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## Endovascular repair of blunt thoracic aortic injury

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ARTICLE INFO	ABSTRACT
<i>Keywords:</i> Aortic rupture Pediatric Endovascular stent	Traumatic thoracic aortic injuries are rare in the pediatric population. Most patients sustaining this injury do not survive and succumb at the scene. Associated injuries can complicate the management of the aortic injury. Aortic injuries have traditionally been treated by open repair. In the adult population, endovascular stenting has become the management of choice. The pediatric literature has isolated reports of the use of endovascular stenting in the repair of aortic injuries. We report an 11 year old female with multiple injuries and a grade III thoracic rupture with a pseudoaneurysm successfully managed with endovascular stenting.

Traumatic aortic injury is rare; blunt trauma is the most common mechanism. It has been reported as the second most common cause of death in individuals aged 4 to 34, following head injury. The great majority of patients sustaining aortic transections die at the scene and of those who survive the initial injury, half will die in the first 24 h following admission [1–5].

Patients with a rtic transections generally sustain multiple injuries which can make the management of the a ortic injury more complicated [1–5].

Traumatic aortic injury is even rarer in children. It has been reported to occur in 0.05–0.1% in pediatric patients with significant chest injuries [6].

Open vascular repair has been the traditional approach to aortic traumatic injuries. Thoracic endovascular aortic repair (TEVAR), now the preferred approach in the adult population [3–5], has been recently gaining popularity in children. However there are only isolated case reports in the surgical literature [6–13].

There are currently no FDA approved stents for traumatic aortic injuries in children.

We report an eleven year old female patient with multiple trauma, who sustained a grade III thoracic aortic injury successfully managed with an off -label endovascular stent.

#### 1. Case report

An 11 year old female, unrestrained back seat passenger, was involved in motor vehicle accident when the car she was traveling in hit a tree. She was initially seen at a local community hospital and transferred to our level 1 pediatric trauma center. She sustained multiple injuries, including bilateral femur fractures, bilateral pulmonary contusion and a grade III blunt traumatic aortic injury (TAI), 5 mm distal to the left subclavian artery (Figs. 1 and 2). The pseudo aneurysm measured 21 mm. X 27 mm with a dissecting intimal flap (Fig. 3).

On admission to our trauma center she was hemodynamically stable. Her Glasgow Coma Scale was 15. There was no evidence of head injury.

Decision was made to proceed with TEVAR, with an off label endovascular stent. The Covered Cheatham platinum stent (CCPS) NuMed, Inc, Hopkinton, NY, 12965 was selected because of our experience with this stent in the management of aortic coarctation. This device is on an investigational phase two trial under emergency use protocol and has been previously reported in the literature in the successful stenting of 4 pediatric cases of aortic rupture.

The stenting was done two weeks after admission. While waiting for the stent approval and arrival, the orthopedic team stabilized the bilateral femur fractures. The anesthesiology team maintained strict blood pressure control throughout the procedures. The patient remained under careful observation in the pediatric intensive care unit. A Computerized Tomography Scan (CT Scan) was repeated one week after admission. The CT scan demonstrated the pseudoaneurysm to be stable with no evidence of expansion.

The stenting procedure was done under general anesthesia. Percutaneous approach to both right radial and right femoral arteries was done.

The pediatric cardiac surgery team was on standby and ready to intervene if a complication occurred. The patient was heparinized to

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Fig. 1. Chest radiograph demonstrating a widened mediastinum.



Fig. 2. CT of the thorax showing a type III aortic rupture with a pseudoaneurysm.

maintain an ACT greater than 240 s.

A 4 Fr. sheath was placed in the right radial artery and a 5 Fr. Sheath in the right femoral artery. The injured aorta and intimal flap were carefully crossed with a 0.035 J wire followed by a 4 Fr. Bentson Hanafee glide catheter. The catheter was positioned in the right subclavian artery and subsequently exchanged for a 035 Amplatz Super stiff guidewire. Angiograms were performed via the pigtail catheter placed in the right radial artery to visualize the aortic arch. The 5 Fr. Sheath was exchanged for a Fr. Cook Performer sheath. The 45 mm. CCPS stent was mounted on a 14 mm. X 5 cm. BIB balloon catheter and positioned across the pseudoaneurysm. The inner balloon was inflated with hand pressure and stent position was confirmed with angiography.



Fig. 3. Measurements of the pseudoaneurysm.

The outer balloon was inflated to a maximum pressure of 6 ATM. The balloon was removed and a repeated angiogram was performed.

Angiography revealed no residual filling of the pseudoaneurysm, normal flow to the left subclavian artery, and no BP wave change form in the left radial artery. The initial gradient was 18 mm. Hg. There was essentially complete resolution of the gradient (Fig. 4).

Postoperatively, the patient continued with Esmolol and Nicardipine with strict BP control to maintain a systolic BP of < 110 for 48 h. Intravenous sedation and Lovenox were continued. She recovered uneventfully and was discharged 10 days following stent placement on daily aspirin.

She was followed up closely as outpatient. She was feeling well but a repeat CT angiogram done 10 months later revealed a type II endostent



Fig. 4. Aortic stents deployed with complete occlusion of the aortic rupture and the pseudoaneurysm and excellent blood flow to the left carotid and left subclavian arteries.

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