Subvalvular Aneurysm

Two-Dimensional Echocardiographic Features

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SUMMARY

A rare case of subvalvular aneurysm diagnosed by two-dimensional echocardiography and confirmed at cardiac catheterization is presented.

Additional Indexing Words:

Diverticulum Congenital aneurysm

CONGENITAL diverticula and aneurysms of the left ventricle are quite uncommon.¹⁾ These are usually poorly trabeculated structures involving the apex of the heart.²⁾ Congenital aneurysms from the basal part of the left ventricle have been rarely reported in Bantu and black races of Central and West Africa and North America.^{3),4)} The echocardiographic features of these aneurysms have not been described. We report an interesting case of subvalvular (mitral) left ventricular aneurysm. The echocardiographic and angiographic features are discussed.

CASE REPORT

R.C., a 34 year old male was hospitalized on January 16, 1987 with class III (NYHA) symptoms. Six months prior to admission he was diagnosed as having rheumatic heart disease with severe mitral regurgitation and cardiac failure at some other center and treated with conventional therapy for congestive failure. There was no history suggestive of rheumatic fever or angina.

Examination revealed a pulse rate of 80/min and regular; BP was 100/70 mmHg and jugular venous pressure was elevated (4–5 cm H₂O). Cardiac apex was felt in the left 7th intercostal space at the anterior axillary line; it was hyperdynamic and of the left ventricular type. A left parasternal heave

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Fig. 1.

Fig. 2.

Fig. 1. Two-dimensional echocardiogram in the parasternal long-axis view showing a large subvalvular aneurysm and a stretched out posterior mitral leaflet (white arrows). An=aneurysm.

Fig. 2. Two-dimensional echocardiogram in the apical four-chamber view showing the aneurysm as if lying inside the left atrial cavity. An=aneurysm.

Table I. Hemodynamic Data

Site	Oxygen saturation (%)	Pressure (mmHg)
HSVC	50.5	
IVC	55.6	
RA	51.7	1/16 mn. 8
RV	51.5	100/16
PA	50.0	100/50 mn. 66
LV	95.0	100/12
AA	94.2	100/60

and S2 were palpable. Auscultation revealed a soft S1, closely split S2 with accentuated pulmonary component, 3/6 holosystolic murmur at the apex and a 2/6 ejection systolic murmur at the upper left sternal border. Examination of the chest and abdomen did not reveal any positive findings. X-ray of the chest in the PA view showed left ventricular type cardiomegaly (CT ratio 65%), prominent upper lobe pulmonary veins and large central pulmonary arteries with peripheral pruning. Electrocardiogram showed sinus rhythm, frontal plane GRS axis $+105^\circ$, P-R interval 0.28 sec, incomplete right bundle branch block and left atrial overload.

Two-dimensional echocardiographic examination in the parasternal long-axis view (Fig. 1) showed a noncontracting circular echo-free space beneath the left atrium communicating with the inferobasal part of the left ventricle.

Fig. 3.

Fig. 4.

Fig. 3. Left ventricular angiogram in the RAO view showing a large subvalvular aneurysm. White small arrows represent the opened mitral valve. An=aneurysm.

Fig. 4. Right coronary arteriogram showing a long displaced left ventricular inferior surface branch (white arrows) of the right coronary artery. An=aneurysm.

The posterior mitral leaflet was stretched and displaced but the anterior leaflet was normal. In the apical four-chamber view (Fig. 2) the echo-free space was seen inside the left atrial cavity close to the lower part of the interatrial septum. When the transducer was tilted anteriorly to bring in the aorta in a five chamber view the echo-free space was no longer visible. The size and contractions of the left ventricle and interventricular septum were normal. The aortic and tricuspid valves were normal, while the pulmonary valve showed evidence of severe pulmonary artery hypertension. Doppler interrogation revealed systolic flow turbulence in the echo-free space but no mitral regurgitation. The diagnosis of subvalvular aneurysm was strongly suspected. Cardiac catheterization revealed a right aortic arch, severe pulmonary artery hypertension and no shunt at any level (Table I). Left ventriculography in the 30° RAO view (Fig. 3) and long-axis oblique view showed a large noncontractile outpouching from the inferobasal part of the left ventricle and mild mitral regurgitation. The movements of the mitral valve were normal. No regional wall motion abnormality of the left ventricle was noticed. The aortic valve was competent. Selective right and left coronary arteriograms in multiple angled views showed a normal left anterior descending artery and left circumflex system. The right coronary artery (Fig. 4) did not have any occlusive disease but its left ventricular inferior surface branch was found to be markedly elongated and displaced. The patient is awaiting surgery.

DISCUSSION

The congenital diverticula/aneurysms are classified as either muscular or fibrous.⁴⁾ The muscular type is typically associated with midline thoracoabdominal⁵⁾ and other cardiac malformations⁶⁾ such as ventricular septal defect, transposition of the great arteries, patent ductus arteriosus, tetralogy of Fallot and atrial septal defect, whereas the fibrous variety usually occurs as isolated ventricular lesions in the subvalvular or apical region. The case under discussion did not have any of these cardiac or thoracoabdominal defects. He had a right aortic arch, the association of which has not been reported previously.

The wall of the diverticulum has intact layers of muscles, whereas true aneurysms have thinned out myocardium intermingled with fibrous tissue.²⁾ It is difficult to differentiate these two types echocardiographically or angiographically. Therefore these terms have been used interchangeably.⁷⁾ The orifice of the subvalvular aneurysm is related to the mitral or aortic annulus. These aneurysms can distort the mitral or aortic valve or both and can compress the atrial or ventricular wall and displace the coronary arteries.³⁾ In the present case the posterior mitral leaflet was pulled and stretched and the left ventricular inferior surface branch of the right coronary artery was markedly displaced. We believe that the severe pulmonary artery hypertension seen in this case was due to distortion of the mitral annulus and compression of the left atrium by the aneurysm. As in our case, most of these aneurysms are noncontractile, but contractile aneurysms have been described.⁸⁾

Acquired true aneurysms arising from the inferobasal part of the left ventricle can occur following inferior myocardial infarction due to occlusion of a dominant right coronary artery.⁹⁾ Echocardiographically^{10),11)} these aneurysms are best seen in the parasternal long-axis view or apical two-chamber view as echo-free space beneath the left atrium, communicating with the left ventricular cavity through a wide neck, whereas congenital diverticula or aneurysms are usually seen as small, circular, echo-free spaces posterior to the left ventricle, communicating with the left ventricular cavity through a narrow neck. In the present case, 2D echocardiography in the parasternal long-axis and apical two-chamber views was of great help in locating the origin of the aneurysm from the inferobasal part of the left ventricle and its relation to the mitral annulus, left atrium and atrioventricular groove. However, in the apical four-chamber view the origin and relation of the aneurysm could not be delineated. The large noncontractile circular echo-free space communicated with the left ventricular cavity through a narrow neck.

Thus, two-dimensional echo-Doppler examination is of great value in the

diagnosis of congenital aneurysm/diverticulum and is complementary to angiography.

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