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Large Hiatus Hernia Compressing the Heart and Impairing the Respiratory Function : A Case Report

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Abstract

A 76-year-old female presented with a large hiatus hernia with intrathoracic stomach manifesting as severe exertion dyspnea. She had no cardiac or pulmonary disease, and neither anemia nor cyanosis, but respiratory function was mildly impaired. Chest roentogenography showed a large abnormal shadow overlapping the lower half of the heart. Transthoracic echocardiography demonstrated a mass compressing the left atrium and extending to the posterior part of the left ventricle, but the actual cause of the mass was not clear. Cross-sectional spiral computed tomography (CT) revealed a large hiatus hernia with intrathoracic stomach located just behind the left atrium with resultant mild anterior shift of the whole heart. Moreover, three-dimensional curved reformation CT suggested that the intrathoracic stomach was located in the upside-down position, which was confirmed by subsequent gastroesophagography. She experienced gradual progression of exertion dyspnea during the following 3 months. Follow-up CT revealed no significant increase of left atrial compression, but subsequent spirometric study showed increased impairment of respiratory function. Surgical repair for the hiatus hernia was successfully performed, and eventually achieved resolution of the symptoms. The cause of exertion dyspnea was probably cardiac compression and impaired respiratory function. The therapeutic strategy of surgical repair is recommended in elderly patients with hiatus hernia complicated with cardiac compression and respiratory impairment.

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Key Words

■**Complication** (**mixed type hiatus hernia**) ■**Echocardiography, transthoracic**
■**Computed tomography** (**spiral, three-dimensional**)

INTRODUCTION

Hiatus hernia is a common disease, which is frequently found in elderly females[1)]. However, hiatus hernia associated with intrathoracic stomach is uncommon and usually occurs only in the advanced stage of hiatus hernia[1)]. Massive hiatus hernia causes space-occupying effects on the surrounding organs and can lead to conditions such as pneumonia, atelectasis, cardiac pain, arrhythmia and heart failure[1,2)].

We treated a patient with a large hiatus hernia who complained of severe exertion dyspnea, and discuss the therapeutic strategy for elderly patients

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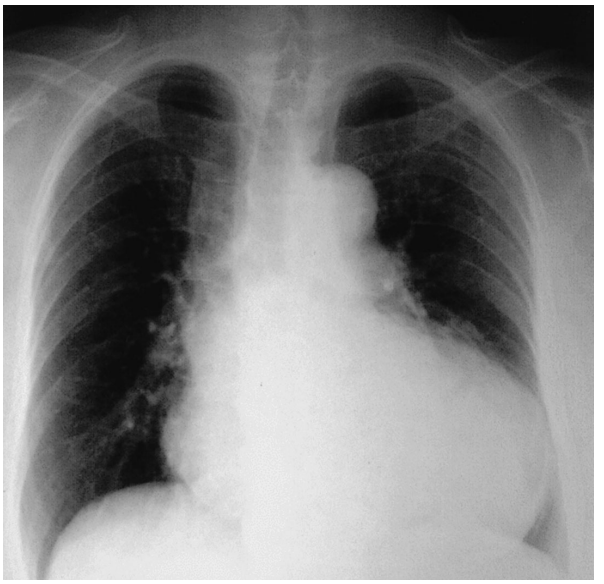

Fig. 1 Posteroanterior chest roentogenogram
A large abnormal high density shadow is seen overlapping the cardiac silhouette, whereas the lung fields are clear.

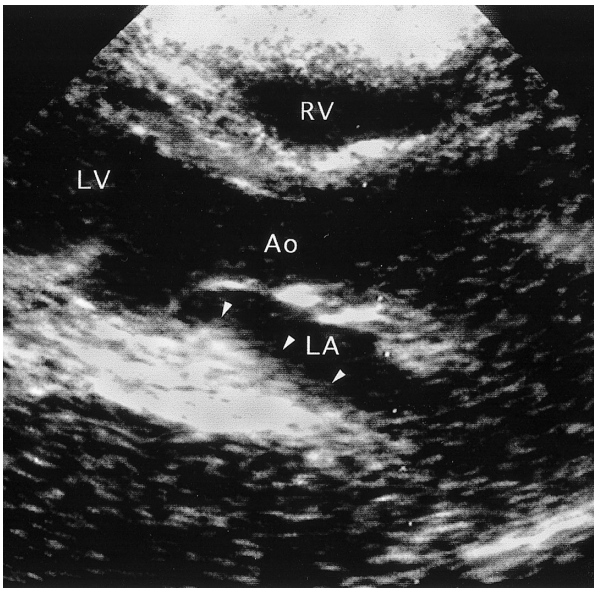

Fig. 2 Transthoracic echocardiogram in the parasternal long-axis view
A hyperechoic mass (*arrowheads*) is seen along the posterior wall of the left atrium and left ventricle, which appears to compress the left heart.
LV = left ventricle; RV = right ventricle; Ao = aorta; LA = left atrium.

with hiatus hernia complicated by dyspnea.

CASE REPORT

A 76-year-old female complained of severe exertion dyspnea, although she had been doing well several months before. She had no history of pulmonary, mediastinal or cardiac disease. Her blood pressure was 130/80 mmHg, and heart rate was 65 beats/min with regular sinus rhythm. No clinical features of anemia or cyanosis were detected. Electrocardiography (ECG) showed a slight decrease in the peak of the T wave in leads V_4–V_6, but no depression of the ST-T segment. Spirometric study revealed that the percentage predicted forced vital capacity (FVC) and forced expiratory volume per second ($FEV_{1.0}$) were 73.8% and 101.7%, respectively.

Chest roentogenography (**Fig. 1**) showed a large abnormal shadow overlapping the cardiac silhouette, indicating a mediastinal mass, but the lung fields were clear.

Transthoracic echocardiography (**Fig. 2**) showed a hyperechoic mass along the posterior wall of the left atrium and posterior left ventricle with associated decrease of the left atrial lumen and mild impairment of diastolic compliance of the left ventricle. However, the mitral valve was not obstructed by the mass and the left ventricle showed good con-

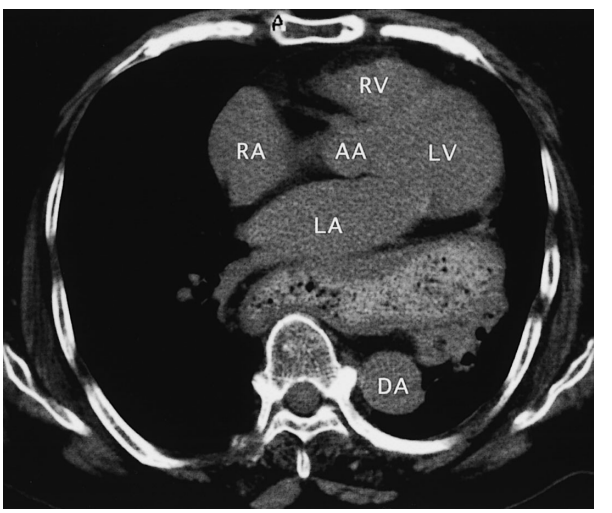

Fig. 3 Cross-sectional spiral computed tomography scan
A large hiatus hernia is located just behind the heart and compresses the left atrium.
RA = right atrium; AA = ascending thoracic aorta; DA = descending thoracic aorta. Other abbreviations as in Fig. 2.

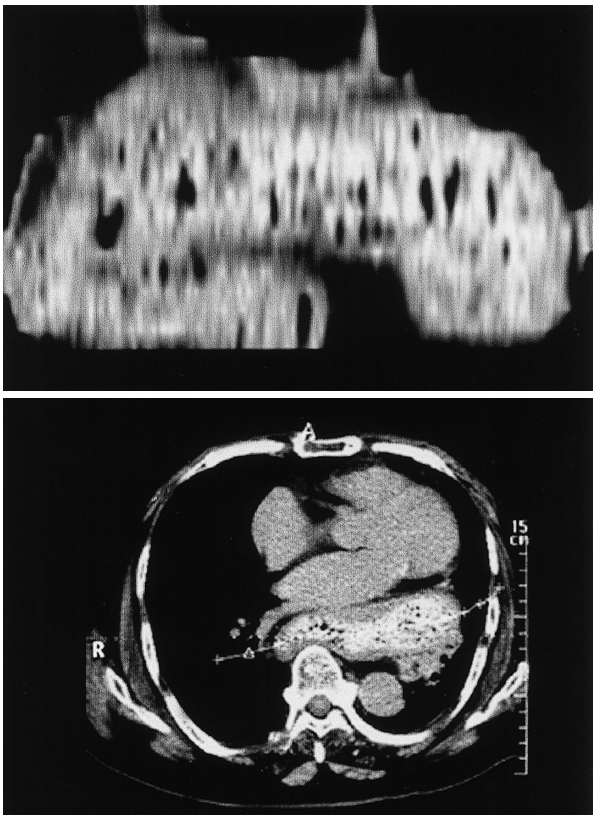

Fig. 4 Three-dimensional curved reformation computed tomography scan
Upper: Three-dimensional reconstruction computed tomography scan suggesting the intrathoracic stomach is in the upside-down position.
Lower: Curved line on the intrathoracic stomach shows the plane of reconstruction of the three-dimensional scan.

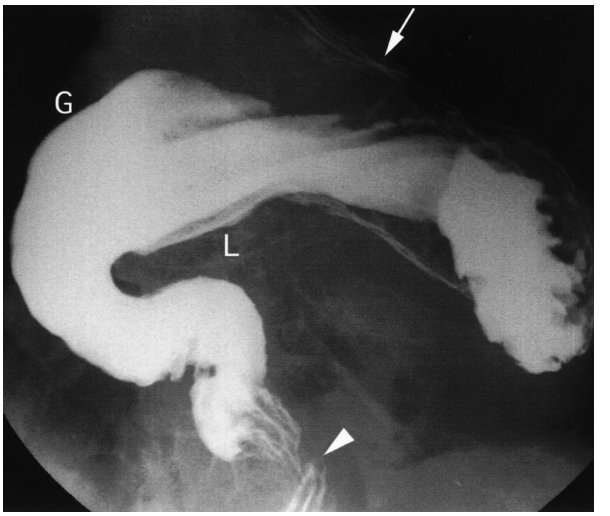

Fig. 5 Swallow gastroesophagogram
The mixed type of hiatus hernia is shown. The stomach is located in the upside-down position and shows organo-axial volvulus with two points of torsion at the distal esophagus (*arrow*) and the distal antrum (*arrowhead*). The greater curvature (*G*) of the stomach is located above the lesser curvature (*L*).

traction.

Spiral computed tomography (CT) was performed to further examine the echocardiographic findings around the left atrium and deep posterior thorax. Cross-sectional CT (**Fig. 3**) demonstrated a large hiatus hernia located just behind the left heart in the lower posterior thorax, which had compressed the posterior wall of the left atrium. In addition, three-dimensional curved reformation CT (**Fig. 4**) suggested that the displaced stomach was situated in an abnormal position. Subsequent swallow gastroesophagography confirmed that the intrathoracic stomach was located upside-down (**Fig. 5**).

She was conservatively followed up for the following 3 months, but complained of severe exertion dyspnea and low grade of chest discomfort. The follow-up spirometric study revealed that the percentage predicted FVC and $FEV_{1.0}$ were 73.8% and 88.0%, respectively. She underwent surgery for the hiatus hernia by an open Hill repair, and eventually the symptoms resolved. The surgery also prevented the potential risk of obstructive gastric volvulus. Postoperative gastroesophagography (**Fig. 6**) revealed that the stomach was located in the abdomen with normal positioning.

DISCUSSION

In the present case, echocardiography showed a hyperechoic and ill-defined amorphous mass along the posterior margin of the left atrium and posterior left ventricle. The mass was located close to the posterior leaflet of the mitral valve, but no obstruction was detected. Left ventricular contraction was good, whereas diastolic compliance was mildly impaired. Our diagnosis was a mediastinal mass compressing the posterior wall of the left atrium and posterior left ventricle, but we did not consider the mass to be intrathoracic stomach, because there was no apparent peristaltic movement or low echoic component to suggest intragastric fluid collection.

In contrast, CT revealed a large intrathoracic stomach with surrounding fatty tissue within the peritoneal sac just behind the heart. Three-dimensional curved reformation CT suggested the stom-

Fig. 6 Swallow gastroesophagograms after surgical repair
Left: Swallowed contrast medium passes through the esophagus with usual peristalsis.
Right: The repaired stomach is normally located in the abdomen.

ach was in the upside-down position, which was confirmed by subsequent gastroesophagography.

Echocardiography and CT have been used to identify left atrial compression of hiatus hernia in previous patients with dyspnea. Echocardiography was suboptimal to reveal the details of hiatus hernia, and subsequent CT revealed a large paraesophageal hernia compressing the left atrium[1]. Moreover, CT revealed sliding hiatus hernia compressing the left atrium, although echocardiography showed left atrial mass mimicking myxoma[2]. Echocardiography is thus useful to show a left atrial mass, but identification is sometimes suboptimal. In addition, echocardiographic findings of the hiatus hernia are based in far-field imaging with resultant poor lateral resolution due to the diverging ultrasonic beam[3].

Spiral CT was superior to reveal the actual location and the cause of the mass in the present patient, clearly showing a large hiatus hernia with intrathoracic stomach that was located just behind the heart. Furthermore, three-dimensional reconstruction CT suggested the intrathoracic stomach was not in the normal position, which was confirmed by gastroesophagography.

Hiatus hernia with intrathoracic upside-down stomach occurs in only 0.32% of patients with hiatus hernia[4]. This abnormal position of the stomach occurs as a result of migration into the thorax with rotation about the longitudinal axis. This potentially catastrophic situation is called organo-axial gastric volvulus[5]. In addition, the hiatus hernia in the present patient had the characteristics of both sliding and paraesophageal hernia, and is called the mixed type of hiatus hernia[6].

Hiatus hernia sometimes causes mass effects on the surrounding organs such as the lung or heart, especially if most of the stomach has migrated into the thorax[4,7], and left atrial compression by hiatus hernia is believed to be an uncommon but important cause of hemodynamic compromise[8]. The grade of cardiac compression by the hiatus hernia may change between lying and standing[9], inspiration and expiration[10], and depends on emptiness or fullness. We speculate that the cardiac compression of the present patient increased during exercise, and thus caused hemodynamic impairment such as transient heart failure and pulmonary congestion, which led to the manifestation of exertion dyspnea.

In our case, the initial spirometric study showed that percentage predicted FVC was decreased mildly, and the follow-up study revealed that both percentage predicted FVC and percentage predicted $FEV_{1.0}$ were decreased. Therefore, we consider that the impaired respiratory function was another potential cause of exertion dyspnea[11]. We suggest that the combination of cardiac compression and impairment of the respiratory function was related to the manifestation of progressive symptoms. We performed successful surgical repair of the hiatus

hernia with resultant resolution of the symptoms. In addition, the surgery prevented the risk of catastrophic obstructive gastric volvulus occasionally associated with upside-down stomach.

Patients with paraesophageal hernia have been considered as high risk for surgical treatment, because they are usually elderly people with medical problems such as impaired respiratory function. On the contrary, surgical repair for such patients has recently been performed with minimum complications, and often resulted in improved respiratory function and symptoms of dyspnea[11,12]. Therefore, elderly patients with large hiatus hernia complicated by dyspnea should be considered appropriate candidates for surgical repair[11].

The present case of a large hiatus hernia manifested as exertion dyspnea, and was identified by echocardiography and CT. Cardiac compression and impairment of respiratory function were probably the causes of the symptoms, although the actual relative contributions are not precisely known. Surgical repair of the hernia achieved resolution of the symptoms. The therapeutic strategy of surgical repair in elderly patients with hiatus hernia that complicates with cardiac compression and impaired respiratory function is recommended.

要　　約

心臓圧排と呼吸障害をきたした裂孔ヘルニアの1例

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症例は数ヵ月来増強する労作性呼吸困難を主訴とした76歳の女性である．心臓病や肺疾患の既往歴はなく，理学的に貧血もチアノーゼもなかった．脈拍は規則的で65/min，血圧は130/80 mmHgだった．心電図では胸部誘導で軽度のT波減高がみられた．呼吸機能検査では，努力性肺活量（FVC）予測率，時間肺活量1秒率（$FEV_{1.0}$）予測率はそれぞれ73.8%，101.7%であった．胸部X線写真では心臓に重なる大きな異常陰影が認められた．経胸壁心エコー図法では，左房および左室後壁を圧排する腫瘤が観察された．左室の拡張制限が疑われたが，僧帽弁の閉塞はみられなかった．ヘリカルコンピューター断層撮影（CT）では，腫瘤の部位には心臓を背側から圧排する大きな食道裂孔ヘルニアが認められた．CT横断像と三次元画像からは，ヘルニア内の胃の位置異常が疑われた．胃食道造影では，胸腔内の胃は逆位をとっており，軸捻転を伴った混合型裂孔ヘルニアと判明した．その後，3ヵ月間経過観察したが，主訴は次第に増強した．CTではヘルニアによる心臓圧排の進行は確認できなかったものの，肺機能検査のFVC予測率，$FEV_{1.0}$予測率はそれぞれ73.8%，88.0%と軽度悪化していた．これらの結果から，ヘルニアによる心臓と肺への影響が症状の発現に関与していると考えて，ヘルニア修復手術（Hillの手術）を施行した．手術は合併症なく終了し，呼吸困難はほぼ消失し，術後経過も良好であった．本例における労作性呼吸困難の発症機序について文献的に考察し，心臓圧排，呼吸機能障害を伴う高齢者の食道裂孔ヘルニアに対する外科的修復法の有用性について述べた．

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