Cross-sectional Echocardiographic Characterization of Atelectatic Lung Segments*

Differentiation from Extracardiac Tumors

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This report describes a unique series of patients who, during routine cross-sectional echocardiographic examination, were each noted to have a large echo-dense extracardiac mass adherent to the lateral aspect of the left ventricle. While this echo-dense mass was considered initially to represent an extracardiac tumor, this mass was shown subsequently to be an atelectatic segment of the left lower lobe of the lung. The salient echocardiographic findings that were considered to be helpful in terms of differentiating these adherent pulmonary atelectatic lung segments were that the lung segments always occurred in the presence of a moderate to large left pleural effusion; in real-time examination, the atelectatic lung masses generally appeared solid, as opposed to cystic, with a characteristic brightly reflective ground-glass appearance; there was never any evidence of extrinsic compression of the heart by the lung mass.

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The diagnosis of extracardiac tumors is an important clinical application of the cross-sectional echocardiographic technique. In the present report we describe a unique series of patients who, during routine echocardiographic examination, were each noted to have a large echo-dense extracardiac mass adherent to the lateral aspect of the left ventricle. Although an extracardiac tumor was considered initially in the differential diagnosis of two of these patients, the echo-dense mass was shown subsequently to be an atelectatic segment of the left lower lobe of the lung. While the finding of atelectatic lung segments on routine echocardiographic examinations is not infrequent, such atelectatic lung segments are usually visualized as discrete, free-floating echo-dense masses, as opposed to masses that appear firmly adherent to the heart. Thus, the series of patients described herein represents, to the best of our knowledge, the first description of a pulmonary atelectatic lung mass simulating an extracardiac tumor. The salient diagnostic features of this new finding are discussed.

CASE REPORTS

Case 1

A 72-year-old man with a history of a previous myocardial infarction and congestive heart failure presented with a three-week history of progressive dyspnea, orthopnea, and pedal edema. Physical examination disclosed a cachectic, chronically ill-appearing man in mild respiratory distress. Examination of the lungs disclosed decreased breath sounds at the bases with early inspiratory crackles. The chest roentgenogram at the time of hospital admission showed an enlarged cardiac silhouette, pulmonary vascular redistribution, and bilateral pleural effusions. His electrocardiogram revealed an old lateral myocardial infarction.

Hospital Course

An echocardiogram obtained on the first hospital day showed a dilated left ventricle and moderate left ventricular dysfunction with hypokinesis at the apex and midventricular anterolateral and posterolateral walls. Figure 1A shows that there was a large echo-dense mass adherent to the midventricle, which during examination in real-time, moved in synchrony with the motion of the heart. Angulated sweeps of the echocardiographic transducer did not demonstrate that the mass was contiguous with any mediastinal structures. As shown in Figure 1A, the mass was solid with a brightly reflective ground-glass appearance. Although no direct intramyocardial infiltration was apparent, the myocardial segments beneath the mass were in fact hypokinetic, raising the possibility that the mass had infiltrated into the myocardium. Further, there was no discernible clear-cut pericardial stripe between the mass and the ventricular wall. A computed tomographic (CT) scan of the chest was obtained to more fully delineate the interface between the echo-dense mass and the heart. As shown by the CT scan in Figure 2, the mass was solid in appearance with compressed air bronchograms radiating out from its center; these findings were believed to be consistent with "passive" atelectasis of the lung. Subsequent to this the patient underwent a left thoracentesis and a repeated echocardiographic examination. Figure 1B shows that the echo-dense mass disappeared following drainage of the pleural effusion and reexpansion of the lung.

Clinical Follow-up

Several months following discharge from the hospital, the patient was again admitted with progressive dyspnea, orthopnea, and pedal edema. An echocardiogram (Fig 1C) obtained at the time of this hospital admission revealed recurrence of the left pleural effusion with reappearance of the atelectatic lung segment along the lateral aspect of the left ventricle.

Case 2

A 73-year-old man with a history of diabetes, hypertension, and a previous myocardial infarction was admitted to the hospital for evaluation of left-sided numbness, weakness, and slurred speech. Examination of the lungs was notable for dullness to percussion

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404 Characterization of Atelectastic Lung Segments (Mann, Thompson, Kaiser)
over the entire left hemithorax with decreased tactile fremitus and bronchial breath sounds. The admission chest roentgenogram disclosed opacification of the entire left hemithorax.

**Hospital Course**

A two-dimensional echocardiogram, obtained to exclude an intracardiac source of embolization, showed mild left ventricular dysfunction with a large echo-dense mass adherent to the lateral aspect of the left ventricle. Before a therapeutic thoracentesis could be performed, the patient underwent a sudden cardiopulmonary arrest and subsequently died. At autopsy the patient was noted to have atelectasis and consolidation of the left lower lobe of the lung; examination of the heart showed evidence of focal fibrosis of the apical and posterolateral walls consistent with a previous myocardial infarction. There was no evidence of an intrathoracic tumor.

**Case 3**

A 58-year-old woman with no previous medical problems was admitted to the hospital for evaluation of postmenopausal bleeding and a right lower quadrant mass. At the time of admission, findings from the cardiac and pulmonary examinations were within normal limits; examination of the abdomen revealed a 15 × 15-cm nontender mass in the right lower quadrant. The admitting chest roentgenogram and electrocardiogram were normal.
Characterization of Atelectatic Lung Segments (Mann, Thompson, Kaiser)

Hospital Course

On the second hospital day the patient underwent an exploratory laparotomy with a total abdominal hysterectomy and bilateral salpingo-oophorectomy. Although she tolerated the procedure well, her postoperative course was complicated by oliguria, congestive heart failure, and a new left pleural effusion with atelectasis of the left lower lobe of the lung. An echocardiogram was obtained to evaluate left ventricular function, which showed normal global left ventricular function and the presence of a large echo-dense mass adherent to the lateral aspect of the heart at the midventricular and apical levels. The patient was given furosemide and underwent diuresis with subsequent resolution of the pleural effusion and left lower lobe atelectasis.

Discussion

Cross-sectional echocardiography is a useful noninvasive method for diagnosing both intracardiac and extracardiac masses, including mediastinal cysts and tumors, pericardial cysts and tumors, intra-thoracic neoplasms, and left ventricular pseudoaneu-rysms. Although atelectatic segments of lung are encountered frequently during routine echocardiographic studies, this entity has not been described well in the literature. Furthermore, these lung masses are usually distinctly separate from the heart and are easily recognized as free-floating, brightly reflective, echo-dense objects. In the present unique series of patients the atelectatic segments appeared to be adherent to the heart, which rendered the initial diagnosis of the mass somewhat more difficult. Indeed, in two of the patients (patients 1 and 2) an extramural cardiac tumor was considered initially, based on the following constellation of findings: the echo-dense mass appeared to be adherent to the heart from the posterolateral to the inferoposterior aspect of the left ventricle; the mass moved synchronously with the heart; the mass was contiguous with hypokinetic segments of the ventricle, which suggested the possibility of myocardial injury secondary to tumor infiltration; there was no clear-cut pericardial stripe between the mass and the ventricular wall in any of the tomographic views; the initial admitting chest roentgenogram did not suggest the presence of coexisting pulmonary atelectasis. To the best of our knowledge, the present case reports represent the first description of an atelectatic lung segment mimicking an extracardiac mass.

Important to the above discussion of the differential diagnosis of extracardiac masses are several echocardiographic signs that may prove useful in separating pulmonary atelectasis from less benign extracardiac masses. First, in our series the atelectatic lung segments always occurred in the presence of a moderate to large left pleural effusion. Thus, the echo-dense lung mass will appear sharply outlined against the sonolucent area of the pleural effusion (Fig 1A and 1C). As evidenced by the third patient in our series, this effusion need not be long-term to result in this finding, but it may also occur in subacutely developing effusions. Second, in real-time examination the atelectatic lung mass generally appears solid, with a characteristic brightly reflective ground-glass appearance. The solid, homogeneous appearance of the lung mass is useful in differentiating atelectasis from a number of sonolucent extracardiac masses, including pericardial and anterior mediastinal cysts and left ventricular pseudoaneu-rysms. Third, there was no evidence of extrinsic compression of the heart by the lung mass, which might be expected based on the composition of pulmonary tissue, which is comprised of elastic and reticular fibers, along with thin layers of epithelial tissue. This latter feature may be useful in differentiating atelectasis from other large extracardiac masses that might be expected to compress the heart by virtue of their mass. Fourth, the mass resolved completely following thoracentesis and drainage of the pleural effusion. Finally, as demonstrated by the first patient in our series, CT examination may sometimes be useful as an ancillary technique in clarifying the abnormality in question.

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References

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