Endovascular repair of traumatic transection of thoracic aorta

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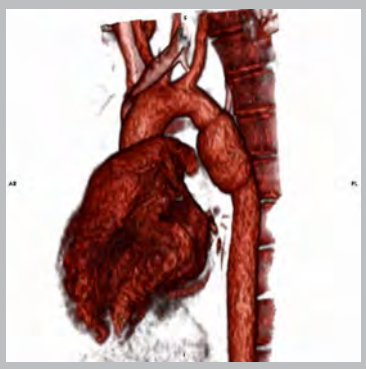

Figure 1. *Pre-operative MPR. Mediastinal hematoma with left hemothorax*

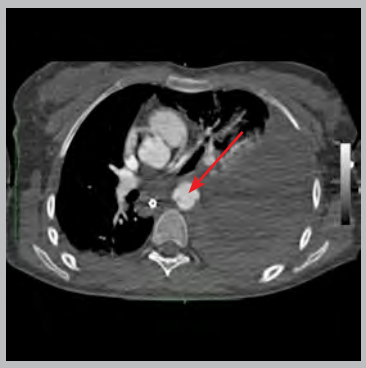

Figure 2. *Axial slice on level of isthmus showing the lesion of the aorta*

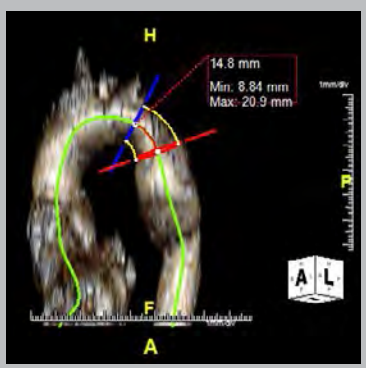

Figure 3. *Measurement of the neck length on the outer curve (max length 20.9 mm)*

INTRODUCTION

Traumatic transection of the thoracic aorta, often referred to as blunt aortic injury (BAI), is the second most common cause of death in trauma patients after brain injury. The majority of cases are due to car accidents and occur at the level of the aortic isthmus. The mechanism of aortic transection is not completely understood, but it is thought to be related to the tearing forces that occur during sudden deceleration at the level of the isthmus, between the relatively fi ed descending thoracic aorta and the more mobile aortic arch. With modern imaging techniques, BAIs have been classified in o four categories based on the severity of aortic disrupture:

- grade 1, intimal tear
- grade 2, intramural hematoma
- grade 3, aortic pseudoaneurysm
- and grade 4, complete transection

A 19-year-old female was admitted with intubation and hemodynamic instability after a high-speed car crash. After an Extended Focused Assessment with Sonography for Trauma (EFAST) examination which showed hemoperitoneum and only mild pleural effusion, the patient underwent emergent explorative laparotomy with splenectomy due to spleen formatting.

The patient was then transferred to the radiology department to perfom total body Computed Tomography Angiography (CTA) scan, which showed a grade 4 BAI with a large left hemothorax *(Figures 1 and 2)*.

PROCEDURE

The patient was immediately transferred to the operating room for emergent stent-graft placement. Aortic diameter measurements for device selection were done using the orthogonal centerline view in a multiplanar reconstruction (MPR), as MPRs measure aortic size and length more accurately. The distance between the left subclavian artery and the lesion was 20.9 mm on the outer aortic curvature, 8.8 mm on the inner aortic curvature and 14.9 mm on the center lumen line *(Figure 3)*. Proximal aortic diameter was 18.8 mm while distal diameter was 16 mm. The required aortic coverage was 100 mm.

In accordance with device *Instructions for Use*, we decided to implant a Conformable GORE® TAG® Thoracic Endoprosthesis (TGE212110) at the distal margin of the left subclavian artery.

After surgical exposure of the right common femoral artery, an 18 Fr GORE® DrySeal Sheath with Hydrophilic Coating was introduced over a 0.035" extra-stiff guidewire (COOK® LUNDERQUIST® Guidewire).

GORE TAG THORACIC ENDOPROSTHESIS
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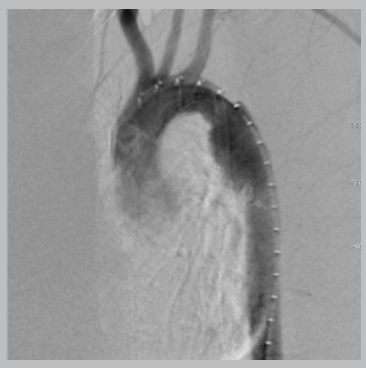

Figure 4. *Angiogram intraoperative*

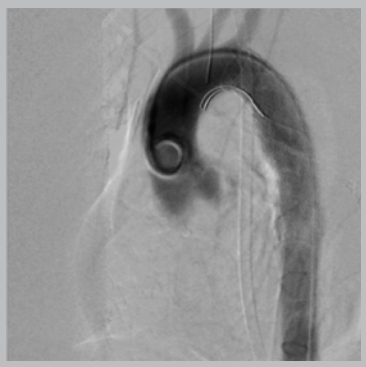

Figure 5. *Completion angiogram with Conformable GORE® TAG® Device at the distal margin of the LSA*

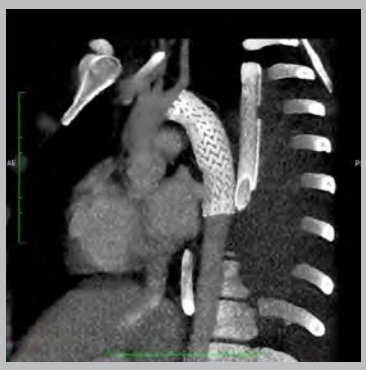

Figure 6. *CT post-implant*

The aortic arch was visualized with a 69° LAO projection. After insertion of the stent-graft, the pigtail catheter was re-inserted using the same 18 Fr sheath (as the diameter of the distal shaft of the device allows the simultaneous insertion of a 4 Fr pigtail catheter) and an angiogram was performed to visualize the proximal landing zone *(Figure 4)*. The stent-graft was then deployed using standard techniques.

Completion angiogram showed complete exclusion of the BAI with no extravasation of contrast outside the aortic lumen of the device *(Figure 5)*.

RESULTS

Post-operative CTA showed good placement of the stent-graft, no evidence of endoleak, and optimal wall apposition of the device to the inner curvature of the acute aortic arch, with no bird-beak effect *(Figure 6)*. A chest tube was then inserted to drain the hemothorax.

DISCUSSION

The Conformable GORE® TAG® Device was purpose-designed for the treatment of BAIs. In 2011, the device was the fi st to earn FDA approval for the treatment of traumatic aortic injuries. The device is available in smaller sizes and with tapered configu ations, thus allowing a signifi antly greater number of patients to be treated within the sizing guidelines.

Young trauma patients usually have a signifi antly smaller radius of curvature of the aortic arch than patients with degenerative aneurysms, the so-called “gothic arch”. This anatomy represents an obstacle for thoracic endovascular aortic repair (TEVAR) treatment due to the risk of device malapposition (“bird-beak effect”), leading to possible endoleak or even device collapse.

To overcome this anatomical challenge, the Conformable GORE® TAG® Thoracic Endoprosthesis introduced the concept of radial fi . Radial fi is a component of conformability. It is enabled by expanded and overlapping oversizing windows, permitting optimization of radial force in a disease- and anatomy-specifi manner. These characteristics allow the Conformable GORE® TAG® Device to appose the entire circumference of the aorta and provide sealing without exerting excessive or unbalanced forces on the vessel wall.

The Conformable GORE® TAG® Device IFU advises to measure the length of the outer aortic curve for the proximal landing zone of the device, rather than the center lumen line or the inner curve, as is recommended for other TEVAR devices. In this specifi case, this allowed us to have a 20.9 mm proximal neck length on the outer curvature and avoid LSA coverage.

In conclusion, the measurement of the proximal neck on the outer aortic curvature and device conformability to the inner arch curvature allowed us to obtain a quick and effective exclusion of the lesion, with no need for LSA coverage and no bird-beak effect.

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