

Atrial Hematoma in Cardiac Postoperative Patients and the Diagnostic Use of Transesophageal Echocardiography

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The formation of atrial hematomas with a mass effect in patients who have undergone cardiac surgery originates a clinical and hemodynamic syndrome that is difficult to assess. Hypotension with high right atrial pressure and equalization of pulmonary wedge pressure is not always present due to the irregular distribution of the hematoma in cardiac chambers. Transesophageal echocardiography is a useful diagnostic procedure for atrial hematomas, differentiating them from other similar clinical and hemodynamic situations like left ventricular or prosthetic valve dysfunction. We present five clinical cases of patients who underwent cardiac surgery and presented atrial hematoma, right atrial in four and left atrial in one. All were diagnosed by transesophageal echocardiography. In one case magnetic resonance imaging was used.

Key words: *Echocardiography. Cardiovascular disease. Surgery. Cardiac tamponade.*

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INTRODUCTION

Cardiac tamponade after heart surgery is an infrequent complication that carries a high risk. Its incidence ranges from 0.5% to 5.8%,^{1,2} and its mortality is 18%.² Most cases appear in the early phase, developing in the first hours or days of the postoperative period. Delay in reaching a correct diagnosis can negatively affect prognosis.² In patients who present marked

El hematoma auricular en el paciente postoperado cardíaco y el papel de la ecocardiografía transesofágica en su diagnóstico

La formación de hematomas con efecto masa sobre las aurículas en pacientes postoperados origina un síndrome clínico y hemodinámico de difícil valoración. La presencia de hipotensión marcada, acompañada de presión auricular derecha aumentada y ecualización con la presión de enclavamiento pulmonar, no siempre está presente debido a la distribución irregular del hematoma alrededor de las cámaras cardíacas. La ecografía transesofágica constituye un procedimiento de gran utilidad para el diagnóstico de hematomas auriculares, permitiendo diferenciarlo de otras situaciones con parecido clínico y hemodinámico, como la disfunción del ventrículo izquierdo o de la prótesis valvular. Presentamos 5 casos clínicos de pacientes sometidos a cirugía cardíaca, quienes presentaron hematoma auricular derecho en cuatro de ellos e izquierdo en el otro. Todos fueron diagnosticados mediante la realización de ecocardiografía transesofágica. En un caso se realizó, además, una resonancia magnética nuclear.

Palabras clave: *Ecocardiografía. Enfermedades cardiovasculares. Cirugía. Taponamiento cardíaco.*

hypotension after heart surgery that is refractory to initial expansion measures and catecholamine support, the differential diagnosis between left ventricular dysfunction, prosthetic dysfunction, sepsis, cardiac tamponade, or intrathoracic hemorrhage, among others, is not simple. Transesophageal echocardiography constitutes a rapid and very effective method for the overall assessment of these patients.³ On the other hand, magnetic resonance imaging (MRI) can contribute additional information to that obtained by the echocardiography in the study of atrial masses.⁴

In this study we report the combined experience of three centers in the use of transesophageal echocardiography in patients who present hemodynamic and clinical instability after a cardiac surgical procedure. In a total of 5 cases, 4 presented right atrial involvement and 1, left atrial hematoma.

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CLINICAL CASES

Case 1

A 62-year-old woman had a history of chronic atrial fibrillation and multiple valve rheumatic heart disease with severe mitral stenosis, moderate aortic stenosis, and severe tricuspid insufficiency. A mitroaortic valve replacement was performed with a St. Jude 27 prosthesis in mitral position and a St. Jude 19 prosthesis in aortic position, enlargement of the aortic root (Manougiu technique) and Seguin 32 tricuspid annuloplasty. Twenty-four hours later she had a fever and a rise in leukocytes to 58 000 UL. With a diagnosis of shock of probable septic origin, an echocardiographic study was requested. The transesophageal echocardiogram showed conservation of the left ventricular function, a mitral prosthesis with an area of 4 cm², absence of insufficiency; an aortic prosthesis with a peak gradient of 54 mm Hg, absence of insufficiency; and mild tricuspid insufficiency with pulmonary systolic blood pressure of 40 mm Hg. A right retroatrial hematoma measuring 5 cm 5 cm in diameter that compromised right atrial filling was found, as well as contrast in the right atrium. The patient died 7 days after the intervention with a diagnosis of multiorgan failure and septic shock. In the blood cultures, growth of *Staphylococcus warneri* was found in three different samples.

Case 2

A 71-year-old woman, obese, had a history of dyslipidemia, repeated syncopal episodes, and dyspnea with intense effort for the last 4 years. Transthoracic echocardiography showed severe aortic stenosis. Coronary angiography revealed undamaged coronary arteries. An Omnicarbon 25 valve was implanted in the aortic position. After 24 h the patient presented hy-



Fig. 1. Transesophageal echocardiography of the middle esophagus. Image of a large left atrial hematoma (*) with almost complete collapse of the cavity. AO indicates aortic valve; LV, left ventricle; MV, mitral valve.



Fig. 2. MRI. A) Cross-section showing an image of left retroatrial hematoma (*). B) Longitudinal section of the same hematoma (*). In both views the intrapericardial location of hematoma can be clearly seen.

potension in spite of inotropic treatment. A transesophageal echocardiogram revealed left ventricular hypertrophy with normal function, normofunctional prosthesis with a gradient of 10 mm Hg, and an image compatible with right retroatrial hematoma that affected inflow from the caval veins. Emergency surgery was performed and numerous clots were removed from the pericardium. The later evolution of the patient was optimal and she was released without further complications.

Case 3

A 70-year-old man, hypertensive and diagnosed as severe mitral insufficiency due to mitral prolapse resulting from rupture of the tendinous cords, underwent surgery for mitral valve replacement with a Carpentier no. 29 prosthesis. Several hours after admission to the intensive care unit, he presented a decrease in cardiac output that required inotropic support with dobutamine and epinephrine. Transesophageal echocardiography revealed an image of heterogeneous density extrinsic to the left atrium that almost completely collapsed the atrial cavity (Figure 1) in the presence of good left ventricular function and a normofunctional mitral prosthesis. MRI revealed an atrial hematoma (Figures 2A and B) in the cross-sectional and longitudinal views.

Case 4

A 35-year-old woman was diagnosed as interatrial septal defect of the *ostium secundum* type. An intervention with extracorporeal circulation was performed to close the interatrial septal defect with a derivative patch. During the postoperative period, a right pleural hematic effusion was observed that required insertion of a drain, as well as acute anemia that required the transfusion of 5 U of packed red blood cells and 2 U of frozen plasma. In the transesophageal echocardiogram made before discharge, dilation of the right cavities and a right retroatrial hematoma were appreciated that did not cause hemodynamic compromise. The interatrial defect was patched without residual flow. The pulmonary veins drained into the left atrium. The patient evolved without further incidents, and the hematoma disappeared without need for reintervention.

Case 5

A 56-year-old woman, hypertensive and dyslipidemic, was diagnosed as severe aortic stenosis. Catheterization confirmed the normality of the coronary arteries. A Carbomedics 19 prosthesis was implanted in the aortic position. Seventy-two hours after the intervention, the patient entered shock and acute oligoanuric renal failure that required continuous



Fig. 3. TEE in the middle esophagus, longitudinal plane, where a right atrial hematoma (arrowhead) with marked collapse of the cavity can be seen. LA indicates left atrium; LV, left ventricle; RA, right atrium.

veno-venous hemofiltration. Blood cultures were made and antibiotic treatment was begun. Transesophageal echocardiogram revealed an image suggestive of right retroatrial hematoma that compromised right atrial filling (Figure 3), so she was reoperated. Later, she presented even greater hemodynamic deterioration and a new pericardial effusion. Although the effusion was drained and the patient reoperated, her clinical situation failed to be compensated and the patient died. During surgery, no atrial lesion was appreciated.

The clinical characteristics of the patients and the findings of surgery and echocardiographic study are shown in Tables 1, 2, and 3, respectively.

DISCUSSION

Retroatrial hematomas that are detected early are usually related with problems that are attributed to the surgical act *per se* and associated with different coagulation disorders that usually also appear in these patients. A delayed presentation seems to be associated more frequently with the postpericardiotomy syndrome, which usually appears after the first week (2-3 weeks after surgery). In these cases of delayed appearance, the association of tamponade with fever and

TABLE 1. Clinical characteristics

Case	Sex	Age	AHT	Diabetes	Dyslipidemia	Baseline pathology	Coronary disease
1	Woman	62	No	No	No	Multiple valve disease (MS+AoS+IT)	No
2	Woman	71	No	No	Yes	Severe aortic stenosis	No
3	Man	70	Yes	No	No	Severe mitral insufficiency	No
4	Woman	35	No	No	No	ASD OS	No
5	Woman	56	Yes	No	Yes	Severe aortic stenosis	No

ASD OS indicates atrial septal defect, ostium secundum type; AoS, aortic stenosis; MS, mitral stenosis; AHT, arterial hypertension; IT, tricuspid insufficiency.

chest pain of pleuritic characteristics is common.^{2,5}

Many situations related to the presence of atrial hematoma, the most frequent site of cardiac surgery, have been described, although they also are described in relation to severe calcification of the mitral ring,⁶ injury to the chest wall,⁷ isolated right atrial infarction with rupture,⁸ dissecting aneurysm of the aorta,⁹ and there are even cases of spontaneous atrial hematoma with no reasonable previous cause.¹⁰ With respect to hematoma originated after cardiac surgery, the pathology most often cited is cardiac valve disease. Postoperative cardiac tamponade can originate for various reasons, including erosion of the atrial wall by catheters, deinsertion or rupture of a coronary graft, and lesions undetected during the surgical procedure, all associated with the aggressive anticoagulation in these patients, particularly those who have valvular prostheses.

The role of echocardiography in the diagnosis of atrial hematoma seems perfectly clear. The importance of an early diagnosis lies in the need to treat the problem immediately, either by reintervention or conservative management. All the published studies of retroatrial hematoma have reached the diagnosis by ultrasound study using either the transthoracic or transesophageal technique. The procedure is easy to perform and quick, and yields a great deal of information,

showing the exact location of the hematoma and the degree of atrial compression present. Bidimensional transesophageal echocardiography and the use of Doppler-color techniques can help to determine if the mass observed is interatrial or has an intra- or extrapericardial location. This is not always feasible with ultrasound images, so techniques such as MRI, which can differentiate between the characteristics of various tissues, must be used. The role of MRI in the diagnosis of hematoma has been shown to be very useful, since it allows the hematoma to be located very clearly with respect to the atrial wall. Nevertheless, MRI is limited in its applicability due to the special clinical and hemodynamic situation of these patients, who cannot be easily maneuvered because they are ventilated and deeply medicated. Other studies have used computed tomography as a diagnostic aid.¹¹

The ease with which an echocardiographic study can be obtained, whether transthoracic or transesophageal, in patients undergoing heart surgery makes complete preoperative, intraoperative, and postoperative follow-up possible. The hemodynamic control of the cardiac postoperative patient increasingly depends on echocardiographic monitoring that, in cases of special diagnostic complexity like retroatrial hematoma, acquires maximum relevance.

TABLE 2. **Characteristics of the intervention**

Case	Procedure	Post CVS manifestations	Initial signs	Reintervention	Mortality
1	St. Jude 27 mitral prosthesis and St. Jude 19 aortic prosthesis. TA.	Fever Septic shock	24 h	No	Yes
2	Omnicarbon no. 25 aortic prosthesis	Hypotension	24 h	Yes	No
3	Carpentier no. 29 mitral prosthesis	Low cardiac output	12 h	No	No
4	Derivative patch of the septal defect	Right pleural effusion Anemia	72 h	No	No
5	Carbomedics no. 1	Shock	72 h	Yes	Yes
1	9 aortic prosthesis	Low cardiac output			

TA indicates tricuspid annuloplasty; CVS, cardiovascular surgery.

TABLE 3. **Echocardiographic characteristics**

Case	Hematoma	Site	LV function	Outcome of surgery	Other findings
1	Yes	Right retroatrial	Conserved	Normofunctional prosthesis and TA	RA contrast
2	Yes	Right retroatrial	Conserved	Normofunctional prosthesis	Entrance to venae cavae obstructed
3	Yes	Left retroatrial	Conserved	Normofunctional prosthesis	LA collapse
4	Yes	Right retroatrial	Conserved	Complete patch Pulmonary venous drainage in LA	Dilation of right cavities
5	Yes	Right retroatrial	Conserved	Normofunctional prosthesis	Entrance to venae cavae obstructed

RA indicates right atrium; LA, left atrium; TA, tricuspid annuloplasty; LV, left ventricle.

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