Hidden Hemorrhagic Shock During Interfacility Transport

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Introduction

A 20-year-old male was found unresponsive on the side of the road next to his motorcycle. He was discovered by a ground emergency medical services (EMS) crew responding to another call, but they stopped to assess the situation. Circumstances surrounding the incident, such as speed or other vehicle involvement, are unknown. Helmet use is unknown.

Patient Assessment and Sending Facility Care

Ground EMS transported the patient to the closest facility. Upon arrival at the facility, the patient's initial survey identified a Glasgow Coma Scale Score 3, unequal pupils at 3mm and 4-5mm, and non-reactive. He was intubated and placed on mechanical ventilation. Further assessment reveals the following injuries:

- Basilar skull fracture
- Intracranial hemorrhage
- Grade V Splenic Devascularization
- Open tib/ fib fracture

The tibia and fibula fractures were reduced and splinted. Extremity bleeding was managed with a pressure dressing. A physical exam and bedside ultrasound identified a stable pelvis and a negative abdominal-focused assessment with sonography for trauma (FAST) exam. Pt is administered 250cc of NaCl 3% for the head injury and sedated with Propofol and Fentanyl for analgesia.

Transfer to HEMS and Interfacility Transport

Helicopter EMS (HEMS) is dispatched for an urgent interfacility for a patient sustaining Multisystem Trauma due to a motorcycle crash. Bedside report to the HEMS crews identified blood pressure via arterial line of 115/83, heart rate (HR) 106, SpO2 of 100%, and shock index of 0.92. After being loaded into the aircraft, the patient's condition rapidly deteriorated with significant hypotension trending from 80 systolic to 40-50 systolic, HR 140-160, and End Tidal CO2 dropping from 35 mmHg to 26 mmHg. The shock index rose to 2.8. The patient is immediately given a 500-cc bolus of warmed Lactated Ringers and 1 unit of warmed packed red blood cells using the QinFlow Warrior Fluid Warmer (see Figure 1 below). One gram of tranexamic acid via an infusion pump is also administered. After a 10-minute flight, the patient arrives at the Level I trauma center.

Warrior lite	**Warrior lite** (Extra Power battery)	**Warrior**
170-250mL/min 1.3-2.5 liters	180-270mL/min 2.5-5 liters	200-290mL/min 3-5 liters
		

Figure 1: The Warrior line of Pre-hospital Warmers with Their Respective Maximal Delivery Rate & Volume (range relate to blood products and room temperature fluids)

Receiving Facility

Upon arrival, blood pressure was 62/50, HR 140, with a slightly improved shock index of 2.25. A repeat FAST exam was positive. The Grade V splenic injury required ongoing resuscitation, and the patient was taken to the operating room. Despite catastrophic injuries, 3-4 days after transport, the trauma center reports that the patient is now stable and following simple commands in the intensive care unit following an emergent, complete splenectomy and neurosurgical interventions.

[1] Ascension St Mary's FlightCare

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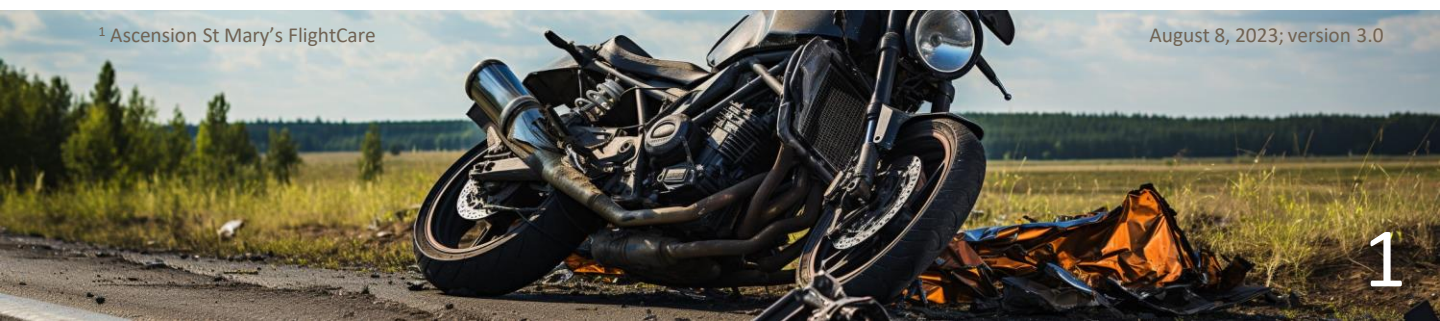

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Discussion

This case highlights the evolving dangers of hidden hemorrhagic shock that can quickly progress from compensated to decompensated (Chapleua, et al., 2022). Compensated shock is when the body experiences an event that decreases the circulating blood volume but can still maintain blood pressure and organ perfusion by increasing the heart rate and constricting the blood vessels. Decompensated shock happens when the body's compensatory mechanisms are overwhelmed, and severe hypotension occurs.

The likely cause of the hemorrhagic shock was due to a significant splenic injury (Oelhaf, et al., 2022). The spleen is the most injured solid organ, predominately occurring with blunt trauma. It is often associated with injuries to the left upper quadrant, left rib cage, or left flank. Since the spleen is the most vascular organ in the body, significant hemorrhage can occur with no visible bleeding source during a patient assessment. Spleen trauma is graded on a scale from 1 to 5 in increasing order of severity. Grade I is a capsular tear with subcapsular hematoma <10% surface area. Grade V is the most severe injury, a shattered spleen. This diagnosis includes a splenic vascular injury with active bleeding extended beyond the spleen into the peritoneum (AAST, 2018).

With the inability to control splenic hemorrhage in the prehospital setting or during an interfacility transfer, aggressive management of the hemorrhagic shock includes administering blood products and a hemostatic agent to help reverse the shock state. Warming the fluids and blood products helps keep the patient warm and decreases the risk of contributing to patient hypothermia. Even with short interfacility transport times, crews must maintain vigilance and be equipped with appropriate tools, such as blood products and fluid warmers, to intervene quickly.

Conclusion

Hidden hemorrhagic shock requires understanding the mechanism of injury, various physiological shock states, continuous patient re-evaluation, and the ability to rapidly intervene with the appropriate treatments and equipment.

References

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