

The Use of Echocardiographic Contrast-Enhanced Rapid Diagnosis of Ruptured Aortic Dissection with Transthoracic Echocardiography

Ameen Abdulmalik, MD, Gerald Cohen, MD, FACC, FASE, *Detroit, Michigan*

Aortic dissection is an uncommon but often fatal condition if not promptly managed. Although the diagnosis is generally established by transesophageal echocardiography, contrast computed tomography, or magnetic resonance imaging, clinical and radiologic assessment and transthoracic echocardiography represent the first-line approach to patients with sudden onset of severe tearing thoracic pain. Although surface image quality and spatial resolution may prevent detection of an intimal flap,

the presence of aortic dilatation, aortic regurgitation, segmental ventricular dysfunction, and effusions indicate a greater likelihood of a lethal outcome and hasten urgent management. Because an aortic rupture may be the cause of an effusion, rapid diagnosis is crucial. We report an unusual case of Stanford type B aortic dissection with rupture that was diagnosed by transthoracic echocardiography and confirmed with an ultrasound contrast injection. (J Am Soc Echocardiogr 2007;20:1317.e5-e7.)

CASE REPORT

A 58-year-old man with a history of hypertension and nephrolithiasis presented to the emergency department with severe lower back pain that started abruptly after dinner. The pain radiated to the abdomen and was associated with vomiting but no chest pain. He presented in moderate distress and was afebrile, diaphoretic, and tachypneic with a blood pressure of 204/102 mm Hg, heart rate of 75 beats/min, and oxygen saturation of 98% on room air. The jugular veins were not distended, heart sounds were normal, and lungs were clear. The abdomen was benign except for mild epigastric tenderness. Pulses were palpable and symmetric but diminished.

Transthoracic echocardiography showed a large left pleural effusion with a collapsed lung, organization, possible hematoma, and a dissection of the normal-sized abdominal aorta with a clear intimal flap (Fig. 1A and B). Suboptimal image quality prevented evaluation of left ventricular function, prompting administration of an ultrasound contrast agent, Definity (Activated Perflutren Lipid Microspheres; Bristol-Myers Squibb Medical Imaging,

North Billerica, Mass). Enhanced images showed normal left ventricular function and opacification of the true lumen, but not the false lumen, of the dissected abdominal aorta (Fig. 1C and D). Rupture of the thoracic descending aorta was indicated by visualization of the Definity contrast bleeding from the aorta into the pleural cavity (Fig. 1C and Video 1C). Emergency transesophageal echocardiography confirmed Stanford type B aortic dissection. These findings prompted urgent insertion of a 26-mm × 10-cm TAG endograft stent (W. L Gore & Associates, Inc., Flagstaff, Ariz) into the descending thoracic aorta. Hospitalization was complicated by loculated pleural effusion with entrapment of the left lung requiring thoracotomy and decortifications. The patient underwent physical rehabilitation and was discharged after 4 weeks. He continues to do well.

DISCUSSION

Acute aortic dissection is associated with early mortality as high as 1% per hour if untreated and carries greater than 50% mortality if ruptured.¹⁻³ Despite our greater understanding of the disease, clinical presentation is diverse and outcome is catastrophic if not promptly managed.^{4,5} Contrast computed tomography, magnetic resonance imaging, and transesophageal echocardiography are highly accurate in establishing the diagnosis⁶ but are not as expeditiously doable as bedside transthoracic imaging. Although transthoracic echocardiography has a low sensitivity for the diagnosis of aortic dissection,⁶ use of intravenous echocardi-

From the Department of Cardiology, St. John Hospital and Medical Center, Detroit, Michigan.

Reprint requests: Ameen Abdulmalik, MD, St. John Hospital and Medical Center, Cardiology, 22101 Moross, Detroit, MI 48236 (E-mail: ameen.abdulmalik@stjohn.org).

0894-7317/\$32.00

Copyright 2007 by the American Society of Echocardiography.

doi:10.1016/j.echo.2007.03.014

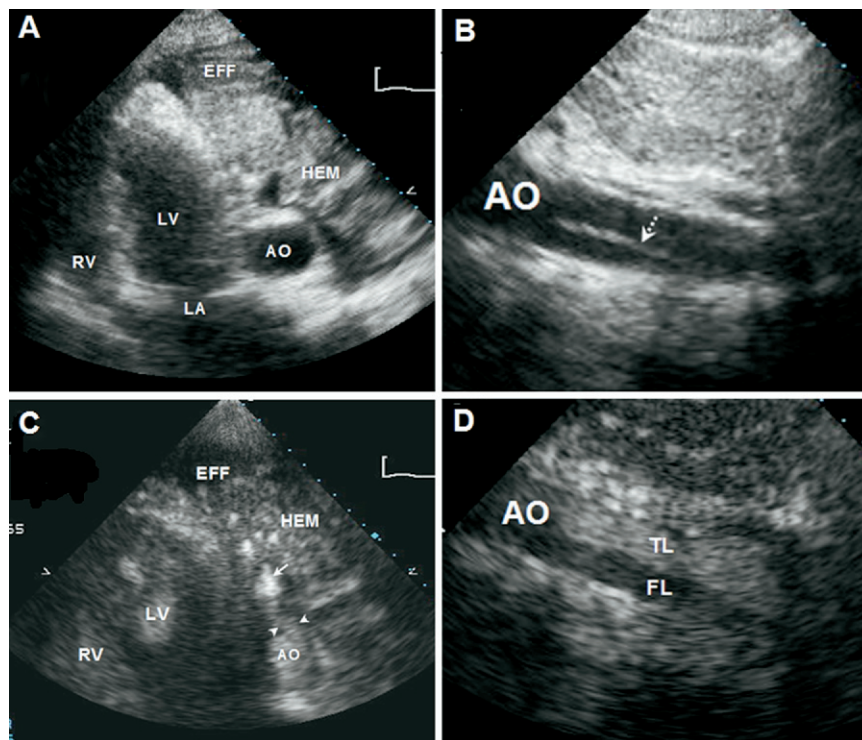


Figure 1 A and C: Apical four chambers without and with contrast, respectively. B and D: Abdominal aorta without and with contrast, respectively. Site of aortic rupture with active extravasations of contrast into left pleural cavity (*arrowheads*). Contrast in left pleural cavity (*solid arrow*). Abdominal aorta intimal flap (*dotted arrow*). *EFF*, Left pleural effusion; *HEM*, hematoma; *AO*, aorta; *LV*, left ventricle; *RV*, right ventricle; *LA*, left atrium; *TL*, true lumen; *FL*, false lumen.

graphic contrast agent can decrease artifact and help delineate the true and false lumen of aortic dissection.^{7,8} Furthermore, our case report shows how intravenous ultrasound contrast can be useful in the diagnosis of aortic rupture.

Pleural effusion is a common finding in aortic dissection, especially Stanford type B, and may be the dissection's only presenting feature.^{9,10} Typically, pleural effusion becomes evident 4.5 ± 3.9 with a range of 1 to 15 days after presentation.¹¹ Whether the pleural effusion is reactive or hemorrhagic secondarily to rupture should be promptly investigated because rupture has a poor outcome. Intravenous ultrasound contrast has also been used to diagnose rupture as the cause of pericardial effusion.¹²

Transthoracic echocardiography with contrast can effectively diagnose a ruptured aortic dissection that is actively bleeding while stabilizing the patient medically and awaiting a definitive diagnostic modality to be performed. The diagnosis of ruptured aortic dissection will expedite the arrangement for surgical or percutaneous intervention. If there is clinical concern that a pericardial or pleural effusion is the result of aortic rupture, bedside confirmation may be quickly achieved by

the administration of ultrasound contrast during transthoracic echocardiography.

REFERENCES

1. Braunwald E. Heart disease: a textbook of cardiovascular medicine. 7th ed. Philadelphia, Pa: Saunders; 2005:1415-28.
2. Hirst AE Jr, Johns VJ, Kime SW Jr. Dissecting aneurysm of the aorta: a review of 505 cases. *Medicine* 1958;37:217-79.
3. McCloy RM, Spittell JA Jr, McGoon DC. The prognosis in aortic dissection (dissection aortic hematoma or aneurysm). *Circulation* 1965;31:665-9.
4. Kodolitsch YV, Schwartz AG, Nienaber CA. Clinical prediction of acute aortic dissection. *Arch Intern Med* 2000;160:2977-82.
5. Hagan PG, Nienaber CA, Isselbacher EM, et al. The international registry of acute aortic dissection (IRAD): new insight into an old disease. *JAMA* 2000;283:897-903.
6. Nienaber CA, Kodolitsch YV, Nicolas V, et al. The diagnosis of thoracic aortic dissection by noninvasive imaging procedures. *N Engl J Med* 1993;328:1-9.
7. McRee D, Matsuda M, Stratton J, Martin G. Transthoracic contrast echocardiographic detection of ascending aortic dissection. *J Am Soc Echocardiogr* 1999;12:1122-4.
8. Kimura B, Phan J, Housman L. Utility of contrast echocardiography in the diagnosis of aortic dissection. *J Am Soc Echocardiogr* 1999;12:155-9.

9. Little S, Johnson J, Moon B, Mehta S. Painless left hemorrhagic pleural effusion: an unusual presentation of dissecting aortic aneurysm. *Chest* 1999;116:1478-80.
10. Gandelman G, Barzilay N, Krupsky M, Resnitzky P. Left pleural hemorrhagic effusion. A presenting sign of thoracic aortic dissecting aneurysm. *Chest* 1994;106:636-8.
11. Hata N, Tanaka K, Imaizumi T, et al. Clinical significance of pleural effusion in acute aortic dissection. *Chest* 2002;121:825-30.
12. Garcia-Fernandez MA, Macchioli RO, Moreno PM, et al. Use of contrast echocardiography in the diagnosis of subacute myocardial rupture after myocardial infarction. *J Am Soc Echocardiogr* 2001;14:945-7.