CASE REPORTS

Lipomatous Hypertrophy of the Interatrial Septum:
In Vivo Diagnosis

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Summary

Lipomatous hypertrophy of the interatrial septum (LHIS), a finding associated with obesity and advancing age, consists of the accumulation of adipose tissue, including fetal adipose tissue, in the interatrial septum cephalad and caudad to the fossa ovalis. Previous descriptions of this entity have been limited to autopsy examination. We report a patient in whom the diagnosis of LHIS was established during life by the use of computed tomographic cardiac imaging. As is often the case in patients discovered at autopsy to have LHIS, this patient had atrial fibrillation and, while in normal sinus rhythm, an abnormal P-wave morphology. This patient represents the first patient in whom the diagnosis of LHIS has been established during life. LHIS should be considered in the differential diagnosis of atrial fibrillation and other supraventricular rhythm/conduction disturbances, particularly in obese, elderly patients.

AN ABNORMAL ACCUMULATION of fat in the interatrial septum of the heart (lipomatous hypertrophy of the interatrial septum [LHIS], or interatrial lipoma) has been identified as a basis for atrial arrhythmias in elderly patients. Because the interatrial septum has until recently been relatively inaccessible to most forms of noninvasive and invasive examinations, the diagnosis of this entity has been limited to necropsy observations. We report a patient in whom computed tomographic cardiac imaging was used to establish the diagnosis of interatrial lipomatous hypertrophy during life.

Case Report

GW, a 66-year-old obese woman, was evaluated for complaints of palpitations, dizziness, and fatigue of several days’ duration. She had not visited a physician during the previous 42 years.

Physical examination disclosed moderate obesity (weight 104 kg, height 162 cm). Systemic blood pressure was 130/84 mm Hg; heart rate (apical) was 120 beats/min and sometimes irregular; and respiratory rate was 22 breaths/min and slightly labored. There were post-tussive inspiratory rales at both lung bases. The cardiac apex was palpable in the fourth intercostal space at the left anterior axillary line. A systolic ejection murmur was heard at the base of the heart; it was associated with normal carotid impulses bilaterally. No diastolic murmurs or sounds were heard.

The ECG showed atrial fibrillation with a rapid ventricular response and nonspecific ST-T-wave changes (fig. 1A). The patient was treated with i.v. digoxin and within 24 hours converted to normal sinus rhythm. An ECG recorded in normal sinus rhythm disclosed an abnormal P-wave morphology (fig. 1B): a normal initial positive deflection followed by a negative deflection of equal magnitude and a prolonged P-wave duration (0.16 second).

The patient’s admission chest x-ray disclosed mild cardiomegaly, including mild enlargement of the left ventricle. There were no other remarkable findings. Radiographic changes involving the lung fields included mild pulmonary vascular engorgement and an ambiguous density in the left lower lobe of the lung. Because of the latter, computed tomography of the chest was performed, using a Siemens Somatom 2 body scanner with a 5-second scanning time per image and 8-mm slice thickness. A transverse image (fig. 2) at the level of the cardiac chambers demonstrated a grossly enlarged interatrial septum; the density of the septum (−60 to −100 Hounsfield units) indicated that it consisted of adipose tissue. The bilobed septal mass projected into the right atrium and encroached upon the posterior aspect of this chamber. An indentation present between the two lobes corresponded to the site of the fossa ovalis. The amount of subepicardial fat was greatly increased, allowing excellent definition of the overlying normal pericardium. No tumor was identified in the lung or mediastinum. The “mass” noted on the chest film was a solitary pulmonary nodule, for which the patient refused further diagnostic evaluation. At 10-month follow-up, the patient is asymptomatic, has normal sinus rhythm and is taking oral digoxin, 0.25 mg/day.

Discussion

Although the extent and configuration of fatty deposits in the interatrial septum of patients like the present one may suggest a discrete tumor-like mass, the term “lipoma” is probably not appropriate. Fat in the interatrial septum is nonencapsulated; instead, the geometry of the interatrial septum confines the fat into what appears to be a discrete mass that simulates a focal fatty growth, or lipoma. However, as this patient...
FIGURE 1. Electrocardiographic tracings before and after cardioversion. (A) Twelve-lead tracing shows atrial fibrillation with fast ventricular response. (B) Lead II after spontaneous cardioversion. The P-wave morphology and the P-wave duration (0.16 second) are abnormal, consistent with an interatrial conduction delay.

illustrates, the fatty deposits in the interatrial septum are part of a generalized process that includes increased deposits of subepicardial adipose tissue as well. Also, true cardiac lipomas occurring at sites other than the interatrial septum characteristically consist of mature adipose cells; in contrast, the hallmark of interatrial adipose tissue is the presence of fetal (granular, multilobular) fat. The term lipomatous hypertrophy of the interatrial septum is therefore preferred.

Although adipose tissue is a normal component of the interatrial septum, the combination of obesity and advanced age have been associated with more egregious collections of interatrial fat. Previous necropsy descriptions have suggested that a maximal transverse dimension of interatrial fat greater than 2.0 cm constitutes LHIS.

The characteristic gross features of LHIS from a necropsy patient are illustrated in figure 3. The fat infiltrates the interatrial septum cephalad and caudad to the fossa ovalis, but always spares the fossa. The cephalad mass of fat is generally more extensive than that found caudad to the fossa, and both project into the right atrial cavity. The cephalad mass is contiguous with the subepicardial adipose tissue, which, in patients with LHIS, is greatly increased. In the present patient, the computed tomographic image of the chest accurately depicts the bilobed, massive collection of interatrial fat projecting toward the right atrium. The
oblique orientation of the heart in relation to the transverse plane allows visualization of both lobes of the septal mass in one tomographic slice and accounts for the apparent equality of the cephalad and caudal lobes; images higher in the chest better showed the cephalad component. The indentation between the two lobes represents the site of the fossa ovalis.

Although the diagnosis of LHIS in the present case was not confirmed at either surgery or autopsy, the capability of computed tomography to identify relative tissue densities excludes alternative considerations. The density of the interatrial mass is identical to both that of the excessive subepicardial tissue over the anterior right ventricle, and the mediastinal tissue underlying the anterior chest wall; the attenuation coefficient (−60 to −100 Hounsfield units) of the tissue at each of these three sites confirms that each represents adipose tissue. Furthermore, the low attenuation coefficient of the interatrial mass in LHIS differentiated it from a true neoplasm, which, because it contains a proportionately small amount of adipose tissue, would be expected to yield an attenuation coefficient > 0 (the value arbitrarily assigned to water). Similarly, if the thickened interatrial septum represented extension of an aortic dissection into the interatrial septum, the attenuation coefficient at this site would be expected to represent that of organizing thrombus; i.e., significantly greater than 0 Hounsfield units. Finally, although an interatrial aneurysm might mimic LHIS — the former, like the latter, protrudes into the right atrial cavity — the greater thickness of the interatrial septum in LHIS would differentiate it from an aneurysm.

Although McAllister and Fenoglio suggested that LHIS might be recognized during life as a filling defect...
on a right atrial angiogram, such a finding, to our knowledge, has never been described. Two-dimensional cardiac ultrasound represents another means by which LHIS might be diagnosed during life. Use of the subxiphoid view in particular, in which dropout of echoes either at the fossa ovalis or cephalad end of the septum is avoided, might allow delineation of the abnormal contour of the cephalad and caudal portions of the septum as well as the “normal” region of the fossa ovalis. Presumably, the sonolucent interatrial fat could be differentiated from intracavitary blood due to the interface provided by compressed fibromuscular tissue along the periphery of the interatrial fat, or by the use of peripheral venous contrast enhancement. Our patient would not submit to a two-dimensional ultrasound examination.

Atrial arrhythmias, particularly atrial fibrillation, are not uncommon among elderly patients in the absence of congenital or valvular heart disease. Such supraventricular rhythm disturbances may result from atrioventricular secondary to diminished ventricular compliance, left-sided in the case of systemic hypertension and right-sided in the case of chronic pulmonary disease. When associated with other evidence of sinus node dysfunction, these arrhythmias may be a manifestation of sick sinus syndrome. When none of these causes can be identified, such rhythm disturbances are usually attributed to coronary artery disease, although little clinical or pathologic evidence supports this concept.

In fact, in an obese and elderly patient with a supraventricular arrhythmia in whom the cause cannot be identified, available evidence favors the concept that such an arrhythmia is due to LHIS. The fact that these large accumulations of interatrial fat are strategically located in the pathways of two of the three tracts that facilitate orderly atrial depolarization forms an anatomic basis for the association between LHIS and supraventricular arrhythmias. The possibility of such a relationship was first recognized by Kluge in 1969. Subsequently, Hutter and Page described atrial arrhythmias and/or an abnormal P-wave morphology in seven of 10 patients with LHIS studied at autopsy. Our patient was typical in this regard: She had atrial fibrillation and an abnormal P-wave morphology consistent with an interatrial conduction delay in the absence of other known heart disease.

References
Lipomatous hypertrophy of the interatrial septum: in vivo diagnosis.
J M Isner, C S Swan, 2nd, J P Mikus and B L Carter

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