Case Report

Successful Repair of Distal Aortic Arch and Proximal Descending Aortic Aneurysm with Coronary Artery Bypass Grafting- A Case Report

Saikat Das Gupta[1], PK Chanda[2], A Mohammed Idhrees[3], Mozibul Hoque[4]

Abstract:

Thoracic aortic aneurysm (TAA) is a rare condition causing dilatation of the thoracic aorta. TAA puts the individual at the risk of aortic dissection, aortic rupture and ultimate death. Diagnosis often requires good radiological support, whereas treatment requiring dedicated aortic program. In a third world country like us, with a population of 170 million or more, due to scarce facilities, surgeons are less interested to perform these types of surgeries. We hereby presenting a case of aortic aneurysm that involved distal aortic arch and proximal descending thoracic aorta (DTA) with significant double vessel coronary artery disease, who was successfully treated by our team.

Keywords: *Thoracic aortic aneurysm, aortic aneurysm, distal aortic arch aneurysm, proximal aortic aneurysm, open aortic aneurysm repair;*

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Introduction:

The thoracic aorta is grossly divided into the aortic root, the ascending aorta, the arch of aorta and the descending thoracic aorta.[1,2,3] Thoracic aortic aneurysm (TAA) is an abnormal enlargement of the thoracic aorta that can involve single to multiple, even all segments of the thoracic aorta. There has been no fixed cut-off value for aortic aneurysm as there is enormous variability in normal aortic diameter.[1] TAA grossly refers to enlargement of the aorta 1.5 times larger than the predicted one, whereas the normal aortic diameter depends on patient's age, sex, and body habitus, etc.[1,4] The commonest location of TAA is the aortic root, ascending aorta while it can also occur in the descending aorta and less commonly, in the arch of aorta.[3] TAA worldwide is accountable for significant cardiovascular morbidity and mortality.

Patients with TAA are diagnosed incidentally and may remain asymptomatic, but sudden chest or back pain should warrant assessment for possible aortic dissection or rupture at an emergency basis. TAA can be identified during routine imaging procedures like routine chest X-ray, transthoracic echocardiography (TTE), computerized tomography of the chest (CT chest), magnetic resonance imaging of chest (CMRI).[2] Moreover, it can also be detected as an acute presentation of the thoracic aortic dissection and sometimes as part of screening of a relative of an individual presenting with aortic disease or congenital cardiac anomalies.[2] Although TTE can give all the measurements, for accurate dimensions three dimensional CT and MRI should be done. We hereby presenting such a case of

1. Department of Cardiac Surgery, Square Hospitals Ltd, Dhaka, Bangladesh;
2. Department of Cardiac Surgery, Square Hospitals Ltd, Dhaka, Bangladesh;
3. Department of Cardiovascular Surgery, SIMS Hospital, Chennai, India;
4. Department of Cardiac Anesthesia, Square Hospitals Ltd, Dhaka, Bangladesh;

Address of Correspondence: Dr. Saikat DasGupta, Associate Consultant, Square Hospitals Ltd, 18/F, Bir Uttam Qazi Nuruzzaman Sarak, West Panthapath, Dhaka-1205. Mobile: +8801715739487, E-mail: saikatdasgupta@ymail.com

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aortic aneurysm involving distal aortic arch and proximal DTA with double vessel coronary artery disease, who was treated by us.

Case reports:

Mr. X, 41 years old, hypertensive, gentleman got admitted to our hospital with the complaints of chest pain with tightness for last few months. His pain was relieved by taking rest and sublingual nitro-glycerine spray. For these complaints he visited chest physician where he was diagnosed of having aortic aneurysm. Patient used to smoke 5/6 sticks per day for 20 years. He had no history of cerebrovascular disease, chronic kidney disease, chronic obstructive pulmonary disease or any major surgery.

His pre-operative biochemical investigations were within normal limits and his serum creatinine was 1.0 mg/dl. Chest X-ray (Fig-1) Postero-Anterior view revealed an abnormal, spherical, radio-opaque shadow over the left lung shadow compressing the left lung and hilum, which continued with the aortic shadow. Color doppler echocardiogram was done, which showed normal cardiac chamber dimensions, normal valve morphology and function with good bi-ventricular function. His ascending aorta was 35 mm, whereas distal aortic arch and proximal descending thoracic aorta was 57 mm with aneurysmal dilatation. CT coronary angiogram showed severe stenosis of Diagonal (D) and left circumflex (LCx). Chest CT also showed (Fig-2, Fig-3) aneurysmal dilatation of aorta extending proximally from the origin of subclavian artery to proximal descending thoracic aorta distally. Conventional coronary angiogram confirmed 90% proximal D1 stenosis and 90% LCx stenosis.

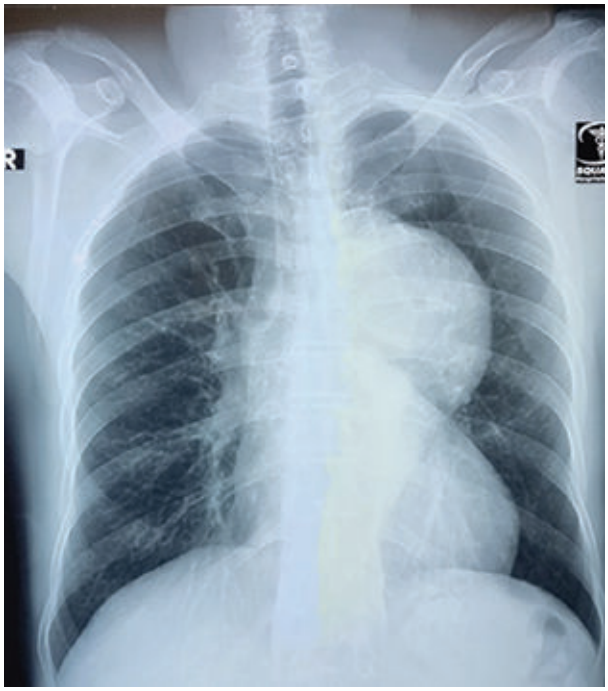

Figure 1: *X-ray chest PA view showing large aortic aneurysm compressing the left hilum and left lung*

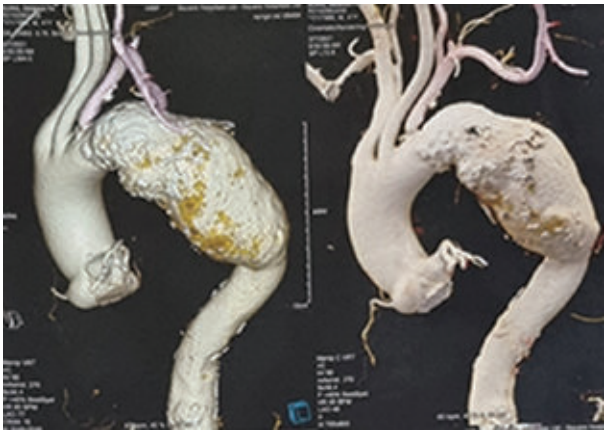

Figure 2: *Pre-operative CT scan showing aneurysmal segment of aorta with extent and measurements*

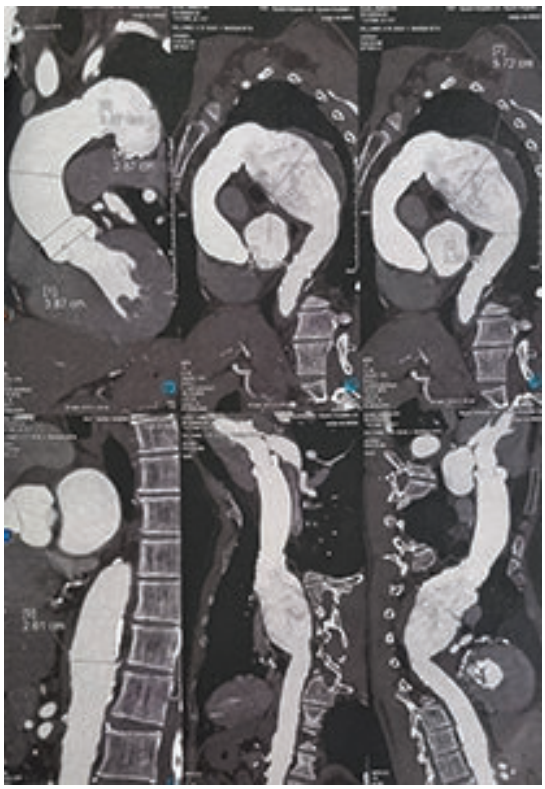

Figure 3: *Pre-operative CT scan showing aneurysmal segment of aorta with extent and measurements*

On March 2021, under all aseptic precaution general anaesthesia was induced after establishment of all necessary lines and probes. Left posterolateral thoracotomy was done through 4th intercostal space. Left lung was found grossly adherent to grossly dilated aorta (Fig-4a, Fig-4b). Cautious dissection of aorta was done and controls were taken around arch of aorta, proximal DTA, distal aorta and the left subclavian artery. CPB was established with left femo-femoral bypass and systemic cooling was done with Left Ventricular (LV) vent through LV apex. Distal coronary anastomoses were done with reversed saphenous vein (RSV) to D1 and OM1, sequentially. At 20°C under total circulatory arrest (TCA) proximal DTA was approached, and upper limit of aortic aneurysm (zone-2) was identified (Fig-5a) and transected. Proximal aortic anastomosis (Fig-5b) was done with 24 mm tube graft at zone 2 (LCC/LSA). During TCA (15 minutes), NIRS was used to see the adequacy of cerebral oxygen supply. CPB was re-established with arterial inflow to femoral and foley catheter to tube graft. For de-airing of proximal aorta, we use low flow carbon-di-oxide insufflation throughout the procedure and after proximal anastomosis we filled the heart with blood by stopping the vent and using foley catheter forward flow from aortic line, as we had no supply of tube graft with side branch. During re-warming LSA was de-branched with 10 mm tube graft and distal aortic anastomosis was completed. Proximal coronary anastomosis was then done to LSA (Fig-6). Heart was then picked up to normal sinus rhythm. Chest was closed after proper haemostasis, keeping two chest drain tubes in situ.

Patient was then shifted to ICU without any inotropes and was extubated on the 1st post-operative day without any difficulty. His post-operative hospital stay was

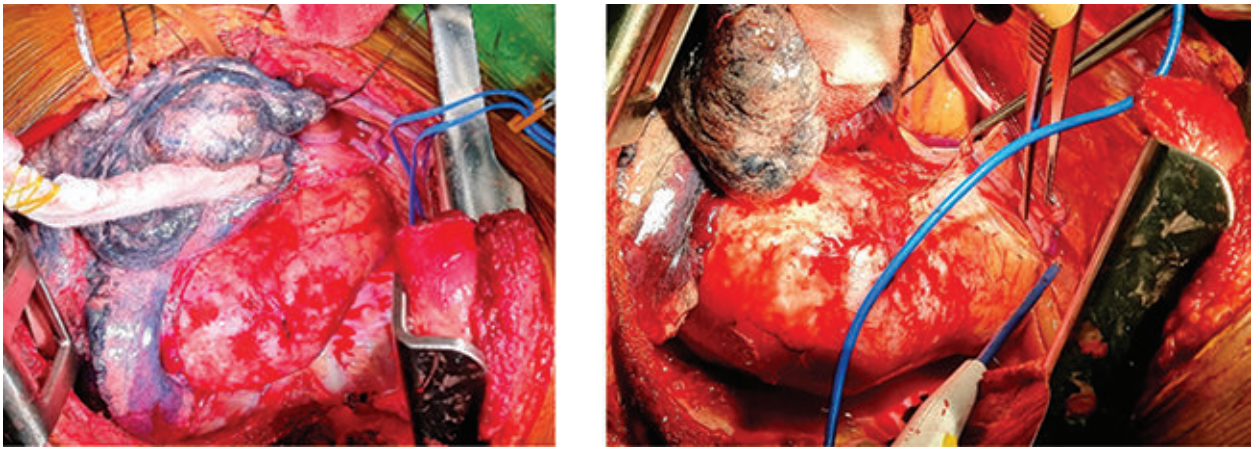

Figure 4: *(a) Per-operative pictures showing hugely dilated aorta, (b) Per-operative pictures showing hugely dilated aorta*

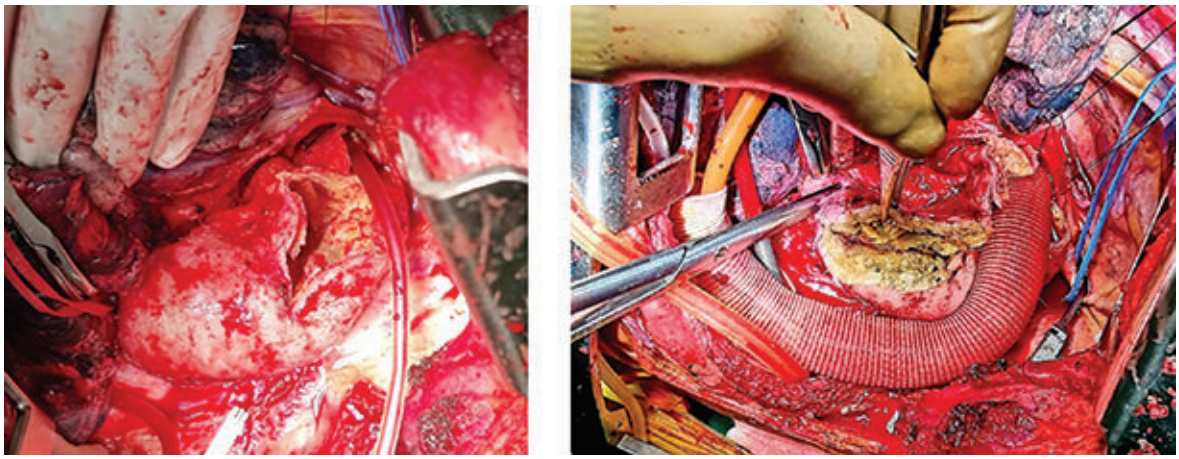

Figure 5: *(a) Per-operative pictures showing distorted aneurysmal wall of thoracic aorta, (b) Per-operative pictures showing distorted aneurysmal wall of thoracic aorta*

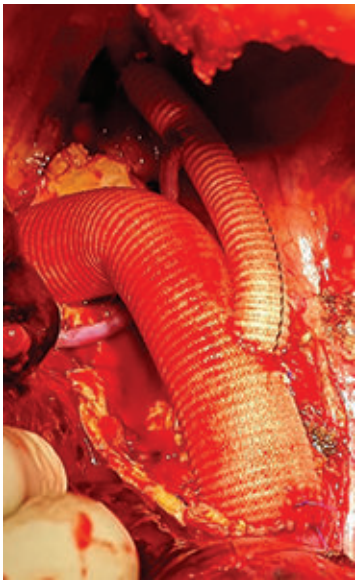

Figure 6: *Post aortic replacement picture showing interposition aortic conduit, debranched LSA and venous conduit for coronary revascularization*

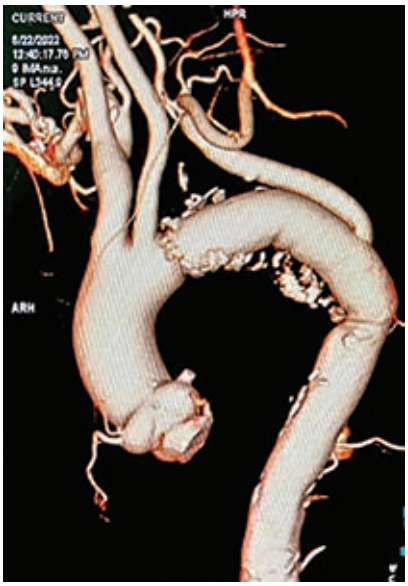

Figure 7: *Follow-up CT scan after 1 year showing replaced segment of aorta with debranched left subclavian artery*

eventless except excessive serous drainage through chest drain tubes which were kept until 7th post-operative days. Patient was discharged on 8th post-operative day.

Discussion:

Medical treatment for TAA consists of aggressive blood pressure control, usually with beta-blockers or angiotensin receptor blockers.[1,5] Blood pressure should be as close as 120/80 mm of Hg.[6,7] Patient who has got associated atherosclerosis are usually benefitted by taking Statins and Aspirin. Other supportive measures to treat TAA are control of diabetes smoking cessation, weight reduction etc.[8]

Thoracic endovascular aortic repair (TEVAR) although relatively costly than open repair, usually are less invasive option with lower mortality and morbidity rates, as well associated with less hospital stays. Spinal cord complications are also less in TEVAR.[1] Alarming complications associated with TEVAR for TAA repair are stroke, spinal cord injury and post procedure endoleak.[1] The choice to treat by open or endovascular (TEVAR) techniques depend on anatomy of the aneurysm, and the achievability of effective repair[1] We thought However, in our patient TEVAR would be less appropriate than the open surgical repair as, a) zone 1-2 landing zone will be required for endovascular graft which in turn will necessitate debranching of left common carotid or subclavian artery or both; moreover, b) our patient was young (41 years), so we avoided endovascular repair and underwent open surgery in our patient. We could have deployed Frozen Elephant Trunk (FET) by median sternotomy but as patient might need sternotomy for coronary artery disease or ascending aortic disease in future, we avoided FET and median sternotomy.

In open surgical repair, mortality rates are 1-8%.[9] In our case patient had to stay up to 10th POD, as he was having excessive serous drainage through chest drain tubes. Lifelong medical follow-ups are recommended in these patients, for prevention of aortic complications and transthoracic echocardiography is recommended yearly.[1,10] patient was followed up at three months, six months, one and two years, both clinically and by CT imaging (at one year, Fig-7). It revealed normal neo-aorta and improved exercise tolerance of the patient.

Conclusion:

Thoracic aortic aneurysm is a rare cause of sudden death when it is expected to have a genetic cause. Imaging is the key to diagnosis and follow-up, both before and after intervention or rupture. Many more dedicated, experienced aortic programs are required to address these patients in our country.

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Ethical approval:
Ethical approval was taken from the institutional ethics review committee for publication of this case report.

Informed consent:
Informed consent was taken from the patient about the possible publication, and the importance of such publication was described to the patient.

Human and animal rights: Not applicable.

Disclaimer: None

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