Magnetic Resonance Imaging for the Diagnosis of Esophago-Aneurysmal Fistula

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A 77-year-old woman who complained of dysphagia was found to have an aneurysm in the descending aorta. Magnetic resonance imaging (MRI) demonstrated the state of thrombi, a thin and irregular soft tissue signal between the aneurysm and the esophagus, which suggested an esophago-aneurysmal fistula revealed by the operation. MRI was effective in the evaluation of the status of aneurysm.

Key words: MRI, thoracic aneurysm

Introduction

Although one of the serious complications of aneurysm is rupture, to our knowledge, an esophago-aneurysmal fistula (EAF) is very rare. The patient described here had dysphagia as her chief complaint caused by distal thoracic saccular aneurysm. The aneurysm grew rapidly and developed an EAF on the mid-esophagus. The EAF could be clearly observed with magnetic resonance imaging (MRI) before its mortal rupture and the usefulness of MRI for the diagnosis of EAF was confirmed.

Case Report

A 77-year-old woman came to our hospital with a history of progressive dysphagia. She had consulted another hospital for diarrhea and febrile state. She recovered once, but began to have dysphagia and became anemic during her admission. Gastrointestinal endoscopy revealed mild gastritis at that time. She had a history of lung tuberculosis about 40 years earlier and recently glucose intolerance was discovered.

She was ill appearing. Her pulse rate was 84/min and pulse was regular. Blood pressure was 134/80 mmHg. Mild anemia was observed and an ejectional systolic murmur was audible at her cardiac apex. Urinalysis demonstrated positive sugar and acetone. Calculation of blood cell and inflammatory signs were as follows: red blood cells $354 \times 10^6$/mm$^3$, Hb 10.9 g/dl, hematocrit 33.0%, white blood cells $11,400$/mm$^3$, platelets $28.6 \times 10^8$/mm$^3$, erythrocyte sedimentation rate 120 mm/h, C-reactive protein 16.1 mg/dl. Blood chemistry showed a triglyceride level of 106 mg/dl and a blood sugar level of 281 mg/dl and serum examination for syphilis was negative.

Chest X-ray film revealed a scarred old tuberculous lesion but there was no finding of abnormal calcification or tumors in the mediastinum. Esophagogram (Fig. 1 A, B) showed marked stenosis at the mid-esophagus with smooth, tapered narrowing and anterior displacement, which suggested the development of a submucosal lesion behind the esophagus. Gastrointestinal endoscopy could not pass through the narrowed portion of the esophagus. In spite of marked narrowing with the dilated vessels, the mucosa appeared to be normal and its slope was smooth, which also indicated a submucosal lesion of the esophagus.

Plain computed tomography (CT) showed a huge mass behind the heart and enhanced CT (Fig. 2) revealed a large aneurysm; the contrast medium flowed into the mass and the mass communicated with the descending aorta. Furthermore, mural thrombi and the oppressed esophagus were noted.

MRI was used for the demonstration of the anatomical correlation between the aneurysm and its adjacent organs. The image was acquired using a MRT 200RX (TOSHIBA) machine operating at 1.5-T. All were T1-weighted parasagittal images, obtained with conventional...
MRI of Esophago-Aneurysmal Fistula

Fig. 1. Esophagogram. A) The abrupt stenotic lesion and dilatation of the esophagus in its oral region (arrow) are observed (P-A view). B) The tapered narrowing and anterior displacement of the esophagus (arrowheads) are caused by the posterior submucosal lesion (L-R view).

Fig. 2. Enhanced CT. The thrombi (arrow) in the aneurysmal cavity and the anterior displaced esophagus (arrowhead) are observed.

Spin echo (SE) pulse sequence. MRI revealed a cavity of the aneurysm and mural thrombi in it (Fig. 3 A). On the adjacent slice (Fig. 3 B), the aneurysm was observed behind the heart and it communicated with the descending aorta. Her esophagus appeared to be pressed between the soft tissue behind the heart and the aneurysm, and the soft tissue between the esophagus and the aneurysm was thin and irregular. These findings suggested that the aneurysm was adhered to the esophageal wall or the EAF covered by the thrombi, however, her clinical aspects might have indicated the latter possibility.

She went into shock because of massive hematoemesis just before the operation for the aneurysm and underwent an urgent operation. The macroscopic findings during the operation were as follows: the aneurysm was almost filled with blood coagula which covered the fistula continuing to the esophagus and the stomach tube was seen through the fistula (Fig. 4 A, B). Resection of the aneurysm and the right subclavian artery-bilateral femoral artery bypass were performed, but she died on the 7th day after the operation due to acute renal failure. The microscopic findings of the resected specimen revealed atherosclerotic changes in the wall: thickening intima, deposit of cholesterol crystal, medionecrosis.
Fig. 3. MRI T1-weighted parasagittal images. A) The mural thrombi (arrowheads) and the oppressed esophagus (large arrow) in front of the aneurysm are displayed. The soft tissue (small arrow) between them appeared to be thin and irregular. B) The relationship between the descending aorta and the aneurysm is clearly demonstrated. DA, the descending aorta.

Fig. 4. Macroscopic findings at the urgent operation. A stomach tube (arrow) is seen through the fistula after removal of the mural thrombi in the aneurysm. A) photograph, B) schema.
and destruction of the elastic fibers.

**Discussion**

Hamaya et al (1) analyzed the frequency of esophageal perforation as a complication of aortic aneurysm in 328,370 autopsy cases in Japan from 1975 to 1985. In these cases, the number of the aneurysmal ruptures including dissecting aneurysm was 1,604 (0.5%) and the number of EAFs was only 24.

The clinical aspects of EAF have been known as the Chiari's triad: midthoracic pain, sentinel arterial hemorrhage, and final exsanguination after a symptom-free interval. For the diagnosis, chest X-ray, esophagogram, gastrointestinal endoscopy, CT and angiography have been thought to be useful (1-5). However, by these procedures, the correct diagnosis could be rarely established before mortal rupture.

The saccular aneurysm in this case induced obstructive dysphagia, which is a rare symptom as the first complaint (6), grew rapidly and resulted in the EAF. The etiology was considered to be atherosclerosis.

The esophagogram and gastrointestinal endoscopy suggested submucosal tumor in the mid-esophagus. The following CT and MRI revealed saccular aneurysm. In particular, the MRI could show mural thrombi and the three-dimensional relationship with its adjacent organs, especially the esophagus, which indicated the possibility of the EAF.

In general, MRI provides good spatial resolution, high contrast between tissues and optional projections for three-dimensional information. To evaluate abnormalities of the cardiovascular system, MRI is one of the most effective technologies (7-9). To study either thoracic or abdominal lesions usually cardiac gated or non-cardiac gated MR techniques, respectively are required (7-9). To display the aneurysm clearly, a 1.5 T superconducting magnet was used and SE sections were adopted provided parasagittal images with a thickness of 10 mm, repetition time (TR) of 500 ms, and echo time (TE) of 20 ms. Furthermore, we chose a matrix of 128 phase-encoding and 256 frequency-encoding steps and 8 signal averages with a non-cardiac gated technique. The scan time for 8 slices was only 8.5 minutes. This method makes spatial resolution only slightly decreased, but can shorten the scan time so that we can increase the number of signal averages. Reduced motion artifacts and the high signal to noise ratio by this method can display excellent contrast and, in particular, the parasagittal images can reveal a comprehensible relationship between the lesion and its adjacent organs, including the surrounding soft tissues. To obtain more available images, it is necessary to choose a matrix of 256 phase-encoding and 256 frequency-encoding steps, a cardiac-gated technique and an increasing number of the signal averages with a thinner slice which decreases signal intensity in itself. Nevertheless, the reason why these methods were not adopted, was the ill condition of the patient and the fact that it was necessary to finish this examination as soon as possible. We failed in timely operation, but the EAF could be managed with an early surgical therapy. An early and correct diagnosis is very important for the treatment of this disease. In addition to the information from conventional examinations, MRI may provide some additional information of aneurysmal structure, EAF and the adjacent organs. We conclude that MRI is one of the available technologies for the diagnosis of EAF.

**References**