Empty-beating Technique Reduces the Ischemic Time in a Combined Ascending Aortic Grafting and Coronary Artery Bypass Procedure — A Case Report

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ABSTRACT

Abdominal aortic dissection with retrograde extension to the ascending aorta during diagnostic coronary catheterization has not been reported before. Although, immediate surgery is indicated, the surgical risks are high when there are severe coronary lesions and impaired ventricular function. We describe a patient with post-myocardial infarction unstable angina and congestive heart failure who had this type of aortic dissection during catheterization. Emergent coronary artery bypass grafting with an empty-beating heart and ascending aortic grafting under deep hypothermic circulatory arrest were successfully done. The patient recovered well and is currently followed up in our out-patient department. (***Tzu Chi Med J*** 2004; **16**:257-260)

Key words: angina, aortic dissection, beating heart, circulatory arrest, coronary artery bypass surgery

INTRODUCTION

Aortic dissection is a life-threatening cardiovascular emergency requiring immediate diagnosis and treatment. Untreated acute aortic dissection involving the ascending aorta (type A) is associated with a high early mortality owing to rupture [1,2]. The risk factors for operative mortality include iatrogenic dissection, preoperative cardiopulmonary resuscitation, longer extracorporeal circulation, and preoperative dissection complications [3,4]. When there are combined procedures, the risks are even higher.

Here we described a successfully managed case of iatrogenic abdominal aortic dissection with retrograde extension to the ascending aorta in a patient with underlying recent anterior myocardial infarction, post-infarction unstable angina and ischemic cardiomyopathy. With modification of the surgical procedures, we successfully performed combined ascending aortic grafting and coronary artery bypass surgery.

CASE REPORT

A 59-year-old man underwent diagnostic coronary catheterization because of a recent anterior myocardial infarction, severe post-infarction angina, and congestive heart failure, NYHA Fc III. The left femoral artery was punctured. The coronary angiogram delineated a totally occluded left anterior descending artery and severely stenosed first diagonal and circumflex arteries. The left ventriculogram showed anteroapical akinesis and moderate mitral regurgitation. At the end of the ventriculogram, contrast medium stasis in a false lumen along the convex of the ascending aorta was noted (Fig. 1). At the

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same time, the patient complained of severe chest pain with radiation to back, which he had never experienced before. The pain, however, subsided later when he left the catheterization room.

Computed tomography was immediately done, and it showed an abdominal aortic dissection with an intimal tear opposite the superior mesenteric artery (Fig. 2). The false lumen extended distally to the level of the renal arteries, and proximally to the aortic root. There was no outlet in the aortic root, and the false lumen along the ascending, transverse, and descending thoracic aorta was thrombosed (Fig. 3). The patient continued having chest tightness during the examinations. Echocardiography at this time suggested a left ventricular ejection fraction of about 25%.

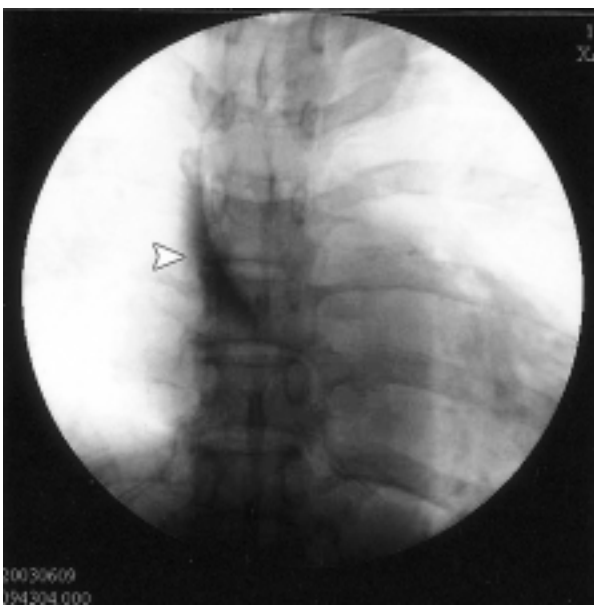

Fig. 1. Contrast medium stasis appears in the false lumen along the convex of the ascending aorta at the end of the ventriculogram.

Emergent surgery was done. Cardiopulmonary bypass was established with bicaval and right femoral artery cannulation. The patient was cooled down to 18˚C. We first started with coronary anastomoses with an empty-beating heart while the patient was being cooled down. Two deep pericardial sutures were placed to present the heart, and a Medtronic Octopus III stabilizer was applied. A piece of reversed saphenous vein graft was anastomosed to the left anterior descending artery in an end-to-side fashion, and another piece of saphenous vein was anastomosed to the first obtuse marginal artery and the first diagonal artery sequentially.

At the completion of the distal coronary anastomoses, the ascending aorta was cross-clamped and transected. Cardioplegic solution was infused through the vein grafts as well as directly into the coronary orifices. The dissection involved the right coronary sinus and the commissures of the aortic valve were prolapsed. The false lumen along the convex of the ascending aorta was thrombosed and no intimal tear was found within the aortic root. The aortic valve was preserved and resuspended with placement of two

Fig. 2. Abdominal aortic dissection at the level of superior mesenteric artery. (Arrow: intima flap)

Fig. 3. Computed tomography shows that the false lumen from the ascending aorta to the abdominal aorta is thrombosed. (Arrow: thrombosed false lumen)

pledgetted sutures at the two commissures (Non-coronary cusp-Right coronary cusp, and Left coronary cusp-Right coronary cusp) of the right coronary sinus. The ascending aorta was then replaced using a 24 mm prosthesis. The proximal anastomosis was at the sinutubular junction and was performed first with the aortic clamps on. The distal anastomosis was just proximal to the brachiocephalic trunk and was conducted using the open method under deep hypothermic circulatory arrest at 18˚C with retrograde cerebral perfusion.

After completion of the distal aortic anastomosis, circulation was restored while the graft was cross-clamped. The two saphenous vein grafts were rapidly anastomosed to the neo-aorta and then the clamp was released. The arrest time was 59 minutes, and the aortic cross-clamp time was 183 minutes. The patient was weaned from pump with low dose inotropic support. Postoperatively, the patient experienced delirium for 7 days, which prevented early extubation. Also, there was nosocomial pneumonia, and it was treated with antibiotics. Thereafter, the recovery was uneventful. Nine months after the operation, the patient is now doing well and is followed-up in the outpatient clinic.

DISCUSSION

Spontaneous retrograde thoracic extension of an abdominal aortic dissection is extremely rare and difficult to manage [5]. Although ascending aortic dissection during coronary intervention is a well- recognized complication, abdominal aortic dissection with retrograde extension to the aortic root (type A) has not been reported in the English literatures. Immediate surgery is a common practice for acute type-A aortic dissections; nevertheless, the surgical risks are high when there are severe coronary lesions and impaired ventricular function. Tan et al demonstrated that iatrogenic dissection, preoperative cardopulmonary resuscitation, and every quarter of an hour longer extracorporeal circulation are independent risk factors for operative mortality [3].

Here we were faced with three conditions. First, there was an iatrogenic acute type-A dissection mandating immediate surgery. Second, there were severe coronary lesions with unstable angina and ongoing ischemia that had to be managed urgently. And finally, and most important of all, there was impaired ventricular function and thus the ischemic time had to be reduced to a minimum.

To cope with these conditions, we used the empting-beating technique, constructing the distal coronary anastomoses first to save time while waiting for central cooling. Thus we didn't have to put the heart in ischemia during the coronary anastomoses. At the same time, better myocardial protection could be achieved with simultaneous infusion of cardioplegic solution through the vein grafts when the aorta was cross-clamped. In this way, the ischemic time could be limited to what was needed for the aortic grafting and the proximal aortosaphenous anastomoses.

There is evidence in the literature suggesting that off-pump coronary artery bypass operations reduce postoperative morbidity, organ dysfunction, and costs, without compromising midterm outcome compared with conventional coronary operations [6]. However, there are few reports on the effects of the empty-beating technique. Further investigation is needed.

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無負荷空跳技術減少上升主動脈置換合併冠狀動脈繞道術之心肌缺氧時間—病例報告

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摘要

診斷性心導管時併發腹部主動脈剝離並延伸至上升主動脈至今並無文獻報告。雖然必須緊急開刀，但當有嚴重冠狀動脈狹窄及左心室功能異常時，手術之風險相對上升。我們在此報告一個心肌梗塞後不穩定心絞痛並有鬱血性心衰竭的病人，在接受診斷性心導管時併發上述合併症。我們成功地用無負荷空跳及深低溫停循環技術完成上升主動脈置換合併冠狀動脈繞道手術。(**慈濟醫學** 2004; **16**:257-260)

關鍵語：心絞痛，主動脈剝離，不停跳，停循環，冠狀動脈繞道手術

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