Cardiac Tamponade Secondary to Rupture of a Distal Aortic Arch Aneurysm

We report the rare rupture of a distal aortic arch aneurysm protruding into the pericardial cavity. A 70-year-old woman who suddenly lost consciousness and was transferred to our hospital by ambulance in profound shock was found in emergency computed tomography and echocardiography to have a dilated distal aortic arch and massive pericardial effusion. Suspecting that a distal aortic arch aneurysm had ruptured, causing cardiac tamponade, we undertook an operation. We found a defect in the aneurysmal wall leading to the pericardium near the main pulmonary artery that was plugged temporarily with an atheromatous mass. We conducted total arch replacement successfully under selective cerebral perfusion and moderate hypothermia. (Jpn J Thorac Cardiovasc Surg 2002; 50: 227–230)

Key words: ruptured aortic aneurysm, aortic arch, total arch replacement, cardiac tamponade

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Hemorrhagic cardiac tamponade due to rupture of a distal aortic arch aneurysm is rare. We report the successful surgical treatment of such a case in which the patient was in profound shock.

Case

A 70-year-old woman who suddenly lost consciousness on the street and was transferred to our hospital by ambulance was found on arrival to be stuporous, with systolic blood pressure of 60 mmHg and a heart rate of 130 beats/min. She was intubated immediately and dopamine infusion of 5 μg/kg/min was started. Chest radiography showed cardiomegaly and dilation of the aortic arch (Fig. 1). Suspecting a thoracic aortic aneurysm had ruptured into the mediastinum, we conducted emergency computed tomography (CT) and echocardiography, with CT confirming an aneurysm of the distal aortic arch and pericardial effusion (Fig. 2). Echocardiography showed a massive pericardial effusion and an aortic aneurysm protruding into the pericardial cavity to the left of the main pulmonary artery (Fig. 3). During examinations, hemodynamic stability was maintained by dopamine infusion of 10 μg/kg/min, then the patient was taken immediately to the operating theater.

The heart and aortic arch, including the distal portion, were approached through a median sternotomy. When the pericardium was opened, a thick layer of freshly clotted blood covered the heart, but no active bleeding was seen. A defect in the pericardium was identified contiguous with the aneurysmal wall. This

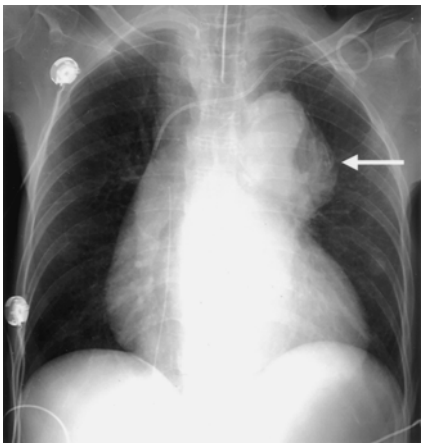

Fig. 1. Chest radiography on admission showing cardiomegaly and dilation of the aortic arch (arrow).

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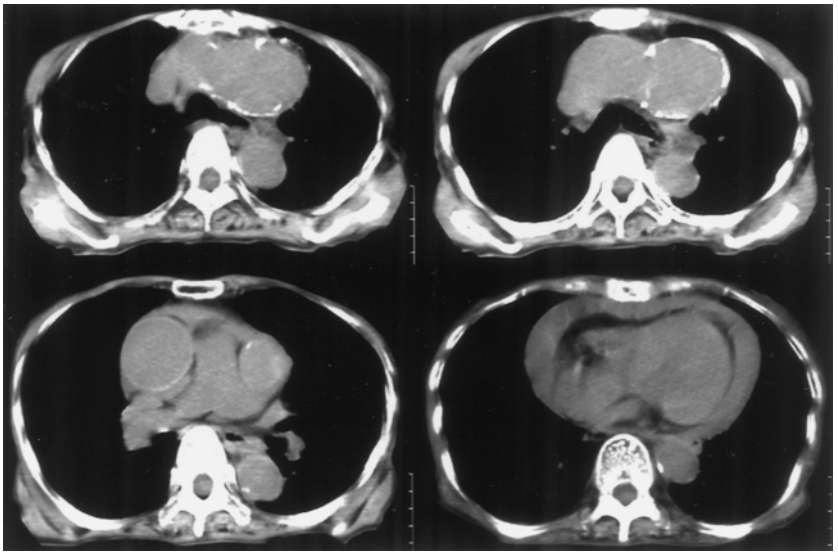
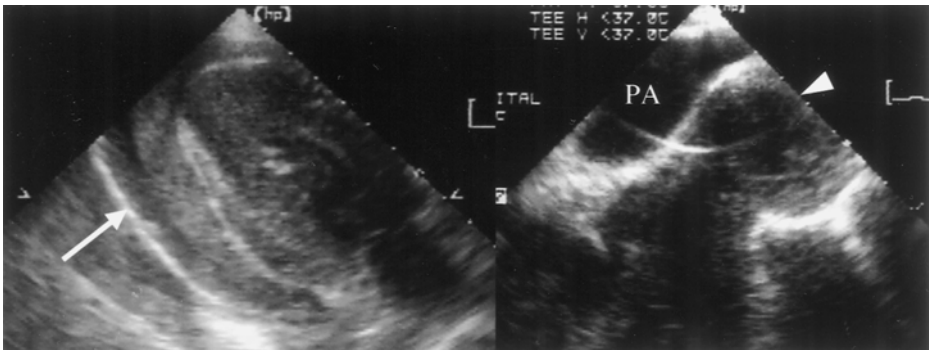


Fig. 2. CT showing a distal aortic arch aneurysm and massive pericardial effusion.



A | B

Fig. 3. Echocardiography showing (A) pericardial effusion and (B) an aortic aneurysm protruding into the pericardial cavity to the left of the pulmonary artery.
PA, Pulmonary artery.

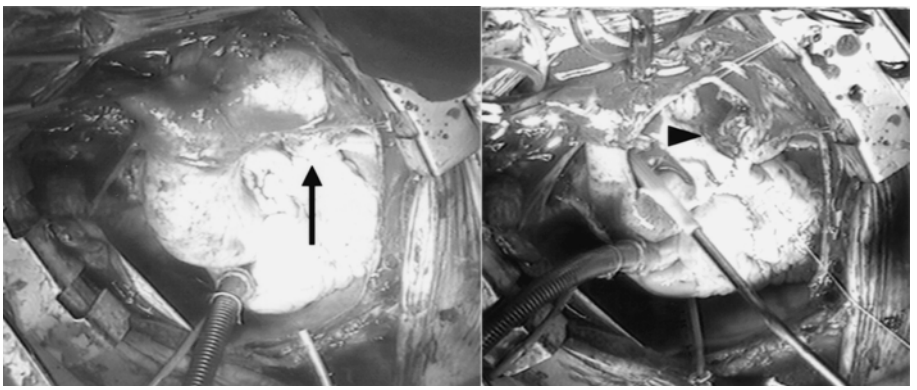
defect was plugged with an atheromatous mass from within the aneurysm (Fig. 4), which provided temporary hemostasis. Cardiopulmonary bypass (CPB) was established with femoral arterial and bicaval venous cannulation. The body temperature was decreased to 30°C, systemic perfusion was temporarily arrested, and selective cerebral perfusion (SCP) to the brachiocephalic artery and the left common carotid artery was initiated. Cardioplegia was infused retrograde from the coronary sinus. We elected to conduct total arch replacement because the arch was severely atherosclerotic. The aortic arch was incised longitudinally, and the plugged defect in the aneurysmal wall was identified. The distal end of a 28-mm Dacron graft with 4 branches was sutured to the aorta distal to the aneurysm, and the third branch was anastomosed to the left subclavian artery. The arch graft was cross-clamped proximal to the third branch, and perfusion through a cannula inserted into the side branch of the graft was resumed. The innominate artery and left common carotid artery were reconstructed by suturing them to their respective branches of the graft. Systemic perfusion through these branches was reinstituted, after which the proximal end of the graft was anastomosed to the ascending aorta. Weaning from CPB was uneventful. CPB time was 113 minutes, cardiac arrest time 55 minutes, SCP time 41 minutes, and open distal anastmosis time 31 minutes.

The postoperative course was complicated by acute renal failure necessitating temporary hemodialysis and respiratory failure necessitating tracheostomy and mechanical ventilation, but no neurological complica-

Table I. *Cases of distal aortic arch aneurysm rupturing into the pericardial cavity*

Case[*1]	*Author*	*Year*	*Age*	*Shock*	*Preoperative drainage*	*Median sternotomy*	*Arch replacement*
1	Inaoka M	1988	61	No	Yes	Plus left thoracotomy	Distal
2	Gohra H	1996	59	Yes	No	Plus left thoracotomy	Distal
3	Koshino T	1997	75	No	No		Total
4	Ohtani N	1997	63	Yes	Yes		Total
5	Yoshida H	1998	71	Yes	No		Total
6	Yasuda H	2000	80	Yes	No		Total
Present case[*2]	Fukui T	2000	70	Yes	No		Total

*[1]All patients survived surgery.
*[2]Our case was the only woman among these patients.



A | B

Fig. 4. Intraoperative findings.
A: The arrow indicates where the distal aortic arch aneurysm protruded into the pericardial space.
B: The arrowhead identifies the atheromatous mass plugging the aneurysm.

tions occurred. The patient remains alive and well 6 months after surgery.

Discussion

Mortality in ruptured thoracic aortic aneurysm is high — 97% in the 1989 Stockholm study.[1] Aneurysm of the distal segment of the aortic arch may rupture into the thoracic cavity, left lung, pulmonary veins, esophagus, or pericardial sac, but rupture to the pericardial cavity is quite rare — only 2.7% of all ruptures of thoracic aortic aneurysms.[2]

The Japanese literature contains 6 case reports of successful treatment of distal aortic arch aneurysms rupturing into the pericardial cavity[3–8] (Table I). Four were in profound shock, as was our patient upon admission. Her hemodynamics remained relatively stable with catecolamine infusion during diagnostic examinations. In this patient, the rupture was temporarily plugged intraoperatively with an atheromatous mass from within the aneurysm, even though the aneurysm had leaked into the pericardial cavity, which stabilized the patient and gave us sufficient time to prepare for CPB in an orderly way.

In 2 reports, patients underwent subxyphoid pericardiocentesis preoperatively. We chose not to relieve intracardial pressure because we were concerned that the aneurysm might leak again if normal blood pressure was restored. The ruptured aortic aneurysm is a true surgical emergency and surgery should be started as soon as possible. We believe that the pericardium should not be opened until after CPB has been implemented.

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