A small hole (5 to 7 mm in diameter) was made in the body of the cylinder. This hole served as the only outlet for air leakage, and it closed with every mechanical inspiration. This caused the balloon to inflate (Fig. 1). The system was changed daily. A fresh, aseptic system was manually prepared near the patient. This required 5 minutes of hand work.

**Results.** The result was immediate. Expired volume rose from 7.5 L/min to 13 L/min. Ventilation was maintained on synchronized intermittent mandatory ventilation. Transcutaneous oxygen saturation rose from 93% to 96%. Blood pressure and heart rate remained unchanged. One day later, the patient was on spontaneous ventilation with inspiratory assistance of 25 cm H$_2$O. To verify the efficacy of our system, the balloon valve was removed for 15 minutes (Fig. 2). The system proved efficacious with whatever mode of mechanical ventilation was used.

Daily radiographs showed no residual pneumothorax. Respiratory function continued to ameliorate and the BPF sealed completely on the twenty-first day of application of the system, so the pleural tube was removed. Definitive weaning from mechanical support was never possible. The patient's condition deteriorated progressively, and he died on the 159th day of intensive care (88 days after the sealing of his BPF) of multiple organ failure.

**Discussion.** In a case of an inoperable BPF, all techniques of ventilation should be tried, as should a pleural drainage system. The technique described here seemed efficacious, but further trials are necessary for evaluation. The risk of tension pneumothorax is relatively low with the technique because any high pleural pressure is transmitted to the valve and opposes inflation of its balloon.

**REFERENCES**
1. Pierson DJ. Persistent bronchopleural air leak during mechanical ventilation. Respir Care 1982;27:408-16.

**ACQUIRED AORTOPULMONARY FISTULA IN PSEUDOANEURYSM OF THE AORTA SIX YEARS AFTER A BENTALL OPERATION**

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Pseudoaneurysm of the ascending aorta is a rare and serious complication after composite graft surgery for combined disorder of the aortic valve and ascending aorta. Rupture of these pseudoaneurysms usually results in death caused by tamponade. In this article, we present an exceptional case of pseudoaneurysm of the ascending aorta complicated by fistulization into the pulmonary artery trunk.

A 72-year-old woman was admitted to our hospital with dyspnea for 3 weeks. Six years before she had undergone a Bentall-DeBono procedure involving a composite conduit with a mechanical valvular prosthesis. At this time, there was no clinical evidence of Marfan syndrome, but aortic parietal biopsy showed signs of cystic medial necrosis. The symptoms began suddenly with constrictive anterior chest pain associated with hemoptysis and progressive congestive heart failure. On admission the patient had marked dyspnea with orthopnea. Physical findings included cyanosis and a rough grade 4/6 continuous murmur maximal at the second right intercostal space. Blood pressure was 100/60 mm Hg on both arms. Electrocardiogram showed sinus rhythm with normal conduction.

Two-dimensional echocardiography showed good left ventricular contraction and a large eccentric pseudoaneurysm of the ascending aorta arising from a dehiscence at the distal aortic anastomosis. Doppler echocardiography showed an important systolic and diastolic flow from the ascending aorta into the truncus pulmonalis.

At aortography, the aortic root appeared markedly dilated and contrast medium passed from the ascending aorta to the proximal part of the pulmonary artery (Fig. 1). Four hours after admission the patient underwent thoracotomy. The ascending aorta was dilated to a maximum diameter of 10 cm just above the coronary arteries down to the origin of the brachiocephalic artery. Total dehiscence at the distal aortic anastomosis was found. A
communication of 1.5 cm in diameter between the aneurysm and right pulmonary artery was seen. The opening in the pulmonary wall was closed with a pericardial patch. The aorta was reconstructed with a Dacron graft. The patient subsequently had an uncomplicated recovery but died after 14 days of a sudden cardiac arrest.

The composite graft method for replacement of the aortic valve and ascending aorta has become a widely accepted procedure, but it carries a potential risk of various late complications. Among these is the development of pseudoaneurysm of the ascending aorta as a result of dehiscence of the suture line at the aortic anulus or distal graft anastomosis. Usually, with the rupture of the aortic wall, the effusion of blood takes place in the pericardial space, and to our knowledge fistulization between the pseudoaneurysm and the pulmonary artery has never been described.

This observation supports the concept that early detection and aggressive treatment of a diseased aorta may improve long-term survival after the Bentall operation. It is particularly true when weakening of the aortic wall is likely to be more rapid, that is, when gross medial disease is present. Furthermore, the importance of full-thickness suturing at the distal anastomosis of the aortic Dacron graft in case of annuloaortic ectasia should be noted.

REFERENCES