

## Calculated risk reaps rewards: Interventional Radiology in hemodynamically unstable trauma

Pinto Krista Philippa Anne<sup>1</sup><sup>1</sup>Department of Emergency Medicine, Bharati Vidyapeeth (DU), Medical College and Hospital, Pune, Maharashtra, India  
E-mail ID: kristapinto17@gmail.com

Submission: 23.10.2023

Acceptance: 04.07.2024

Publication: 30.09.2024

[https://www.doi.org/10.56136/BVMJ/2023\\_01547](https://www.doi.org/10.56136/BVMJ/2023_01547)**Introduction**

Effective management of trauma cases necessitates a collaborative, multidisciplinary approach. Immediate life-saving measures, such as maintaining the airway, administering intravenous fluids, and providing blood transfusions, are essential. Simultaneously, the trauma team in the Emergency Department (ED) conducts a rapid assessment of the patient's injuries and arranges the necessary diagnostic imaging to formulate a treatment plan.

Traditionally, Interventional Radiology (IR) has been a pivotal player in controlling active bleeding resulting from trauma, primarily using endovascular techniques in patients who are hemodynamically stable. However, there has been a growing trend toward utilizing IR, even in cases of hemodynamically unstable patients. IR's role in managing vascular injuries to solid abdominal organs serves as a critical link between conservative management and emergency surgical intervention, often negating the need for immediate surgery. Therefore, it is imperative for the ED to integrate IR as an essential component of trauma management in suitable cases<sup>(1)</sup>.

For instance, a single-center study reported the use of Transcatheter Arterial Embolization (TAE) in 209 sites among 149 patients, with the pelvis, lumbar arteries, and spleen being common targets<sup>(2)</sup>.

**Case Report**

A 30-year-old male patient, without any known underlying medical conditions, was transported to the Emergency Department in the early hours of June 6, 2023, from another city. He had reportedly sustained a stabbing injury in the left lumbar region, and by the time of arrival, more than six hours had elapsed since the incident.

A Contrast-enhanced CT scan (CECT) of the Abdomen and Pelvis indicated an active bleed in the left psoas muscle. The patient was transferred to the hospital while receiving intravenous fluids and a blood transfusion.

Upon arrival in the Emergency Department, the primary survey conducted by the Emergency Medicine Resident on duty revealed that the patient's airway was patent. The room air saturation was reduced to 85%. However, the inspection

and palpation of the chest and neck were normal, with bilateral air entry equal. The patient had a rapidly declining blood pressure, the value being 60/40 mmHg on arrival. The patient was tachycardic, at a pulse rate of 120 beats/min with cold extremities, indicating a severe Class IV hemorrhagic shock. The patient exhibited a Glasgow Coma Scale of 15/15, with bilaterally equal and reactive pupils. The blood sugar levels were within the normal range (174 mg/dl). Exposure revealed a penetrating wound of 5 × 2 × 3 cm on the left lumbar region. Adjuncts to the primary survey showed sinus tachycardia on the ECG and severe metabolic and lactic acidosis (pH - 7.26, pCO<sub>2</sub> - 30.2, HCO<sub>3</sub> -14.8, Lactates - 7.1. K<sup>+</sup> - 4.6). The patient's E-FAST was negative.

In view of the worsening shock, the emergency physician took the decision to intubate the patient and initiated a massive blood transfusion protocol through two wide-bore intravenous cannulas. After a bolus of 1 Liter of warm IV Crystalloids was administered. Additionally, a right radial arterial line was secured. Other medical management included administration of IV antibiotics and IV antifibrinolytics.

Following consultations among the Departments of Emergency Medicine, Surgery, Urology, Interventional Radiology, and Critical Care, the trauma team made the decision to pursue Interventional Radiology as the preferred treatment option. This choice deviated from the Advanced Trauma Life Support (ATLS) protocol, which typically recommends immediate exploratory laparotomy for such cases.

With ongoing blood transfusion, the patient was transported to the Cath Lab, where the L2 and L3 lumbar arteries were successfully embolized using Polyvinyl Alcohol (PVA) particles (350 - 500 micrometers) within two hours of arriving at the Emergency Department (Refer Figure 1 and 2). Subsequently, the patient was moved to the Intensive Care Unit (ICU), where he achieved hemodynamic stability.

During the course of the ICU stay, the patient received IV antibiotics, IV, transdermal, and oral analgesics. IV and oral Proton Pump Inhibitors were started for stress ulcer prophylaxis, and eventually, the patient was initiated on anticoagulants for thromboprophylaxis.

## Case Report

After 16 days of critical care, the patient was discharged routinely on June 22, 2023.



**Figure 1: Extravasation of blood from L2 Lumbar artery**



**Figure 2: Containment of blood following embolization of the artery using Polyvinyl Alcohol (PVA) particles (350-500 micrometers)**

### Discussion and Conclusion

Trauma represents a prominent global cause of death, claiming over five million lives each year, with nearly one billion people requiring medical attention for injuries annually. To put this in perspective, the worldwide injury burden results in 32% more fatalities compared to the combined total of malaria, tuberculosis, and HIV/AIDS. Notably, within the age group of 5-45, trauma stands as the primary contributor to years of healthy life lost due to disability. These premature deaths and extended periods of disability resulting from injuries exert a significant economic

impact. For instance, road traffic injuries, which constitute only a fraction of global injuries, are estimated to cost up to 2% of a country's gross national product<sup>(9)</sup>.

India bears a significant burden of trauma-related fatalities, accounting for more than 20% of such deaths worldwide. In India, injuries have been recognized as a substantial public health concern. Moreover, in a Delphi study examining injury-related deaths in India, it was revealed that over 50% of these deaths were considered preventable<sup>(9)</sup>.

Uncontrolled bleeding, specifically exsanguination, stands as the most prevalent reason for early trauma-related fatalities, constituting approximately 30% to 40% of trauma cases<sup>(1)</sup>.

In recent times, there has been a significant shift in the approach of managing traumatic injuries, moving toward Non-Operative Management (NOM). The integration of Interventional Radiology (IR) procedures is an extension of this approach, focusing on minimally invasive interventions to achieve hemostasis. What makes endovascular techniques unique is their ability to address vascular injuries at the source without disrupting the surrounding normal tissue or the tamponade effect of hematoma. These techniques swiftly control life-threatening hemorrhages through embolization. This not only has contributed to a decrease in mortality but has also significantly reduced morbidity and accelerated recovery. Thanks to the availability of advanced CT scanners that allow rapid image acquisition and provide a comprehensive overview of the extent of injuries. Surgical expertise is primarily reserved for cases involving penetrating injuries, multiple bleeding sites, or hemodynamic instability<sup>(1)</sup>. However, in recent times, Interventional Radiology is increasingly considered for hemodynamically unstable patients, and exploring this field in the management of trauma is filled with potential.

Interventional Radiologists (IRs) are well-suited to play a crucial role in the care of trauma patients. In addition to their specialized expertise in administering transcatheter treatments, IRs undergo comprehensive training in various imaging modalities. This extensive imaging training equips them with the ability to effectively interpret findings from pre-procedural imaging studies, facilitating the rapid diagnosis and treatment of trauma patients in emergency situations<sup>(4)</sup>.

Furthermore, the effective management of trauma patients necessitates the optimal utilization of resources and a high level of collaboration and communication within a multidisciplinary team. Swift and accurate patient assessment is essential for promptly identifying the nature and severity of injuries, enabling the prioritization of treatment. While angiography and transcatheter therapy are

valuable, they can be time-intensive and potentially impede other crucial procedures. Hence, it is of paramount importance to minimize any delays in interventional treatments<sup>(4)</sup>.

### Conclusion

Present case was a young, hemodynamically unstable patient with a penetrative trauma to the lumbar region resulting in an active retroperitoneal bleed that ideally should have been shifted to the Operation Theatre for an Emergency Explorative Laparotomy. However, the multidisciplinary trauma team made a calculated risk to use all the resources available at hand and go ahead with Interventional Radiology to control the source of hemorrhage. This reaped rewards not only saved the life of the patient in a timely manner but also time and money without even having to take an invasive approach.

### Acknowledgements

I am thankful to the staff of the departments of Critical Care Medicine, Surgery, Urology and Interventional Radiology that formed the trauma team. They helped in making decisions regarding management of the patient and putting those decisions to action, ultimately saving the life of the patient.


**Conflict of Interest:** Nil

**Source of Support:** Nil

**Copyright** © 2024 Bharati Vidyapeeth Medical Journal (BVMJ). This is an open access article, it is free for all to read, download, copy, distribute, adapt and permitted to reuse

under Creative Commons Attribution Non CommercialShareAlike: CC BY-NC-SABY 4.0 license.

### ORCID

Krista Pinto  0000-0002-2038-3980

### Ethical Consideration

The written informed consent was obtained from patient. The identity of the patient has not been disclosed in the case study.

### Data Availability Statement

Data will be available with corresponding author on request.

### References

1. Singh A, Kumar A, Kumar P, Kumar S, Gamanagatti S. "Beyond saving lives": Current perspectives of interventional radiology in trauma. *World J Radiol.* 2017 Apr 28;9(4):155-77.
2. Okada I, Hifumi T, Yoneyama H, et al. Survival benefits of interventional radiology and surgical teams collaboration during primary trauma surveys: a single-centre retrospective cohort study. *BMC Emerg Med.* 2024 Apr 16;24(1):65.
3. Amato S, Bonnell L, Mohan M, Roy N, Malhotra A. Comparing trauma mortality of injured patients in India and the USA: a risk-adjusted analysis. *Trauma Surg Acute Care Open.* 2021 Nov 1;6(1):e000719.
4. Gould JE, Vedantham S. The role of interventional radiology in trauma. *Semin Intervent Radiol.* 2006 Sep;23(3):270-78.