

## Case Report

# Intraoperative Descending Aorta Dissection During Cardiac Surgery

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## Abstract

Intraoperative acute descending aortic dissection is a rare and potentially fatal complication of open cardiac surgery. We report the case of a 62-year-old female who developed this condition during surgery including mitral valvuloplasty, tricuspid valvuloplasty and the MAZE procedure. After induction of general anesthesia, baseline Transesophageal Echocardiography (TEE) examination revealed a normal ascending and descending aorta. At the time of weaning off cardiopulmonary bypass, we decided to use intra-aortic balloon pumping (IABP) because of insufficient left ventricular output. TEE examination of the descending aorta at this time revealed descending aortic dissection, which extended from just beyond the left subclavian artery to above the celiac artery (DeBakey IIIb type). We decided to adopt a conservative approach because the dissection did not compromise circulation in the branch arteries; we also avoided using IABP. TEE is commonly used intraoperatively and is considered the modality of choice to diagnose this complication and direct the surgeon to the extent of the dissection. TEE is also useful for determining the therapeutic strategy for acute descending aortic dissection. This case highlights the importance of maintaining a high level of suspicion of intraoperative descending aortic dissection and its prompt diagnosis using TEE.

## Keywords

- Open cardiac surgery;
- Descending aorta: Intraoperative aortic dissection;
- Transesophageal echocardiography

## ABBREVIATIONS

TEE: Transesophageal Echocardiography; IABP: Intra-Aortic Balloon Pumping; AF: Atrial Fibrillation; MR: Mitral Valve Regurgitation; TR: Tricuspid Valve Regurgitation; CHF: Congestive Heart Failure; CPB: Cardiopulmonary Bypass

## INTRODUCTION

Intraoperative acute aortic dissection is a rare and potentially fatal complication of open cardiac surgery, the reported incidence of which is approximately 0.16% to 0.35% [1]. Its early diagnosis and treatment are essential to achieve a favorable outcome. Transesophageal Echocardiography (TEE) is routinely used intraoperatively during open cardiac surgery and is the only useful monitor for detection and diagnosis of intraoperative aortic dissection. We report an unusual case of intraoperative descending aortic dissection, and its detection by TEE during extracorporeal circulation.

## CASE PRESENTATION

A 62-year-old female presented with Atrial Fibrillation (AF), severe mitral valve regurgitation (MR), pulmonary hypertension (pulmonary systolic arterial pressure of 50 mmHg estimated by transthoracic echocardiography) and severe Tricuspid Valve

Regurgitation (TR). She had been admitted in the past month for treatment of Congestive Heart Failure (CHF). She was scheduled for surgical treatment after control of the CHF by medical therapy.

After applying standard monitors and preoxygenation, general anesthesia was induced with midazolam (5 mg), fentanyl (100 µg) and rocuronium (40 mg). The patient's trachea was intubated in the first attempt. Anesthesia was maintained with 1.2% sevoflurane, fentanyl and rocuronium. Monitoring was facilitated by a left radial artery cannula, a right internal jugular central venous catheter, and TEE. Baseline TEE examination revealed severe MR and TR, while the ascending and descending aorta were normal.

The patient remained hemodynamically stable during tracheal intubation, midline sternotomy, heart exposure, and the insertion of bicaval and ascending aortic cannulae. During cardiopulmonary bypass (CPB), the heart was arrested with antegrade and retrograde cold cardioplegia, which was repeated every 15 min during the aortic cross-clamp period. Mitral valvuloplasty, tricuspid valvuloplasty and the MAZE procedure for treatment of AF were performed uneventfully. At the end of the procedures, we started to wean the patient off CPB with inotropic support of 5 µg/kg/min of dobutamine and pacing at the rate of 80 beats/min after closing the atrium. However, because

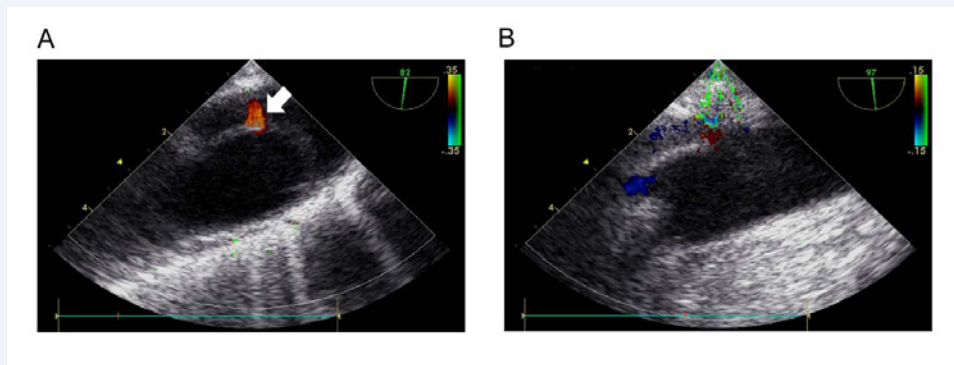
of insufficient left ventricular output, we decided to discontinue CPB with assistance from intra-aortic balloon pumping (IABP). We checked the descending aorta using TEE, which revealed descending aortic dissection extending from just beyond the left subclavian artery to above the celiac artery (DeBakey IIIb type) (Figure 1). However, rather than surgical treatment, we opted for conservative therapy because the dissection did not compromise circulation in the branch arteries. We also abandoned the plan for IABP. The patient was weaned off CPB with additional inotropic support consisting of dobutamine, norepinephrine and epinephrine. After surgery, she was admitted to the intensive care unit. The total CPB time was 5 h 33 min. General anesthesia lasted for 11 h and 13 min. The total amount of fluid given during the operation was 9480 ml, including red blood cells, fresh-frozen plasma and platelets. Total blood loss was 1800 ml and urine output was 4750 ml.

The patient was extubated and performed enhanced computed tomography (Figure 2) on the 7th postoperative

day. The descending aortic dissection was thrombosed and not exacerbated compared with the intraoperative period. She remained in the intensive care unit for 10 days, and was discharged from the hospital on the 21th postoperative day.

## DISCUSSION

Iatrogenic intraoperative aortic dissection associated with cardiac surgery is a rare complication, with an incidence of 0.16% to 0.24% and a high mortality rate, ranging from 24% to 43% [1-4]. Still et al. [1] reported that delaying the diagnosis worsens the prognosis from 20% to 50%. Morphological studies have shown that the predisposing factors increasing the risk of iatrogenic intraoperative aortic dissection include atherosclerotic aorta, longstanding hypertension, dilated thin-walled aorta, congenital connective tissue disorders, and cystic medial necrosis [1,5,6]. These features represent the morphologic expression of an interaction within the aortic wall of traumatizing and reparative processes due to hemodynamic impact. However, nearly half



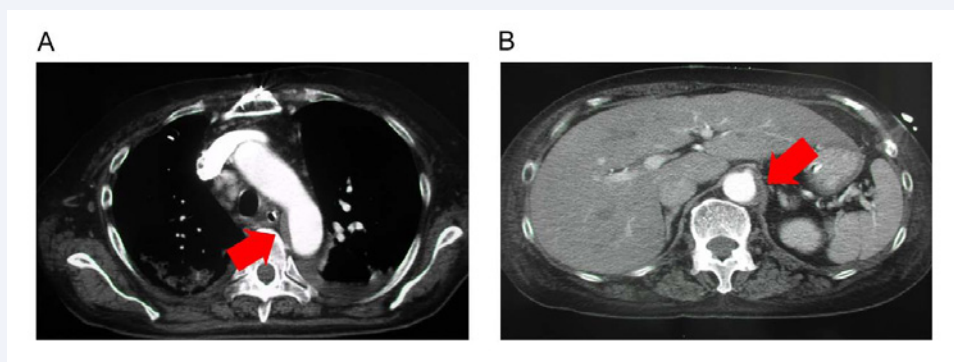
**Figure 1** Image of the descending aorta dissection by intraoperative transesophageal echocardiography

a) A long axis view at the level of the distal arch.

The color flow Doppler shows outward (white arrow) blood flow from the true lumen to the false lumen.

b) A long axis view at the level of the celiac artery.

Distal ischemia due to obstruction of the celiac and superior mesenteric arteries was not apparent. Aortic dissection did not reach the level of the celiac artery.



**Figure 2** Image of the descending aorta dissection by intraoperative transesophageal echocardiography enhanced computed tomography (Figure 2) on the 5th postoperative day

a) An axial view at the level of the aortic arch.

b) An axial view at the level of the celiac artery.

The aortic dissection (white arrow) from the aortic arch to celiac artery was thrombosed and not exacerbated compared with the intraoperative period.

of the patients who developed iatrogenic intraoperative aortic dissection were observed to have clinically normal aortas [1,7]. Asian race was also shown to be a predisposing factor [8].

Iatrogenic intraoperative aortic dissection can arise from the sites of aortic or antegrade cardioplegic cannulation, cross-clamp application, aortotomy, or a proximal venous anastomosis site [2,9,10]. Most cases of intraoperative aortic dissection occurred in the ascending aorta and were due to the above-mentioned causes. Descending aorta dissection, as seen in our patient, is very rare. Varghese et al. [11] postulated that a jet of blood from the aortic cannula could cause an intimal tear in the descending aorta.

TEE is commonly used during the intraoperative period and is considered the modality of choice not only for diagnosing this complication, but also for directing the surgeon as to the extent of the dissection. TEE findings consistent with an intimal flap in the proximal ascending aorta or descending aorta are considered diagnostic [12-16]. TEE has a good sensitivity of 98% and specificity of 95% in detecting aortic dissection [17]. The routine use of TEE for cardiac surgery has been found to reduce the mortality rate of iatrogenic aortic dissection from 75% to 17% [3]. Furthermore, Orihashi et al. reported that TEE can be used to evaluate the abdominal aortic branches, such as the celiac and superior mesenteric arteries [18]. Creation of distal ischemia by obstruction of the abdominal branch arteries is an important part of the treatment strategy for acute descending aorta dissection. TEE is also useful for determining the appropriate therapeutic strategy for acute descending aortic dissection.

Although early diagnosis is very important, it is difficult to detect this complication by visual observation of aortal discoloration. In a previous report, discoloration was observed on rupture of the descending aorta. Hence, it is difficult to suspect the occurrence of this complication purely on the basis of clinical features. We fortunately discovered occurrence of this complication in our patient when we performed TEE before insertion of the IABP, which contributed to the favorable outcome.

The present patient had no disease in the descending aorta, as seen on baseline TEE. Although a definitive diagnosis could not be established in our patient without pathological investigation, the possibility of cystic media necrosis increases with advanced age. CPB jet flow is also a potential cause of our patient's aortic dissection. In the present case, TEE revealed that aortic dissection was confined to the descending aorta from below the left subclavian artery to above the celiac artery, and did not extend to the abdominal branch arteries. Surgical repair becomes technically more challenging and risky when the dissection is in the descending aorta. We decided on a conservative therapeutic approach, considering the limited dissection in the descending aorta and exacerbation of heart failure. This therapy, as in a previous report [19], resulted in a favorable outcome.

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