

Acquired Intercostal Arteriovenous Fistulas:

Transesophageal Doppler Echocardiographic Diagnosis

SAAD A. SUBAHI, M.D., MRCP,* SALEH AL-DAMEGH, M.D.,**
MOHAMMED JAWAID AKHTAR, M.D., MRCP,* MOHAMMED R. ARAFAH, FRCP(C),*
and ELGAMRI E. MOHAMMED, MRCP***

Departments of *Medicine and **Radiology, King Khalid University Hospital, Riyadh, and
***Department of Medicine, King Fahad Specialist Hospital, Qassim, Saudi Arabia

Acquired intercostal arteriovenous fistulas are recognized complications of traumatic injuries. In this article, transesophageal Doppler echocardiographic findings in a patient with posttraumatic acquired intercostal arteriovenous fistulas are presented. The findings have been confirmed by angiography. The demonstration of intercostal arteriovenous fistulas by transesophageal Doppler echocardiography has not been reported before. (ECHOCARDIOGRAPHY, Volume 13, November 1996)

intercostal, arteriovenous fistulas, transesophageal echocardiography, diagnosis

Case Report

A 29-year-old female sustained trauma to her dorsal spine in late childhood. This resulted in subluxation of the seventh dorsal vertebra (D7) on the eighth dorsal vertebra (D8). She underwent surgical stabilization of the spine by Harrington rods about a year ago. She presented with a history of palpitations and mild dyspnea on exertion for several years. Physical examination revealed a large volume pulse, a wide pulse pressure, and cardiomegaly. A continuous murmur was heard just below the middle part of the dorsal spine with the maximum intensity to the right of the spine. Chest X ray showed cardiomegaly with a prominent azygos vein. Transthoracic two-dimensional echocardiography showed a moderately dilated left ventricle with normal function. No valvular regurgitation or shunts were detected by Doppler. Transesophageal echocardiography (TEE) was performed using a 5-MHz biplane transducer (Ultramark 7 Ultrasound System, Advanced Technology Labora-

tories, Bothell, WA, USA). The probe was gradually advanced into the stomach and the short-axis view of the upper abdominal aorta was obtained. The probe was then withdrawn gradually while the aorta was kept in view. Color flow Doppler imaging was kept on while withdrawing the probe. Thirty-one cm from the incisors, color flow Doppler imaging identified a high velocity turbulent jet that originated from the right side of the aorta and extended posteriorly (Fig. 1A). Pulsed Doppler, with the sample volume positioned on the turbulent jet, showed a continuously aliased high velocity flow. The longitudinal view of the aorta at the same depth showed two separate turbulent jets along the posterior wall of the aorta (Fig. 1B). Pulsed Doppler at both sites showed high velocity continuous flow. The diagnosis of two adjacent arteriovenous communications was made. Cardiac catheterization revealed a cardiac output of 12 L/min with a significant step up in oxygen saturation in the superior vena cava. Descending thoracic aortogram demonstrated two enlarged right posterior intercostal arteries at levels D7 and D8 (Figs. 2A and 2B). Selective injection showed that the two arteries supplied large vascular structures (Figs. 2C and 2D). The azygos vein filled faintly.

Address for correspondence and reprints: Dr. Saad A. Subahi, MRCP, Consultant Cardiologist, Department of Medicine (38), K.K.U.H., P.O. Box 2925, Riyadh 11461, Saudi Arabia. Fax: 966-1-467-9491.

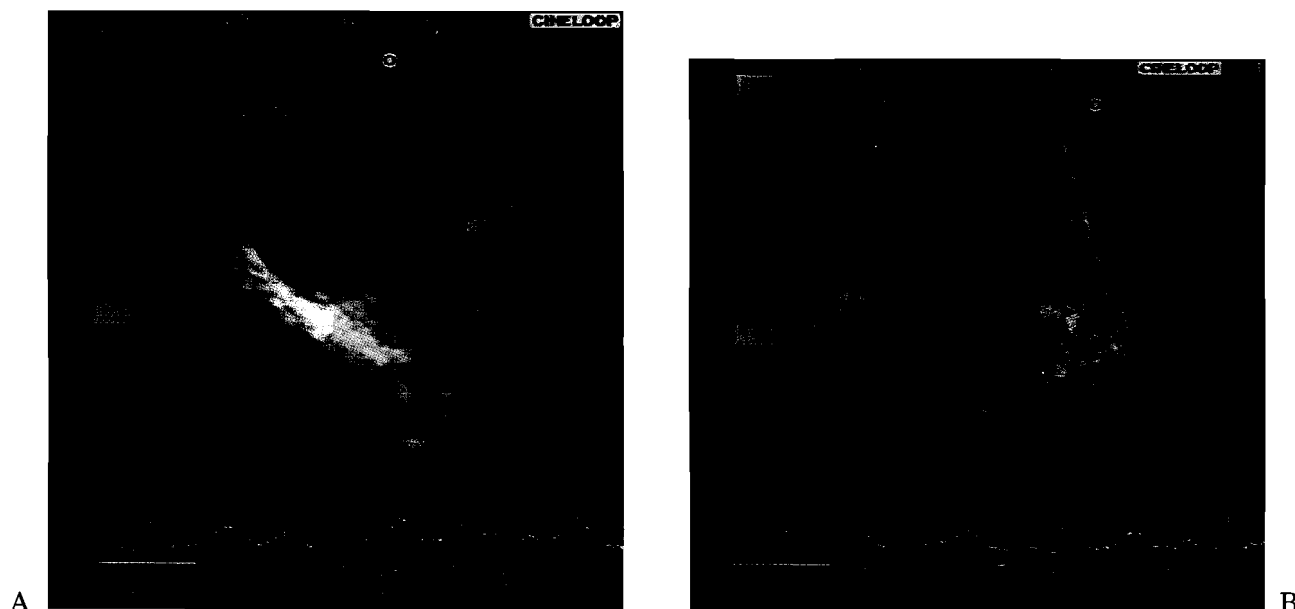


Figure 1. (A) Transesophageal echocardiography, descending thoracic aorta, short-axis view demonstrating a turbulent jet by color Doppler originating from the right side of the aorta and extending posteriorly. (B) Longitudinal view, descending thoracic aorta at the same depth as Figure 1A demonstrating by color Doppler two separate jets originating from the aorta and extending posteriorly. The upper jet is on the right side of the picture.

Discussion

Arteriovenous fistulas are abnormal communications between arteries and veins by which arterial blood enters the veins directly without traversing a capillary network.¹ Systemic arteriovenous fistulas may be congenital or acquired. The latter are either posttraumatic or iatrogenic.² Acquired arteriovenous fistulas occur most frequently after gunshot or stab wounds.³ Acquired intercostal arteriovenous fistulas are rare. They occur as a result of a complication of thoracocentesis or pleural biopsy in most of the few reported cases. Lai et al.⁴ reported an intercostal arteriovenous fistula due to pleural biopsy in which the diagnosis was confirmed by selective angiography. Derdeyn et al.⁵ reported an iatrogenic intercostal arteriovenous fistula that occurred after thoracocentesis. The diagnosis was confirmed by duplex and color Doppler sonography. The diagnosis of intercostal arteriovenous fistulas by TEE has not been reported before.

The lower nine posterior intercostal arteries are branches of the thoracic aorta. The corresponding posterior intercostal veins on the right

side drain into the azygos vein, which lies on the sides of the vertebral bodies on a plane posterior to that of the esophagus and drains into the superior vena cava.⁶ Therefore, there is a close anatomical relationship between the descending thoracic aorta, posterior intercostal arteries, posterior intercostal veins, and the azygos vein. The ability that the TEE transducer gives us to closely approach these structures made it a good choice for the detection of the intercostal arteriovenous fistulas in our patient. Precise localization of such fistulas by TEE is difficult due to the lack of definite internal anatomical landmarks. Therefore, the depth of the transducer tip from the incisors was recorded throughout withdrawal in order to determine the site of the arteriovenous fistulas. This study showed that TEE can provide a less invasive way to diagnose intercostal arteriovenous fistulas. A more important role for TEE may be in the follow-up of such cases, particularly after surgical ligation or transcatheter embolization.

Acknowledgment: The authors would like to thank Mrs. A. Osman and Mr. D. Thevalapperuma for their technical assistance.

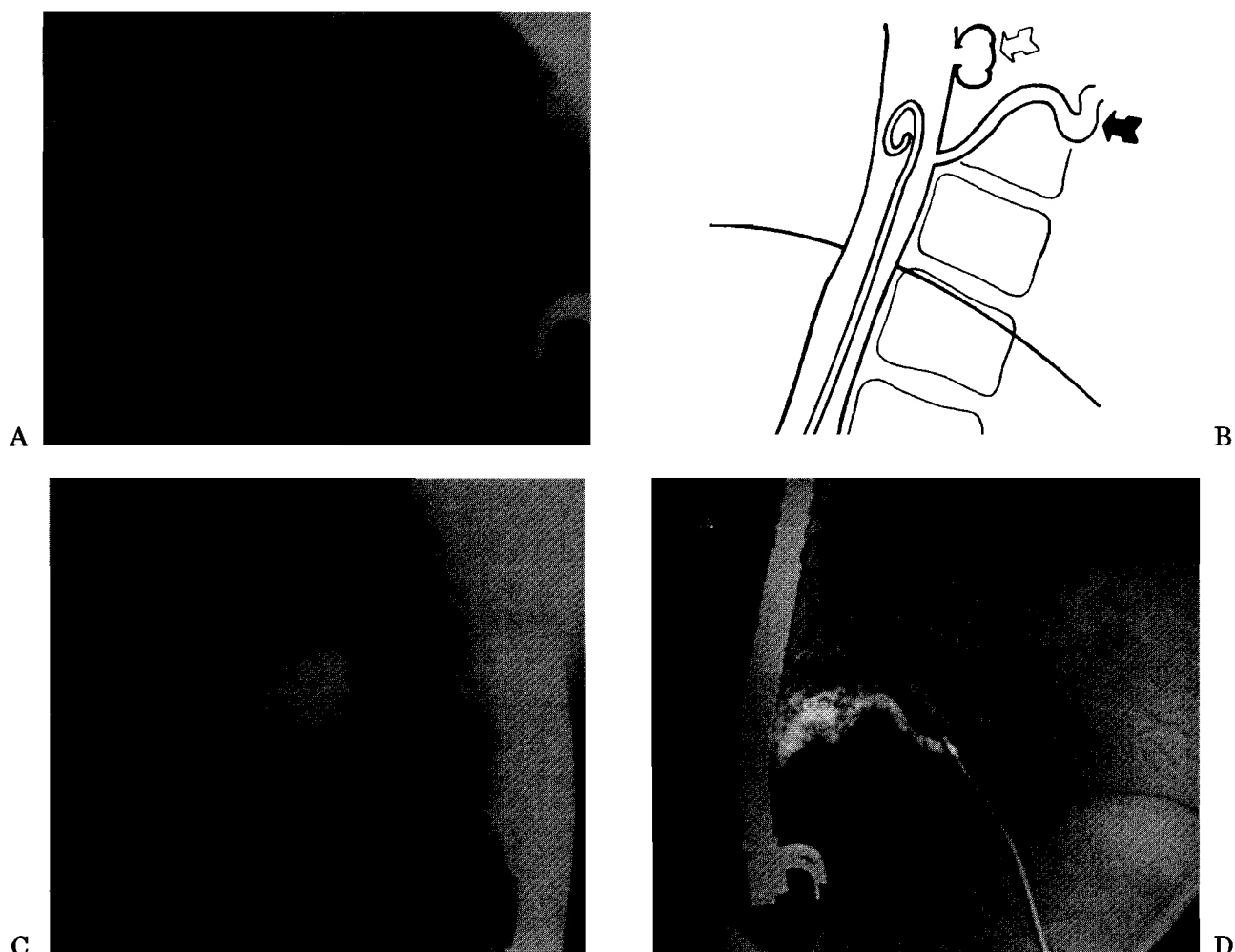


Figure 2. (A) Aortogram, descending thoracic aorta, left lateral view, showing two right intercostal arteriovenous fistulas at levels D7 and D8. (B) Diagrammatic illustration of Figure 2A showing the two intercostal arteriovenous fistulas (closed and open arrows). (C) Selective angiogram left lateral view showing the upper right intercostal arteriovenous fistula. (D) Selective angiogram right lateral view showing the lower right intercostal arteriovenous fistula. In all angiographic views note the presence of Harrington rods used for stabilization of the dorsal spine.

References

1. Miles WM: Peripheral aneurysms and fistulas. Aortic and peripheral vascular diseases. Cardiovascular Diseases. In Andreoli TE, Bennett JC, Carpenter CCJ, et al (eds): *Cecil Essentials of Medicine*. Philadelphia, PA, W.B. Saunders, 1993, p. 119.
2. Braunwald E, Grossman W: Systemic arteriovenous fistulas. High output heart failure. Clinical aspects of heart failure. In Braunwald E (ed): *Heart Diseases: A Textbook of Cardiovascular Medicine*. Philadelphia, PA, W.B. Saunders, 1992, p. 459.
3. Dorney ER: Peripheral AV-fistula of fifty-seven years with refractory heart failure. *Am Heart J* 1957;54:776-780.
4. Lai JH, Yan HC, Kao SJ, et al: Intercostal arteriovenous fistula due to pleural biopsy. *Thorax* 1990;45:976-978.
5. Derdeyn CP, Middleton WD, Allen BT, et al: Acquired intercostal arteriovenous fistula: Color Doppler ultrasonographic diagnosis. *J Ultrasound Med* 1993;12:679-681.
6. McMinn RMH (ed): *Last's Anatomy, Regional and Applied*. Edinburgh, Churchill Livingstone, 1993, pp. 247 and 280.