ventricular hypertrophy, tamponade may occur without pulsus paradoxus. This patient did not demonstrate clinical clues indicating cardiac tamponade; however, there was some concern about early tamponade perhaps on the basis of a recent increase in the effusion volume, with a slight narrowing of the pulse pressure. Moreover, right heart catheterization demonstrated equalization of right and left heart diastolic pressures. Impending tamponade was avoided after pericardiocentesis and recurrence by pericardiectomy.

We conclude that this patient's restrictive lung impairment was on the basis of encroachment by the large effusion, as indicated by the pulmonary function data in Table 2. Pre- and post-pericardiocentesis studies indicated 44 percent improvement in vital capacity and 56 percent improvement in forced expiratory volume at one second, while diffusing capacity remained unchanged.

While pulmonary encroachment has been described previously, documented improvement in pulmonary function has not been reported. It remains to be seen whether pulmonary encroachment will be found to be important only when there is other underlying pulmonary impairment as in this case, or if it will be of clinical significance in patients with normal lungs.

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A patient with a saccular aneurysm of the thoracic aortic arch presented with severe right ventricular failure due to pulmonary artery compression. Contradictory data were derived from computed tomography, pulmonary isotope perfusion scan and cardiac catheterization. Transesophageal echocardiography revealed a saccular aneurysm which compressed the main pulmonary artery and gave access to a fistulous connection to the left pulmonary artery. Surgery confirmed these findings.

The incidence of aneurysmal involvement of the transverse thoracic aorta equals that of the ascending aorta. Life-threatening complications of aneurysm of the thoracic aorta include compression of adjacent vascular structures, rupture and fistula formation. Angiography and computed tomography are established diagnostic methods. We present a patient in whom transesophageal echocardiography correctly established a complicated saccular aneurysm of the aortic arch.

CASE REPORT
A 60-year-old patient developed hoarseness and a 10-kg increase in weight in two weeks and was admitted to a community hospital with intractable right heart failure. He had been treated for 15 years for systemic hypertension, but his medical history was otherwise uneventful. On admission, he was orthopneic and had upper right abdominal pain. There was edema of the legs, scrotum, ascites and a 5 cm enlarged, painful liver. Blood pressure and pulse rate were normal. The jugular venous pressure was extremely elevated. The left vocal cord and hemidiaphragm were paralyzed. A grade 3/6 systolic murmur existed, radiating to the carotid arteries and back.

On the electrocardiogram, signs of right ventricular overload and a right axis were present. Chest x-ray film showed right-sided pleural effusion and a mediastinal mass underneath the aortic arch suggestive of an aortic aneurysm or a tumor. No diagnostic information from the aortic arch could be obtained from precordial echocardiography.

The CT-scan of the thorax showed a main pulmonary artery aneurysm. A pulmonary isotope perfusion scan showed no apparent abnormality. Aortography revealed a saccular aneurysm with its origin proximal to the left subclavian artery compressing the pulmonary artery. Right heart catheterization showed pulmonary hypertension (60/20 mm Hg) and an elevated right atrial pressure (10 mm Hg).

The patient was transferred to our unit for surgery. As the above findings were conflicting, the surgeon demanded further investigation. Transesophageal echocardiography was scheduled. A 3.7 MHz phased-array transducer was used mounted at the tip of a gastroscope and interfaced with a Hewlett-Packard ultrasonograph (HP 77020 AC). A pulsed Doppler study was concurrently performed using the same transducer switched to a Toshiba ultrasonograph (SSH 80A). The patient fasted for 8 hours and antihypertensive drugs as premedication were given. As a local anesthetic, topical lidocaine was administered to the patient's hypopharynx. A large saccular aneurysm was visualized underneath the aortic arch. Neither dissection nor thrombus formation was present. Pulsed Doppler tracings showed bloodflow from the aneurysm into the left pulmonary artery indicating a fistula (Fig I). The main pulmonary artery was compressed by the aneurysm. Numerous atherosclerotic lesions were noted in the thoracic aorta. Planned selective left cardiac catheterization was no longer felt mandatory.

Within 24 hours after transesophageal echocardiography, the patient underwent surgery. Epicardial echocardiography after sternotomy confirmed the transesophageal findings. Deep hypothe-

Saccular Aneurysm of the Transverse Thoracic Aorta Detected by Transesophageal Echocardiography

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Saccular Aneurysm of Transverse Thoracic Aorta (Taams et al)
mia, cardioplegia and 64 minutes of circulatory arrest without occlusion of the aorta were performed. The ascending aorta was incised to the innominate artery. The orifice of the sacular aneurysm was situated in the inner curve of the arch and closed with a Hemashield patch and fibrin glue.

The postoperative course was uneventful. The right axis deviation seen on the electrocardiogram normalized within 24 hours. Transesophageal echocardiography performed two months postoperation showed the aneurysm sealed off by the patch. Its size had significantly decreased. There was thrombus formation, and bloodflow between aneurysm and left pulmonary artery was no longer detectable with pulsed Doppler. The patient is doing well one year postoperation.

**DISCUSSION**

Saccular types of aneurysms of the thoracic aorta are mostly situated at the inner curve of the aortic arch or descending thoracic aorta. Less often the ascending aorta is involved.\(^1\) The aneurysm, by definition, has an orifice with the aorta and is often filled with thrombus material. Atherosclerosis is the most frequent etiology of this form of aneurysm.\(^2\) Less commonly, the aneurysm results from a diverticulum of the ductus arteriosus. The latter type clearly shows a distinct pathologic entity fulfilling several diagnostic criteria. These include communication with the aorta at the site of the ductus, closure of the pulmonary orifice, and the presence of a portion of the lower end of the ligamentum arteriosum.\(^3\) Associated atherosclerosis occurs in one third.\(^4\) In our opinion, the patient herein reported falls in the latter category, as it fulfills the criteria of this pathologic entity.

Visualization of aortic aneurysms by means of precordial echocardiography has been disappointing because of the inability to obtain diagnostic images.\(^5\) On the other hand, an aortogram can easily miss a saccular thoracic aneurysm either due to contrast medium dilution in the aneurysm or due to the absence of opacification in the presence of thrombus.\(^6\) Computed tomography avoids the vascular catheterization needed for aortography, but is limited by low spatial resolution. Occlusion of major vessels or a fistulous connection will stay undetected with this technique.\(^7\)

Transesophageal echocardiography overcomes the limitations of precordial echocardiography, computed tomography and angiography.\(^8\) The investigation can be performed at the patient's bedside, is not time-consuming, and is inexpensive. The transducer is in close proximity to the thoracic aorta and allows high quality images. Moreover, the short distance between transducer and the area of interest yields the unique possibility for diagnostic pulsed Doppler studies. Surgery was carried out without delay on the basis of the crucial morphologic information obtained with transesophageal echocardiography.

This report illustrates one of the superior aspects of transesophageal echocardiography: the ability to image the thoracic aorta in comprehensive detail.

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