A Race Against Time: Collaborative Emergency and Cardiothoracic and Vascular Surgery–Led Endovascular Repair in Traumatic Aortic Transection with Polytrauma

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Abstract:

Blunt traumatic aortic transection is one of the most lethal injuries following high-energy deceleration trauma. Early diagnosis, prompt haemodynamic stabilisation, and seamless coordination between emergency medicine and cardiothoracic and vascular surgery (CTVS) teams are critical to survival. A 38-year-old male presented to the emergency department after a high-velocity road traffic accident with multiple injuries, including a right femoral deformity and upper abdominal pain radiating to the back. The emergency physician initiated advanced trauma life support (ATLS)–based resuscitation and ordered urgent computed tomography (CT) polytrauma imaging, which revealed a contained rupture of the descending thoracic aorta, 4.5 cm distal to the left subclavian artery, associated with mediastinal haematoma compressing the oesophagus, mild haemopericardium, bilateral pulmonary contusions, and a comminuted right femoral fracture. Recognising the critical nature of the injury, the emergency team activated the multidisciplinary trauma protocol, involving the CTVS and orthopaedic teams. Following rapid stabilisation, thoracic endovascular aortic repair (TEVAR) using a Medtronic Endurant stent graft (24/24/100 mm) was performed through right femoral artery exposure, achieving immediate haemodynamic control. Subsequently, the patient underwent open reduction and internal fixation (ORIF) for the femur fracture. Postoperatively, mild hypoxaemia due to fat embolism was managed conservatively. The patient made a full recovery, maintaining stable haemodynamics and oxygenation at discharge. This case highlights how rapid emergency leadership and precise CTVS intervention can transform an otherwise fatal aortic transection into a survivable event. Early clinical suspicion, timely imaging, and multidisciplinary teamwork remain the cornerstones of modern trauma success.

Key words: Traumatic Aortic Rupture, TEVAR, Emergency Medicine, CTVS, Fat Embolism.

Introduction

Blunt traumatic aortic injury is a time-critical vascular emergency accounting for approximately 20% of deaths following high-speed motor vehicle collisions.[1] It typically occurs at the aortic isthmus, just distal to the left subclavian artery, where the fixed and mobile segments of the aorta meet.[2] While the majority of patients succumb at the scene, those who reach the hospital alive have a limited window for diagnosis and intervention. The emergency physician's role is pivotal — ensuring early

recognition, stabilisation, and activation of a coordinated trauma response involving the cardiothoracic and vascular surgery (CTVS) team for definitive repair.[3] With the advent of thoracic endovascular aortic repair (TEVAR), outcomes in blunt trauma aortic injury have improved substantially compared to open surgical approaches, reducing mortality, morbidity, and recovery time.[4-6] This case exemplifies outstanding teamwork between emergency medicine and CTVS teams, showcasing how time-sensitive decision-making and multidisciplinary precision led to survival from a near-fatal injury.

Case Report

Initial presentation and assessment

A 38-year-old male was brought to the emergency department following a high-energy two-wheeler accident. On arrival, he was conscious and oriented (Glasgow Coma Scale [GCS] 15/15) and haemodynamically stable.

Primary survey: No airway compromise, equal bilateral breath sounds, no external bleeding.

Secondary survey: Scalp abrasions, no abdominal tenderness, and right thigh deformity with shortening, suggesting femoral fracture. The emergency medicine physician initiated advanced trauma life support (ATLS)–based stabilisation, including oxygen supplementation, fluid resuscitation and blood transfusion.

Imaging and diagnostic findings

Contrast-enhanced computed tomography (CECT) polytrauma revealed:

- **Aorta:** Acute transection with limited dissection 4–6 cm distal to the left subclavian artery, forming a contained pseudoaneurysm with mediastinal haematoma compressing the oesophagus
- **Thoracic findings:** Mild haemopericardium, bilateral pulmonary contusions, and thrombus extending to the pulmonary artery bifurcation
- **Brain:** Small bilateral frontal contusions without mass effect
- **Musculoskeletal:** Comminuted right femoral shaft fracture with posterior displacement

Emergency and surgical management

Recognising the imminent risk of rupture, the emergency medicine team activated the multidisciplinary trauma protocol, alerting the CTVS, orthopaedics, and neurosurgery teams. After stabilisation, the patient was shifted to the hybrid operating suite for emergency TEVAR on 27th September 2025.

Procedure details

- **Access:** Right femoral artery open exposure and left femoral artery catheterisation
- **Device:** Medtronic Endurant stent graft (24/24/100 mm)
- **Result:** Successful sealing of the pseudoaneurysm; no endoleak; haemodynamics normalised intraoperatively

The patient was extubated the next morning and remained stable under intensive monitoring. Neurosurgical management of frontal contusions was conservative. After stabilisation, ORIF with intramedullary nailing of the right femur was performed by the orthopaedics team. Within 30 hours post-ORIF, the patient developed irritability and desaturation. Computed tomography pulmonary angiography (CTPA) ruled out pulmonary embolism; fat embolism syndrome was diagnosed clinically. Conservative management with oxygen, fluids, and corticosteroids led to steady improvement. The patient was discharged in a fully alert and haemodynamically stable condition, requiring assistance with ambulation.

Discussion

Traumatic aortic transection represents a critical challenge in emergency trauma care. Mortality remains high without rapid diagnosis and intervention.[5] In this case, early recognition by the emergency physician, guided by mechanism-based suspicion, was pivotal. Activation of the hybrid trauma response ensured simultaneous stabilisation and endovascular repair within hours, demonstrating exemplary emergency–CTVS synergy. Endovascular repair (TEVAR) has now replaced open repair as the standard of care for descending thoracic aortic injuries due to its reduced risk of bleeding, paraplegia, and mortality.[7,8] The multidisciplinary collaboration extended beyond surgery — orthopaedic, neurosurgical, and internal medicine teams coordinated seamlessly, allowing safe sequential management of injuries. Continuous

postoperative vigilance for complications like fat embolism was crucial to overall recovery.[9] This case exemplifies modern trauma management principles — speed, system activation, and multidisciplinary precision — that transform outcomes in previously unsurvivable injuries.

Patient Consent

Written informed consent for publication of this case and accompanying clinical details was obtained from the patient and family.

Conclusion

This case demonstrates that timely suspicion, rapid imaging, and coordinated multidisciplinary intervention — led by emergency medicine and executed by the CTVS team — can convert a catastrophic aortic transection into a survival success. The keys to the outcome were time, teamwork, and technical excellence.

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