

## Delayed Ascending Aortic Dissection following Off-Pump Coronary Bypass Surgery in Preexisting Stanford B Dissection

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### ABSTRACT

Delayed ascending aortic dissection following coronary artery bypass surgery is a rare but lethal complication. We present the case of a 54-year-old man with a delayed acute Stanford A aortic dissection following an off-pump coronary artery bypass surgery in preexisting chronic type B disease. Such a case of an iatrogenic acute aortic dissection poses a significant challenge and dilemma in choosing the best technique for coronary revascularization in this group of patients. The pathophysiology and technical options are discussed.

### INTRODUCTION

The incidence of acute aortic dissection following the use of cardiopulmonary bypass has been reported at 0.12% to 0.16%, with a mortality of >50% [Pappas 1998]. Despite the advances in coronary artery bypass techniques, such as off-pump surgery, increasing numbers of cases of iatrogenic aortic dissections have been reported and have been diagnosed either intraoperatively or after a delay of several weeks or months [Chavanon 2001]. We share our experience of a case of lethal acute Stanford A aortic dissection following an off-pump coronary artery bypass (OPCAB) procedure, which was thought to be the best technique for a patient with multiple comorbidities and a preexisting chronic Stanford B dissection. To the best of our knowledge, this case of a delayed acute ascending aortic dissection following OPCAB in a patient with preexisting chronic type B disease is the first to be reported in the literature. Its pathophysiology and the dilemma of choosing the best technique for coronary artery surgery are discussed.

### CASE REPORT

A 54-year-old hypertensive man with a preexisting chronic Stanford B aortic dissection presented with unstable angina.

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A coronary angiogram and an echocardiogram revealed severe triple-vessel coronary artery disease and an impaired left ventricle with an ejection fraction of 35%. The patient also had hypercholesterolemia, insulin-dependent diabetes mellitus, renal impairment, and chronic obstructive pulmonary disease (COPD). In view of the significant comorbidities and to reduce the risk of further dissection in preexisting aortic disease, we chose to use the OPCAB technique. Long saphenous vein grafts were used as conduits. The distal anastomoses

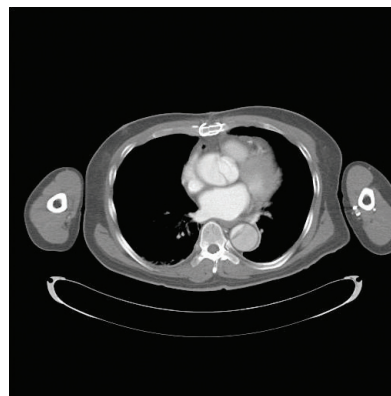


Figure 1. Computed tomography scan showing acute Stanford A and chronic Stanford B aortic dissections.

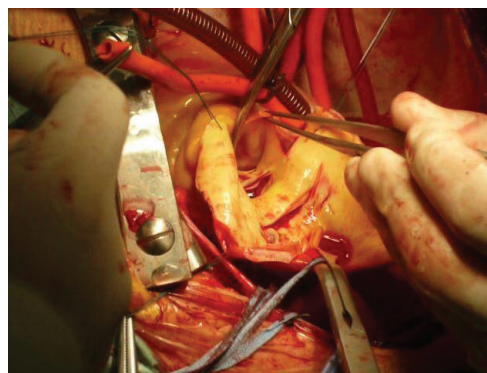


Figure 2. Intraoperative image showing an entry point of the dissection at the posterior wall of the ascending aorta.

were grafted onto the left anterior descending, distal right coronary, and second obtuse marginal arteries with the aid of an Octopus stabilizer and a Starfish positioner (Medtronic, Minneapolis, MN, USA). The proximal anastomoses on the ascending aorta were completed with an aortic punch and side-biting clamp techniques. The ascending aorta was noted to be slightly thin but normal in size and free from atheroma. The mean arterial pressure was maintained between 60 and 70 mm Hg throughout the procedure. The surgery was uneventful, and the patient was discharged well on the seventh postoperative day.

The patient returned to the emergency department 2 weeks later, however, with severe chest pain and an ischemic right upper limb. A computed tomography scan confirmed the diagnosis of an acute Stanford A aortic dissection involving the brachiocephalic and right common carotid arteries (Figure 1). He underwent a supraaortic tube graft replacement and reimplantation of vein grafts. The entry point of the dissection was noted intraoperatively to be at the posterior wall, exactly opposite the previously applied side-biting clamp (Figure 2). Despite our best efforts, the patient died from massive hemorrhage.

## DISCUSSION

The belief that use of the OPCAB technique reduces the incidence of aortic dissections following coronary revascularization compared with the on-pump approach has slowly been discarded as more examples of this kind of complication have been reported. Manipulation of the aorta by cross-clamping and cannulation was thought to be the cause of dissection when cardiopulmonary bypass was used during coronary bypass surgery [Stanger 2002]. Unfortunately, the reporting in the literature of more cases of OPCAB contributing to aortic dissection has led to a dilemma about which method is the best for reducing the frequency of this complication [Chavanon 2001; De Smet 2003; Ozasa 2003].

In OPCAB, the technical aspects of the proximal anastomosis onto the ascending aorta are the major concern. As supported by other authors, we believed that although the dissection could arise from the anastomotic site, the manipulation of the aorta by the side-biting clamp caused significant injury to the aortic wall. The bite of the clamp crushed all the layers of the aorta, leaving a nidus for a potential intimal tear. The pulsatile flow during off-pump surgery further swept the inner aortic wall with its turbulent flow through a partially occluded lumen. Despite a constant arterial pressure during the procedure, there would definitely be times when fluctuations occurred, further diminishing the laminar flow. In addition, Ozasa et al [2003] reported their experience that vertical displacement of the heart during OPCAB caused aortic dissection in their patient. The immediate effects may not be obvious, because the damage is more likely to occur

at a microscopic level and thus reveals itself as a dissection after a period of repeated injury. This was the situation in our patient, who was hypertensive and already had preexisting aortic disease. He presented with acute dissection only 2 weeks after the OPCAB surgery.

Our patient had multiple comorbid factors, such as poor left ventricular function and renal impairment. These factors in a way forced us to perform OPCAB to reduce the potential for complications. Anticipating the involvement of the left internal mammary artery because our patient had a chronic Stanford B dissection starting very close to the left subclavian artery, we did not use this artery as a conduit. The use of the right internal mammary artery or more-bilateral mammary arteries was ruled out because we thought their use would pose major postoperative complications to the sternum and the lungs, given that the patient had poorly controlled insulin-dependent diabetes mellitus and COPD.

As described above, this case created a dilemma as to the best option for the patient's coronary surgery. In general, when there is a potential danger of developing aortic dissection, as in our patient, who had hypertension and preexisting aortic disease, or in patients with Marfan syndrome, perhaps the best option is the use of bilateral mammary arteries or T, Y, or  $\pi$  grafts with the no-aortic-touch technique. The use of a side-biting clamp can be replaced with a "heart string" which causes less disharmony to the flow-pressure pattern within the ascending aorta. Healthy brachiocephalic and axillary arteries qualify as sites of proximal anastomoses in this group of patients.

In conclusion, this case clearly demonstrates the lesson that no single method is superior to another in reducing the potential for acute dissection following OPCAB. Many of the technical options available today can be tried, but they should be tailored according to individual needs. The ideal management is still debatable, and we hope more reports in the literature will eventually resolve this dilemma.

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