

Case Report

Successful Surgical Repair of Intraoperative Ascending Aortic Dissection Associated With Cross-Clamp Injury during Aortic-Coronary Artery Bypass: A Case Report

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Abstract: Background: Early or late dissection of ascending aorta is a rare complication of aorto-coronary bypass surgery. Surgical procedure to be performed before any complication develops saves lives. Aortic dissection due to cross-clamp injury during coronary bypass surgery was successfully repaired. **Case summary:** A 62-year-old woman was performed classically coronary artery bypass surgery by using 1 safen vein graft and internal mammarian artery anastomosis. Immediately after the remove of cross-clamping, aortic dissection was showed on ascending aorta. Aortic cannula removed and axillary cannulation was made with new arterial cannula, right away. Cardiopulmonary bypass was resumed and the ascending aortic replacement was performed with dacron graft using open technique. The graft of safen vein was implanted into the frontal wall of the aortic prosthesis. Cardiopulmonary bypass terminated after hemodynamic stability is achieved. He was discharged on postoperative 10th day. The patient is followed without any problems. **Discussion:** Although per-operative aortic dissection is rare, the patient's aorta should be monitored until the procedure is complete in each cardiac operation. In case of per-operative dissection due to fatal complications, surgical repair should be performed immediately.

Keywords: Aortic dissection • Cross clamping injury • Aortic graft replacement • Emergency repair • Case report.

INTRODUCTION

Coronary artery bypass graft (CABG) surgery has gained wide acceptance in the treatment of symptomatic ischemic heart disease. Myocardial infarction, pericardial tamponade, pericarditis, and postoperative infection are some of the more frequently encountered complications. However, dissection of the ascending aorta at the time of coronary artery bypass grafting is an uncommon and potentially fatal complication of cardiac surgical procedures (Ohashi, H. *et al.*, 1993; Fuzellier, J. F. *et al.*, 2005).

Patients predisposed to aortic injury are those with the following conditions: severe atherosclerotic changes in the aortic wall, a thin or dilated ascending aorta, cross-clamping injury, cystic medial necrosis, or collagen vascular disease (Fuzellier, J. F. *et al.*, 2005; Ruchat, P. *et al.*, 1998). By recognizing the population at risk and then using a gentle operative technique in such patients, the surgeon can usually avoid iatrogenic injury to the aorta. Aortic cross-clamping may lead to

iatrogenic tissue damage resulting in immediate or later aortic dissection or rupture. We report a case of acute dissection of the ascending aorta after cross-clamping removed during coronary artery bypass grafting surgery and successful repair.

Case Report

A 62-year-old woman was admitted to our clinic for CABG surgery. There was a long history of hypertension. There was no sign of cardiac failure. The chest x-ray film was normal. Left ventricular end-diastolic pressure (10 mmHg) and ejection fraction (55%) were within normal limits in echocardiography, and the diameter of the supra-avalvular ascending aorta was normal. There were occlusions that would require surgical intervention in left anterior descending and circumflex arteries. Using classical method, cardiopulmonary bypass (CPB) was established with aorta-caval cannulation. After sternotomy, pericard was opened. The aorta was soft, pliable, and of normal size. After decreasing to 32°C, distal of ascending aorta was

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placed cross clamp. Coronary bypass surgery was performed with grafts of the left internal mammary artery to the left anterior descending coronary artery, and reversed saphenous vein bypass grafts to the circumflex coronary artery. We maintained the patient's systolic blood pressure at 40-50 mmHg during coronary bypass distal anastomoses. After distal anastomoses are complete, aortic cross clamp removed. After the remove of cross-clamping, damaged in the ascending aorta was seen. The ascending aorta expanded and its color changed. Cross-clamp-related injury and aortic dissection were considered. Aortic cannula removed and axillary cannulation established with new arterial cannula, right away. CPB was re-established between the right axillary artery and the right atrium. CPB started and the patient was cooled down to 28°C. Innominate artery was clamped, so that cerebral perfusion was continued. Using open technique, the dissected ascending aorta was transected. The dissection was found to have originated at the cross clamping site. The intimal flap extending from the aortic root site to the anterior arcus aorta. The intimal flap in the dissection part was fine, the aortic intima was somewhat irregular, minimal calcified, and intimal atherosclerotic plaques were present. Primary repair or patchplasty is not appropriate because the intimal damage extends laterally to the ascending aorta. The ascending aorta was excised from the top and bottom of the dissection site. A prosthetic graft (28-dacron graft) was replaced to the ascending aorta using Teflon felt strips (Fig. 1 and 2). Anastomoses strengthened with fibrin glue. The innominate artery clamp was removed and total circulation was resumed. The proximal anastomosis was made to the ascending prosthetic graft with 4/0 prolene continuous sutures using a side clamping (Fig. 3). The patient was re-warmed. Weaning from the CPB was uneventful using a minimal dopamine infusion. Patient was stable without any problems in intensive care unit. The patient's postoperative course was remarkably uneventful. Histologic examination of the resected aorta revealed chronic inflammation, atherosclerosis and thrombus. The patient was discharged on the 10th postoperative day. The patient has been followed for one year without any problems.

Figure Legends



Figure 1: Intraoperative photograph shows an aortic dissection that intimal flap in ascending aorta.

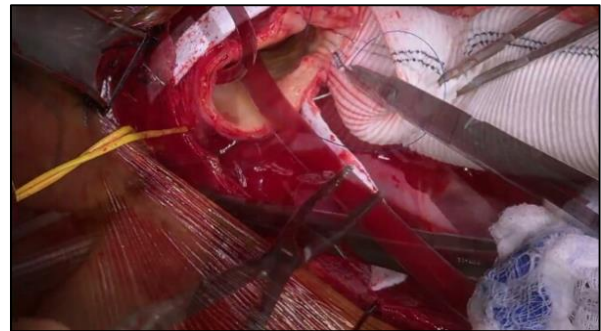


Figure 2: Distal anastomosis of prosthetic tube graft.



Figure 3: Safen vein is anastomosed proximally to the ascending prosthetic graft.

DISCUSSION

Aortic dissection after cardiac surgery is a rare but potentially fatal complication among surgical patients. If the dissection is immediately diagnosed and treated; the life threatening of patients may be reduced.

Aortic dissection may occur spontaneously in diseases such as hypertension and medial necrosis, but may occur at any time after iatrogenic of cardiac surgeries. The medical literature shows many cases of aortic dissection occurring and treated at the time of operation and postoperative term (Eitz, T. *et al.*, 2003; Kpodonu, J. *et al.*, 2008) after cardiac surgery. Whether intra-operative or post-operative, the goal should be to reduce the morbidity and mortality by promptly diagnosing.

Intra-and postoperative acute aortic dissections usually originate at the site of an intimal tear that has been caused by aortic cannulation, insertion of a cardioplegia needle, application of an aortic cross-clamp or side biting clamp, or at the site of a proximal anastomosis (Kpodonu, J. *et al.*, 2008; Tabry, I. F., & Costantini, E. M. 2009). Invasive procedures, such as those performed on ascending aorta, may be caused disruption and damage of the aortic intima (Nakayama, Y. *et al.*, 2004; Yaku, H. *et al.*, 1996) or acute dissection of the ascending aorta. The acute dissection of the ascending aorta during coronary operation was determined and reported by many authors (Ohashi, H. *et al.*, 1993; Fuzellier, J. F. *et al.*, 2005; Yaku, H. *et al.*, 1996; Cebi, N. *et al.*, 2008). In our patient, acute

dissection of the ascending aorta occurred per-operatively after cross clamping removed. We think that it is reasonable to assume that the dissection of the ascending aorta occurred in a weakened part of the intima of the aortic wall, associated with the cross clamping injury. It has been reported that uncontrolled hypertension, cystic media-necrosis and/or atherosclerosis is a major risk factor in the causation of aortic dissection during open heart operations.¹⁻³ As explained in the Laplace's law, increasing intraluminal tension and raised blood pressure may be effect to the aorta. Thus, both atherosclerosis and hypertension are known to predispose to the development of aortic dissection (Nishizaki, K. *et al.*, 2006), and the importance of pre-existing disease of the aortic wall must not be overlooked, but it is surgical trauma that acts as the trigger mechanisms, whether through pursing sutures, cannulation or clamping. If the presence of atherosclerotic and calcify plaques is detected in the ascending aorta by hand examination, it can help the surgeon to choose more carefully aortic cannula, safen venous anastomosis and cross clamping sites. In our case, there was history of hypertension; but we could not find a significant plaque formation in the aorta by manual examination at the time of the cannulation. Accordingly, prevention of early postoperative dissection in CABG should be directed toward averting trauma to the ascending aorta: avoiding aortic clamping as beating heart, maintain a low systemic blood pressure by pharmacologic means during the performance of proximal anastomoses (systolic blood pressure at less than 80 mmHg during proximal anastomoses), avoided using a partial-occluding clamp as possible. However, replacement of the ascending aorta with a prosthetic graft can be made in the presence of a dilated, calcify, or diffusely atheromatous ascending aorta.

The aortic injury can be repaired by local replacement of the dissected aortic segment with a patch graft or by replacement of the entire ascending aorta with a tube graft, followed by re-implantation of the veins in both cases as our case. We routinely use GRF glue to reconstruct the layers of the proximal and distal ends of the aorta. We find that graft anastomosis is easier and more secure using gelatin-resorcinol-formaldehyde *glue* and Teflon felt strips.

CONCLUSION

There is a need for operative evaluation and aortic observation until the last moment to diagnosis of intra-operative aortic dissection. Once diagnosed, urgent repair is necessary to prevent the enlargement of the dissection and the emergence of complications. The shape of the repair varies according to the location and width of intimal tear. In patients with localized dissection, primer repair is the shortest possible treatment option. Patchplasty or graft interposition should be performed quickly in patients with extensive intimate damage. When a dissection occurs, rapid

diagnosis and appropriate surgical treatment are required to improve patient outcome.

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Authors' contributions

Bilgehan Erkut conceived and planned this work and wrote the manuscript with support from Azman Ates. Both authors collected and analyzed the data. Bilgehan Erkut helped supervise the findings of this work and assisted with data collection. All authors read and approved the final manuscript.

Conflict of Interest

We declare that there is no conflict of interest in our article

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No funding was received in this study.

Ethical Approval

This study was ethically approved by local ethics committee of Regional Training and Research Hospital Ethics Committee (date: March 01, 2018).

Consent

Written consent was provided by participants or their relatives.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

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