Case Report

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Endovascular Stent in Traumatic Thoracic Aortic Dissection

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Traumatic thoracic aortic injury is typically fatal. However, recent improvements in pre-hospital care and diagnostic modalities have resulted in an increased number of patients with traumatic aortic injury arriving alive at the hospital. Also, the morbidity and mortality associated with endovascular repair are significantly lower than with conventional open surgery in traumatic thoracic aorta injury. We experienced two cases of successful management of traumatic thoracic aortic dissection with endovascular stents caused by traffic accidents.
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KEY WORDS: Aorta, thoracic; Dissection; Aortography; Multidetector computed tomography.

Introduction

Patients with blunt traumatic thoracic aorta injuries are increasingly admitted to hospital due to the increasing number of traffic accidents per day. Traumatic thoracic aortic injury is typically fatal. The thoracic aorta wall ruptures after blunt thorax trauma and if not treated, has very poor outcome with an initial survival rate ranging from 10 to 30%. The hospital mortality rate is up to 32% during the first day, 61% within the first week and 74% after 2 weeks. Moreover, according to the literature, patients surviving the acute phase without surgery had a 30% risk of late traumatic thoracic aorta aneurysm rupture.[1)]

Fortunately, acute and chronic traumatic lesions of the descending aorta can now be treated via an endovascular approach in specialized centers, with low morbidity and mortality rates.[2)3)] We report two cases of endovascular stenting in traumatic thoracic aortic dissection due to traffic accidents.

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Cases

Case 1

A 28-year-old male suffered from a traffic accident while in a car. His mental status was confused but brain CT revealed non-specific findings. He had no known history of hypertension, diabetes, hepatitis, and pulmonary tuberculosis. He was an 8 pack-year current smoker. His family history was non-specific. On admission his vital signs were stable except for blood pressure of 100/70 mm Hg. A 12-lead electrocardiogram (EKG) showed normal sinus rhythm with 72 beat/min. The results of electrolyte panel and kidney function studies were all within normal limits. The aspartate aminotransferase (AST) was 70 U/L, alanine amino-transferase (ALT) was 47 U/L, creatinine kinase (CK) was 255 U/L and CK-MB was 28 U/L. However, serum level of troponin I was within normal limits. Initial 2-dimensional echocardiography (2DE) showed no regional wall motion abnormality with normal left ventricular ejection fraction, but chest CT angiogram (CTA) showed traumatic aortic dissection in proximal descending thoracic aorta/distal aortic arch around aortic isthmus with left pleural effusion (Fig. 1). Therefore, we performed a thoracic aortography, which showed an aortic aneurysm distal to the subclavian artery, for which a 24×112 mm valiant thoracic stent was implanted. Follow-up aortogram showed no evidence of leakage. Follow-up 2DE did not show evidence of turbulent flow or flow disturbance near the entrance of the left subclavian artery. Follow-up chest CTA showed vascular stent graft insertion state from distal aortic arch to proximal descending thoracic aorta and resolved state of previous traumatic aortic dissection (Fig. 2). After uneventful recovery, he was discharged on day 33 and has been followed up at the out-

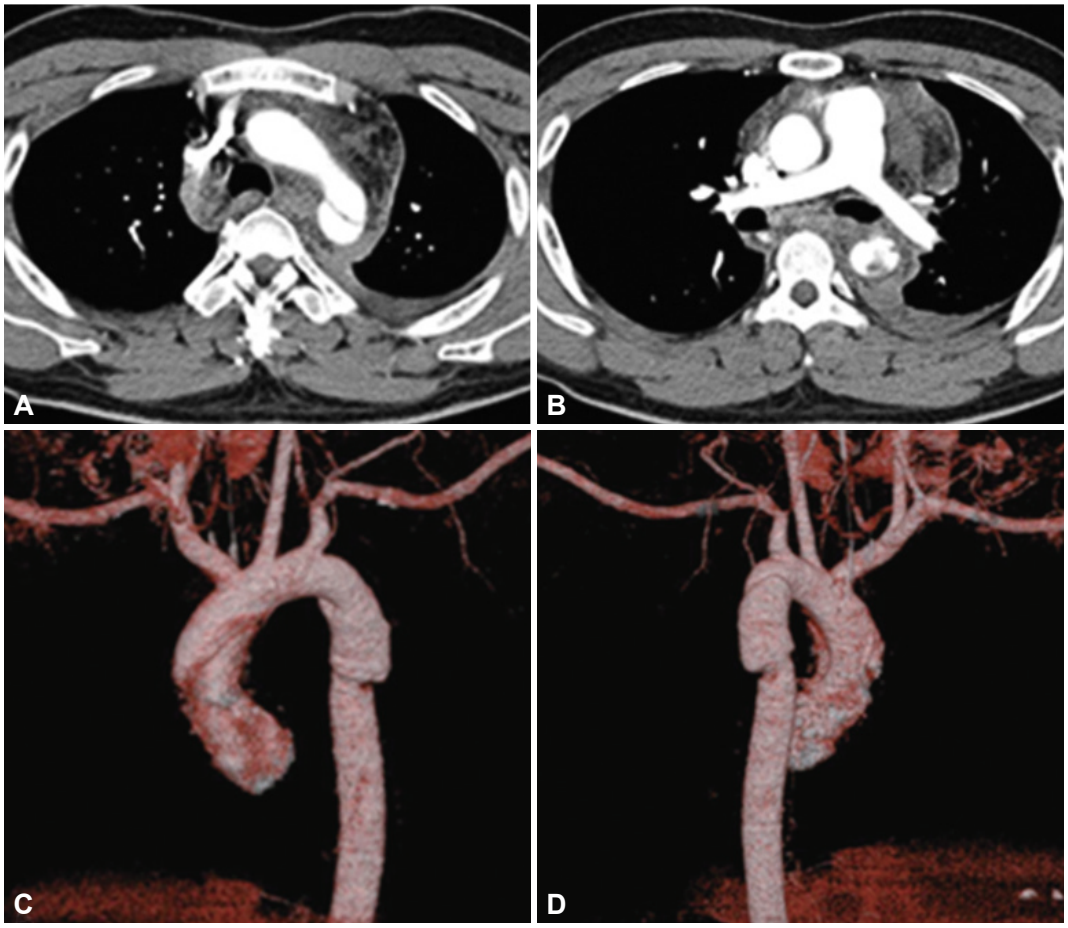

Fig. 1. Chest computed tomography angiogram shows traumatic aortic dissection in proximal descending thoracic aorta/distal aortic arch around aortic isthmus with left pleural effusion. A: aortic arch level. B: pulmonary artery level. C: anterior view. D: posterior view.

patient clinic.

Case 2

A 52-year-old male suffered from a traffic accident in a car. He complained of left flank pain and had multiple left rib fracture. He had no known history of hypertension, hepatitis, or pulmonary tuberculosis, but had been on diabetes medication for 3 years. He was a non-smoker and non-alcoholic drinker, and his family history was non-specific. On admission his blood pressure was 70/40 mm Hg. EKG showed sinus tachycardia with 138 beats/min. The results of electrolyte panel and kidney function studies were all within normal limits. The AST was 219 U/L, ALT was 153 U/L, CK was 2113 U/L, CK-MB was 51.7 U/L and troponin I was 0.24 U/L. Initial chest CTA showed traumatic aortic dissection in distal aortic arch/proximal descending thoracic aorta with surrounding hematoma (Fig. 3). The patient underwent medical treatment for 3 weeks, but follow-up chest CTA showed no remarkable change of traumatic aortic dissection and increased amount of bilateral hemothoraces. Based on this information, we performed the thoracic aortography on day 24. Aortogram revealed dissecting aneurysm approximately 1 cm distal from the left subclavian artery ostium. Stenting was performed using a 26×112 mm valiant thoracic stent graft. Follow-up aortogram showed good expansion of the stent without dye leakage. Follow-up chest CTA showed a graft insertion state from the distal aortic arch to the proximal descending thoracic aorta and a resolved state of a previous traumatic aortic dissection (Fig. 4). After uneventful recovery, he was discharged on day 34 and has been followed up at the outpatient clinic.

Discussion

The main etiology of aortic injury in thoracic blunt trauma is rapid acceleration and deceleration. The trauma mechanisms described have included shear forces applied at the ligamentum arteriosum, acute compression by the diaphragm, torsion of the aorta, acute intravascular hypertension and/or compression of the aorta between the sternum and spine (osseous pinch).[4)5)]

Traumatic thoracic aortic injuries are usually located distal to the left subclavian artery. Because of the presence of intercostal arteries, pleura and the ligamentum arteriosum, the descending aorta is

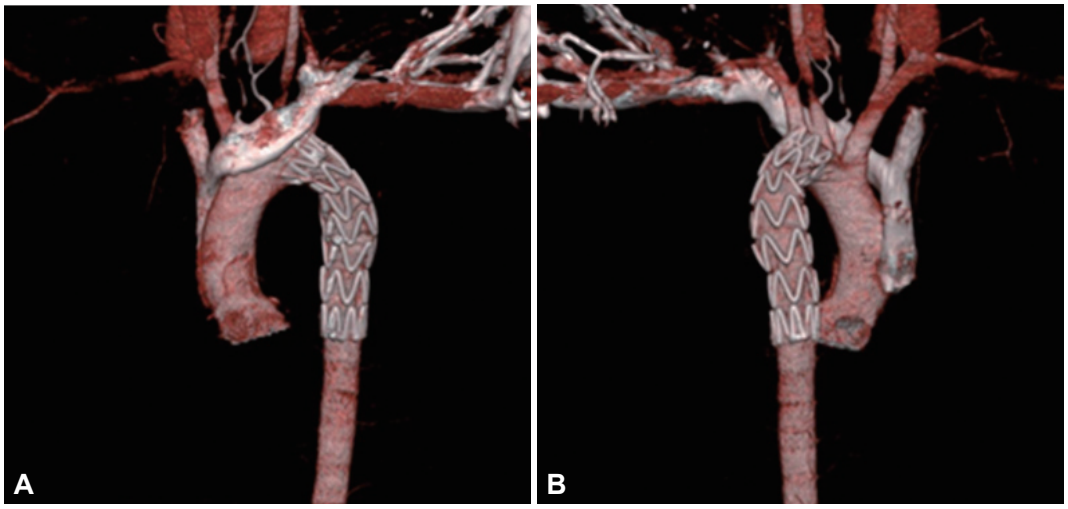

Fig. 2. Follow-up chest computed tomography angiogram shows vascular stent graft insertion state from distal aortic arch to proximal descending thoracic aorta and resolved state of previous traumatic aortic dissection. A: anterior view. B: posterior view.

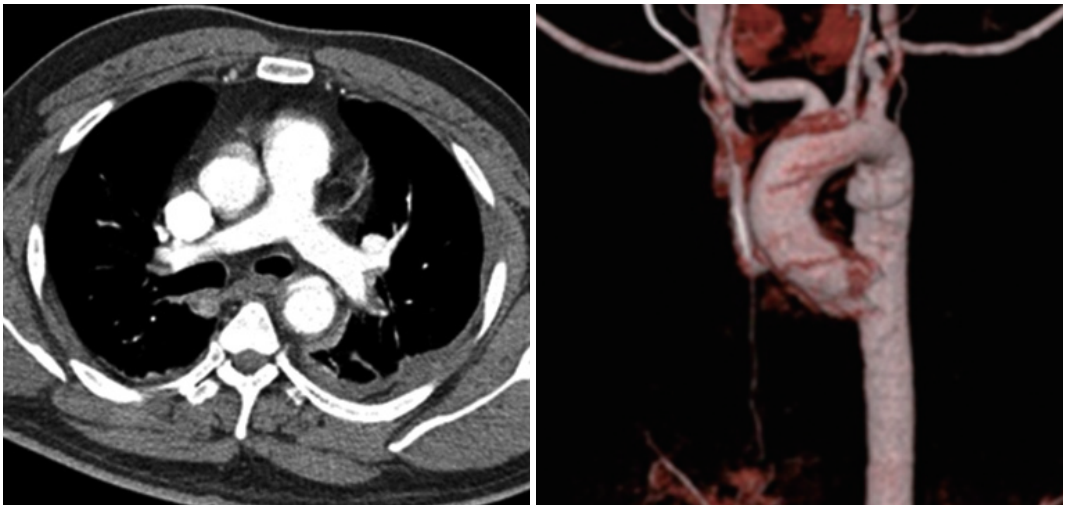

Fig. 3. Initial chest computed tomography angiogram shows traumatic aortic dissection in distal aortic arch/proximal descending thoracic aorta with surrounding hematoma.

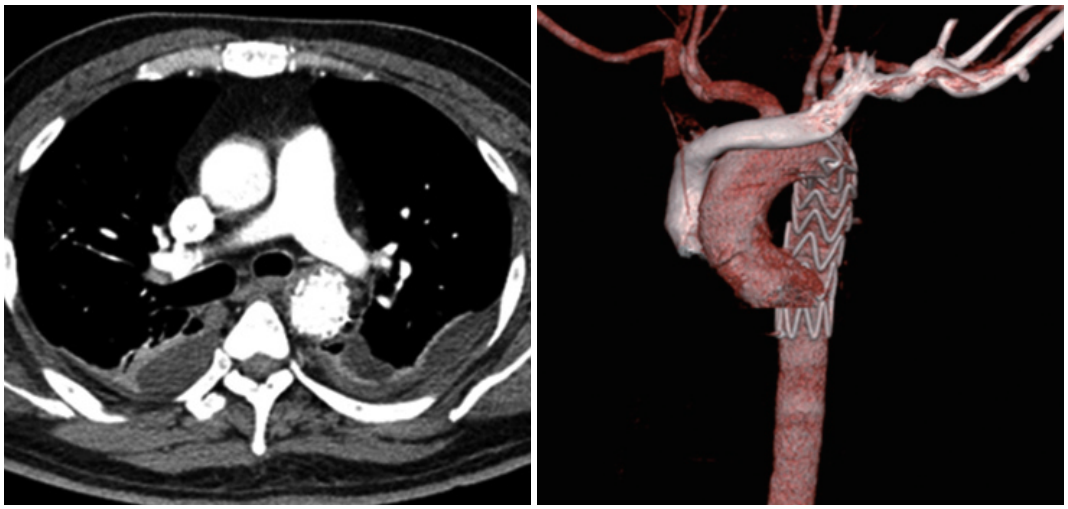

Fig. 4. Follow-up chest computed tomography angiogram shows graft insertion state from distal aortic arch to proximal descending thoracic aorta and resolved state of previous traumatic aortic dissection.

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fixed more rigidly than the aortic arch and the heart during its course through the vertebral sulcus. During a horizontal deceleration trauma, the descending and other parts of the aorta move at different speeds. As a result, the isthmic part of the aorta is under maximum stress, and may yield total or partial rupture of the vessel.[6]

Results of a meta-analysis comparing the 30-day outcomes between 278 aortic ruptures managed surgically vs. 355 managed by endovascular means showed no significant differences in injury severity or age between the groups.[7] The endovascular group had significantly lower mortality (7.6% vs. 15.2%, p=0.008), paraplegia (0% vs. 5.5%, p<0.0001) and stroke (0.81% vs. 5.1%, p=0.003) compared to the open surgical repair cohort.

Endovascular repair is particularly attractive in managing patients whose associated injuries or comorbid conditions put them at greater risk for open repair.[8] Furthermore, endovascular grafts may also be used not as a definitive treatment, but in complicated cases as a bridge therapy to definitive treatment in selected patients who are not candidates for either medical treatment or operative treatment.[9]

The main advantages include shorter time procedure and lower operative risk. If the patient is not affected by other priority life-threatening injuries, endovascular repair should be performed at first before any other surgical treatment in order to eliminate the risk of sudden aortic rupture. Another benefit acquired from this technique is the absence of cardiopulmonary bypass and the low-dose systemic heparinization.[10] Despite great achievements from endovascular stent grafts, several complications of endovascular stenting have remained. Although complications do not occur frequently, endoleak, stent collapse, subclavian occlusion, stroke, embolization, bronchial obstruction, implant syndrome, dissection, migration, and paralysis may develop.[4] In our cases, procedure-related complications did not develop. Blood flow to left subclavian artery was not disturbed by the endovascular stent.

More reports and follow up data about endovascular stenting in traumatic thoracic aortic injury have been presented recently. Endovascular treatment for acute traumatic aortic rupture is feasible and represents a valid alternative to conventional open surgery in selected patients.

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