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## Traumatic Pseudo-Aneurysm and Concurrent Dissection of the Aortic Arch Treated with Endovascular Stenting

The pseudo-aneurysms of thoracic aorta are rare and a life-threatening complication of aortic surgery and blunt chest trauma. This article demonstrates a case report of a traumatic aortic arch dissection and formation of a false aneurysm after blunt chest trauma in Iran. A 23-year-old man was referred complaining of chest pain and exertional cough. He had a history of chest and abdominal trauma five months ago after a car accident, resulting in acceleration-deceleration injury. The trauma resulted in an extensive injury on the left side of the chest and abdomen associated with multiple rib fractures, hemothorax and splenic rupture. Splenectomy and left chest tube drainage was performed. The patient was admitted for 15 days. Finally, he recovered to normal and was discharged in satisfactory condition. However, his chest pain and cough restarted and its severity gradually increased. In chest x-ray, a left upper mediastinal mass was detected, which was later confirmed by 64 multi-slice chest CT scan as a false aortic arch aneurysm and aortic dissection. It seems endovascular stent-graft technique for the treatment of thoracic aorta aneurysm may present a good treatment choice with a low risk and less invasive approach.

**Keywords:** Aorta, Aneurysm, Trauma, Stent-Graft, Dissection

### Introduction

One of the rare and life-threatening complications of blunt chest trauma is aortic dissection resulting in gradual formation of a false aneurysm of the thoracic aorta.<sup>1</sup> Traumatic pseudo-aneurysm of the aortic arch is an uncommon pathology.

Chronic traumatic false aneurysm develops as a delayed complication long after a traumatic injury of the thoracic aorta in 1-2% of the patients, and the problem is not identified initially.<sup>2</sup> A false aneurysm occurs in approximately 2% to 5% of patients with aortic disruption either due to the lack of diagnosis or after non-operative treatment.<sup>2</sup> At the initial stage, a false aneurysm may partially clot and later be organized with a fibrous wall causing a saccular or fusiform aneurysm. Previous data report that the aortic isthmus is involved in 90% of false aneurysms.<sup>2,3</sup> Among patients suffering from developing chronic pseudo-aneurysms of the thoracic aorta, the incidence of associated injuries is lower at the time of trauma.<sup>2,4</sup> Between the treatment methods of thoracic aorta aneurysm, aortic graft interposition has been preferred for many years.<sup>5,6</sup> Even with the newer techniques applied during the past years, the post operative mortality and morbidity rates of aortic aneurysm are still high.<sup>5,6</sup> The classic management of thoracic aortic aneurysms routinely includes sternotomy, cardiopulmonary bypass, graft interposition and intimal repairing of the aortic arch with a high mortality rate.

In 1992, endovascular stent-graft repair of thoracic aortic aneurysms was introduced.<sup>7,8</sup> After that, this technique was proved as a safe technique with easy access to stent-

graft repair. This invasive technique was also widely expanded to other lesions of the thoracic aorta.<sup>7,9</sup> Many authors in the field of endovascular surgery have reported their successful experience of stent-graft repair for traumatic aortic injuries.<sup>7,10,11</sup>

We came across a similar patient five months after initial blunt chest injury caused in a high speed motor vehicle accident. This article demonstrates a case report of a traumatic aortic arch dissection and formation of a false aneurysm after blunt chest trauma in Iran.

## Case Presentation

Our patient was a 23-year-old man complaining of pain in the back of the chest with cough on exertion. He described a history of trauma during a traffic accident 5 months earlier, leading to abdominal and chest injury associated with multiple rib and upper sharp sternal fractures, hemothorax and splenic rupture. He was operated in the emergency and managed with chest tube and drainage along with splenectomy. The patient was admitted for 15 days in the hospital. Finally, he recovered and was discharged in satisfactory condition. Consequently, chest pain and cough restarted and gradually increased in severity.

The physical examination on second consultation revealed a healthy-looking young man in no distress. His oral temperature was 37.0°C. His pulse rate was 80 beats per minute, with a regular rhythm. His blood pressure was 120/80 mm Hg. His lungs were clear to auscultation on both sides, with normal respiratory effort. The patient's heart auscultation revealed a holosystolic cardiac murmur on the left hemithorax radiating to the back and both sides of his neck over the carotid arteries. The peripheral arterial pulses were normal in all extremities.

Chest radiography revealed a mass in the left mediastinum compatible with aneurysm of the thoracic aorta. Computed tomographic scan of the chest with a 64 multi-slice showed a false aortic aneurysm (7×8 cm) arising from the thoracic aorta along with the dissection of the aortic arch (Fig. 1).

## Procedures

We performed percutaneous endovascular intervention under local anesthesia with the help of



**Fig. 1.** A 23-year-old man presenting with chest pain and cough. Chest CT scan shows a false aneurysm of the thoracic aorta.

intravenous sedation. For preoperative assessment, the patients underwent chest X-ray, 5 mm contrast enhanced spiral CT-scan of the chest, abdomen and pelvis and arteriography in order to evaluate the site, morphology and extension of the aortic lesion.

We approached through the right common femoral artery to the aortic arch allowing the insertion of a 5F pigtail catheter for angiographic controls, advancing throughout a hydrophilic guide wire which was easily withdrawn at the end of the procedure. A Medtronic endovascular stent was inserted (Fig. 2).

Immediately after stenting, the murmur was obscured. The patient was discharged after 48 hours with a prescription of oral anticoagulant (Plavix 75 mg). Final angiography showed optimal sealing at the proximal and distal landing sites and complete exclusion of the pseudoaneurysm from blood flow in the absence of primary endoleak. In 6 months clinical follow up, the false aneurysm of the patient was doing well without dyspnea or cough on exertion. Controlled monthly chest X-ray showed the gradual shrinking and absence of false aneurysm (Fig. 3).

## Discussion

Over the past 10 years, with the increased use of the endovascular approach, the management and outcome of traumatic aortic injuries have changed



**Fig. 2.** Medtronic endovascular stent applied within the thoracic aorta. dramatically from a hazardous aortic replacement open chest surgery to the safe endovascular stent treatment. The pathogenic mechanism underlying aortic injury is critical in choosing the kind of stent-graft. Since a long time ago, authors in this subject have tried to find the possible mechanisms of non-penetrating blunt trauma of the aorta, but the result was not satisfactory.<sup>12</sup> Again, the differential acceleration and deceleration movements exerting in horizontal and/or longitudinal planes, during a fast running automobile accident may increase the endovascular pressure abruptly causing a direct or indirect compression of the thoracic aorta from the bony structures of the thoracic wall.<sup>12</sup>

The similar mechanism was involved in our patient presented in this report. Our patient had suffered from a high speed motor vehicle traffic accident, leading to acceleration and deceleration movements. The ascending aorta and the descending thoracic aorta under the isthmus area are more frequently involved by the rupture caused by direct compression of the sternum and spine with a sudden increase in endoluminal pressure when blunt chest trauma suddenly occurs in a fast running motor vehicle accident.<sup>12</sup> On the other hand, Cammack and co-authors had put forward the hypothesis that the trauma generated by differential acceleration and deceleration movements leads to the rupture of the isthmus. As the points of fixity of the aorta through the junction of the ligamentum arteriosum and the first ribs coincide with isthmus, this part



**Fig. 3.** Post operative chest X-ray demonstrating shrinking of the false aneurysm.

is more vulnerable to trauma and rupture.<sup>13</sup> Most of these patients die at the scene of the accident or on transfer to the hospital.<sup>14</sup> Some authors also believe that open surgical repair of such cases results in 30% of perioperative mortality and 8% of paraplegia, which is considered as a high risk.<sup>7,15</sup> Recently, the treatment of patients injured by blunt chest trauma and aortic lesion is managed by endoluminal stent-graft technique as an alternative to conventional surgery because of its less traumatic nature, especially in cases of multiple and extensive associated lesions.<sup>7,16</sup>

During the 5 years of our experience in endovascular stent-graft devices available at our department in Tehran, this is the first case of false aneurysm in the aortic arc after blunt chest trauma. The mid-term results of stent treatment in this particular patient have been encouraging.

Some authors reported a successful stent-graft repair of chronic traumatic aortic rupture in nine patients treated from one month to 25 years after the accident.<sup>12,17,18</sup>

Some surgeons of Stanford university declared in their pioneer work and valuable experience that stent-grafting is safe in selected patients with chronic traumatic aneurysms associated with satisfactory

but not optimal mid-term durability.

We conclude that endovascular stent-graft technique for the treatment of thoracic aorta aneurysm may present a good treatment choice with a low risk and less invasive approach.

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