Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Aortic Bifurcation Injury Following Blunt Trauma Presenting as Bilateral Lower Limb Ischemia: A Case Report

S Sakashan
Teaching Hospital Jaffna
Dayas M
Faculty of Medicine, University of Jaffna
Andrew Nishanthan
Teaching Hospital Jaffna
Vinojan Satchithanantham
vinojan@univ.jfn.ac.lk

Faculty of Medicine, University of Jaffna

Case Report

Keywords: blunt abdominal aortic injury, aortic bifurcation, lower limb ischemia, polytrauma

Posted Date: June 28th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9605129/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Version of Record: A version of this preprint was published at BMC Surgery on August 27th, 2026. See the published version at https://doi.org/10.1186/s12893-026-04165-8.

Abstract

Background

Blunt abdominal aortic injury (BAAI) is rare but life threatening. Injury near the aortic bifurcation can cause acute lower limb ischemia and is often associated with multisystem trauma, increasing morbidity and mortality.

Case Presentation

A 57-year-old man presented after being run over by a heavy vehicle, with right-sided rib fractures, pneumothorax, and intra-abdominal injury. In the secondary survey he was found to have absent lower limb pulses with neurological deficits. CT angiography revealed ESVS grade X injury at the aortic bifurcation and a grade I right renal injury. After transfer to a tertiary center, fasciotomy demonstrated a non-viable right lower limb and partially viable compartments in the left. The patient underwent resection of the injured distal aorta with polyester graft reconstruction and a right above-knee amputation, with controlled reperfusion. Despite initial hemodynamic stabilization, the patient developed severe reperfusion injury and multiorgan dysfunction syndrome postoperatively and died in the intensive care unit.

Discussion

BAAI is uncommon and complete aortic bifurcation occlusion is extremely rare. Patients with acute lower limb ischemia and multisystem trauma have higher mortality than those with isolated or partial aortic injuries. Early recognition, prompt imaging, and urgent multidisciplinary surgical intervention are essential. However, prolonged ischemia, reperfusion injury and systemic metabolic derangements often complicate management and can lead to poor outcomes even after aggressive surgery.

Conclusion

Blunt aortic bifurcation injury carries high morbidity and mortality particularly when associated with multisystem trauma. Vigilance for early diagnosis, rapid intervention, and comprehensive critical care are vital although outcomes remain poor due to the risk of systemic complications such as reperfusion injury and multiorgan failure.

Background

Blunt abdominal aortic injury (BAAI) occurs when high energy trauma applies direct or indirect forces to the abdominal aorta. This part of the aorta is anchored between the spine, peritoneum, and abdominal organs, making it vulnerable to shear and compressive forces during sudden deceleration or crush

injuries (1). BAAI is rare in both adults and children. It represents only 4%–6% of all aortic injuries and less than 1% of blunt trauma cases (1, 2). Despite its low incidence, it carries a high risk of mortality with reported rates ranging from 17% to 92% (1).

Blunt thoracic aortic injuries are far more common. This difference is partly because the thoracic aorta is relatively mobile except at fixed points such as the ligamentum arteriosum and the base of the heart, whereas the abdominal aorta is largely fixed along its course (1, 3). The infrarenal segment near the aortic bifurcation is especially vulnerable to severe injury. Damage in this area often causes acute lower limb ischemia, muscle necrosis and systemic metabolic complications (1).

These injuries frequently occur alongside trauma to other organ systems including the chest, spine, pelvis, and abdominal organs, which complicates management and worsens prognosis (1, 4). Early recognition, rapid imaging, and urgent surgical intervention are critical to improving survival in such cases (1, 4).

Case presentation

A 57-year-old man was admitted to a District General Hospital after being run over by a heavy vehicle, sustaining injuries to the right side of his abdomen and lower chest. Initial evaluation revealed fractures of the right 7th and 8th ribs, a right-sided pneumothorax, and a small amount of free fluid in the abdomen. He was hypotensive, with a systolic blood pressure of 70 mmHg.

In the emergency department, he was resuscitated with intravenous fluids and blood transfusions, and a chest tube was inserted on the right side. Following stabilization, his blood pressure improved. During the secondary survey, both lower limb pulses were absent, and there was sensory loss up to the level of the umbilicus. He retained movement of the toes on the left side, but had no movement at the toes or ankle on the right side.

A CT angiogram was performed to assess for vascular injury. This revealed an occlusion at the aortic bifurcation (ESVS Grade X injury), along with a grade I injury to the right kidney *(*Fig. 1*)*.

After initial stabilization, he was transferred to a tertiary care center for vascular intervention. On arrival, he was hemodynamically stable. Examination of the lower limbs showed that on the right side, he had no movement at the ankle or toes, with a fixed ankle joint. On the left side, toe movements were present but reduced. Both lower limbs were cool to touch, more so on the right.

A decision was made to perform fasciotomy and then proceed with definitive aortic repair. During fasciotomy, none of the compartments in the right leg were viable. In the left leg, only the superficial posterior and lateral compartments were viable. Based on these findings, it was decided to proceed with vascular repair along with a high above-knee amputation of the right lower limb.

An exploratory laparotomy revealed a contused segment of the distal aorta. Proximal control of the aorta and both iliac arteries was achieved. The aorta was transected at the level of the contusion, revealing an

intimal flap extending into both iliac arteries, causing thrombosis and occlusion (Fig. 2). The damaged segment of the distal aorta and proximal iliac arteries was resected and reconstructed using a 16 × 8 mm polyester graft (Fig. 3).

Controlled reperfusion was carried out, initially restoring blood flow to the left lower limb. On the right side, a groin incision was made, and clamps were applied to the common femoral artery, allowing only the internal iliac circulation to be perfused at first. A high above-knee amputation was then performed. Following completion of the amputation, perfusion to the right side was established.

Postoperatively, he was transferred to the critical care unit. However, his condition progressively deteriorated, with signs of reperfusion injury and multiorgan dysfunction. Despite aggressive resuscitative efforts, he ultimately succumbed.

Discussion

Blunt abdominal aortic injury (BAAI) is a rare but dangerous condition. It usually happens after severe trauma, such as high-impact accidents (5, 6). Even though it is not common, it is often associated with injuries to other parts of the body (5, 7) Most patients who survive to hospital have injuries in the lower part of the abdominal aorta near the bifurcation, which was the site affected in this case. Injury severity can range from small intimal tears to complete rupture or occlusion of the vessel (5, 7). Patients presenting with lower limb ischemia, where blood flow to the legs is blocked, have a much higher risk of death compared to those without ischemia (8).

Hospital mortality for BAAI remains significant even with operative intervention. Some literatures report that about 30% of patients who reach hospital alive may die, and those undergoing surgery still carry substantial risk due to the severity of vascular injury and the overall physiological burden (1, 9). Severe metabolic derangements including shock, acidosis, hyperkalemia, and reperfusion injury compounded by rhabdomyolysis are common in major vascular compromise with prolonged ischemia and predict poor outcomes.

In many reported cases, less severe abdominal aortic injuries do not cause profound systemic complications and can sometimes be managed successfully with less invasive treatments including endovascular repair. Patients in these scenarios often maintain distal limb perfusion and have better overall outcomes compared to those requiring extensive open surgery (5, 6, 8). In contrast, our patient had a complete occlusion at the aortic bifurcation, resulting in acute bilateral lower limb ischemia. Clinical findings included absent distal pulses, a fixed right ankle, and cold toes on the right, indicating severe malperfusion. This level of vascular injury, combined with extensive muscle necrosis, represents an extreme ischemic insult (6, 8).

Fasciotomy findings further guided limb management. The right lower limb demonstrated complete non-viability, necessitating above-knee amputation. In the left lower limb, only the superficial posterior and lateral compartments were viable. Notably case series have reported satisfactory functional outcomes

following reperfusion of limbs previously deemed marginal (10). The presence of partially viable muscle compartments suggested a potential, albeit limited, for limb preservation. Furthermore, bilateral major lower limb amputation is associated with significant long-term functional impairment, poor rehabilitation potential, and reduced quality of life, particularly in resource-limited settings where access to advanced prosthetics and rehabilitation services is constrained. Therefore, an attempt at limb salvage on the left side was considered more appropriate.

Another factor affecting the patient's outcome was the presence of multisystem trauma. The patient sustained chest injuries, spinal fractures from T12 to L5, pelvic trauma, retroperitoneal injury, and compression of the inferior vena cava. Patients with isolated or partial abdominal aortic injuries and no multisystem trauma generally show better survival and limb salvage rates (7, 9). Complete bifurcation occlusion when associated with multiple injuries as seen in our case carries a much higher risk of mortality (7, 9).

Management of severe BAAI requires prompt diagnosis, rapid vascular imaging, and urgent multidisciplinary intervention. Open surgical repair remains the standard for complete occlusion or when endovascular options are not feasible (5, 8). In this patient, vascular repair with a prosthetic graft and bilateral four-compartment fasciotomies were necessary to restore perfusion and relieve compartment pressure. Despite these interventions, extensive muscle necrosis and metabolic derangements led to irreversible systemic complications, highlighting the limitations of surgical intervention in extreme cases (6, 8).

Conclusion

Blunt abdominal aortic injury particularly at the aortic bifurcation is a rare but life-threatening condition that carries high mortality especially when associated with multisystem trauma. Complete occlusion in this region can rapidly lead to acute bilateral lower limb ischemia, muscle necrosis, and severe systemic complications such as rhabdomyolysis, acidosis, and multiorgan dysfunction. Early recognition, prompt imaging and urgent multidisciplinary intervention are critical to optimize outcomes but even with aggressive surgical management, prognosis may remain poor in severe cases. This case underscores the importance of maintaining a high index of suspicion for BAAI in high energy trauma and highlights the challenges in managing complex vascular injuries complicated by multisystem trauma and metabolic derangements.

Abbreviations

BAAI
Blunt abdominal aortic injury

Declarations

Ethics approval and consent to participate

Ethical approval was not required for this single case report, in accordance with the institutional / national policy.

Consent for publication

Informed written consent was obtained from the patient for publication of this case report.

Competing interests

Not applicable

Funding

No funding was received.

Author Contribution

S.V and A.A were the primary clinicians involved in patient management and contributed to the clinical interpretation of the case. They also revised and corrected the manuscript. S.S and D.M were responsible for data collection, the initial drafting of the manuscript, and the literature review. All authors reviewed the manuscript and approved the final version.

Acknowledgement

We thank the patient and the medical and nursing staff involved in this case, as well as the consultant team and department staff for their support and guidance in preparing this report.

Availability of data and materials

Data supporting the findings of this study are stored locally at Teaching Hospital, Jaffna, Sri Lanka.

References

1. Li M, Wang C, Tu H, Zhu H, Guo Z, Guo L. A systematic review of blunt abdominal aortic injury and analysis of predictors of death. Biomolecules Biomed. 2024;24(3):486. 10.17305/. BB.2023.9831 PubMed PMID: 37865918.
2. Li M, Yan Y, Wang C, Tu H. Hospital mortality of blunt abdominal aortic injury (BAAI): a systematic review and meta-analysis. World J Emerg Surg. 2023;18(1):26. 10.1186/S13017-023-00492-W . PubMed PMID: 36991444.

3. Mouawad NJ, Paulisin J, Hofmeister S, Thomas MB. Blunt thoracic aortic injury – concepts and management. J Cardiothorac Surg 2020. 2020;15(1):1. 10.1186/S13019-020-01101-6 . PubMed PMID: 32307000.
4. Shalhub S, Starnes BW, Brenner ML, Biffl WL, Azizzadeh A, Inaba K, et al. Blunt abdominal aortic injury: a Western Trauma Association multicenter study. J Trauma Acute Care Surg. 2014;77(6):879–85. 10. 1097/TA.0000000000000353 PubMed PMID: 25248064.
5. Tobler WD, Tan TW, Farber A. Endovascular Repair of a Blunt Abdominal Aortic Injury. Int J Angiol. 2012;21(2):117. 10.1055/S-0032-1315796 . PubMed PMID: 23730142.
6. Murata T, Ogino H, Isogai N, Kashiwagi H, Shimoyama R, Kawachi J. Endovascular aortic repair for abdominal aortic injury complicated with bowel injury due to blunt abdominal trauma: A case report. Int J Surg Case Rep. 2021;85:106216. 10.1016/. J.IJSCR.2021.106216 PubMed PMID: 34293653.
7. Dhakal P, Regmi PR, Shingh SS, Adhikari B, Dhakal S. A Rare Case of Isolated Abdominal Aortic Injury in Blunt Abdominal Trauma: A Case Report. Cureus. 2025;17(9). 10. 7759/CUREUS.92638 PubMed PMID: 41122567.
8. View of Isolated Abdominal Injury of Blunt Aortic Trauma. Two Case Reports and Review of the Literature [Internet]. [cited 2026 Apr 5]. Available from: https://publicera.kb.se/jevtm/article/view/17296/14566
9. Juneja A, Aparajita R, Zia S. Blunt Abdominal Aortic Injury and Multiple Traumatic Abdominal Wall Hernias: A case of Rare Concomitant Injuries. J Vas Health Surg [Internet]. [cited 2026 Apr 5];1(1):102. Available from: www.annexpublishers.com.
10. Arudchelvam J, De Soyza M. Revascularisation of marginally viable limbs; a long-term follow-up study. J Surg. 2020;1(1):1002.

Figures

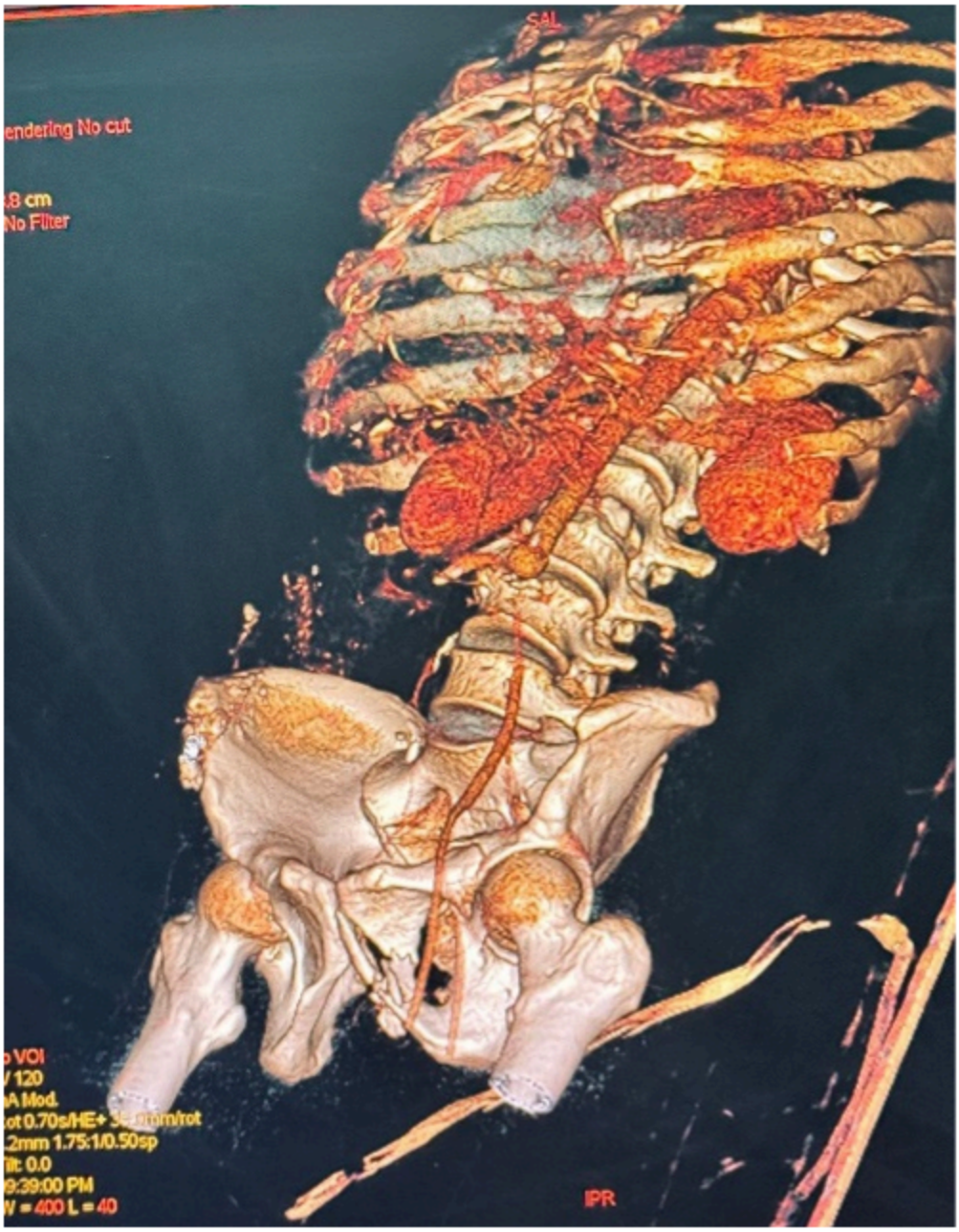


Figure 1

CT angiography showing occlusion at the aortic bifurcation (ESVS Grade X vascular injury) with an associated Grade I injury to the right kidney.

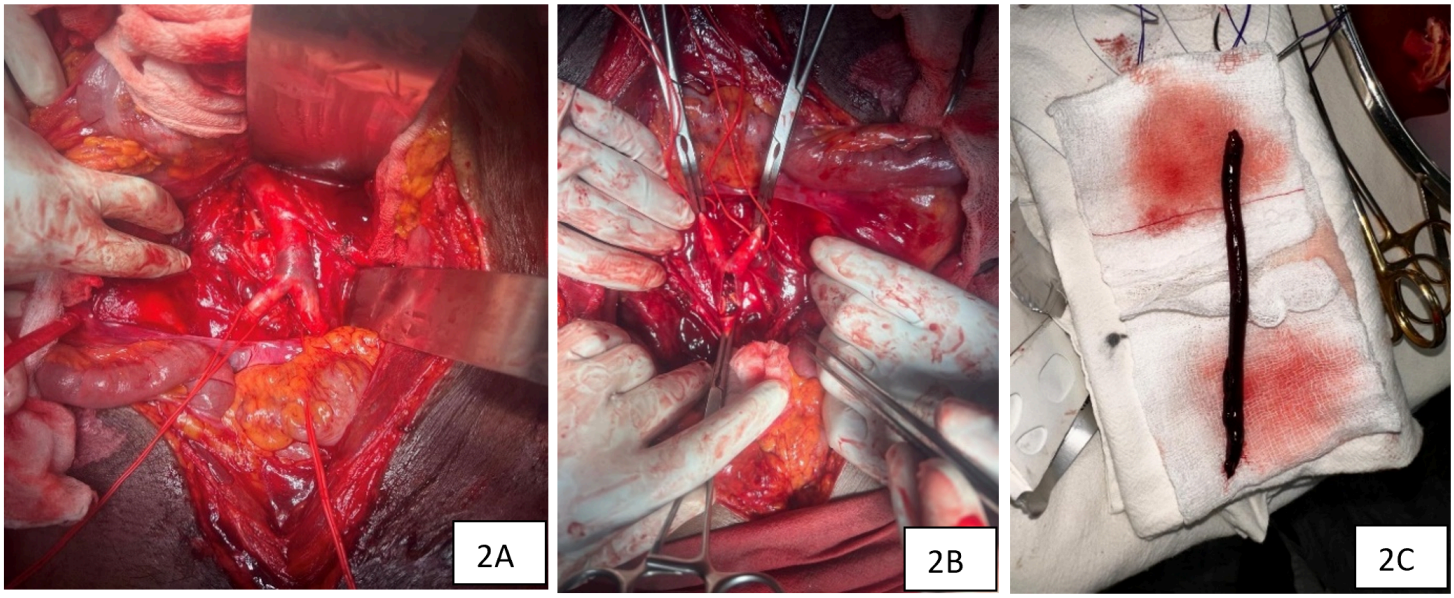


Figure 2

A,B,C - Intraoperative images showing distal aortic contusion at the bifurcation with intimal flap extending into both iliac arteries causing thrombosis and occlusion; the affected segment was resected and thrombus removed.



Figure 3

Intraoperative view showing reconstruction with a 16 × 8 mm polyester graft to restore vascular continuity.