How to establish myocardial protection during aortic arch operation in patients with patent left internal thoracic artery graft: Careful dissection or no touch technique?

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There has been controversy regarding the management of the patent internal thoracic artery (ITA) as a coronary arterial graft during the operation for aortic arch aneurysm after coronary artery bypass grafting. We present a simple and effective method of myocardial protection with antegrade cold blood cardioplegia combined with cold blood perfusion of a patent graft through the subclavian artery without dissecting and touching the patent graft.

Clinical Summary

We used this technique in the 2 patients described in Table 1.

Selective angiographic evaluation of the patent ITA graft was performed before the operation to detect the relationship between the sternum and the ITA. The heart was approached through a repeat median sternotomy after the femoral artery was exposed. After careful dissection of the surface of the ascending aorta, right atrium (RA), and right ventricle without touching the left side of the heart (including the patent ITA graft), cardiopulmonary bypass was instituted, with right atrial drainage and ascending aortic return with right upper pulmonary vein venting. The brachiocephalic, left carotid, and left subclavian arteries were carefully dissected and taped. Meanwhile, the patients were cooled down, the aneurysm surface was carefully dissected, and the tissue including the ITA graft was lifted to the upper side. When rectal temperature reached 25°C, cold blood cardioplegia was administered through the aortic root. After this, circulatory arrest was induced. The aneurysm was incised, and the three neck vessels were perfused selectively at 18°C with a soft-ballooned cannula.

With this method, the ITA graft was continuously perfused with 18°C cold blood. The distal aorta was transected, and a four-branched graft was sutured. After the distal anastomosis, systemic perfusion was started from the fourth branch of the graft. After the second infusion of cardioplegia was finished, proximal anastomosis was performed and aortic clamp was released. The left subclavian artery was sutured, and the patient was rewarmed. The left carotid artery and brachiocephalic arteries were reconstructed.

Both patients were successfully operated on and had stable postoperative hemodynamics, with maximum creatine kinase isoenzyme MB levels within the normal range (Table 2). No remarkable changes in the ST segment of the electrocardiogram were noticed, and the patients were discharged without complications.

Comment

The left ITA is routinely used for coronary artery revascularization because of its long-term durability. On the other hand, the number of patients requiring aortic valve or aortic surgery who have undergone previous coronary artery bypass grafting is gradually increasing. In such situations, establishment of effective myocardial protection is an important but difficult problem.

There are two major strategies for establishing myocardial protection. One method consists of retrograde cardioplegia with a dissected and clamped ITA graft, and the other consists of antegrade cardioplegia and hypothermic perfusion without dissection of the ITA graft. Retrograde cardioplegia is useful to establish myocardial protection even in reoperative cases.¹⁻³ However, the technical difficulty of cannulating the coronary sinus in cases with severe adhesions and the necessity of dissecting and clamping the patent ITA graft remain major problems. Injury to the ITA graft during dissection is associated with elevated incidence of perioperative myocardial infarction and increased operative mortality.⁴

We established myocardial protection with antegrade cardioplegia and cold blood perfusion of the ITA graft. This combination was simple and safe, because we did not need to touch the ITA graft. Previous reports have described the safety of this method for aortic valve surgery after coronary artery bypass grafting with a patent ITA graft.^{5,6} In our cases, with aortic arch operations, deep hypothermic selective cerebral perfusion also protected the brain and the myocardium supplied by the ITA. Therefore in cases of aortic arch aneurysm with patent ITA graft, this method is con-

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TABLE 1. Patient profiles

Case	Age (y)	Sex	Preoperative diagnosis	Previous procedure	Graft patency	Interval (mo)
1	62	Male	Distal arch aneurysm	Coronary artery bypass grafting (left ITA to left anterior descending coronary artery, saphenous vein graft to right coronary artery)	Left ITA patent, saphenous vein graft occluded	55
2	77	Female	Distal arch aneurysm	Coronary artery bypass grafting (left ITA to left anterior descending coronary artery, saphenous vein graft to diagonal coronary artery)	Left ITA and saphenous vein graft both patent	89

TABLE 2. Results

Case	Procedure	Operative time (min)	Cardiopulmonary bypass time (min)	Crossclamp time (min)	Postoperative maximum creatine kinase isoenzyme MB	Intensive care unit stay (d)	Postoperative complications
1	Total aortic arch replacement	315	170	64	31	2	No
2	Total aortic arch replacement	335	169	58	26	2	No

sidered to be more useful and effective for establishing myocardial protection without risk of ITA injury.

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