



EM CASES SUMMARY

Episode 119 Trauma, The First & Last 15 Minutes – Part 2

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Binding the Pelvis in Trauma: The Trochanteric Binder

One important source of massive hemorrhage besides abdominal visceral organ damage and long bone fractures in trauma is the venous hemorrhage as a result of an unstable pelvic fracture. Consider laying out the pelvic binder on the stretcher in advance of patient arrival, and empiric early binding of the pelvis for patients with evidence of shock. Our experts consider it acceptable to bypass examining the pelvis bone and simply bind the pelvis on speculation. X-rays can be done *after* the binder has been placed. The phrase “pelvic binder” is misleading because the device is ideally placed around the greater trochanters, *not* the pelvis.

Consider a rectal and genital exam to assess for bleeding and bone shards that suggest an open pelvic fracture before placing the pelvic binder as this may guide antibiotic therapy and surgical priorities. A study in 2001 showed that the rectal exam influenced management in only 1.2% of cases. While the rectal exam is no longer recommended to

assess for “high riding prostate” there are 3 situations where a rectal exam is warranted: spinal cord injury (to assess for sacral sparing), pelvic fracture (to assess for open fracture) and penetrating abdominal trauma (to assess for gross blood).

Do’s and Don’ts of Binding the Pelvis

If you choose to examine the pelvic bone, **do not** place outward pressure or assess for vertical instability. **Do not** rock the pelvis. Rather, **do** apply inward pressure on the iliac wings to assess for movement. If there is movement, **do** maintain the inward pressure immediately followed by application of the binder.

When applying the trochanteric binder, **do not** apply the binder over the iliac crests. **Do** place the binder over the greater trochanters. **Do** place the legs in internal rotation and tape them together at the ankles. This will decrease the anatomic bleed space. **Do** obtain a post reduction x-ray if time permits.

If a commercial pelvic binder is not available, it is important to apply a bedsheet properly. The force required to close an open book pelvic fracture cannot be attained by twisting a bedsheet and tying it in a knot across the pelvis. Rather, fold the sheet so that is about 18 inches wide, have one team member hold the sheet that has been wrapped around the contralateral trochanter at the ipsilateral trochanter while another team member secures the sheet at the other trochanter with towel clips (see image below). With this technique there is no convincing evidence that commercial pelvic binders are more effective at binding the pelvis than a bedsheet.



Note that one team member is holding down the sheet across the patient's right trochanter while the other team member is tightening the sheet across the opposite trochanter which will then be held in place by towel clips.

Keeping track of your trauma resuscitation progress

Three techniques that help to maintain team situational awareness and keep track of your progress in a trauma resuscitation are:

1. **The tactical pause/periodic situation report** – approximately every 5-10 minutes, team leader vocalizes what has been accomplished thus far and what actions still need to be accomplished and in what order, articulating priorities and seek input from the team.
2. Write down a brief patient history, vital signs and list of confirmed and suspected injuries on a **whiteboard** in the trauma bay so that any team member joining in can be directed to read it, rather than the team leader needing to re-explain the details for every new person who joins the team.
3. Activate a digital stopwatch that the entire team can see.

Resuscitation targets in the first 15 minutes of trauma resuscitation

There are two targets to be considered in early trauma resuscitation presumed to be caused by hemorrhagic shock:

1. **Adequate tissue perfusion.** This involves the presence of peripheral pulses in the blunt trauma patient and central pulses in the penetrating trauma patient and mentation in the absence of major head injury.
2. **Adequate hemostasis.**

While there are no evidence-based absolute BP targets in early trauma resuscitation that can be applied to all trauma patients, a reasonable guide is the following:

Presumed hemorrhagic shock: Systolic BP \geq 70 mmHg

Presumed spinal shock: MAP \geq 80-90 mmHg

Shock in the severe head injured patient (GCS $<$ 8, lateralizing findings, depressed skull fracture): MAP \geq 80 mmHg

There is an association between hypotension and worse outcomes in patients with severe head injury. It is reasonable to avoid hypotension in severely head injured patients, however there is no convincing evidence that this improves outcomes. Hypoxemia and hypercarbia should also generally be avoided in the patient with severe head injury. Vasopressors are only indicated in presumed spinal shock in the setting of trauma. Norepinephrine is the vasopressor of choice based on current guidelines.

When two or more of these causes of shock are identified, our experts recommend targeting the one that is the more immediate threat to life.

Airway considerations in trauma the first 15 minutes

The concept of **resequencing the trauma resuscitation** was discussed in **Part 1**. Aside from critical airway compromise (*critical/refractory hypoxia* – $<$ 90% oxygen saturation despite maximal noninvasive ventilation OR *dynamic airway* – anticipate evolving disruption of airway, head/neck injuries that are expected to worsen over the next few minutes), circulation should take priority over airway. Endotracheal intubation can usually be delayed until adequate hemodynamic resuscitation has occurred.

Because our early resuscitation targets often involve low blood pressures, and because some trauma patients are “sympathetically deplete” usual doses of induction agents may precipitate post intubation hypotension and cardiac arrest. It is thus recommended by our experts to *lower* the induction agent dose by 50-75% of the usual RSI induction agent dose for all patients with a shock index of \geq 1, even when using ketamine. A *higher* paralytic dose is recommended because the drug may not circulate as readily in the shocked patient.

Patient positioning in trauma: Avoid laying flat throughout the resuscitation

Consider placing the trauma patient in reverse Trendelenburg immediately after the FAST exam to maximize respiratory physiology and CNS physiology, especially for the high BMI patient and/or the severely head injured patient.

If a patient is more comfortable sitting up and/or refuses to lay flat, consider maintaining them in the sitting up position rather than laying them flat throughout the resuscitation. Forcing a patient to lay flat who is more comfortable sitting up may precipitate airway compromise.

Breathing considerations in trauma the first 15 minutes

Consider bilateral finger thoracostomies in the 5th intercostal space (approximately the level of the nipple) just anterior to the mid-axillary line in any trauma patient with unexplained shock and suspected chest injury.

Trauma – The Last 15 Minutes: Preparation for Transport to a Trauma Center

Indications for transport to a trauma center

Any time your patient outstrips your ability to take care of a trauma patient, consider transport to a trauma center. This decision has regional variation and depends on several factors:

- Surgical/procedural capabilities of the sending institution
- Significant injuries involving two or more body systems (eg. abdominal and head injury)
- Patient physiological factors including current and anticipated hemodynamic status, age, anticoagulation, immunosuppression, pregnancy, hypothermia, GCS < 10
- Patient anatomical factors including suspected spinal cord injury with paraplegia or quadriplegia, severe head injury, amputation above the wrist or ankle, unstable pelvic fractures, major crush or vascular injury, trauma with significant burn or inhalation injury
- Transport logistics (distance, weather, expertise of transport team etc)

Minimal workup prior to transfer to a trauma center

Consider whether each test prior to transfer will change your management or management immediately upon arrival to the trauma center. The minimal data set should include:

- POCUS FAST +/- extended FAST exam
- CXR
- Pelvis x-ray (may help determine need for angiography which often takes time to arrange)

- Trauma blood work drawn (usually includes CBC, lactate, VBG, fibrinogen, liver enzymes, BhCG, INR/PTT); note that there is no standard trauma blood panel and regional variation exists

There is little role for CT imaging prior to transport to a trauma center. CT imaging done prior to transport will often be duplicated at the trauma center and may cause delays to definite care. Nonetheless, there are some situations (eg. low suspicion for serious injury so that if the CT is negative transport would not be necessary) when it is reasonable to do CT imaging locally. This should be discussed with the trauma center.

Transport checklist (ABCDEFGHIJKLMN)

adapted from: Mattu A. Damage Control: Advances in Trauma Resuscitation. Emerg Med Clin North Am. 2018;36(1):xv-xvi.

Airway: Secured endotracheal tube verified on CXR

Breathing: Oxygen saturation +/- ETCO₂, chest tube(s) functioning and secured

Circulation: Documentation of serial BP and HR, timing of tourniquets, volume/type blood products given, pelvic binder for suspected or confirmed pelvic injury

Disability: Documentation of serial GCS or AVPU, neurologic exam prior to paralysis, timing of paralytic

Exposure: Splint fractures, dress wounds, then cover patient and keep them dry

Fluids: Measure urine output, chest tube output, IV fluids given

Gut: NG tube placed and confirmed

Heme: Tranexamic acid or prothrombin complex concentrates given, INR drawn

Infusions: Sedation and analgesia

JVP: Signs of tension pneumothorax/tamponade

Kelvin: Initial and current temperature. Keep patient warm.

Lines: Two lines minimum, check all lines (IV, IO, foley, chest tubes)

Micro: antibiotics and tetanus as needed

Next of Kin: Family made aware of plan, contact information documented

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