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Endovascular Repair of a Traumatic Aortic Pseudoaneurysm in a Polytrauma Patient: A Case Report

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Abstract

Purpose: This case report aims to present the successful early management of a traumatic aortic pseudoaneurysm in a polytrauma patient using thoracic endovascular aortic repair (TEVAR) and to highlight the procedure's efficacy as a primary treatment modality.

Methods: A 43-year-old male with a history of blunt chest trauma from a road traffic accident was admitted for a life-threatening traumatic aortic dissection with pseudoaneurysm formation. Diagnostic CT aortography was performed to characterize the injury, and TEVAR was chosen as the definitive treatment. A Valiant Thoracic Stent Graft was deployed to exclude the injury.

Results: The TEVAR procedure was technically successful with no intraoperative complications. Post-deployment angiography confirmed good exclusion of the pseudoaneurysm and restoration of normal blood flow. The patient's post-operative course was uneventful, and he was discharged on the fifth day.

Conclusion: Early TEVAR is a safe and effective treatment for traumatic aortic injuries in hemodynamically stable patients. It offers significant advantages over open surgical repair, including reduced morbidity and a shorter hospital stay, leading to a favorable clinical outcome.

Keywords: Traumatic Aortic Injury, Thoracic Endovascular Aortic Repair (TEVAR), Aortic Pseudoaneurysm, Blunt Chest Trauma

Introduction

Traumatic aortic injury (TAI) is a life-threatening consequence of high-energy blunt chest trauma, with the aortic isthmus being the most common site of injury due to shearing forces. TAI is classified on a spectrum of severity, with a pseudoaneurysm (Grade 3) representing a contained rupture that carries a high risk of progression to an uncontained, often fatal, event. Historically, open surgical repair was the standard of care for TAI; however, with advancements in endovascular techniques, thoracic endovascular aortic repair (TEVAR) has emerged as the preferred, minimally invasive alternative. A growing body of evidence supports TEVAR as the gold standard for TAI management in hemodynamically stable patients due to its superior clinical outcomes. This case report details the successful early intervention with TEVAR in a 43-year-old male with a traumatic aortic pseudoaneurysm.

Case Description

A 43-year-old male, identified as Ruban V., was admitted to the hospital on 23/7/24 after a high-energy road traffic accident. On presentation, he was hemodynamically stable. Contrast-enhanced computed tomography (CT) aortography, considered the gold standard for diagnosing TAI, revealed a traumatic aortic dissection just distal to the origin of the left subclavian artery. The intimal tear measured 3.3 cm in length, and a pseudoaneurysm with a maximum width of 3.1 cm was noted at the aortic isthmus. According to the Society for Vascular Surgery (SVS) grading scale, this constituted a Grade 3 injury. The patient's vital signs and key imaging findings are summarized in Table 1.

A multidisciplinary team discussion concluded that early TEVAR was the optimal strategy to prevent rupture. The procedure was performed under general anesthesia. The right femoral artery was accessed percutaneously, and a 6F sheath was inserted. A stiff guidewire was advanced into the aorta under fluoroscopic guidance, and the landing zone was identified. A Valiant Thoracic Stent Graft (Medtronic, Santa Rosa, CA, USA) measuring 26x26x100mm was selected. The stent graft was advanced and deployed to cover the intimal tear. Post-deployment angiography confirmed the correct placement and successful exclusion of the injury with no evidence of endoleak. The procedure concluded with the closure of the femoral artery access site.

The patient’s post-operative course was uneventful. He was monitored in the intensive care unit with his blood pressure maintained below 120 mmHg. A chest X-ray was taken post-TEVAR (Figure 1), confirming the proper placement of the stent graft. He was discharged on the fifth post-operative day, consistent with the shorter hospital stays associated with TEVAR.

Table 1: Patient's Admission Vitals and Imaging Findings

Parameter	Value
Age	43 years
Mechanism of Injury	Road Traffic Accident
Vital Signs on Admission	HR: 88 bpm, BP: 125/70 mmHg
CT Aortography Findings	Traumatic aortic dissection below left subclavian artery, 3.3 cm intimal tear, 3.1 cm pseudoaneurysm at the aortic isthmus

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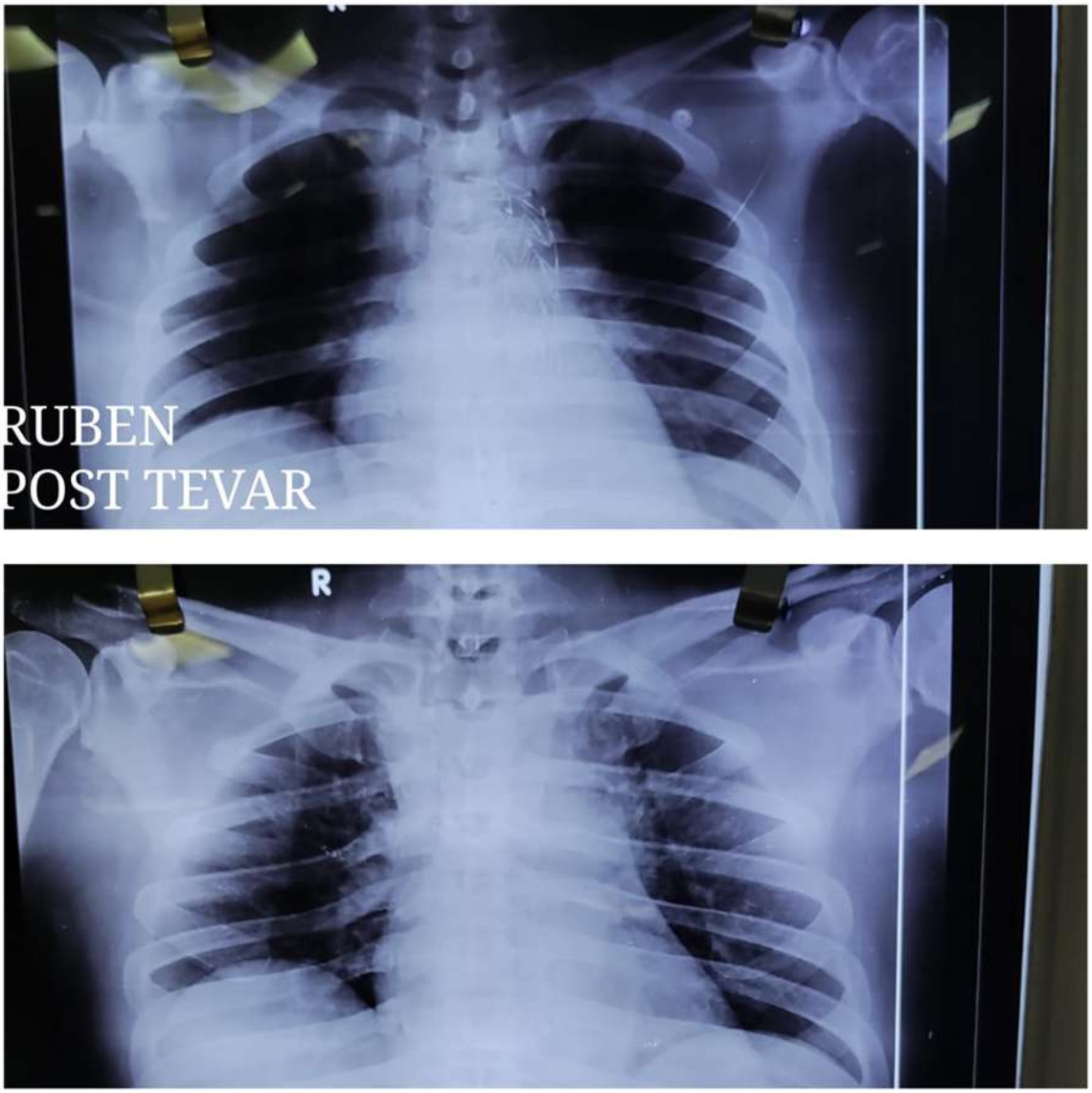
Figure 1: Post-operative chest X-ray showing the properly positioned Valiant Thoracic Stent Graft (Medtronic) at the aortic isthmus.



A post-operative chest X-ray of the patient, showing the stent graft in place after TEVAR.

Table 2: Comparison of TEVAR vs. Open Surgical Repair for Descending Thoracic Aortic Disease

Outcome Metric	TEVAR	Open Surgical Repair
Mortality Rate	9%	19%
Paraplegia/Spinal Cord Ischemia Rate	Reduced risk	Higher risk
Operative Time	Significantly shorter	Significantly longer
Blood Loss	Decreased	Increased
Intensive Care Unit Stay	Decreased by 4 days	N/A

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Outcome Metric	TEVAR	Open Surgical Repair
Hospital Stay	Decreased by 7 days	N/A

Discussion

TEVAR has revolutionized the management of TAI due to its minimally invasive nature, which significantly reduces perioperative morbidity and mortality compared to open surgical repair. A meta-analysis comparing the two procedures for descending thoracic aortic disease demonstrated TEVAR's superior outcomes, including a lower mortality rate, reduced risk of paraplegia, shorter operative time, and decreased blood loss. The clinical and technical benefits are summarized in Table 2.

The choice of TEVAR for this patient was based on his stable hemodynamic status and the severity of his Grade 3 injury. Early intervention was crucial to prevent the imminent risk of rupture without the extensive physiological insult of open surgery, which is particularly beneficial in a polytrauma patient. The Valiant stent graft, designed specifically for blunt traumatic aortic injuries, provides excellent conformity to the native aorta, minimizing the risk of endoleaks and device migration. While short-term outcomes are excellent, long-term follow-up is essential to monitor for potential complications and ensure the continued integrity of the repair.

Conclusion

This case report demonstrates that TEVAR is an effective and reliable treatment for traumatic aortic pseudoaneurysms. The procedure successfully and definitively repaired the injury, leading to a swift and uncomplicated recovery. This highlights the clear advantages of TEVAR over open surgical repair as the primary treatment modality for suitable patients with TAI.

Declarations

Ethical Declaration: The study was conducted in accordance with the ethical standards of the institutional and national research committee and with the Helsinki Declaration of 1975, as revised in 2008.

Patient Consent: Informed consent was obtained from the patient for the publication of this case report and the accompanying images, with appropriate anonymization of all personal details.

Author Contributions: All authors have made substantial contributions to all of the following: (1) the conception and design of the study, or acquisition of data, or analysis and interpretation of data, (2) drafting the article or revising it critically for important intellectual content, (3) final approval of the version to be submitted.

Conflicts of Interest: The authors declare no conflicts of interest related to this case report.

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