Early Diagnosis of Traumatic Thoracic Aortic Rupture by Transesophageal Echocardiography*

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Traumatic aorta rupture survival depends on early diagnosis requiring aortography. Aortography is the "gold standard" method, but it is time-consuming and may be dangerous in trauma patients with multiple organ injuries. Transesophageal echocardiography is a noninvasive technology that can be performed at the bedside. We report two cases in which transesophageal echocardiography enabled us to make the early diagnosis of thoracic descending aorta rupture.

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The incidence of thoracic aortic rupture in trauma patients with multiple organ injuries is difficult to assess. Among patients with blunt chest trauma who die, aortic rupture may occur in 16 to 40 percent.1 Traumatic rupture of the aorta is a severe complication of rapid deceleration injuries and mortality is estimated at 80 to 90 percent before hospital admission.2 However, survival rate depends on early diagnosis that requires aortography. Nevertheless, this "gold standard" method is time consuming, invasive, and presents some risks of hazardous mobilization of the trauma patient with multiple organ injuries who often has an unstable hemodynamic status.

The following two cases illustrate the interest of the newly developed method of transesophageal color Doppler echocardiography (TEE) in the early and noninvasive diagnosis of traumatic thoracic aorta rupture.

**Case Reports**

**Case 1**

A 35-year-old man fell about 15 m. Initial assessment showed multiple injuries, including head trauma with brain swelling demonstrated by computed tomographic (CT) scan and spinal fracture at the level of the first lumbar vertebra with paraplegia. Because of his abdominal tenderness, a progressive drop in arterial blood pressure, and intraperitoneal bleeding shown by echography, this patient underwent emergency laparotomy that revealed multiple ruptured mesenteric vessels and left diaphragmatic laceration. Chest roentgenogram showed multiple rib fractures, left hemothorax associated with mediastinal widening, left main bronchus lowering, and a shift of the nasogastric tube to the right side. At the bedside in the emergency room, TEE was performed using a 5-MHz phased array transducer with a single-plane probe that provides transverse views of the thoracic aorta. TEE showed a normal aortic root and horizontal part of the aorta. A left hemothorax was also easily visualized. While imaging 2 cm from the incisor teeth, a mobile intimal flap established the diagnosis of descending thoracic aortic rupture (Fig 1). Above that lesion, a pseudoaneurysm was produced by the localized bleeding inside the adventitia of the aorta.

**Figure 1.** Transesophageal echographic views of the thoracic aorta at different levels (A to D) in case 1, showing the intimal flap (1), the false aneurysm (2), the true lumen (3), and the false collar of the aneurysm (4).
DISCUSSION

Accuracy of TEE for diagnosis of nontraumatic aortic dissection has been reported by a multicenter European study and other groups. The sensitivity of TEE is greater than that of angiography and CT scan, and TEE has replaced CT scan and aortography in some centers. However, to our knowledge, no studies have evaluated the accuracy of TEE for diagnosis of traumatic aortic rupture.

Recently, two cases have been reported, suggesting TEE for diagnosis of traumatic aortic transection. Brooks et al reported the case of a young man with widened mediastinum for whom CT scan showed “blood around the descending thoracic aorta;” angiogram showed “minimal widening of the proximal descending aorta.” Although a thoracotomy was recommended, TEE was performed after anesthesia induction, visualizing a large flap within the lumen just distal to the left subclavian artery, confirmed by the surgeon. Galvin et al reported a case in which TEE was performed immediately at the bedside in the intensive care unit; TEE showed an aortic tear 30 cm from the incisor teeth just distal to the left subclavian artery. Without previous aortography, thoracotomy was performed and confirmed the aortic rupture.

TEE is a useful noninvasive diagnostic method that can be performed rapidly at the bedside in the emergency department. The limitation of transthoracic echocardiography is the reduced image quality in immobilized patients with pulmonary contusion and/or mechanical ventilation with positive end-expiratory pressure. In contrast, TEE is always available in these critical conditions, resulting in high-quality echocardiographic images. However, using a single plane probe, TEE is somewhat limited when evaluating the aortic arch and the arch vessels, because of the blind area resulting from the interposition of the trachea between the aorta and the esophagus. This limitation could be solved by the introduction of biplanar probe. Even if 95 percent of aortic ruptures are described at the level of the isthmus and thus easily visualized by single plane probe, the biplanar probe would probably improve the diagnosis of other rare sites of traumatic aortic rupture.

In trauma patients with multiple organ injuries at risk of hemorrhagic shock, transport to the radiology department may be dangerous. TEE is a noninvasive method without any severe complication if arterial blood pressure is carefully controlled during the examination (because blood pressure often increases during aortic isthmus injury). It allows the accurate diagnosis of aortic injuries, may localize the entry tear (color Doppler), shows associated injuries such as myocardial contusion, pericardial effusion, and provides a rapid noninvasive assessment of the hemodynamic status (preload, contractility). In our two cases, TEE excluded associated cardiac injury and excluded hypovolemia.

The absence of widened mediastinum is encountered in 18 percent of patients with aortic rupture, leading to unavoidable delay in diagnosis. Consequently, TEE could be the method of choice for the initial examination of all patients with severe thoracic trauma, quickly revealing intrathoracic bleeding, myocardial contusion, and thoracic aortic injury.

In conclusion, in the two cases reported, traumatic aortic rupture was diagnosed using TEE. However, thoracic trauma may lead to various types of aortic injuries, including hematoma and dissection. Traumatic aortic dissection has been identified easily by TEE in recent reports; nevertheless, the accuracy of TEE in demonstration of limited aortic lesion, such as hematoma, presently remains unknown. Thus, a prospective study must be conducted in a large population of patients with blunt chest trauma to compare the accuracy of TEE vs aortography for the diagnosis of traumatic aortic rupture.

REFERENCES


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Chronic Brucella Empyema*  
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Brucellosis rates have decreased in developed countries in recent years, but the pathologic condition still occurs in developing countries and well-known endemic areas such as the Mediterranean and Middle Eastern countries. A Portuguese patient presented in Switzerland with long-term pleural empyema, which was later diagnosed as Brucella empyema through positive cultures of Brucella melitensis. Brucellosis should be considered in patients who have traveled to Middle Eastern countries or any other areas where brucellosis is more frequently encountered. (Chest 1993; 103:620-21)

Chronic pleural exudate may represent a difficult clinical problem. We report the case of chronic Brucella empyema. This etiology is rarely mentioned in developed countries where the incidence of brucellosis has markedly decreased.1 However, this pathologic condition may have to be recalled not only for patients from well known endemic areas such as the Mediterranean and Middle Eastern countries,2,3 but also from most developing countries.

CASE REPORT

A 39-year-old man was hospitalized on April 5, 1989, for treatment of an anal fistula. The pulmonary service was called for the evaluation of a chronic left pleural exudate.

This Portuguese patient resided in Switzerland since 1960 when left pleural thickening was discovered on a routine chest roentgenogram. The tuberculin skin test yielded a 20 mm reaction, and six months of prophylaxis with isoniazid (300 mg/d) was given. On a routine chest roentgenogram April 16, 1983, the pleural opacity was three times thicker while the patient reported no symptoms, and his weight was unchanged. The pleural fluid WBC value was 1,300/cu mm, with mostly polymorphonuclear cells, protein value of 67 g/L, and a LDH value of 1,680 U/ml. The culture for aerobic bacteria after four days and for Mycobacteria remained negative.

In the pleural biopsy specimens, nonspecific granulomatous tissue was described, but no organism was noted with the Zielh coloration on two occasions. Trituration with isoniazid, rifampicin, and ethambutol was prescribed and stopped four months later. In May 1984, a mild cholestatic icterus was investigated. The work-up included a liver biopsy. The mild fibrosis and inflammation were attributed to alcohol abuse. The follow-up was discontinued in July 1985, the chest roentgenogram being unchanged, and the patient having no complaints.

In April 1989, the patient presented without chest pain, cough, fever, or chills, but had a mild tremor and a subicterus. The physical examination revealed a mild dullness on the left side with a few crackles. There was no hepatosplenomegaly. On the chest roentgenogram, the pleural thickening was slightly enhanced on the left side (Fig 1 left), with some interstitial markings adjacent to it. The hematocrit value was 43 percent. The WBC was 7,200/cu mm, with 58 percent neutrophils, 8 percent monocytes, and 28 percent lymphocytes. The platelet count was 527,000/cu mm. Aspartate aminotransferase value was 330 U/L, and alanine aminotransferase, 628 U/L. The prothrombin time was normal. A left pleural puncture revealed a hemorrhagic exudate with RBC of 2.2 x 109/cu mm; WBC, 4,500/cu mm, with 88 percent neutrophils, 9 percent lymphocytes, and 3 percent macrophages. The protein value was 72 g/L; glucose, 0.5 mmol/L; and LDH, 3,251 U/L. Routine cultures were performed on 5 percent sheep blood agar, chocolate agar, and brain heart infusion broth incubated in 5 percent CO2. Growth on agar plates was negative; however, routine subsutures of the broth after one week on chocolate agar revealed growth of Gram-negative catalase and oxidase-positive coccobacilli.

The strain was identified by the Swiss reference center as Brucella melitensis biochemically,4 with growth on Petragnani medium and agglutination with monospecific antisera anti-A and anti-M (FAO-WHO collaborating Center for Reference and Research as Brucellosis, Central Veterinary Laboratory, United Kingdom).

Cultures for Mycobacteria performed on Bactec, Loewenstein, and Middlebrook media remained negative. The immunoserology was positive in a single serum sample with an elevated titer of 1/160 by tube agglutination.4 A sonogram of the abdomen showed no liver or pancreatic abnormality. Scintigraphy revealed no osteo-articular involvement. The patient was treated with doxycycline, 100 mg/d for six weeks in association with gentamicin, 3 x 80 mg/d for two weeks. The surgical cure of the anal fistula was uneventful, and the histologic findings showed only a nonspecific inflammatory tissue. The liver function test results were normal two months later. The chest roentgenogram during the following year revealed a marked decrease of the left pleural thickening (Fig 1 right). The Brucella serology decreased to a titer of 1/40.

DISCUSSION

This case illustrates a rare cause of empyema. However, this etiology has to be considered in patients with recent travel to Middle Eastern countries such as Kuwait, where the incidence of brucellosis reaches 70/100,000 inhabitants,5 or to Mediterranean countries such as Spain, where 22.3 cases per 100,000 inhabitants are reported. If brucellosis is also frequent in Latin America or in Asia, the annual incidence rates for human brucellosis ranged from 0.4 to 0.9 cases per million in the United States between 1983 and 1989.6 Transmission to humans usually occurs by direct

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