Two Stage Repair of Aortic Coarctation with Severe Coronary Artery Disease in a 37 year old male

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Citation

Abstract
Coarctation of the aorta is a treatable cause of secondary hypertension. Its prevalence varies from 5% to 8% of all congenital heart defects. Late presentation is rare and is associated with severe left ventricular hypertrophy and coronary artery disease with or without left ventricular damage. Chest X-ray, computed tomography, coronary angiogram, and echocardiogram are useful diagnostic tools. Repair of coarctation in presence of coronary artery disease and left ventricular hypertrophy is a surgical challenge. A two-stage repair of aortic coarctation is a safe procedure for late presentation of aortic coarctation with severe coronary artery disease. A generous antegrade and retrograde cardioplegia is needed to protect hypertrophied left ventricle. A continuous spinal drainage is recommended during repair of coarctation.

CASE REPORT
We describe a 37 years old man who was presenting to hospital with an acute myocardial infarction, sudden onset of chest discomfort and shortness of breath. He was diagnosed to have severe coronary artery disease, new onset atrial fibrillation, and pulmonary edema.

Diagnostic workup revealed coarctation with near complete interruption of the distal arch and proximal descending aorta on CXR and computed tomogram (Figures 1a and 1b).

Figure 1
Figure 1a: CXR demonstrates enlarged heart; proximal descending aorta shows the configuration of coarctation. Notching of right and left upper ribs (arrows) indicate collateral vessels.
A cardiac Catheter had to be performed through the brachial artery, which demonstrated severe diffuse multi-vessel coronary artery disease and severe LVH with EF approximately 50%. Echocardiography showed left atrial enlargement and marked thickening of left ventricular walls. Given the constellation of problems including severe left ventricular hypertrophy, which makes the myocardial protection difficult, the decision was made for a two-stage approach. The patient underwent coronary artery bypass grafting through median sternotomy followed by repair of aortic coarctation through left lateral thoracotomy 8 weeks later.

**OPERATIVE TECHNIQUE**

After a median sternotomy, the inspection of heart and aorta revealed a very thin walled ascending aorta and severe left ventricular hypertrophy (LVH). Cardiopulmonary bypass was initiated and the patient was cooled down to 26 °C. The patient's blood pressure had an approximately 40-50 mmHg mean gradient. To avoid the hypoperfusion of the kidneys and the liver, the left common femoral artery was cannulated with a 20-French cannula. After cross clamping of aorta, coronary artery bypass grafting with vein grafts only was performed. The patient recovered from the surgery rapidly and was discharged home on postoperative day 4.

Approximately eight weeks after surgical revascularization the patient underwent repair of aortic coarctation. A spinal drain was placed preoperatively for continuous spinal drainage. The patient was placed in right lateral decubitus position, a posterolateral thoracotomy through the fourth intercostal space was performed, and the coarctation was exposed (Figure 2).

**DISCUSSION**

Coarctation of aorta is usually detected in early ages, however, a small percentage of patients present in advanced age. It is most commonly detected because of a murmur or hypertension found on routine examination [1]. The coarctation is characterized by thickening of the medial layer of aorta with intimal hyperplasia. It is accompanied by dilatation and poststenotic parietal thickening [2]. The anatomy of the lesions varies which considerably influences the type of treatment [3]. Delayed presentation is characteristic by cardiac symptoms including shortness of breath, chest pain, and in rare cases atrial fibrillation and pulmonary edema as in our case. Delayed or absent femoral pulses and an arm/leg systolic blood pressure difference of 20 mm Hg or more in favor of the arms can be considered as
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evidence for aortic coarctation [1]. The universally accepted indications for treatment are systolic gradient at rest ≥ 20-30 mm Hg (>20 mm Hg under catheterization and sedation), left ventricular hypertrophy in the electrocardiogram or echocardiogram, previous stroke or the presence of severe isthmic stenosis in imaging studies [2].

The surgical technique, includes excision of the diseased wall and end to end anastomosis (at least for young patients), patch aortoplasty, and Dacron graft [3]. Surgical treatment for aortic coarctation associated with coronary artery disease is a challenging problem. A long standing aortic coarctation and a late presentation with severe coronary artery disease are associated with severe ventricular hypertrophy, which makes myocardial protection during surgery more difficult. A single stage surgical repair of aortic coarctation and coronary artery bypass grafting has been reported in the literature [4], however, this approach might expose the patient for higher risk. The most feared complication of aortic surgery is paraplegia and risk of spinal cord injury. The risk of these complications increases with prolonged aortic cross-clamp time. Other surgical difficulties include need for extensive mobilization of the aorta, control of collateral blood vessels, and damage to the recurrent laryngeal or phrenic nerves [5]. A repair of aortic coarctation through a left thoracotomy after coronary artery bypass grafting can reduce the risk of complications in patients with late presentation of coarctation.

References
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