Perforation of the Descending Aorta by the Tip of an Intra-Aortic Balloon Pump Catheter

Ryo Shiraishi, MD*; Yukio Okazaki, MD; Kozo Naito, MD; Tsuyoshi Itoh, MD

Perforation of the proximal descending aorta occurred in a patient on intra-aortic balloon pump (IABP) support after emergency coronary intervention for acute myocardial infarction. The IABP catheter was inserted under fluoroscopic guidance into the right femoral artery without difficulty, but after 8 h on IABP support the patient went into shock with a left hemothorax. Emergency surgery was performed with cardiopulmonary bypass and a perforation of the proximal descending aorta with active bleeding was found and successfully repaired. A distorted descending aorta in which the IABP catheter was kinked, as in the aortic arch, was discovered during surgery and confirmed postoperatively with 3-dimensional computed tomography scans, particularly in the lateral view. Not only the antero-posterior but also the lateral fluoroscopic view is recommended to prevent aortic perforation by a kinked IABP catheter. (Circ J 2002; 66: 423–424)

Key Words: Aorta; Intra-aortic balloon pump; Perforation

Although the intra-aortic balloon pump (IABP) is widely used as a simple, safe circulatory support device, vascular complications have been reported from the clinical experience or have been detected at necropsy.1–4 We report a case of IABP support that was complicated by perforation of the thoracic aorta, a condition that has been rarely reported.5,6

Case Report

A 74-year-old man with acute myocardial infarction underwent emergency coronary angiography, which detected severe coronary stenosis with delayed flow at the posterolateral branch of the left circumflex artery. Percutaneous transluminal coronary angioplasty did not sufficiently improve the obstructed coronary flow with residual stenosis, and so an IABP catheter (9F, 32 cc, Aisin Co Ltd, Kariya, Japan) was inserted percutaneously into the right femoral artery under fluoroscopic guidance without difficulty. The tip of the catheter was appropriately positioned at the proximal descending aorta and the patient became free of chest pain on IABP support, with satisfactory hemodynamic measurements after the coronary intervention. However, after 8 h on support his hemodynamic status suddenly worsened and his systolic blood pressure decreased to less than 60 mmHg. Emergency radiography of his chest revealed a left hemothorax and reconfirmed that the tip of the IABP catheter was in the correct position. There was no evidence of left ventricular free wall rupture, ventricular septal perforation, papillary muscle rupture, or cardiac tamponade on echocardiography, but there was slight pericardial effusion. Emergency surgery was required to stop the bleeding of unknown origin. Following general anesthesia, it was difficult to place the patient in the right lateral position because of his poor hemodynamic status, so an emergency median sternotomy incision was made. No bleeding from the left ventricle or ascending aorta was seen. After systemic heparinization, cardiopulmonary bypass (CPB) was established with an arterial cannula inserted into the ascending aorta and a 2-stage venous cannula was inserted into the right atrium. The left chest was opened through the mediastinal pleura, and active bleeding from the proximal descending aorta was apparent. An anterolateral thoracotomy was then performed to obtain a better view. The distorted descending aorta was observed through the thoracotomy, and an aortic perforation, 3 mm in diameter, was evident at the posterolateral wall of the proximal descending aorta, 8 cm distal to the origin of the left subclavian artery (Fig 1A). The aortic wall in the vicinity of the perforation was not fragile and was successfully repaired using a 4-0 polypropylene mattress suture with felt pledgets (Fig 1B). The patient was weaned off CPB with a low dose of dobutamine. The distorted descending aorta in which the IABP catheter was kinked, as in the aortic arch, was postoperatively confirmed with 3-dimensional (3-D) computed tomography (CT) scans, particularly in the lateral view (Fig 2A,B). The patient was discharged in a satisfactory general condition on postoperative day 14.

Discussion

Perforation of the aorta by the tip of the IABP catheter is rare, except when the tip is located in the aortic arch.5,6 In the present case, under fluoroscopic guidance, insertion of the IABP catheter was straightforward and it was positioned correctly. During IABP support the patient was supine and the correctly positioned catheter was confirmed on the later anteroposterior chest radiograph. Therefore, there was no likelihood of aortic injury associated with dislocation of the IABP catheter, as reported by O’Rourke and Shepherd.6 There was no other reason for this serious complication than the distorted descending aorta, which was discovered during the emergency surgery and confirmed by postoperative 3-D
CT scans. In this situation, the tip of IABP catheter was kinked, as can occur in the aortic arch.

It is usual to only take an anteroposterior chest radiograph to confirm the location of the IABP catheter, but it is not possible to detect the distorted descending aorta with its kinked IABP catheter from this view. The lateral fluoroscopic view would assist in locating this anomaly because the curving of the aortic arch does not usually terminate at the origin of the left subclavian artery, but continues to the proximal descending aorta at the level of the 4th thoracic vertebra. Even in patients without a distorted descending aorta, potentially the IABP catheter can be kinked anteroposteriorly in the proximal descending aorta despite the anteroposterior chest radiograph showing that the IABP catheter is appropriately positioned.

Other factors related to perforation by the tip of an IABP catheter are the fragility of the aortic wall and the stiffness of the tip. In the present case, the aortic wall was not fragile and direct closure was performed successfully; however, a histopathological study of the aortic wall was not performed because specimens could not be taken. Although the relatively hard tip with a pressure sensor of the type of IABP catheter used in this case may be related to the perforation, a case of perforation caused by another type of IABP catheter has been reported.

In conclusion, perforation of the proximal descending aorta during IABP support occurred in a patient with an anteroposteriorly distorted descending aorta. Kinking of the IABP catheter could not be detected on either fluoroscopic or radiographic antero-posterior views and it is recommended that additional lateral fluoroscopic views be taken to confirm the position of the IABP catheter.

References