Trans-Systolic Murmur During the Valsalva Maneuver in a Patient With Apical Aneurysm — A Case Report —

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We present a 74-year-old female in whom a systolic murmur became trans-systolic during the Valsalva maneuver.

The patient had had stable effort angina for 20 years and coronary angiography revealed complete obstruction of the left anterior descending artery in addition to other atherosclerotic lesions. Left ventriculography showed a small apical aneurysm with a narrow orifice. Aorto-coronary bypass surgery and aneurysmectomy were performed; true aneurysm was confirmed pathologically.

We conclude that apical aneurysm with a narrow orifice can produce trans-systolic murmur.
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TRANS-systolic murmur is defined as a murmur extending over the second heart sound. It usually derives from stenotic lesions distal to the aortic or pulmonary valve, such as coarctation of the aorta or pulmonary artery branch stenosis¹.

We report here a case of small left ventricular aneurysm in which systolic murmur became trans-systolic during the Valsalva maneuver.

CASE REPORT

A 74-year-old female was hospitalized for the evaluation of stable effort angina pectoris of 20 years' duration associated with mild hypertension. On physical examination, heart rate was 72 beats/min and blood pres-

sure was 125/70 mmHg. A grade 2/6 systolic murmur, heard along the cardiac apex to the fourth left sternal border, increased and became trans-systolic during the Valsalva maneuver (Fig 1). Neither S3 nor S4 was heard. An electrocardiogram showed a normal sinus rhythm with ST elevation in leads V₃–V₄ and negative T wave in leads V₄–V₆ (Fig 2). Two-dimensional echocardiogram revealed a left ventricular aneurysm confined to the apex with a narrow orifice. The left ventricular wall was slightly thickened only around the orifice. Echo-Doppler showed 2 separate flow signals, both from the apical aneurysm toward the base of the left ventricle, during early systole and in early diastole (Fig 3). During the Valsalva maneuver, these 2 signals became confluent and increased in intensity as much as 2 m/sec, resulting in trans-systolic characteristics similar to those on phonocardiogram. Magnetic resonance imaging in the long-axis

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Fig 1. Phonocardiograms at the 4th left sternal border showed that an early systolic murmur (left) became trans-systolic during the Valsalva maneuver (right). (CP=carotid pulse)

Fig 2. An electrocardiogram on admission showed ST elevation in leads V₃–V₄ and negative T wave in leads V₄–V₆.

view showed a small apical aneurysm with a narrow orifice (Fig 4). Left ventriculogram showed an apical aneurysm and coronary angiography revealed segment #7 as 100% obstruction, and segment #4PD as 90%, segment #9 as 90% and segment #12 as 75% stenoses according to the American Heart Association classification (Fig 5); aorto-coronary bypass surgery was performed in addition to aneurysmectomy. At

surgery, no adhesion was noted between the aneurysm and pericardium. Pathologically, there was no disruption of either the endocardium or epicardium in the resected aneurysm. Left ventricular myocytes near the orifice were hypertrophic with a maximal diameter of 40 μ m, but they did not show marked disarray. The postoperative course was uneventful and the patient is free from angina.

Fig 3. Doppler signal around the orifice of the left ventricular apex showed that 2 separate flow signals (left) increased in velocity and became confluent, giving the signal a trans-systolic character (right).

Fig 4. Magnetic resonance imaging of the long axis showed a small apical aneurysm with a narrow orifice (ED=end-diastole, ES=end-systole).

DISCUSSION

In the present case, left ventricular aneurysm with a narrow orifice was associated with multi-vessel coronary artery disease. The shape of this aneurysm suggested pseudoaneurysm rather than true aneurysm resulting from old antero-septal myocardial infarction. However, the echo-Doppler flow pattern in the aneurysm was not consistent with that of pseudoaneurysm? Considering that pseudoaneurysm could not be ruled out completely and the patient had had angina pectoris, aneurysmectomy was performed in addition to aorto-coronary bypass surgery.

Barbaresi et al reported that apical aneurysm developed in 3 cases during the follow-up of 160 cases with hypertrophic cardiomyopathy³. Early diastolic flow from the apex to the base defined as paradoxical jet flow is a characteristic Doppler flow pattern, which suggests that early diastolic decay of pressure was not steep in the apical aneurysmal chamber⁴. The Doppler signal across the orifice in the present case was consistent with this paradoxical jet flow. Pathologically, this aneurysm proved to be a true aneurysm and hypertrophic muscle was seen only around the orifice. It was not conclusive whether this hypertrophy was

Fig 5. Left ventriculogram showed apical aneurysm and coronary angiograms showed complete obstruction of the left anterior descending artery receiving collateral vessels from the right coronary artery (ED=end-diastole, ES=end-systole).

secondary to the aneurysm due to ischemic heart disease or concomitant hypertrophic cardiomyopathy with apical aneurysm.

The Valsalva maneuver is a simple yet important bed-side diagnostic method for estimating heart murmur; a systolic murmur from hypertrophic cardiomyopathy may increase while other systolic murmurs decrease in intensity⁵. In the present case, the Valsalva maneuver increased the systolic murmur. Moreover, the murmur extended to early diastole, giving it a trans-systolic character. Echo-Doppler confirmed that this murmur derived from the accelerated flow signal from the left ventricular apex to the base. This indicated that a persistent pressure gradient from early systole to early diastole developed between these 2 chambers during the Valsalva maneuver. The systolic pressure gradient might have increased and the duration may have been prolonged because the Valsalva maneuver made the left ventricle smaller. In addition, the early diastolic pressure gradient became greater presumably because of either prolongation of systole or exaggerated left ventricular diastolic

dysfunction in the apical portion.

In conclusion, when a systolic murmur becomes trans-systolic during the Valsalva maneuver, the possibility of apical aneurysm should be considered.

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