Left Atrial Myxoma; Evidence of Tumor Movement by Apexcardiogram*

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Simultaneous recordings were made of the apexcardiogram (ACG), phonocardiogram, left atrial and left ventricular (LV) pressures, and electrocardiogram at the time of cardiac catheterization in a patient with a mobile myxoma of the left atrium. Notches on the upstroke of the ACG and LV pressure were demonstrated and were shown to coincide exactly. It is suggested that the notch on the ACG, like that on the LV pressure, is related to sudden movement of the tumor from left ventricle to left atrium, and is therefore a useful diagnostic sign of mobile left atrial myxoma.

In spite of increased awareness, left atrial myxoma remains a difficult diagnostic problem because of its variable clinical presentation.1-4 Recent publications have emphasized clues that may be obtained from the phonocardiogram and apexcardiogram (ACG).5-7 Phonocardiograms of patients with myxoma often have an early diastolic sound resembling a ventricular gallop ("tumor plop") and a prolonged first heart sound associated with a notch on the upstroke of the ACG.7

Pitt et al5 published tracings obtained at cardiac catheterization which demonstrated a notch on the upstroke of the left ventricular pressure tracing in two patients with mobile left atrium myxoma. They were able to show that the notch coincided with movement of the tumor from left ventricle to left atrium. They did not record an ACG, but suggested that the notch on the upstroke of the ACG seen in other cases of myxoma might also result from tumor movement and be related to the notch on the left ventricular pressure tracing. While other authors have pointed out the diagnostic value of the notch on the ACG,7 simultaneous intracardiac events have not been recorded.

This report presents evidence that movement of left atrial myxoma can be detected by apexcardiography. The patient represents the first instance of myxoma in which simultaneous recordings of intracardiac pressure, phonocardiogram and apexcardiogram are reported. We have been able to show that the notch on the upstroke of the ACG exactly coincides with the notch on the upstroke of the left ventricular pressure. Our findings support the concept that the abnormalities seen in the

References

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phonoocardiogram and ACG are related to tumor movement and are therefore useful in the diagnosis of atrial myxoma.

Case Report

A 22-year-old white housewife first became symptomatic eight months before admission when she noted left chest pain and progressive exertional fatigue and dyspnea. One month before admission, the chest pain recurred, along with fever and cough. Her physician detected the murmur of mitral stenosis and referred her for cardiac evaluation. There was no edema, hemoptysis, syncope, orthopnea, paroxysmal nocturnal dyspnea, or history of rheumatic fever.

On physical examination slight tachycardia was noted. The precordium was active with a prominent left parasternal heave. The apex was tapping in the midscapular line and a soft diastolic thrill was felt. The first sound was loud, the second sound was physiologically split with an accentuated pulmonic component, and an opening snap and fourth heart sound were present. A grade 3/6 diastolic murmur with presystolic crescendo and a grade 1/6 pansystolic blow were audible at the apex. Findings did not vary with changes in position. The hemograms were normal and reticulocyte count 3.9 percent with normal red cell morphology. The serum globulin was 2.9 gm percent. The electrocardiogram showed sinus rhythm, right axis deviation, incomplete right bundle branch block, left atrial abnormality, and non-specific ST segment and T wave abnormalities. The chest roentgenogram revealed slight enlargement of the left atrium. Pre-catheterization diagnosis was mitral valve stenosis and pulmonary hypertension. Cardiac catheterization was performed, including transseptal catheterization of the left atrium; the results are shown in Table 1. Left atrial cineangiogram demonstrated a large, globular filling defect which descended partly into the left ventricle in diastole and returned to the left atrium in systole. At surgery, a 5 x 4 x 4 cm left atrial tumor was excised which had a pedicle attached low on the atrial septum near the anterior commissure of the mitral valve. The tumor was dumbbell-shaped and the inferior portion was hemorrhagic whereas it entered the left ventricle. Histologic examination demonstrated a typical myxoma with areas of focal hemorrhage. Three months following surgery, the patient was asymptomatic. Signs of pulmonary hypertension were gone and there was no cardiac murmur.

Special Studies

Simultaneous left atrial and left ventricular pressure, phonocardiogram, and ACG were recorded at the time of cardiac catheterization (Fig 1). The phonocardiogram revealed prolonged first heart sound, third heart sound beginning .10 sec after the start of the second heart sound (with oscillations visible between the second and third sounds), and a fourth heart sound beginning .08 sec before the first heart sound. Vibrations were also recorded throughout diastole. The ACG demonstrated a prominent notch on the upstroke. The left atrial pressure showed an unusual configuration, with a sharp c inflection, large v wave and steep y descent. The left ventricular pressure was striking due to the presence of a prominent notch on the upstroke, and early and late diastolic filling waves were both seen.

The notch on the upstroke of the left ventricular pressure tracing exactly coincided with the notch on the upstroke of the ACG. These events occurred during the prolonged first heart sound shortly before the left atrial c wave. During early diastole, the rapid y descent of the left atrial pressure terminated in several sharp vibrations, which coincided with an early diastolic filling wave in the left ventricle and a third heart sound ("tumor plop") in the phonocardiogram. In late diastole, the a wave in the left ventricle occurred slightly before the fourth heart sound.

Table 1—Cardiac Catheterization Data

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<th>RA</th>
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Pressures are in mm Hg. S = systolic pressure; D = diastolic pressure; EDP = end diastolic pressure; MMG = mean mitral gradient; CI = cardiac index.

Figure 1. The electrocardiogram (ECG), mid-precordial phonocardiogram (Phono), apexcardiogram (ACG), left ventricular pressure (LV) and left atrial pressure (LA) are depicted. In the phonocardiogram the first sound (1), second sound (2), "tumor plop" (T), and fourth sound (4) are labelled. Arrows point to the notches that are present in the apexcardiogram and left ventricular pressure; these notches may be seen to exactly coincide.

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Mitral stenosis. Early diastolic sounds have been shown to occur after the 0-point of the apexcardiogram, suggesting it was not really an opening snap. However, the sound was thought to be related in some way to the movement of the myxoma. During ventricular relaxation the tumor moved from left atrium to left ventricle, coinciding with the rapid descent in the left atrium. Abrupt cessation of tumor movement occurred at the time of the third heart sound.

Similar hemodynamic-phonocardiographic correlations were observed in our patient. In addition, the ACG was recorded simultaneously with intracardiac pressures, representing the first case of myxoma in which this has been done. The fact that the notches on the upstroke of the left ventricular pressure and ACG exactly coincided provides evidence that the abnormality of the ACG is due to sudden movement of the tumor from left ventricle to left atrium. A large notch on the ACG has been a specific sign for myxoma, but it should be mentioned that a small notch may occasionally be recorded in patients without myxoma.\(^6\) It has been pointed out that a better sign may be the presence of low frequency vibrations on the upstroke of the apexcardiogram.\(^7\) The notch has not been reported in mitral stenosis, and its presence should alert one to the possibility of myxoma.

Although this patient was thought to have mitral valve stenosis, in retrospect there were clues that she did not have typical mitral stenosis. The first heart sound lasted .12 sec and had two distinct components. Although the first sound is loud in mitral stenosis, it is not so prolonged and is not double.\(^1\) The prolongation and double quality in myxoma is probably the result of fusion of the mitral closure sound and the sound of tumor ejection from the left ventricle.

An early diastolic sound was heard in this patient and was thought to be an opening snap. However, the sound occurred after the O-point of the apexcardiogram, suggesting it was not really an opening snap. Moreover, the second sound opening snap interval was .10 sec, somewhat prolonged in a patient considered to have severe mitral stenosis. Early diastolic sounds have been recorded in myxoma,\(^2,7,8,9,10\) but are related to tumor movement from left atrium to left ventricle rather than to opening of the mitral valve, since they have been shown to occur after mitral valve opening. Consequently, the interval between the second sound and early diastolic sound in myxoma tends to be longer than the second sound opening snap interval in mitral stenosis.

A fourth heart sound is rare in mitral stenosis.\(^1\) On the other hand, myxoma patients in addition to ours have been noted to have fourth sounds.\(^1,7\) Production of this sound is not completely understood, but there may be sudden deceleration of blood leaving the left atrium as it strikes the tumor, or atrial contraction may cause the tumor to hit the left ventricular wall.

From a practical clinical standpoint it is important to make the correct diagnostic differentiation between mitral valve stenosis and left atrial myxoma. If the diagnosis of myxoma is suspected prior to cardiac catheterization, transcatheter puncture of the left atrium should not be performed because of the danger of tumor embolization.\(^3,11\) A pulmonary arteriogram is the diagnostic procedure of choice in this setting. The surgical approach to the two lesions is also different. Mitral commissurotomy is usually performed through a left thoracotomy, whereas excision of an atrial myxoma requires cardiopulmonary bypass and is more easily done through a median sternotomy incision.

REFERENCES

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