Trauma Protocol (ABCDE)

13

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Recommendations

Level I

There are insufficient data to support a Level I recommendation.

Level II

There are insufficient data to support a Level II recommendation.

Level III

Implementation of systematic trauma protocols has shortened the time interval to definitive care and reduces the frequency of overseen injuries. A lateral (or mini-) thoracostomy is recommended to relieve tension pneumothorax. Rapid four-step procedure is the preferred method for emergency cricothyroidotomy.

13.1 Overview

Systematic evaluation and re-evaluation of the patient following the ABCDE principles will diminish the risk of overlooking injuries in the trauma patient. Primary focus in the first 5 min is to discover the most critical injuries and treat those first. The secondary survey is more thorough and will reveal the injuries causing problems later.

Tips, Tricks and Pitfalls

- (**A**irway) Nasopharyngeal airway is *not* an option in patients with skull base fractures.
- (**A**) The presence of gastric contents (vomiting) in the oropharynx represents a significant risk of aspiration. Suction and rotation (log roll) are indicated.
- (**A**) Abusive and belligerent patients may in fact have hypoxia and should not be presumed intoxicated.
- (**A**) Performing a needle cricothyroidotomy with jet insufflation can provide the time necessary to establish a definite airway when all other options have

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failed, and hypoxia and patient deterioration are a threat. The rapid four-step tracheotomy procedure is recommended over standard technique for emergency tracheotomy.
- (**B**reathing) Patients with a penetrating thoracic trauma are presumed to have a pneumothorax until proven otherwise.
- (**B**) Both tension pneumothorax and massive haemothorax are associated with decreased breath sounds. Hyperresonance in percussion confirms a pneumothorax and dullness a haemothorax. Definite diagnosis, however, is made by lung ultrasound, LUS or X-ray (noise in the trauma settings can make the differentiation impossible!)
- (**B/C**irculation) Pressure pneumothorax and cardiac tamponade can cause shock. Pneumothorax is much more frequent than tamponade.
- (**C**) Until proven otherwise, bleeding is the reason for shock in a trauma patient! Replace the volume loss.
- (**D**isability) Intracranial haemorrhage is almost never the reason for shock—at least not because of bleeding! Important exception: infants!
- (**ABCDE**) Initial monitoring and tests:
  - Pulse oximetry
  - Capnography (intubated patients)
  - Invasive blood pressure
  - Continuous ECG
  - Temperature
  - Urinary catheter
  - Plain X-ray (thorax, pelvis)
  - FAST (abdomen)

13.2 Background

The initial 5 min is the primary survey and should include a rapid and prioritized attention to life-threatening injuries (Enderson et al. 2001; Esposito et al. 2005; American College Committee on Trauma 2012). The patient is quickly assessed and the injuries are managed, as they reveal themselves according to the ABCDE mnemonic. The greatest threat to life is treated first.

13.2.1 Airway

- Assess airway patency simultaneously with securing the cervical spine. Bleeding, facial fractures, direct trauma against head/neck or unconsciousness can cause problems handling the airway.
- GCS < 9 indicates intubation.
- Endotracheal intubation includes sedation, especially in the presence of TBI.
- See (alertness, colour, breathing movements, lesions/obstructions).
- Listen (breathing sounds/noise, speech).
- Feel (trachea in midline).

Endotracheal intubation for secure/definitive airway is a multiple-person procedure: one person fixating the head and cervical spine, a person giving medication and providing suction and tube whenever necessary and an intubator to do the laryngoscopy and insert the tube. There is no longer general consensus to the use of cricoid pressure application during rapid sequence induction. It may be detrimental and worsen the conditions for laryngoscopy (Algie et al. 2015; Salem et al. 2017; Caruana et al. 2017; Bohman et al. 2018).

If a definite airway is not obtainable through endotracheal intubation, a surgical airway is necessary. This is done through the cricothyroid membrane either as a needle or surgical cricothyroidotomy, in which the latter is to consider as a definite airway with insertion of a small endotracheal or a tracheostomy tube through the membrane. The rapid four-step technique is the recommended procedure of choice (Holmes et al. 1999; Schober et al. 2009).

Temporary options to a definite airway includes chin lift, jaw thrust, oro- and nasopharyngeal airways (see Tips, Tricks and Pitfalls), laryngeal mask airway, multilumen oesophageal airway, laryngeal tube airway and of course oxygen provided either directly through the

established airway, through a nasal catheter or through a mask (American College Committee on Trauma 2012).

13.2.2 Breathing

- See (movement of the thorax, lesions).
- Listen (percussion, stethoscope).
- Feel (fractures of the ribs/sternum, subcutaneous emphysema).
- Measure respiratory frequency, pulse oximetry and end-tidal CO_2.
- Check for signs of tension pneumothorax, haemothorax, unstable thorax (at least two fractured adjacent ribs, flail chest) and cardiac tamponade.

Open pneumothorax can be immediately handled by placing a closed bandage on the lesion, fastening it to the skin on three sides and with the fourth open as a one-way valve. This turns it into a closed and simple pneumothorax.

A tension pneumothorax can potentially be managed by placing a large-calibre needle into the second intercostal space in the midclavicular line of the affected hemithorax. However, these needles tend to bend and loose effectiveness—or they are simply too short and quickly end up with the tip outside the pleural cavity—the latter being very probable and should be anticipated especially in adipose or very muscular patients. A failure rate of up to 80% is described with needle thoracocentesis (Kaserer et al. 2017).

An alternative in managing a tension pneumothorax in the emergency setting is a lateral/mini-thoracostomy or tube thoracostomy in case of coexisting massive haemothorax (Drinhaus et al. 2016).

More than one chest tube may be needed. Treatment of an unstable thorax is primarily intubation and ventilation.

Cardiac tamponade is diagnosed using ultrasound/focused assessment with sonography in trauma (FAST) and treated initially by pericardiocentesis under ECG monitoring (American College Committee on Trauma 2012). Definite treatment is surgery.

13.2.3 Circulation

Shock is defined as insufficient perfusion of the organs and is presented by a clinical picture with symptoms and objective findings from all the organ-related systems. It is imperative to recognise the presence of shock in order to treat it accordingly.

- Stop apparent bleeding by compression.
- Introduce two large-calibre intravenous catheters. Other peripheral lines and intraosseous and central venous lines or cutdowns should be used when necessary in accordance with the shock level of the patient and the skill level of the doctor.
- Draw blood samples for blood type, crossmatch, haemoglobin, electrolytes, arterial blood gases, toxicology studies, and, if indicated, pregnancy test.
- Administer warmed crystalloids (lactated Ringer's or normal isotonic saline) and initial bolus of 20 mL/kg, which can be repeated.
- If continued need for volume arises, transfusions with blood products (SAG-M, plasma, platelets) are warranted. Use of colloids is controversial. They have been associated with a worsened outcome if administered in the patient with burns, multitrauma, renal insufficiency or severe coagulopathy (Rehm et al. 2017; Mullier et al. 2016). Other studies don't find a significant difference in mortality or morbidity (Orbegozo et al. 2014), and yet newer literature suggest a favourable outcome if designed colloids, such as polygelenes, are used (Singh et al. 2017).
- It is recommended with goal-directed therapy including viscoelastic haemostatic assays for early and management of trauma-induced coagulopathy (Stensballe et al. 2017).
- Evaluate response. Circulatory parameters have to normalise, not just stabilise!
- The goal of resuscitation is a systolic blood pressure >90–100 mmHg. Permissive hypotension where lower targets are accepted has been suggested for patients awaiting definitive haemostasis. This is by delaying aggressive fluid resuscitation until haemostasis is

achieved (American College Committee on Trauma 2012). Head trauma patients, though, should have a systolic blood pressure >110–120 mmHg to ensure sufficient cerebral blood flow.
- Seek the source of bleeding! Damage control surgery, DCS, may be necessary in the emergency setting (Rodrigues et al. 2016).
- Reasons for shock are the following: bleeding, tension pneumothorax and neurogenic (medullary compression) and cardiac tamponade (American College Committee on Trauma 2012).

13.2.4 Disability

A rapid neurological exam is performed.

- Glasgow Coma Scale score.
- Pupil reaction, size and form.
- Movement of the extremities, lateralizing signs?
- Indication for intubation at GCS < 9.
- Rule out hypoglycaemia.

13.2.5 Exposure

Hypothermia is of great concern in the trauma patient. A cascade of hypothermia, acidosis and coagulopathy (resuscitative haemodilution) is nick-named the "Trauma Triad of Death" or "The Lethal Triad" (Gerecht 2014; Michail 1999; Martini 2016). Coagulopathy alone is a prognostic factor for increased mortality and a challenge if the patient is being resuscitated and in need of DCS (Samuels et al. 2017).

- Undress the patient in order to make a complete and thorough examination/inspection including the back. At the same time avoid hypothermia.
- Use warmed fluids.
- Use blankets to cover the patient.
- High room temperature should be maintained in the resuscitation area.

Continuously reassess ABCDE throughout the initial treatment period. Make sure that the intervention actually provides the response expected (American College Committee on Trauma 2012).

13.3 Specific Paediatric Concerns

The recommendations regarding paediatric patients follow the adult protocol, apart from the different reference values in children and the alertness regarding the shorter interval between seemingly normal values during monitoring and the sudden deterioration leading to a shorter period for resuscitation, if alertness is not appropriate.

NB! Intracranial bleeding may on rare occasions cause hypovolaemic shock before neurological deterioration in small infants!

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