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Case Report Open Access

Adult Coarctation with Post-Stenotic Calcified Aneurysm Managed Surgically in a Single Setting- A Case Report

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Abstract

A 39 year-old lady with coarctation of the thoracic aorta and post stenotic double calcified aneurysm underwent single staged elective repair of the aneurysm and coarctation of the aorta. Computed tomographic angiogram showed coarctation of aorta at the level of the ductus and post stenotic aneurysm at the proximal descending thoracic aorta (3.5x4.9 cm). Another small saccular aneurysm (2.2x2.0) was seen 1 cm distal to the above mentioned aneurysmal dilatation. Left subclavian artery showed severe narrowing at the origin. Coronary angiogram revealed coarctation of aorta at the level of aortic arch followed by post stenotic calcific aneurysmal dilatation. The aneurysmal pressure was 112 mm Hg and pull back gradient was 60 mm Hg. The entire coarctated segment along with the origin of the subclavian up to the middle of the descending thoracic aorta was excised. An 18 mm Dacron graft was sutured end-to-end to the arch of the aorta distal to the left carotid and end-to-end to the descending thoracic aorta above the diaphragm. The patient had an uneventful course and the postoperative echocardiographic follow up showed no gradient and concentric hypertrophy. The authors examine the special considerations in the treatment of this infrequent clinical condition.

Keywords: Coarctation; Post stenotic; Calcified aneurysm

Introduction

Aortic coarctation is a serious pathology often requiring surgical intervention. About 50% of uncorrected isolated aortic coarctation cases survive upto the age of 10 year; only 10% may reach the age of 50 years. The most common cause for mortality in untreated aortic coarctation is the aneurysm or rupture of aorta or side branches. Hence it is important to decide whether surgical operation will be of single or two stages and determine intraoperative strategy [1]. In patient of aortic coarctation with coexisting aortic aneurysm, the coarctation may be repaired initially as a part of two-stage procedure. This lessens the proximal hypertension, decreases the incidence of progressive aortic dissection or rupture and enables a safe surgical intervention of the aortic aneurysm. We present a case report of management in a 39 year old lady who underwent surgical correction of coractation of aorta and post-stenotic aneurysms as a single stage procedure.

Case Report

A 39 year old female was admitted with dyspnoea on exertion for past one month and giddiness on and off for past four days. She was a known hypertensive and was on Tab. Losartan Hydrochlorazide. She was evaluated and found to have blood pressure of 150/80 mm Hg in the right upper limb and 100/80 mm of Hg in the left upper limb and lower limbs. Her electrocardiogram showed normal sinus rhythm. Chest x-ray showed cardiomegaly and calcification and dilatation of upper descending aorta (Figure 1). Echocardiogram showed normal left ventricular function. Computed tomographic angiogram showed coarctation of aorta at the level of the ductus and post stenotic aneurysm at the proximal descending thoracic aorta (3.5x4.9 cm) (Figure 2). Another small saccular aneurysm (2.2x2.0) was seen 1 cm distal to the above mentioned aneurysmal dilatation (Figure 2). Left subclavian artery showed severe narrowing at the origin (Figure 2). Coronary angiogram revealed coarctation of aorta at the level of aortic arch followed by post stenotic calcific aneurysmal dilatation. The aneurysmal pressure was 112 mm Hg and pull back gradient was 60 mm Hg. She was posted for resection of aneurysm with repair of coarctation of aorta. Preanaesthetic evaluation was done a day before surgery. She was a well built female weighing 82 Kg. Her mouth opening and airway was adequate. Hematological and biochemical investigations were in the normal range. She was premedicated with 10 mg T. diazepam and T. pantoprazole 40 mg the night before and on the morning of surgery.

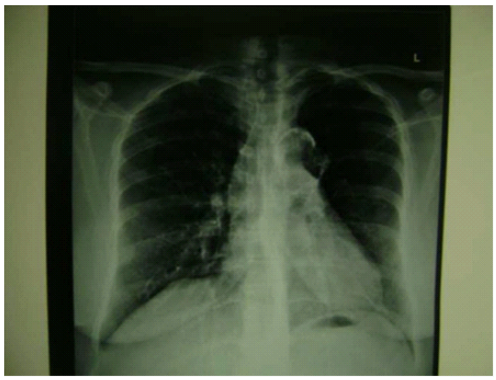

Figure 1: Chest x ray showed cardiomegaly and calcification and dilatation of upper descending aorta.

Preinduction monitors included electrocardiogram in lead II and V5, bispectral index and pulse oximeter. Wide bore intravenous

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access was secured and cefuroxime 1.5 g was administered. Invasive arterial blood pressure was inserted in right radial and left doralis pedis artery and the gradient noted (Figure 3). Patient was preoxygenated with 100% oxygen for 5 minutes. Anaesthetic induction was carried out with injection fentanyl 200 µg, midazolam 2 mg and thiopentone 250 mg. After being able to achieve ventilation with mask, patient was paralysed using injection vecuronium 8 mg and intubated with 7.5 mm endotracheal tube. Bilateral air entry was confirmed. She was ventilated with tidal volume of 500 ml, respiratory rate of 12/minute and with a Fio2 of 0.5 9F triple lumen sheath was inserted in the right internal jugular vein. Post induction monitoring included central venous pressure, temperature, urine output and serial arterial blood gas analysis.

Anaesthesia was maintained with 50% oxygen, 50% nitrous oxide, sevofluorane, midazolam and fentanyl with bispectral index titrated to 40. In supine position with right arm outstretched, the right axillary artery was dissected through a transverse incision and an 8 mm Gore-Tex graft was anastamosed to the axillary artery after 5000 units of heparin. The graft was clamped and the wound was closed. The left femoral artery and vein were dissected and cannulated. The cannulas were covered and the patient was repositioned in the left

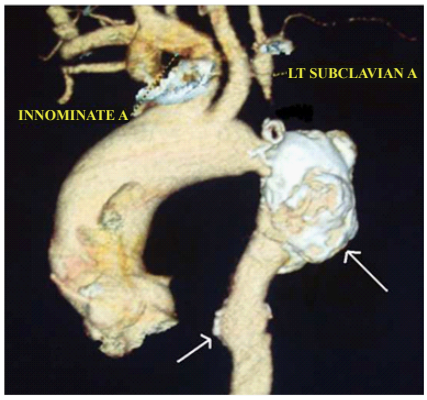
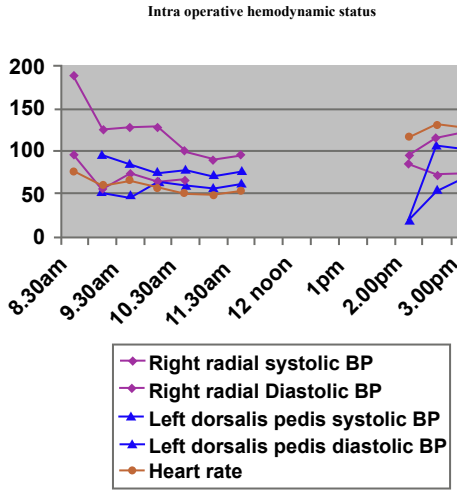


Figure 2: Computed tomographic angiogram.



Y axis- Blood pressure in mm of Hg
X axis-Timing of the procedure (Empty place in the middle is the duration of cardiopulmonary bypass)

Figure 3: Intra operative hemodynamic status.

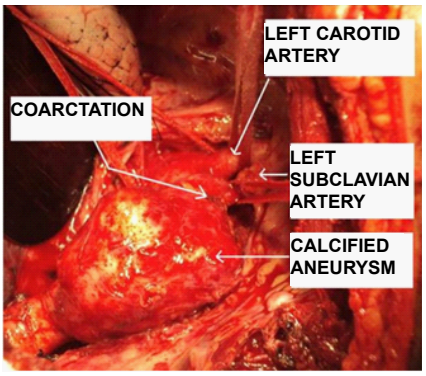


Figure 4: Coarctation along with two large aneurysms in the descending thoracic aorta.

posterolateral thoracotomy position. The chest was opened via the 4th space posterolateral thoracotomy. The lung was retracted and there was a coarctation along with two large aneurysms in the descending thoracic aorta (Figure 4). Pulmonary artery was cannulated with 28 mm right angled cannula. A 24 French aortic cannula was inserted into the Gore-Tex graft, which was anastamosed to the right axillary artery. Before initiating the cardio pulmonary bypass adequate heparinisation was done and serial activated clotting time measurements made every half an hourly to maintain it above 400 seconds. Cardiopulmonary bypass commenced through the right axillary artery, left femoral artery and the left femoral vein. Patient was cooled to 32°C. The entire aortic arch and the descending thoracic aorta were dissected. All the intercostal arteries and the veins were ligated and divided. The entire arch coarctation and aneurysms were mobilized. The left carotid and the left subclavian artery were taped and a clamp was applied between the innominate and carotid arteries. Another clamp applied in the descending thoracic aorta above the diaphragm. The entire coarctated segment along with the origin of the subclavian up to the middle of the descending thoracic aorta was excised. An 18mm Dacron graft was sutured end-to-end to the arch of the aorta distal to the left carotid and end-to-end to the descending thoracic aorta above the diaphragm. The duration of cardiopulmonary bypass time was 110 minutes, aortic cross clamp time was 20 minutes and subclavian clamp time was 22 minutes.

Patient was weaned off bypass with dobutamine and nitroglycerine infusion. After neutralization of heparin with protamine the chest was closed. The patient was repositioned in supine position. Left femoral artery and vein were decannulated, repaired and the wound was closed in layers. The right axillary artery graft was ligated and the wound was closed in layers. Intraoperatively five units of packed cell, four units of fresh frozen plasma and two units of platlets were used. Patient was transferred to the intensive care unit with stable hemodynamics. In the intensive care unit the heart rate was around 130/minute, blood pressure was in the range of 140/80 mm Hg and the gradient between the radial and dorsalis pedis artery blood pressure was less than 10 mm Hg (Figure 3) and it was confirmed echocardiographically. Patient was ventilated overnight and extubated on the first postoperative day. Dobutamine was tapered and stopped on the first postoperative day. Low molecular weight heparin and beta blocker (T. Metoprolol 50 mg) were started on the second postoperative day. Oral feeds were started on second postoperative day. Patient was shifted from the intensive care unit on the third postoperative day and discharged from the hospital on the tenth postoperative day. Patient was followed up two months after surgery and the echocardiogram revealed no gradient and concentric hypertrophy.

Discussion

Coarctation of the aorta most commonly is characterized by a narrowing of the aortic lumen opposite the opening to the ductus arteriosus and just distally to the opening of the left subclavian artery [2]. The diagnostic features of coarctation of the aorta are systolic and mean blood pressure differences between the upper extremities and lower extremities. A gradient greater than10 mm Hg is considered significant. In our patient the gradient was more than 40 mm Hg preoperatively and after correction came to less than 10 mm Hg.

The adult form of coarctation of aorta is accompanied by a limited life expectancy in its natural course. Most patients die before the age of forty years. Cardiac defects, aortic rupture, bacterial endocarditis or endarteritis with their complications as well as cerebral hemorrhage are the most common causes of death in connection with coarctation [3]. Our patient had symptoms of giddiness and dyspnoea on exertion which led to the diagnosis of coarctation of aorta with post stenotic double aneurysm after adequate evaluation .Surgical correction was decided as in any case of adult coarctation with post stenotic aneurysm. The aim of repair of cases with aortic coarctation is to allow proximal blood flow to pass distally without obstruction. This can be achieved by either widening the narrowed region or by creating an alternate path for blood flow. Surgical or endovascular techniques can be used as an alternative treatment. Surgery although complex was decided in our case as there was significant coarctation and two calcified aneuyrsms distal to it. Anaesthetic goals of management are to maintain normal peripheral vascular resistance, adequate venous return and to avoid bradycardia. Being a fixed cardiac output lesion, the ability to compensate during hypotension is compromised. Hence fall in systemic vascular resistance is avoided. In our patient, blood loss was one factor which could contribute for decreased venous return. This was prevented by transfusion of optimum amount of blood products guided by central venous pressure and urine output monitoring and serial hemoglobin measurements. In our patient axillary cannulation was done and cardiopulmonary bypass initiated through it, taking into consideration the difficulty in looping around the upper part of the aneurysm. If such difficulty happened, then maintenance of cerebral circulation would have been compromised. Hence commencement of cardiopulmonary bypass along with axillary artery cannulation maintained the cerebral circulation. The early postoperative period is often complicated by the onset of hypertension. Greater than one-half of patients who undergo repair of a coarctation experience significant increases in blood pressure for up to 2 weeks [4]. It has been postulated that the increase in blood pressure may be secondary to stimulation of the sympathetic system distal to the anastomotic site, with the subsequent increases in plasma renin activity. This could have been the reason in our patient for increased heart rate and blood pressure in the post operative period. The increase in blood pressure was hence controlled with beta blocker treatment.

In terms of lower body perfusion, it is the spinal cord that is most vulnerable. The arterial blood supply of the spinal cord is segmental, and viability of the spinal cord cells can be dependent on an artery (arteria magna or artery of Adamkewicz) or arteries arising from the low intercostal or lumbar territory (T8 to L2), which is temporarily or permanently excluded in the process of aortic aneurysm surgery. Spinal cord protection techniques done to preserve the spinal cord are minimizing the aortic clamping time, endovascular stent-graft placement, partial CPB or partial left heart bypass for distal aortic perfusion, hypothermia, mild to moderate (32-35°C) or selective spinal cord cooling (epidural cooling 20°C), maintenance of spinal cord perfusion pressure, lumbar CSF drainage (CSF pressure <10 mm Hg), arterial pressure augmentation (mean pressure >85 mm Hg) with vasopressor therapy and pharmacologic neuroprotection [5,6].

Conclusion

Management of aortic coarctation together with post stenotic aortic aneurysm requires good radiological work up, meticulous preoperative planning, discussion with the surgeon regarding the procedure and position of the patient, cardiopulmonary bypass management with non conventional axillary and femoral route, cerebral and spinal cord protection and adequate hemostatic management as it is true of any major vascular surgery.

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