

## Simultaneous Abdominal Aortic Aneurysm Repair during the On-pump Coronary Artery Bypass Grafting

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**A case of simultaneous coronary artery bypass grafting (CABG) and abdominal aortic aneurysm (AAA) repair on cardiopulmonary bypass (CPB) is reported. A 74-year-old man was diagnosed with left main coronary disease and infrarenal AAA. Triple CABG and infrarenal AAA repair were performed simultaneously, by different surgeons, on CPB. The duration of CPB, aortic clamp time, and total operation time was 81 min, 33 min, and 245 min, respectively. The patient was extubated three hours after ICU admission and the postoperative course was uneventful. This method is useful for reduction of operation time, for blood salvage, and for adjustment of preload and afterload of the vulnerable heart during AAA repair. (Ann Thorac Cardiovasc Surg 2003; 9: 409–11)**

**Key words:** coronary artery bypass grafting, abdominal aortic aneurysm, simultaneous surgery

### Introduction

The optimal management of severe coronary artery disease in the presence of a large abdominal aortic aneurysm (AAA) remains controversial. We have routinely performed combined on-pump coronary artery bypass grafting (CABG) and AAA repair since 1990. In our series, AAA repair was usually performed following CABG. However, a high incidence of postoperative complications occurred when the operation time exceeded seven hours.<sup>1)</sup> Therefore, in an effort to reduce operation time, we experienced simultaneous CABG and AAA repair both under the pump run by separate teams.

### Case

A 74-year-old man was diagnosed with angina pectoris and infrarenal AAA. Coronary angiogram showed moderate stenosis of the left main trunk (50%) and multiple stenosis (90%) of the left anterior descending artery (LAD) and first diagonal branch (D1, Fig. 1). Left ven-

tricular ejection fraction was 60%. CT revealed infrarenal aortoiliac aneurysm with a maximal diameter of 65 mm (Fig. 2). He was found to have depressed respiratory function (FEV 1.0% was 60% of expected values). To reduce the operation time, simultaneous CABG and AAA repair using cardiopulmonary bypass (CPB) was planned.

Four surgeons were divided into two teams, namely, the CABG team and the AAA repair team. Median sternotomy, followed by harvesting of the left internal thoracic artery (LITA) and saphenous vein, was performed by the CABG team. Simultaneously, median laparotomy, followed by dissection of the abdominal aorta and bilateral common iliac arteries through a separate skin incision, was done by the AAA team. The chief surgeon of the CABG team stood on the right side of the patient while the chief surgeon of the AAA team stood on the left. CPB was established in the usual fashion and moderate hypothermia (28°C) was induced. Three distal anastomoses were conducted using LITA to LAD, and vein to D1 and obtuse marginal branch sequentially, using a running suture of 7-0 polypropylene. At the same time, the infrarenal abdominal aorta and bilateral common iliac arteries were clamped. Clamping of the infrarenal aorta during CPB did not cause significant hemodynamic changes. The aneurysm was opened and the distal anastomosis was done first, employing a bifurcated graft (16×8 mm, Hemashield®, Boston Scientific Co., Natick, MA) using

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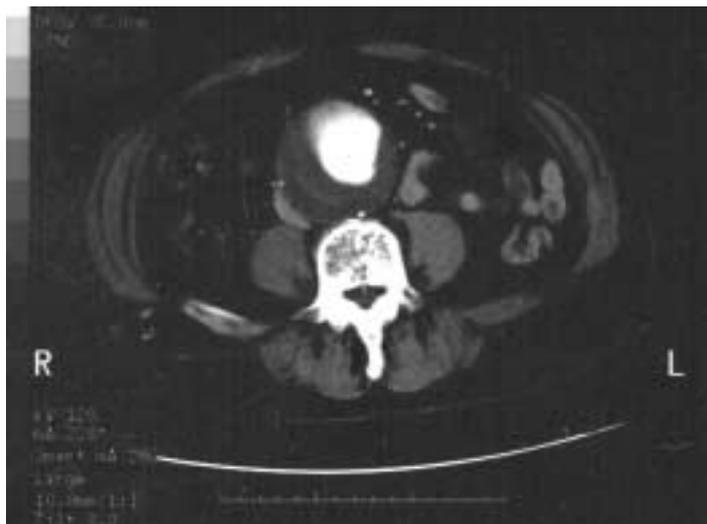


**Fig. 1.** Preoperative left coronary angiography in the cranial projection showing moderate stenosis of the left main trunk and multiple severe stenosis of the left anterior descending artery and first diagonal branch.

a running suture of 5-0 polypropylene. Proximal anastomoses of the prosthetic graft were performed during systemic rewarming, using a running suture of 4-0 polypropylene (Fig. 3). Hemorrhage during AAA repair was salvaged by the pump suction. The patient was easily weaned from bypass after reperfusion of the lower extremities. CPB time, aortic clamp time, and total operation time were 81 min, 33 min, and 245 min, respectively. No blood transfusion was required during the perioperative period. The patient was extubated three hours after ICU admission, and the postoperative course was uneventful.

## Discussion

Almost half of patients with AAA have concomitant coronary artery disease (CAD). Most hospital and late deaths in patients undergoing major vascular surgery are due to cardiac accidents.<sup>2,3)</sup> In an attempt to decrease the high mortality rates and to minimize the risk of myocardial infarction associated with concomitant CAD, myocardial revascularization is often performed prior to the AAA repair.<sup>4,5)</sup> In 1990, we introduced combined CABG and AAA repair for those patients in whom both lesions were considered to have surgical indications. Recent reports of successful simultaneous operations have encouraged us to routinely employ this procedure.<sup>6,7)</sup>

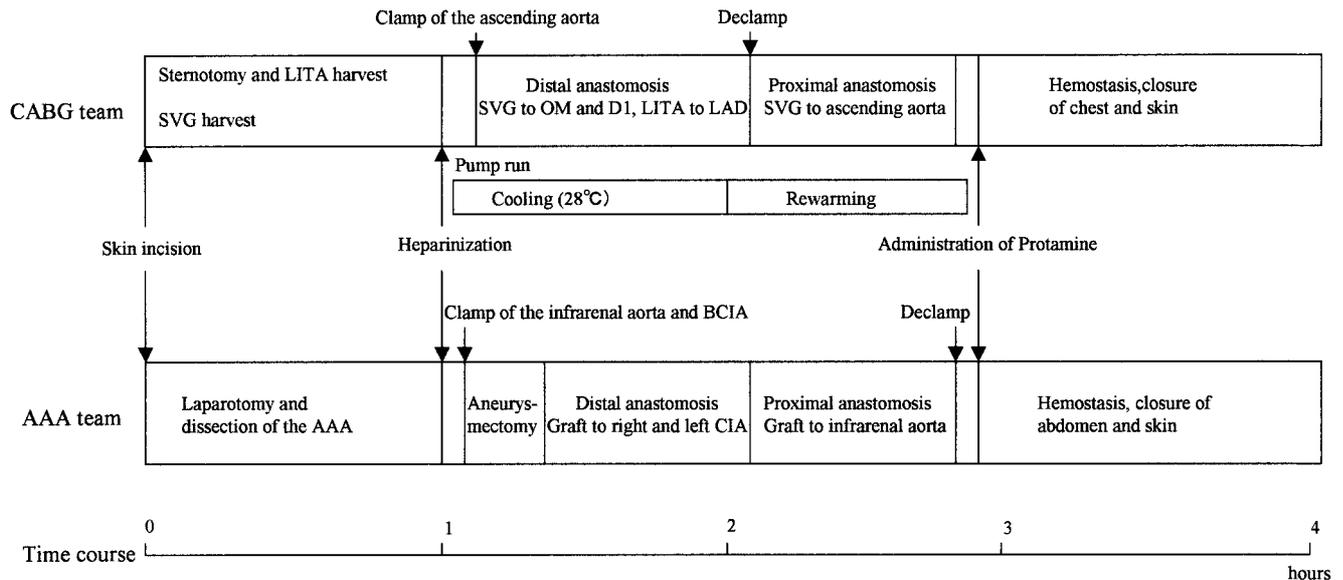


**Fig. 2.** Preoperative enhanced CT of the abdomen showing an infrarenal abdominal aortic aneurysm 65 mm in diameter.

However, in our series of 28 consecutive patients undergoing combined CABG and AAA repair, 31% morbidity, mainly from wound infection and stroke, occurred. Statistically, the incidence of postoperative complications was highest in patients with an operation time of more than seven hours.

AAA repair had been performed after the CABG procedure, in that series. Thus, we considered the possibility of reducing operation time by doing CABG and AAA repair at the same time. From our experiences, severe renal dysfunction, symptomatic chronic obstructive pulmonary disease, history of previous laparotomy, and emergency operation should be contraindications for simultaneous surgery.<sup>1,8)</sup>

Ascione et al. reported that off-pump CABG decreased postoperative complications in high-risk patients undergoing simultaneous coronary and abdominal aortic operations, in comparison to the conventional one-stage procedure.<sup>9)</sup> The off-pump strategy is a useful option for reducing mortality and morbidity in combined CABG and AAA repair. However, a cross-clamp on the abdominal aorta increases the afterload to the myocardium. This results in an increase in left ventricular wall stress that may adversely affect subendocardial perfusion and ultimately lead to myocardial ischemia and depression of cardiac function. In patients with impaired left ventricular function, AAA repair during CPB was found to be desirable.<sup>10)</sup> Off-pump strategy can avoid the adverse effect of CPB, but can not reduce the operation time when AAA repair



**Fig. 3.** Intraoperative course of simultaneous abdominal aortic aneurysm repair during on-pump CABG.

Four surgeons were divided into two teams, namely, the CABG team and the AAA repair team. CABG and AAA repair were performed simultaneously under the pump run by the different teams.

CABG, coronary artery bypass grafting; LITA, left internal thoracic artery; SVG, saphenous vein graft; OM, obtuse marginal branch; D1, first diagonal branch; LAD, left anterior descending artery; AAA, abdominal aortic aneurysm; BCIA, bilateral common iliac arteries.

is performed following coronary revascularization.

In our experience the two surgical teams did not interfere with each other. If the proximal anastomosis to the abdominal aorta had been performed at the same time as the distal anastomosis for coronary bypass, the two surgeons' hands would have presented hazards to each other. To avoid this conflict, the proximal anastomosis to the abdominal aorta should be performed last.

In conclusion, simultaneous AAA repair during the on pump CABG is an efficacious option for reducing long operation times that may otherwise contribute to operative mortality and morbidity.

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