Atrial Septal Aneurysm: A Cause for Midsystolic Click

Report of a Case and Review of the Literature

M. DON ALEXANDER, M.D., MAJ, MC, KENNETH R. BLOOM, M.D., LTC, MC, PATRICIA HART, MA, RDMS, FRANCIS D’SILVA, M.D., MAJ, MC, and JOSEPH P. MURGO, M.D., COL, MC

SUMMARY A patient who was evaluated for a midsystolic click was found to have an aneurysm of the atrial septum as an isolated anomaly. Bulging of this aneurysm into the right atrium was associated with the production of the click. Echo-, phono-, and angiocardiographic features are presented, with a review of the literature on atrial septal aneurysms. These aneurysms, although rare, should be considered in the differential diagnosis of patients with midsystolic click.

ATRIAL SEPTAL ANEURYSM rarely occurs as the only congenital problem in an otherwise normal heart. Most reports associate atrial septal aneurysms with increased atrial pressures and bulging of the interatrial septum away from the high-pressure side.1-4 In most cases, the diagnosis has been made incidentally during echocardiography,4 cardiac catheterization,5 surgery, or autopsy. No auscultatory findings have been related to this anomaly. In this report we discuss a patient who was referred for evaluation of a midsystolic click and whose only abnormality was an aneurysm of the interatrial septum. We postulate that movement of the aneurysm causes this click, and we offer this as another cause of midsystolic clicks.

Case Report

A 39-year-old asymptomatic active-duty Army sergeant was referred for evaluation of a midsystolic click noted at the time of a routine physical before his retirement. He had been completely well, with nothing abnormal in his history. Physical examination revealed a normal-appearing white male with normal bodily proportions. His physical examination was normal except for that of his cardiovascular system. This revealed normal jugular venous and carotid pulsations and a normal precordial examination. The first and second heart sounds were normal, with the S2 split physiologically. There were no murmurs, gallops or abnormal diastolic sounds. A loud midsystolic click was heard best at the lower left sternal border in the third and fourth intercostal spaces. The click did not change significantly with position, hand grip or squatting. The intensity of the click increased with inspiration and slightly decreased with Valsalva.

Noninvasive data accumulated included a normal chest x-ray and normal ECG. A phonocardiogram recorded at the lower left sternal border and apex with the patient in the left lateral decubitus border and apex with a frequency setting of 120-500 Hz revealed the distinct midsystolic click. An M-mode echocardiogram performed in the left lateral decubitus position using a 2.25-MHz transducer revealed an echo-dense structure in the left atrium that appeared in early systole (fig. 1). The rest of the study was normal. Two-dimensional echocardiography both from the apical and subcostal views showed bulging of the interatrial septum into the left atrium in early systole, with a sudden reversal into the right atrium in midsystole (fig. 2). A simultaneous phonocardiogram and echocardiogram revealed that the recorded midsystolic click was temporally associated with this sudden protrusion into the right atrium (fig. 3).

Right-heart catheterization was performed after percutaneous puncture of the right femoral vein and revealed completely normal right-sided and pulmonary capillary wedge pressures. There was no intracardiac shunting of blood. Cineangiography was performed with injection of contrast into the superior vena cava with the patient placed in the hepatocavicular position, so that the atrial septum was perpendicular to the x-ray plane.6 This confirmed the presence of an aneurysm of the interatrial septum that bulged into the left atrium in early systole and then into the right atrium (fig. 4). No other abnormalities of cardiovascular structure or function were found.

Discussion

Aneurysm of the interatrial septum is a rare occurrence. Its pathology has been described by Lev and Thomas,1 Gould,2 and others.3-6 Lev and Thomas questioned the defect as a true congenital anomaly, as most cases of atrial septal aneurysm have been reported in association with right (most often) or left inflow obstructions causing marked elevation of the
respective atrial pressures. As a result, a weakened or redundant portion of the interatrial septum (usually in the region of the fossa ovalis) bulges toward the atrial chamber with a lower pressure. Angiocardiographic findings of both left and right atrial septal aneurysms have been described. We found only one other report of a right atrial septal aneurysm where both right and left atrial pressures were normal. No abnormal clinical findings were reported. The M-mode echocardiographic findings of an atrial septal aneurysm have been described in a patient who also had hypoplastic right-heart syndrome. When filling defects or unusual echoes are seen in the left or right atrium (fig. 1), numerous defects or abnormalities must be considered (table 1).

To our knowledge, midsystolic or nonejection clicks have not been reported in association with atrial septal

**Figure 1.** M-mode echocardiogram showing echo-dense structure (arrow) in left atrium (LA) in early systole. AO = aorta. See table 1.

**Figure 2.** Two-dimensional echocardiographic apical view with right atrium (ra), right ventricle (RV), left atrium (la) and left ventricle (LV). (A) Early systole. Atrial septum (arrow) is seen bulging into the left atrium. (B) Midsystole. The atrial septum (arrow) is now seen bulging into the right atrium.

**Figure 3.** A phonocardiogram recorded at the second and fourth left intercostal spaces (2 LICS and 4 LICS) and simultaneous M-mode echocardiogram obtained from the subcostal position. The interatrial septum echo is shown moving into the left atrium (LA) in early systole, with a sudden reversal and movement into the right atrium (RA) in midsystole. A midsystolic click (X) occurs at the time of this rapid movement into the right atrium. RESP = respiration; inspiration is represented by the downslope.
aneurysms. A simultaneous echocardiogram and phonocardiogram revealed that the click occurred at the time of maximal bulging of the atrial septum into the right atrium. Because the patient had no other demonstrable causes of midsystolic click, and as the response of the click to various maneuvers was not typical of mitral valve prolapse, we concluded that the source of the click must be tensing of the interatrial septum as it bulged into the right atrium. Indeed, on angiography, there appeared to be a “checking” of the aneurysmal bulge in midsystole. Therefore, we believe that atrial septal aneurysm should be included in the differential diagnosis of a midsystolic click.

Acknowledgment

We thank Helen Smith for assistance in preparing this manuscript.

References

7. Mall FH: Aneurysm of the membranous septum projecting into the right atrium. Anat Rec 6: 291, 1912
18. Prior JT: Lipomatous hypertrophy of cardiac interatrial septum. Arch Pathol 78: 11, 1964

Table 1. Differential Diagnosis of Conditions That Could Result in Abnormal Echoes in the Left Atrium

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrial septal aneurysm</td>
</tr>
<tr>
<td>Surgical patch material</td>
</tr>
<tr>
<td>Aneurysm of the membranous septum</td>
</tr>
<tr>
<td>Multiple or single saccular aneurysm of</td>
</tr>
<tr>
<td>the atria</td>
</tr>
<tr>
<td>Atrial septal hematoma</td>
</tr>
<tr>
<td>Tumors</td>
</tr>
<tr>
<td>Thrombi</td>
</tr>
<tr>
<td>Lipoma</td>
</tr>
<tr>
<td>Lipomatous hypertrophy of interatrial</td>
</tr>
<tr>
<td>septum</td>
</tr>
<tr>
<td>Diverticulum of the atria</td>
</tr>
<tr>
<td>Enlarged coronary sinus</td>
</tr>
<tr>
<td>Anomalous pulmonary venous return</td>
</tr>
<tr>
<td>Cor triatriatum</td>
</tr>
<tr>
<td>Prolapsed mitral valve</td>
</tr>
<tr>
<td>Flail mitral valve leaflet</td>
</tr>
</tbody>
</table>
M D Alexander, K R Bloom, P Hart, F D'Silva and J P Murgo

Circulation. 1981;63:1186-1188
doi: 10.1161/01.CIR.63.5.1186
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 1981 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on
the World Wide Web at:
http://circ.ahajournals.org/content/63/5/1186