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Obstacles in the Diagnosis of Acute Aortic Dissection

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ABSTRACT

Acute aortic dissection (AAD) is a life-threatening condition for which prompt diagnosis is essential for successful management. The imaging modalities for demonstrating the dissecting membrane include retrograde aortography, contrast-enhanced computed tomography (CT), transesophageal echocardiography (TEE), and magnetic resonance imaging. Of these, aortography had long been considered the gold standard in diagnosing aortic dissection. We present a case of AAD in which contrast-enhanced CT and retrograde aortography failed to demonstrate an aortic membranous flap, whereas TEE swiftly provided clear-cut evidence of the pathology. TEE should be considered when AAD is suspected despite negative findings on other imaging modalities.

INTRODUCTION

Dissection of the ascending thoracic aorta is one of the most complex and lethal disorders [Hirst 1958]. At least 50% of the patients with acute aortic dissection (AAD) die within the first 48 hours, a fact that often precludes a prompt diagnosis and swift appropriate action. The different imaging modalities for demonstrating and identifying the dissecting membrane include magnetic resonance imaging (MRI), contrast-enhanced computed tomography (CT), retrograde aortography, and transesophageal echocardiography (TEE), each of which has certain advantages and limitations in evaluating a suspected AAD. We present a case in which transthoracic echocardiography (TTE), contrast-enhanced CT, and retrograde aortography failed to demonstrate the aortic membranous flap, whereas TEE rapidly provided clear-cut evidence of the pathology that fixed the diagnosis and led to curative surgical intervention.

CASE REPORT

A 69-year-old man known to suffer from hypertension was admitted with recent sudden chest pain. Physical examination was unremarkable except for pallor and slightly low blood pressure (100/60). The electrocardiogram showed no signs of active ischemia, and the laboratory test results were within normal range. The chest x-ray revealed a widened mediastinum with a slight tracheal shift. The patient underwent contrast-enhanced CT (Figure 1) that showed fluid collection around the ascending aorta and in the pericardium but showed no signs of an intimal tear or dissection. A TEE was ordered, and while waiting for the TEE technician to arrive, the patient began to deteriorate hemodynamically. An emergent TTE was performed and revealed pericardial effusion compressing the cardiac chambers, but no other pathological signs. The patient was rushed for pericardiocentesis and aortography in the catheterization laboratory, where 300 mL of blood was successfully evacuated. Surprisingly, his retrograde aortograph had appeared entirely normal and failed to demonstrate a dissecting membrane or a false lumen in the ascending aorta (Figure 2). A TEE was then quickly performed and it clearly demonstrated a large membranous flap in the ascending aorta, originating 1 cm above the sinotubular junction, with slight aortic valve insufficiency and normal-appearing leaflets (Figure 3). During surgery, we observed a type A dissection originating near the noncoronary sinus propagating toward the aortic arch. A Tiron David valve-preserving operation was performed, and the patient was discharged in excellent condition 2 weeks later.

DISCUSSION

AAD is a life-threatening condition whose prompt diagnosis is essential for successful management. Although early mortality may be as high as 1%/hour among untreated patients [Hirst 1958], the chances of survival can be vastly improved by the rapid institution of appropriate medical and surgical measures.

Aortography, for many years the only available accurate diagnostic procedure for the evaluation of patients with suspected AAD, had been considered the gold standard for diagnosing this condition. In recent years, contrast-enhanced CT, echocardiography (particularly TEE), and MRI have emerged as very useful diagnostic tools. In clinical practice, TEE or contrast-enhanced CT scanning has replaced aortography as the initially preferred diagnostic strategy for the assessment of patients with suspected acute aortic syndromes. The use of MRI, the definitive diagnosis modality, has been limited by its restricted availability and by considerations of patient safety [Kersting-Sommerhoff 1988].

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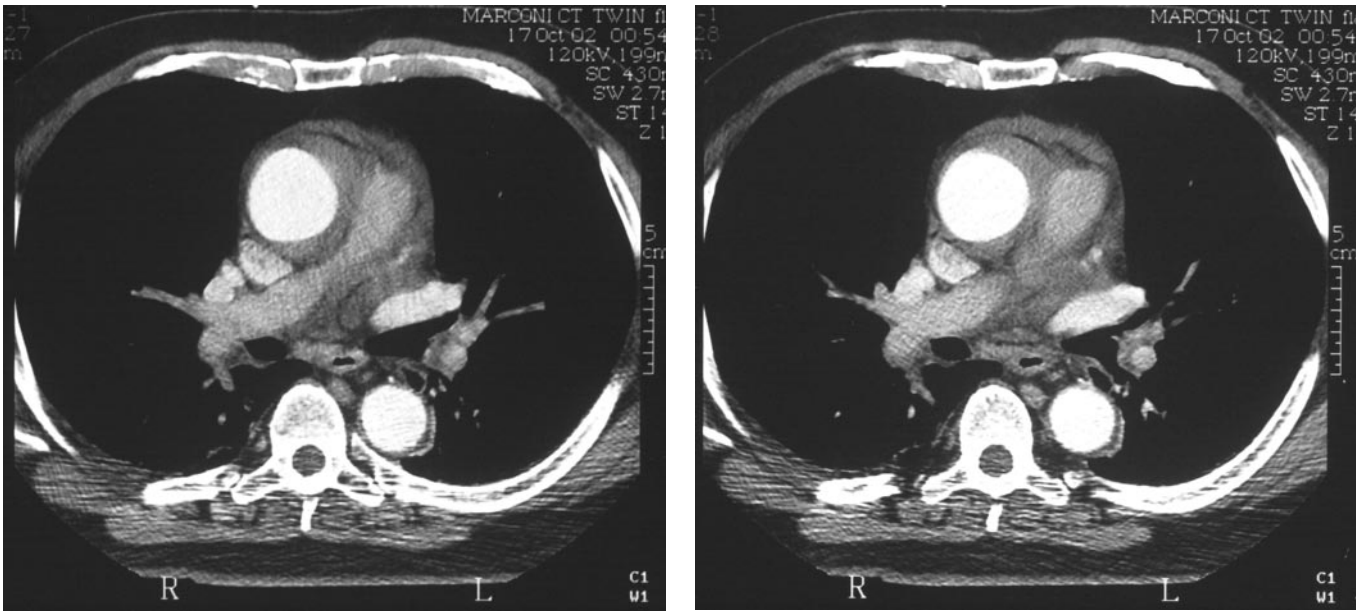

Figure 1. Contrast-enhanced computed tomographic images fail to demonstrate membranous aortic flap.

The definitive diagnosis of aortic dissection requires identification of a dissecting membrane that separates the aorta into true and false lumens. The diagnosis of aortic dissection by retrograde aortography is made on the basis of specific signs such as visualization of a double lumen or an intimal flap. There are also indirect suggestive signs that include compression of the true aortic lumen by the false lumen, thickening of the aortic wall, aortic insufficiency, ulcer-like projections along the aortic wall, abnormalities of branch vessels, and an abnormal position of the catheter in the aorta. Some studies have shown aortography to have sensitivity that ranges from 81% to 91% and a specificity of up to 94% [Shuford 1969, Wilbers 1990]. Aortography has a number of disadvantages: it is invasive, intravenous contrast agents must be administered, and it may fail to detect false lumen if blood flow is brisk (as in intramural hematomas).

CT scans are superior to aortography in terms of sensitivity and specificity, particularly if blood flow in the false lumen is reduced or clotted. Several reports that evaluated the effectiveness of contrast-enhanced CT demonstrated a sensitivity of 83% to 100% and a specificity of 90% to 100% [Harris 1979, Godwin 1980]. Disadvantages of this modality are the use of intravenous contrast material, low sensitivity rates in identifying the intimal tear, inability to

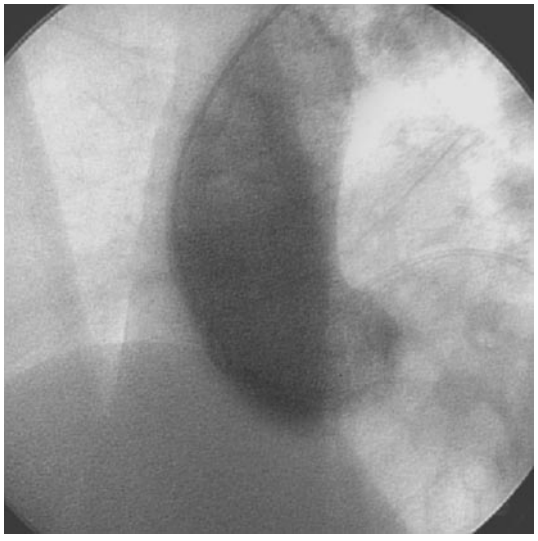

Figure 2. Retrograde aortograph showing intact ascending aorta.

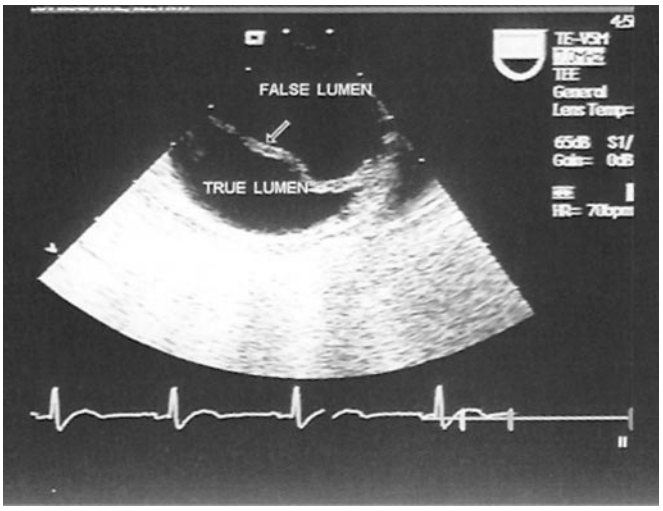

Figure 3. Transesophageal echocardiographic image clearly demonstrating the protruding aortic false lumen.

recognize aortic valve insufficiency or coronary artery involvement, and again, the use of contrast material [Vasile 1986, Batra 2000].

TEE was reported to have a sensitivity of 97% to 100% and a specificity of up to 100% in identification of a dissecting intimal aortic flap [Godwin 1980, Hashimoto 1989, Ballal 1991]. Its disadvantages are associated with the difficulty in using this technique to capture the upper portion of the ascending aorta and proximal aortic arch, because of the interposition of the air-filled trachea and left main bronchus. There are also reports of false-positive results that probably stem from reverberations from atherosclerotic calcified structures and vessels; this technique is also highly operator dependent. Finally, arrhythmias, hypertension, bronchospasm, and even esophageal perforation have been documented to occur, although infrequently, during the procedure.

We report a patient who underwent 4 of the 5 imaging modalities used clinically for diagnosing AAD, and only TEE revealed definitive evidence of an aortic dissection type A. Our experience does not argue against the importance of aortography or contrast-enhanced CT in the diagnosis of aortic dissection, but we do recommend that TEE should be considered in cases of a suspected dissection and negative findings on other imaging techniques.

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