Case Series

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Transthoracic Endovascular Repair: Alternative Treatment for Type B Aortic Dissection

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Abstract

Background: Type B aortic dissections have historically been treated with best medical therapy. Surgical repair is associated with significant morbidity and mortality. In East Africa there are a limited number of surgeons who are able to successfully operate on Type B aortic dissections. *Method:* We present four cases that were managed by Thoracic Endovascular Aortic Repair (TEVAR). The outcomes were acceptable with no mortalities and in-hospital stay of less than one week. *Conclusion:* TEVAR is now considered the standard of treatment for type B aortic dissections and should be considered in patients with suitable anatomy.

Keywords: Aortic Dissection; Thoracic endovascular aortic repair; TEVAR; Hypertension.

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Background

Aortic dissection is defined as a tear of the inner layer of the aortic wall, with blood flowing within the wall leading to separation of the layers, possible rupture and death. Classification of aortic dissection is based on anatomical location and time from onset. Stanford Type A dissections involve the ascending aorta and Type B dissections occur distal to the left subclavian artery. The 14-day period after onset has been designated the acute phase.[1]

Acuteaortic dissection is a preventable life-threatening condition. Uncontrolled hypertension remains the most significant treatable risk factor for acuteaortic dissection.[2] Mortality for patients with Type B dissection who underwent surgery was 31.4%. Mortality was highest within the first 7 days of presentation.[1] Case series will focus on our limited but expanding experience of endovascular repair ofdescending aortic dissections.

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Case One

A 45-year-old gentleman, known hypertensive for six years, non-compliant, with history of excess

alcohol consumption, presented with severe, acute-onset chest pain. On physical examination he was diaphoretic, blood pressure 210/106 mm Hg and heart rate of 64 beats per minute. Echocardiogram revealed a descending thoracic aortic dissection. Computed tomography (CT) aortogramconfirmed a descending aortic dissection, from the aortic arch just distal to the left subclavian artery, extending to both iliac arteries. The left renal artery, all the lumbar arteries, right internal iliac artery, and right external iliac artery received blood supply from the false lumen.

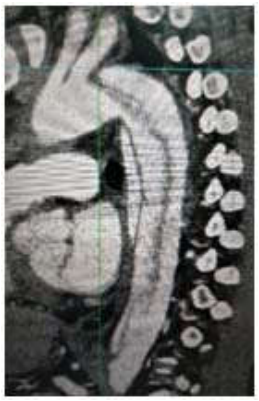

Fig. 1: CT aortogram Type B aortic dissection.

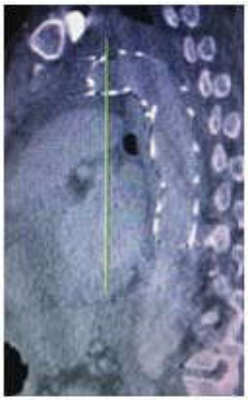

Fig. 2: CT aortogram Type B post TEVAR.

Thoracic Endovascular Aortic Repair (TEVAR) was performed four days pos-admission, under general anesthesia, guided by fluoroscopy and transesophageal echocardiography to confirm placement of two stents in the true lumen. Stents deployed from left subclavian artery to theaorta at the 10th thoracic vertebra. Post-procedure patency of both renal arteries and common iliac arteries were noted.

A repeat Aortogram revealed interval placement of aortic stent graft seen from the level of aortic arch to the mid thoracic aorta with expansion of the true lumen. The celiac artery, superior mesenteric artery, bilateral renal arteries and iliac arteries patency was maintained. There was a mural thrombus in the false lumen just distal to the stent. He was transferred to the ward on the third day post-procedure, and discharged home four days later with a blood pressure of 122/75.

Case Two

An 84-years-old gentleman, known to have hypertension for over 20 years, and on follow up for prostate cancer was referred with a diagnosis of Type B aortic dissection after he presented with complains of chest pain. Further inquiry revealed a previous admission within the year for uncontrolled blood pressure. Physical examination was significant for blood pressure of 161/78 mm Hg and a weak left dorsalis pedis arterial pulse. Computed tomography aortogram showed anextensive long segment aortic dissection from distal aortic arch up to the abdominal aorta, with a thrombus in the false lumen.

The patient was reviewed by the heart team and a decision was made to proceed with TEVAR. Procedure was performed under general anesthesia, access via the right femoral artery. The stents were placed from just distal to origin of left subclavian artery to the aorta at the 9th thoracic vertebra.

Fig. 3: CT aortogram Type B.

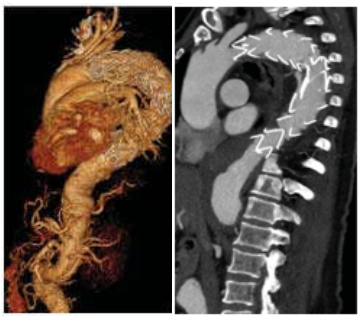

Fig. 4: CT aortogram 3D reconstruction and plain post TEVAR Aorticdissection.

Post-procedure, the patient was admitted to intensive care unit, and extubated the following day. No complications noted immediately post TEVAR. Repeat aortogram done two days after the procedure revealed aortic stent graft with no endovascular leak. Patient was discharged on the fifth day after admission,with a blood pressure of 134/92.

Case Three

54-years-old male, with a history of 15 pack years of smoking, excess alcohol consumption, known to have hypertension, non-compliant to medication, presented with complains of constant, dull chest pain, dizziness and hemoptysis. Physical examination showed blood pressure of 86/46 mm Hg, pulse rate of 105 per minute, and low oxygen saturations of 86%. Respiratory examination revealed reduced breath sounds on the left hemi thorax. A chest radiograph revealed left pleural effusion followed by an urgent CT aortogram that showed a thoracoabdominal aortic

aneurysm, ruptured with proximal descending aortic anterolateral luminal thrombus acting totamponade the defect.

TEVAR was performed under general anesthesia, access via right femoral artery, two grafts deployed, from left the subclavian artery, to the aorta at the 11th thoracic vertebra. Patient was admitted to the intensive care unit, extubated the following day and discharged to ward after three days. The renal function remained deranged, and a repeat CT aortogram was deferred. Patient was discharged after seven days in the ward. Post-discharge course involved a readmission for an acute stress disorder, persistent kidney injury andesophageal candidiasis. Blood pressure was 133/81 three weeks post-discharge.

Case Four

66-year-old male history of hypertension and low back pain referred for cardiac evaluation. Blood pressure control was suboptimal with a blood pressure of 160/97. Chest radiograph revealed an aneurysmal aorta, and computed tomography aortogram revealed Type B aortic dissection.

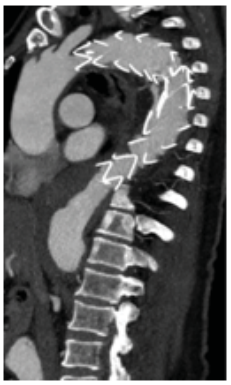

Fig. 5. Type B aortic dissection CT aortogram stretched aorta view.

Fig. 6: CT aortogram 3D reconstruction TEVAR. Showing length and landing zones of stent

TEVAR performed using two stents under general anesthesia. Lumbar drainwas inserted to monitor cerebrospinal fluid pressure. Transesophageal echocardiogram guided wire placement in the true lumen due to different entry and exit points of dissection. Stents deployed form left subclavian to 12th thoracic vertebra. Patient extubated in cardiac catheterization laboratory. Lumbar drain removed in intensive care unit next day. Blood pressure 110/80, transferred to ward second day post-procedure and discharged on the 5th day.

Discussion

This case series builds on our previous experience in Kenya of acceptable outcomes with endovascular repair in patients with suitable anatomy. This is supported by both the European Society of Cardiology and European Society for Vascular Surgery guidelines on the management of aortic dissection that recommend TEVAR as a first-line intervention in case of complicated Type B aortic dissection–defined as an aortic dissection starting distally from the left subclavian artery and complicated by rupture, bleeding or compromised blood flow into important aortic side branches.[5] TEVAR is superior to best medical therapy or open surgery for treatment of Type B aortic dissections in terms of mortality, complications, and cost.[3] Open surgical repair is associated with increased odds of early postoperative mortality but reduced late hazard of death. Despite the late advantage of open repair, mean survival is superior for TEVAR.[6]

TEVAR ideally requires a proximal landing zone of 15 mm. There were two patients who did not have adequate proximal landing zones, necessitating partial obstruction of the left subclavian artery. This however did not cause any clinically significant adverse effects. Arterial saturation on the left hand was maintained at greater than 90% and no pulse or functional deficit noted.

There was concern that closing the false lumen would impair blood flow to vital organs. Post-procedure angiograms in the cardiac catherization laboratory illustrated adequate flow in particular to the kidneys. This was further confirmed by the post -procedure computed tomography aortograms. Post-discharge there were no reported adverse events related to blood supply to vital organs.

Guidelines recommend tight systolic blood pressure (SBP) control for favorable outcomes of Type B aortic dissection but are still limited by the optimal cut-off value of SBP. In one study the optimal cut-off value of SBP at discharge was 130 mm Hg.[4] The four patients achieved this cut-off by discharge and required fewer medications than pre-procedure to control blood pressure. It is important to note that hypertension and suboptimal blood pressure control is a significant risk factor for dissections. Improved population blood pressure control may lead to a decrease in the incidence of aortic dissections.

A useful adjunct to fluoroscopy was transoesophageal echocardiography. It assisted in confirming the proximal landing zone was adequately covered without complete occlusion

of the left subclavian artery. It was useful in determining the second stent did not end in aneurysmal section and had good vessel apposition. It also ensured that prior to deployment that guide wire and stents were in the true lumen.

Conclusion

Thoracic endovascular aortic repair provides a lifesaving alternative to open surgery with good short and long-term outcomes in relation to morbidity and mortality. It is a cost-effective option with a shorter hospital stay. Best medical therapy for blood pressure control remains an essential part of treatment.

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