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Retrograde Cerebral and Coronary Perfusion for Acute Dissection of Stanford Type A with Destruction of the Right Coronary Ostia

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ABSTRACT

Repair of acute aortic dissection with destruction of the right coronary ostia and aortic valve regurgitation is described. The patient was a 54 year-old female with Marfan syndrome, who was admitted to our hospital for acute dissection with annulo aortic ectasia, accompanied by myocardial ischemia of the inferior wall. Retrograde dissection to the aortic annulus and destruction of the right coronary ostia due to extended dissection were noted. Retrograde coronary infusion through the coronary sinus was conducted during replacement of aortic annulus by the Cabrol method in conjunction with supplementary vein grafting to the right coronary artery. Distal repair was carried out, supported by hypothermic circulatory arrest and retrograde cerebral perfusion through the superior vena caval cannula. Retrograde cerebral and coronary sinus perfusion have been shown to be quite effective for treating patients requiring complex reconstruction of the ascending aorta.

Key words: *Retrograde cerebral perfusion, Retrograde coronary sinus pefusion, Acute aortic dissection*

Acute dissection is a serious aortic disease. In Stanford type A dissection, death may occur suddenly owing to cardiac tamponade and myocardial infarction as a result of coronary arterial dissection. In urgent operations for acute dissection, deep hypothermic circulatory arrest or isolated cerebral perfusion is commonly conducted for brain protection during the aortic arch procedure[1-4]. But circulatory arrest can be tolerated for only a limited period of time even with deep hypothermia. Retrograde cerebral perfusion (RCP) through a superior vena caval cannula is a new and simple technique for protecting the brain[7,11]. The authors have conducted continuous RCP for aortic arch operation and retrograde coronary sinus infusion for acute dissection. Retrograde cerebral and coronary sinus perfusion is particularly effective for treating acute dissection with Stanford type A complicated with coronary ostial dissection.

CASE REPORT

The patient was a 45-year-old woman referred to our hospital for chest pain and dyspnea. The diagnosis was Marfan syndrome with annulo aortic ectasia, causing acute aortic dissection of Stanford type A. An electrocardiogram showed ST depression in leads II, III, and aVf. An echocardiogram indicated severe aortic regurgitation and aortic dissection extending to the aortic annulus, in addition to moderate pericardial effusion. Owing to the chest pain and ST depression of the electrocardiogram, the dissection was assumed to reach the right coronary ostia. An emergency operation was conducted following admission.

After inducing extracorporeal circulation with deep hypothermia, aortotomy indicated the dissection to reach the anterior aortic annulus. The right coronary artery was detached completely from the intima of the right coronary ostia. Intimal tear of the dissection was not found in the ascending aorta. A retrograde coronary sinus perfusion cannula (DLP, 13 French) was inserted through the coronary sinus and blood cardioplegic solution (600ml) was infused intermittently every 20 min. The zelatin coated prosthesis (26mm Vascutek) with bileaflet aortic valve (23mm Carbomedicus) was sutured with buttress sutures to the aortic annulus following excision of the de-

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generated aortic leaflets. The left coronary orifice was located near the aortic annulus and it was thought that direct anastomosis of the left coronary ostia to the prosthesis would be difficult. The left coronary ostia was reconstructed by the Cabrol procedure using a small prosthesis (8mm Dacron) and the saphenous vein was bypassed from the aortic prosthesis to the proximal portion of the right coronary artery. After completing proximal repair, circulatory arrest was conducted with deep hypothermia (rectal temperature 20°C) and the aortic clamp was released. RCP through the superior vena caval cannula was started with low flow perfusion (300ml/min). Intimal tear could not be detected in the ascending and arch aorta and thus retrograde dissection from the distal portion of the left subclavian artery was considered. Distal anastomosis was perfomed by the open aortic technique with RCP. Forty min were required for distal anastomosis with RCP. Rewarming started following completion of prosthetic repair and the heart was pulsated spontaneously. The electroenchephalogram showed resumption of cerebral activity after 10 min and normal activity after 60 min from the start of rewarming.

The patient awoke within 8 hours after operation and the tracheal tube was extubated the following morning. No complications developed postoperatively. A postoperative angiogram showed the valved conduit to be sutured well and there was neither aortic regurgitation nor anastomotic leakage (Fig. 1). Intimal tear was found at the root of the left subclavian artery and a small false lumen remained in the descending aorta. A coronary angiogram indicated a patent vein graft to the right coronary artery (Fig. 2a) and a suitable interposed graft to the left coronary artery (Fig. 2b). The patient was discharged on the 31st postoperative day and has had no reccurence of dissection for 10 months since the operation.

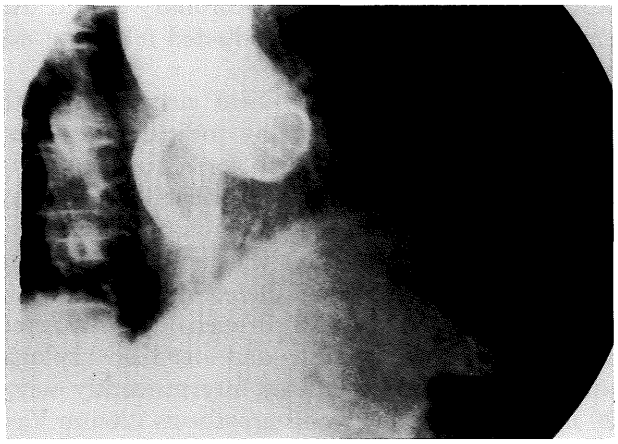

Fig. 1. Postoperative angiogram of the valved conduit
The angiogram of the conduit shows neither anastomotic leakage nor aortic regurgitation.

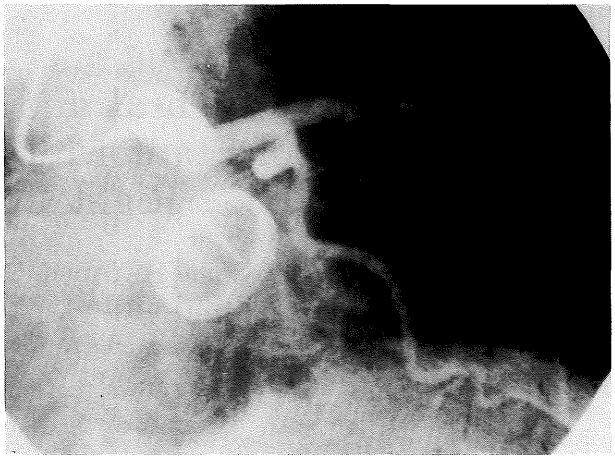

Fig. 2a. Postoperative angiogram of the left coronary artery
The interposed graft is patent, with neither stenosis nor kinking of the graft.

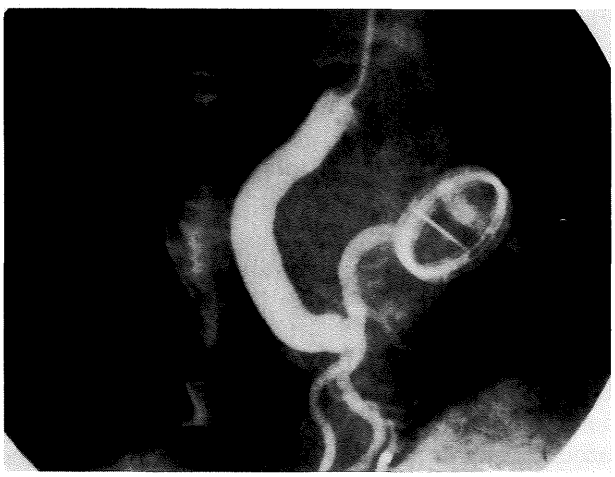

Fig. 2b. Postoperative angiogram of the venous graft to the right coronary artery
The angiogram shows the patent venous graft and right coronary artery.

DISCUSSION

Deep hypothermic circulatory arrest or isolated cerebral perfusion is commonly used to protect the brain during aortic arch operation[1-4,8]. In circulatory arrest, there is a limit to the period of 60 min even with deep hypothermia. Isolated cerebral perfusion requires complicated and hazardous cannulation techniques. RCP through a superior vena caval cannula had been used in the management of massive air embolism during

CPB[7]. Hypothermic RCP as a technique for protecting the brain has been reported[11,12]. We have treated 14 cases of the ascending and/or aortic arch aneurysm using continuous hypothermic RCP through the SVC since February 1991, with low mortality 2/14 (14%) and minimum morbility (1/12, 8.3%), these results being superior to those obtained using selective cerebral perfusion (mortality 3/8, 37%, $p<0.05$, morbility 0/5, 0%). One improvement made possible by RCP is that cervical arterial cannulation is not necessary. Techniques in conjunction with RCP and open aortic anastomosis without aortic clamping provide a wide and clean operative field and facilitate the aortic arch procedure. Although the cerebral protective effect of RCP has not been evaluated experimentally, we obtained good results for cerebral protection from the start with RCP. Animal experiments on mongrel dogs showed RCP to provide better cerebral cooling and more evident recovery of somate evoked potential (SEP) than hypothermic circulatory arrest with same rectal temperature[10]. Since recovery of SEP after prolonged RCP was poor, particularly for a period exceeding 120 min, RCP application within 100 min should thus be safe.

We conducted retrograde coronary infusion through coronary sinus ostia for aortic valvular replacement and aortic dissection with Stanford type A. Although there is no evidence that coronary sinus cardioplegia provides better myocardial protection than standard methods of anterograde cardioplegia delivery[5], with the retrograde approach, it appears to have distinct technical advantages as an alternative to direct ostial cannulation. Elimination of intermittent obscuring of the operative field by coronary arterial perfusion cannulas is particularly helpful for patients scheduled for complex reconstruction on the ascending aorta[9]. This technique has been shown to better preserve the hypertrophied myocardium subjected to ischemic episodes[6]. The present case of acute dissection showed destruction of the right coronary ostia due to extended dissection to the right aortic annulus, thus necessitating retrograde coronary perfusion to the ischemic right coronary lesion. In addition, retrograde cardioplegia could facilatate complex reconstruction on the aortic root due to non touch procedure for the coronary arterial orifice.

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