ACUTE CLINICAL MANAGEMENT OF TRAUMA

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Trauma represents a leading cause of disability and preventable death and is mainly affecting people between 15 and 40 years of age, accounting for 10% of global mortality. For every trauma death, several patients are left permanently disabled and represent a major economic burden on society. Injuries accounted for 17% of the total disease burden in adults aged 15-59 in 2001, thus figuring among the ten leading causes of burden of disease worldwide.

What is trauma care about?

In order to prevent cell death, tissue perfusion has to be restored. Except in fatal head injuries, inadequate oxygen delivery is what ultimately causes most trauma deaths, whether due to airway obstruction, inadequate ventilation or shock. Regardless of aetiology, shock represents a state of hypoperfusion and thus oxygen delivery insufficiency. Shock following blunt trauma is caused by hypovolaemia until proven otherwise.

Factors influencing outcome in trauma

Time is of the essence and every person involved in patient care consumes time on the way to definitive treatment. The amount of time available depends on the severity of the injury, the care provided, the patient's physiologic reserves and haemodynamic response. Improved pre-hospital care allows most patients to survive their accident and to arrive at the hospital alive, thus increasing the challenge and resources for the in-hospital phase of the patient treatment. In-hospital resuscitation time strongly influences outcome of trauma care. Furthermore, delayed surgery has been shown to be one of the most important factors to both mortality and morbidity following major trauma. Uncontrolled haemorrhage is a leading cause of early in-hospital trauma deaths, accounting for more than 40%. Most preventable trauma deaths occur early in hospitalization, and involve airway management, thoracic injuries and control of haemorrhage.

Organized trauma systems based on designated centres with strong multidisciplinary involvement are essential for optimal outcome, and have been shown to reduce the rate of preventable deaths from >30% to <3%. Ideally, all critically injured patients should be transported directly to a dedicated trauma centre. Where this is not possible, the system should be organized so that every hospital admitting trauma patients has prearranged trauma teams with predefined competence and equipment, appropriate prehospital triage criteria and transfer criteria to a predefined higher level when appropriate. In spite of constructive proposals for national trauma systems, in most countries only fragments of these systems are implemented.

Predictable competence and an organized approach are crucial to successful outcome in a critically injured patient. Given the complexity of the decisions that must be made without delay during the acute management, predictable competence is necessary and the following 3 complementary teaching modules should be the minimum mandatory for any clinician involved in trauma care:

1. ***ATLS*** offers basic individual training in initial assessment and resuscitation, following the ABCDE prioritized algorithm in order to diagnose and treat the greatest threat to life first.
2. ATLS teaches initial assessment on an individual basis. In order for a team to work efficiently, specific roles have to be assigned to the different team members, and the team approach should be trained. Options are video coaching of trauma resuscitations and simulated team training. The BEST ***team training*** in Norway is a good example on how this can be performed.
3. However, ATLS and simulated team training give little or no ***training in surgical decision-making and trauma-specific surgical procedures***. DSTC is one example, incorporating the complexities of surgical decision-making with practical training. Trauma is a surgical disease (until proven otherwise) and the competence to perform trauma-specific surgical procedures is required for any surgeon in charge of trauma patients.

Damage Control Surgery (DCS) has greatly contributed in improving survival in critically injured patients. DCS defines a series of well planned, staged strategies to only control bleeding and contamination in the face of severe anatomical damage and physiologic compromise. The goal is to rapidly reverse shock, with definitive surgery delayed until physiology has been restored.

How to approach the potentially severely injured patient?

The haemodynamically compromised patient is at risk of dying. However, any trauma patient sustaining high energy injury, whether physiologically deranged or not, should be assessed systematically, with treatment directed at correcting life-threatening conditions as soon as detected during the primary survey. The physical examination can be supplemented by simple bedside diagnostic adjuncts like chest x-ray, pelvic x-ray and portable ultrasound. The severely injured patient is dynamic and may present more than one problem at different times. Maintain a high index of suspicion and reevaluate frequently. A stabilised patient can be subjected to a full clinical exam (secondary survey) and more time-consuming investigations when necessary.

A – Airway with spinal precautions

An obstructed airway results in inadequate oxygenation and ventilation and causes severe hypoxemia that result in death within minutes. A talking patient generally has a clear airway. Any compromise must be dealt with immediately. The haemodynamically compromised patient should be intubated early, to ensure optimal oxygenation, avoid aspiration and permit the team to focus on other injuries. A strategy in case of failed intubation is vital. Remember to protect the spine until spinal clearance and especially during intubation, since cervical spine injuries are present in up to 20% of severely traumatized patients. Because clinical assessment is unreliable, correct tube placement should be ensured by capnography, chest xray and arterial blood gases.

B – Breathing

Thoracic injuries are responsible for 25% of trauma deaths. Most thoracic injuries arriving to hospital alive can be treated by placement of a chest tube. However, some patient will need emergent thoracotomy for haemorrhage control, massive air leak, cardiac tamponade, or by clamping the aorta to prioritize perfusing the brain and heart until control of subdiaphragmatic bleeding is obtained. Tension pneumothorax should be relieved if clinical suspicion. In the haemodynamically compromised patient, diminished breath sounds should prompt chest tube insertion. In this case, the distinction between a haemo- and a pneumothorax is unnecessary as both should have a chest tube inserted. The importance of occult pneumothoraces diagnosed on CT is still debated. Death from pneumothorax is preventable.

C – Circulation

Preventing shock by arresting haemorrhage remains the most important task of the trauma surgeon. Clinical assessment of the circulation includes observing and talking to the patient while assessing pulses manually. Reduced consciousness, tachycardia, weak pulses and pallor are signs of compromised circulation. The cause should be identified while initiating resuscitation. Fluid resuscitation should attempt to maintain a critical level of perfusion to vital organs, avoiding over-resuscitation that might cause worsened bleeding, coagulopathy and hypothermia. Whether and when to administer fluid to the trauma patient, what type and how much remains controversial. The response to administered fluid gives valuable information for further management strategy. Recent experience with massive haemorrhage in both civilian and military settings advocates early transfusion of RBC with plasma at a ratio of 1:1. However, to avoid “the lethal triad” of hypothermia, coagulopathy and acidosis, the most compelling source of bleeding should be found quickly. The 5 anatomic locations in an adult patient where bleeding can cause shock are: external, chest, abdominopelvic cavity (intra- and retroperitoneal) and long bone fractures. Chest and pelvic x-ray, FAST and DPL are useful diagnostic adjuncts.

D – Disability

During primary survey, this would typically consist in assessing the patient's level of consciousness, papillary reactions and whether or not extremity movement is present. Early assessment of neurological function is important, especially before intubation.

E – Exposure/environment

The patient should be completely exposed early in order to detect all visible abnormalities. Care should be taken to prevent hypothermia.

Conclusion

Acute clinical management of trauma aims at detecting and addressing life-threatening conditions as early as possible. No time-consuming or unnecessary diagnostic tests should be performed. Because the injured patient is dynamic, the clinician should keep a high index of suspicion and reassess the patient frequently. The treatment of bleeding is to stop the bleeding.

Recommended reading

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