Resuscitation Resequenced

A Rational Approach to Patients with Trauma in Shock

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KEYWORDS

• Trauma • Resuscitation • Shock • Shock index • ATLS

KEY POINTS

- Apply evidence-based clinical measures to identify shocked patients with trauma, such as Shock Index (SI) greater than or equal to 1.0, prehospital systolic blood pressure (sBP) less than 90 mm Hg, or sustained sBP less than 110 mm Hg.
- Critical hypoxemia or dynamic airway in patients with trauma represents the rare circumstance for immediate definitive airway management on emergency department arrival.
- Among most patients with trauma in shock, a resequenced approach to trauma care is preferable, emphasizing physiologic optimization before intubation.
- A reduction of 25% to 50% of the usual rapid sequence intubation induction agent dose is recommended in patients with SI greater than or equal to 1.0 or other evidence of shock.

CASE 1.1: ADVANCED TRAUMA LIFE SUPPORT APPROACH

A 63-year-old female pedestrian is struck by a car. Her Glasgow Coma Scale (GCS) score in the field is 13. In the emergency department (ED), evaluation proceeds according to the Advanced Trauma Life Support (ATLS) protocol. Her vitals are as follows: respiratory rate (RR) 26 breaths/min, O_2 saturation 90% on 100% oxygen, heart rate (HR) 105 beats/min (bpm), blood pressure (BP) 103/80 mm Hg, and temperature 36.0°C. Her airway is assessed to be patent, and air entry is decreased in the right chest. A focused assessment with sonography in trauma (FAST) examination is positive for free fluid in the right upper quadrant. Her pelvis is mechanically stable. Her peripheral neurologic examination is normal. She has no past medical history, takes no medications, and has no drug allergies.

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Following the A-B-C-D-E (airway-breathing-circulation-disability-exposure) heuristic, the team identifies her management priorities as (1) need for intubation based on projected clinical course, (2) chest tube placement, (3) blood product administration, (4) axial imaging (panscan). According to the ATLS shock classification, the patient is in class II shock (estimated blood loss, 750–1500 mL). Two units of uncrossmatched packed red blood cells (PRBCs) are requested and 1 L of crystalloid is given as an initial bolus.

A rapid sequence intubation (RSI) with 120 mg (2 mg/kg) of ketamine and 120 mg (2 mg/kg) succinylcholine is performed without difficulty. Five minutes after intubation, the patient becomes profoundly hypotensive, with a BP of 53/30 mm Hg. Suspecting a tension pneumothorax, the team quickly decompresses the right chest with a needle thoracostomy in the second intercostal space, midclavicular line, and an additional 1 L of crystalloid is given before blood products. A massive transfusion protocol (MTP) is activated, and tranexamic acid (TXA) is administered. Following chest tube placement, the patient's BP improves to 75/40 mm Hg; however, she remains hypotensive for an additional 30 minutes until 3 units of PRBCs are administered. Her hemodynamics stabilize, and she is transported to the computed tomography (CT) suite, where her systolic BP once again decreases to less than 70 mm Hg, requiring further blood products. She is found to have a small subdural hematoma, a right-sided pneumothorax, and a grade 3 liver laceration.

INTRODUCTION

Trauma resuscitation is a complex and dynamic process that is best managed by experienced, highly trained teams. Until the development of ATLS, patients received heterogeneous care by physicians lacking formal trauma resuscitation training.[1] The development of ATLS brought a much needed standardized approach to the care of critically injured patients. It facilitated a common language among care providers, highlighting the importance of a team approach and introduced the A-B-C-D-E sequence to trauma care.[2]

Using this simplified algorithm, teams are directed to assess injuries during a primary trauma survey in a predictable and sequential manner (ie, address A before moving on to B, and so on). The premise is to move in a stepwise and ordered fashion, particularly when multiple injuries may exist, in order to, for example, not miss the subtle tension pneumothorax by fixating on the obvious limb amputation. This paradigm is based primarily on experience rather than carefully conducted trials.

The sequence of priorities in ATLS until recently aligned similarly with the Advanced Cardiac Life Support (ACLS) approach of airway-breathing-circulation (A-B-C). Updated guidelines, based on new evidence, introduced a radical reordering of ACLS priorities to C-A-B in an effort to emphasize chest compressions.[3] High-quality chest compressions are linked to improved survival in medical cardiac arrest, and interruptions to cardiopulmonary resuscitation for any reason is associated with increased mortality.[3]

In major trauma, the value of strict and rigid adherence to the A-B-C-D-E sequence is also questionable.[1] Specifically, the ATLS approach overemphasizes the need to immediately secure a definitive airway and undervalues the importance of shock identification and preintubation resuscitation. The primacy of the airway often comes at the expense of more critical interventions related to supporting circulation and preventing hemodynamic collapse.

This article outlines an evidence-based update for the initial resuscitation of critically injured patients on arrival in the ED. It presents an algorithm (**Fig. 1**) that focuses first