

Left Subclavian Artery to Descending Aorta Bypass for Coarctation Physiology after Descending Aortic Repair

Hitoshi Hirose, MD and Inderjit S. Gill, MD

Stenosis of the aorta observed after descending aorta replacement for traumatic aortic injury was managed by a placement of a bypass between the left subclavian artery and the distal descending aorta with success. (Ann Thorac Cardiovasc Surg 2004; 10: 389–90)

Key words: aortic trauma, coarctation

Introduction

Blunt traumatic injury to the descending aorta commonly occurs at the level of the left subclavian artery origin. The standard treatment of a descending aortic injury is the placement of an interposition graft.¹⁾ A patient developed coarctation physiology after descending aortic replacement at the level of the proximal anastomosis. The coarctation and pressure gradient was immediately recognized intraoperatively and corrected using the left subclavian – descending aorta bypass graft.

Case Report

A 53-year-old male was transferred to our hospital for further management after a fall from a height of 15 feet. Chest tubes were inserted at the scene and he was intubated in the emergency room. Chest x-ray showed widening of the mediastinum, and subsequent chest CT revealed a mediastinal hematoma. Angiography demonstrated descending aortic injury with pseudoaneurysm 3 cm distal to the left subclavian artery origin. His concomitant injury included; multiple rib fractures, flail chest, bilateral pulmonary contusions, thoracic spine fracture (T12) with compression of the spinal cord, and posterior acetabular fracture. Neurologically, he was paraplegic due

to the thoracic spine injury.

The patient was initially managed medically with tight blood pressure control. The surgical repair of the descending aorta was delayed due to severe pulmonary contusion requiring ventilator support with high oxygen demand. After stabilization of the overall condition, the patient was taken to the operating room for repair of the descending aortic injury 24 days after injury.

At a left posterolateral thoracotomy, the pseudoaneurysm of the descending aorta was observed a few centimeters below the left subclavian artery with inflammatory adhesion around it and the arch had a patchy calcification. After heparinization, the aorta was cross clamped just below the left subclavian artery origin and the mid thoracic aorta. The aorta was opened and the intimal tear was observed at the level of the pseudoaneurysm, extending to the tip of the proximal aortic cross clamp. A 24 mm Dacron graft was placed using 3-0 prolene sutures. The aortic cross clamp time was 25 minutes. After removal of the cross clamp, significant bleeding from the proximal suture line was encountered and it was controlled with three pledgetted sutures. At the completion of these, a thrill was palpated on the graft. Intraoperative pressure measurement disclosed significant pressure gradient (45 mmHg) between the aorta proximal to the left subclavian artery and the interposition graft. The left subclavian artery was isolated and it was anastomosed with a 10 mm Dacron graft, which was extended to the distal descending aorta and anastomosed to the distal descending aorta under a side clamp. After completion of the subclavian – descending bypass, the thrill was no longer palpable and the pressure gradient disappeared. Postoperative recovery was uneventful and he was transferred to a rehabilitation facility.

From Department of Thoracic and Cardiovascular Surgery, Cleveland Clinic Foundation, Cleveland, OH, USA

Received May 28, 2004; accepted for publication July 5, 2004.
Address reprint requests to Hitoshi Hirose, MD: Department of Thoracic and Cardiovascular Surgery, Cleveland Clinic Foundation, ME90, 3rd Floor, Hamann Bldg., 2500 Metro Health Drive, Cleveland, OH 44109-1998, USA.



Fig. 1. Postoperative MRI shows stenosis at the proximal descending aorta and patent subclavian – descending aorta bypass. An interposition graft between the left subclavian artery and the distal descending aorta was placed to correct the coarctation physiology.

Comments

The standard treatment of descending aortic injury is the placement of interposition graft.¹⁾ This patient had a tear that extended to the proximal clamp site. This can be fixed with re-clamping of the proximal aorta and the left subclavian artery; however it requires extensive dissection and it may have been time consuming due to inflammatory tissues around the aorta. In addition to this, our patient had an aberrant vessel coming out of the arch between the left common carotid artery and the left subclavian artery, which made the dissection of this area more risky. Furthermore, clamping the aorta with calcification is not safe. Thus we chose clamping of the aorta below the left subclavian artery, replaced the aorta, and controlled the bleeding most likely from the tear extending into the proximal anastomosis suture line with pledgetted sutures. Unfortunately it resulted in stenosis of the aorta, and this stenosis was significant enough to produce a pressure gradient and thrill over the graft. We performed a left subclavian artery – descending aorta interposing graft instead of redoing the proximal anastomosis because of the above mentioned reasons. The left subclavian – descending aorta bypass has been used for the repair of adult coarctation.²⁾

The advantage of this procedure is minimal dissection of the left subclavian artery and the descending aorta, and the avoidance of total cross clamp of the aorta. The prolonged aortic cross clamp correlates with increased risk of spinal infarction.³⁾ Furthermore, the anastomosis of the left subclavian – descending aorta bypass is always tension free.

A thrill on the graft is an indication of the presence of the stenosis and pressure gradient across the anastomosis site. Redoing the anastomosis after thoracic aorta replacement is not always easy and carries risks. The use of the left subclavian – descending aorta bypass would be an option to solve this potentially difficult problem.

References

1. Feliciano DV. Trauma to the aorta and major vessels. *Chest Surg Clin N Am* 1997; **7**: 305–23.
2. Elkerdany A, Hassouna A, Elsayegh T, Azab S, Bassiouni M. Left subclavian-aortic bypass grafting in primary isolated adult coarctation. *Cardiovasc Surg* 1999; **7**: 351–4.
3. Connolly JE. Prevention of spinal cord complications in aortic surgery. *Am J Surg* 1998; **176**: 92–101.