed 660 g and showed dilation of the 4 cavities, particularly the left ventricle. We noticed a transmural infarction scar in the left ventricular posterolateral wall, which was thinned, and an extensive organizing thrombosis in the left ventricular cavity, which was semiocclusive and particularly exuberant in the apex and outlet flow (fig. 3). The aortic valve was bivalvular, calcified, and pervious (approximately 2cm), with a stenosis grossly assessed as mild to moderate (fig. 4). The epicardial coronary arteries were dissected and underwent histologic examination, which proved they were normal (fig. 5). Multiple small scars of infarction in the spleen and kidneys were noticed, the latter ones depicting infarctions in an

Fig. 3 – Transection of the ventricles. Note the scar of transmural infarct with thinning of the left ventricular posterolateral wall (arrow) and extensive thrombosis (asterisk) of the left ventricular cavity.

Fig. 4 – Aortic valve seen from its arterial face, composed of two thickened leaflets with a dense calcification at the raphe (arrow).

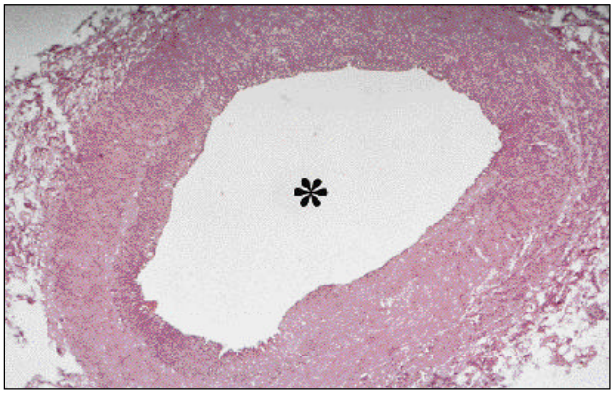

Fig. 5 – Histologic section of the circumflex artery (6º cm) with no pathological alterations and wide lumen (asterisk). Hematoxylin and eosin, X50.

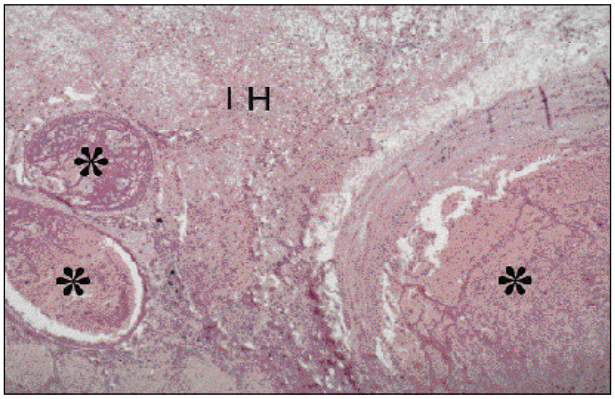

Fig. 6 – Histologic section of the lung showing hemorrhagic infarct (HI) and arterial obstruction due to emboli (asterisk). Hematoxylin and eosin, X50.

advanced phase of organization. The liver and lungs showed chronic passive congestion. The aorta showed mild atherosclerosis. Pulmonary thromboembolism was also present, with recent hemorrhagic infarcts in the right medium and lower lobes (fig. 6), which constituted the final cause of death.

(Dr. Luis Alberto Benvenuti)

Anatomicopathological diagnoses – 1) Ischemic heart disease with normal coronary arteries; 2) Calcified and stenotic bivalvular aortic valve; 3) Semiocclusive thrombosis of the left ventricular cavity; 4) Pulmonary thromboembolism and infarcts (final cause of death).

Comments

The presence of ischemic heart disease with normal coronary arteries associated with dilation and thrombosis of the left ventricular cavity and calcified aortic stenosis of a mild to moderate degree (in a congenitally bivalvular valve) allows 3 sequential anatomicopathological possibilities.

As the first hypothesis, we could consider that the calcified aortic stenosis would be related to the initial left ventricular dysfunction. Therefore, we would have a case of valvar cardiomyopathy, according to the last classification of the World Heath Organization [31], because the ventricular dysfunction would be disproportionate to the ventricular overload, because the aortic stenosis was mild to moderate. Ventricular dilation would favor thrombosis of the cavity and the myocardial infarction could be consequent to coronary embolism. In dilated cardiomyopathy, acute transmural infarcts are reported in which coronary embolism due to cavitary thrombi are speculated [32]. The fact that no obstruction in any coronary segment was found could be explained by complete resorption of the embolus.

As a second hypothesis, we could consider that the process had begun as an ischemic heart disease with normal coronary arteries, stressing then, the probable role played by coronary spasm in the genesis of ischemia. Left ventricular dilation would be secondary to ischemic heart disease with superimposition of cavitary thrombosis.

As a third hypothesis, we could consider the existence of an undiagnosed coagulation disorder that would explain the myocardial infarction due to coronary thrombosis (later reabsorbed) and the extension of the left ventricular cavity thrombosis (semiocclusion), which would be very uncommon.

According to the last two hypotheses, the calcified aortic stenosis would be only an autopsy finding with no importance in the pathogenesis of heart failure, because it was of a mild to moderate degree.

The cause of death was pulmonary thromboembolism and infarction, frequent complications in the evolution of congestive heart failure.

(Dr. Luiz Alberto Benvenuti)

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