Early management of trauma: The golden hour

Article *in* Current Medical Issues · January 2020

DOI: 10.4103/cmi.cmi_61_19

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Early Management of Trauma: The Golden Hour

Kundavaram Paul Prabhakar Abhilash, A. Sivanandan
Department of Emergency Medicine, Christian Medical College, Vellore, Tamil Nadu, India

Abstract

The first 60 minutes after traumatic injury which is the most crucial period that determines the patient's outcome has been termed the "golden hour." The concept that definitive resuscitative trauma care must be initiated within this early window has been publicized, taught, and practiced worldwide for more than four decades. The main steps in the early management of trauma are primary assessment; resuscitation: perform primary assessment and resuscitation together; reassessment of airway, breathing, and circulation; and secondary assessment. The primary assessment provides basic data essential for the patient's survival when life or limb is threatened. Resuscitation should be initiated simultaneously with the primary assessment. It is performed when any component of the primary assessment appears unstable. The secondary assessment is to be performed after the completion of primary assessment and resuscitation. It provides comprehensive information about the various organ systems.

Key words: Early management, emergency department, golden hour, trauma

Address for correspondence: Dr. A. Sivanandan, Department of Emergency Medicine, Christian Medical College, Vellore - 632 004, Tamil Nadu, India.
E-Mail: siyavlr@gmail.com

Introduction

Trauma is a leading cause of death in the first four decades of life. There is a trimodal peak of death and the first peak occurs within seconds to minutes. It is usually due to laceration of the brain stem, heart, aorta, and other large vessels. Salvage after injury in these instances is difficult, and the victims most often succumb to the trauma. The second peak occurs within minutes to hours later and can be due to diverse injuries such as subdural hematoma, hemopneumothorax, splenic laceration, life-threatening long bone fractures, and significant blood loss. This group is potentially at risk of death, which may be averted if aggressive and appropriate management is instituted at the earliest. The concept of the golden hour (the 1st h after trauma) arose from the treatment of this group of patients.

Golden Hour

The first 60 minutes following trauma is a critical period for getting patients to a trauma center and has been called the "golden hour."[1,2] This concept is deeply entrenched in trauma systems, field triage guidelines, emergency medical services, and emergency department management of trauma victims.[2,3] The concept that definitive resuscitative trauma care must be initiated within this early window has been publicized, taught, and practiced worldwide for more than 4 decades.[4,5] Numerous studies have, in the past, explored the relationship between out-of-hospital time and outcome following injury.[4-14]

Early Management of Trauma

The focus of early management of trauma will essentially be on patients with a compromised airway, breathing, or circulation. The third peak of death occurs several days to weeks after the initial injury and is most often due to sepsis and multiple organ

Date of Submission: 19-Nov-2019 **Date of Review:** 06-Dec-2019
Date of Acceptance: 20-Dec-2019 **Date of Web Publication:** 03-Feb-2020

Access this article online

Quick Response Code:

Website: www.cmijournal.org

DOI: 10.4103/cmi.cmi_61_19

How to cite this article: Abhilash KP, Sivanandan A. Early management of trauma: The golden hour. Curr Med Issues 2020;18:36-9.

system failures. Certain basic principles need to be clearly understood in the early management of trauma:

- Treat the greatest threat to life first
- Lack of a definitive diagnosis should never impede the application of an indicated treatment
- A detailed history is not a prerequisite to begin the evaluation of an acutely injured patient.

To be able to focus on the priorities in an injured patient, a definite system or drill needs to be implemented. The advantage of such a system is that priorities are established and as every member of the team follows the system; communication between team members is easier and more meaningful. The main steps in the early management of trauma are:

1. Primary assessment
2. Resuscitation: Perform primary assessment and resuscitation together
3. Reassessment of airway, breathing, and circulation (ABC)
4. Secondary assessment.

Primary Assessment

The purpose of the primary assessment is to identify life and limb-threatening injuries.[15] It should be conducted in a sequential manner as follows:

Airway with in-line cervical spine immobilization

Patency of the airway should be assessed first. In a conscious patient, clear speech is a good indicator of a clear airway. Noisy breathing is an indication of airway obstruction. Suctioning of the mouth with a chin lift or jaw thrust maneuver will prevent the airway from being obstructed.[16] An oropharyngeal airway may be required to maintain a patent airway. If the above initial measures are inadequate to maintain an effective airway, endotracheal intubation should be carried out.[17] Patients who have lost airway protective reflexes and who have risk aspiration of gastric contents where an endotracheal intubation is not possible, a surgical airway must be established without delay.[18]

Measures to establish a patent airway should include the protection of the cervical spine. Always assume that the patient has a cervical spine injury. This is particularly in any patient with multisystem trauma, altered level of consciousness, or a blunt injury above the clavicle. Unintentional movement of the cervical spine during orotracheal intubation is minimized by manual in-line stabilization of the neck, provided by an assistant.

Breathing with oxygen supplementation

Airway patency alone does not ensure adequate ventilation. Adequate gas exchange is mandatory. Once the airway is established, oxygen is administered using high flows or reservoir bag to ensure a high fraction of inspired oxygen concentration. This is followed by inspection, palpation, and auscultation of the patient's chest. The type of breathing pattern can provide clues about the presence of a neurological injury. For example, no chest wall movement with abdominal breathing may indicate a cervical cord lesion. Paradoxical chest wall motion may indicate the presence of a flail chest. The flail segment will move inward with inspiration and outward with expiration. Chest excursions and symmetry of breathing patterns should be observed. Injuries than can acutely impair ventilation include tension pneumothorax, flail chest with pulmonary contusion, massive hemothorax, and open pneumothorax. A tension pneumothorax is a life-threatening condition and is treated immediately by performing a needle thoracostomy prior to further assessment of the patient.[19,20]

Circulation with hemorrhage control

Hemorrhage, a predominant cause of death in trauma, is amenable to the effective treatment. Clinical parameters that provide information about the circulation status are pulse, neurological status, and blood pressure. A rapid and thready pulse is an early sign of hypovolemia. A restless or an unusually cooperative patient is usually because of decreased cerebral perfusion. The assessment of circulation begins with the insertion of two large-bore cannulae so that rapid infusions of fluids may be administered if necessary.[21,22]

If obvious external bleeding is noted, external pressure is applied to the site. If hypotension is present, an initial fluid bolus of 1–2 l of Ringer's lactate (RL) solution is infused and circulatory status is reassessed. If hypotension persists, the patient may have an injury that continues to bleed. A search for the source of hemorrhage must be made and the hemorrhage must be controlled before proceeding with the rest of the primary assessment. The search for internal hemorrhage may require imaging modalities like a focused assessment with sonography for trauma or computed tomography. It is prudent to remember that the endpoints of volume resuscitation are unclear. There is some evidence that bringing up the blood pressure to normal levels in the face of an ongoing hemorrhage may actually cause more damage than good. The relationship to normal parameters of blood pressure, heart rate, and urine output may be inadequate.

Disability – neurological status, as expressed by the patient

A rapid neurological evaluation should be performed as a part of the primary assessment. The level of consciousness is assessed using the Glasgow Coma Scale (GCS).[23]

Exposure of the entire body, looking for occult injuries

It cannot be overemphasized that complete disrobing of the patient is mandatory if occult injuries are to be identified. However, in view of sociocultural restraints, undergarments of the patient may be retained, after the physical examination. Examination of the external genitalia and rectal examination are part of the secondary assessment.

Resuscitation

Resuscitation should follow the ABC pattern of the primary assessment and should be performed simultaneously.

- If the airway is compromised, the primary assessment should be suspended till the airway is secured

- If breathing is compromised, then that should be dealt with appropriately. This may require decompression of a tension pneumothorax or a massive hemothorax. It may also involve endotracheal intubation and mechanical ventilation in a patient who is not breathing adequately
- Resuscitation of circulation includes insertion of two large-bore cannulae and infusing 1–2 l of normal saline/RL solution. At the same time, blood is taken for the cross match, electrolytes, and hemoglobin (Hb).

Reassessment of the ABC is an integral component to ensure that there has been no decompensation. This should be done as each step of the primary assessment is completed or if there is a time lag between components.

By the end of the primary assessment and resuscitation, the following should be achieved:

- Airway established and maintained
- Supplemental oxygen initiated
- Cervical spine immobilized
- Two large-bore intravenous lines started
- Blood drawn for baseline investigations and cross-match
- External hemorrhage control achieved
- Electrocardiography (ECG), blood pressure, and SaO_2 monitoring
- Brief neurological examination completed
- Full exposure and environmental control done.

Adjuncts to primary assessment

- ECG monitoring is essential for all trauma patients. Tachycardia indicates volume loss and arrhythmias indicate blunt trauma to the chest. The pulseless electrical activity where there is an ECG trace but no palpable pulse is seen in tension pneumothorax or cardiac tamponade
- Pulse oximetry is a useful adjunct to monitoring. The pulse oximeter measures the oxygen saturation of Hb and is an indirect means of measuring the adequacy of ventilation.

Secondary Assessment

The secondary assessment should be performed after the completion of the primary assessment. It is a head-to-toe systematic and comprehensive evaluation of all organ systems. It is during this phase of management that the patient's detailed history should be elicited. A useful system for history elicitation is the AMPLE:

- A Allergies
- M Medications (especially anticoagulants, insulin, and cardiovascular medications)
- P Previous medical/surgical history
- L Last meal (time)
- E Event – details regarding the biomechanism of injury.

Examination of the head and face

- Immobilize the neck with a hard cervical collar until the cervical spine X-ray is done and cleared. With an assistant immobilizing the head, remove the cervical collar and examine the neck for any lacerations, tenderness, bogginess, or step deformities indicating the possibility of a cervical spine injury
- Scalp lacerations tend to bleed profusely because of abundant vascular supply. Apply direct pressure to control any bleeding. Check the continuity of the cranium with a gloved hand, palpating gently with the fingertips. Beware of small puncture wounds of the scalp, which may indicate penetrating injury of the brain
- Assess the GCS
- Examine the nose and ears for bleeding and leakage of cerebrospinal fluid
- Inspect the mouth for lacerations, broken teeth, or vomitus since they could jeopardize the airway.

Examination of the thorax

Although assessed during the primary assessment, the thorax should again be reviewed for injuries. Check SpO_2 to assess peripheral oxygen saturation.

Examination of the abdomen

- Abdominal assessment includes inspection for contusions, abrasions, and distension. Discoloration of the flanks may indicate retroperitoneal bleeding. Any wound above the umbilicus may have penetrated the thorax
- Femoral pulse should be simultaneously palpated bilaterally and assessed for equality
- The integrity of the pelvis should be evaluated by pushing on the wings of the iliac bone to determine if this action elicits pain
- Examine the urinary meatus for the presence of blood, which may indicate ruptured urethra
- Perform a digital pelvic examination in females to look for the presence of vaginal bleeding
- The patient should be logrolled with the head aligned to the body and the spine evaluated for asymmetry and the presence of tenderness
- During the logroll, perform a rectal examination to evaluate the sphincter tone and presence of blood.

Examination of the extremities

- Palpate the extremities for tenderness, crepitus, and deformities
- Evaluate for quality and integrity of pulses. Diminished pulses suggest disrupted blood vessels. Traction generally restores blood flow
- If the patient is conscious, assess sensory and motor functions
- Suspected fractures and dislocations should be splinted for further radiographic and diagnostic evaluation.

Adjuncts to Secondary Assessment

1. A urinary catheter is a vital adjunct for polytrauma management. The urine output is an excellent way of assessing perfusion in patients with an intact renal function. Moreover, blood in the urine may indicate renal trauma. The urinary catheter should be inserted only

after ensuring that there are no pelvic fractures that could have injured the urethra. Blood in the meatus, perianal hematoma, or a high-riding prostate on rectal examination should raise suspicion of urethral injury. Under these circumstances, urinary catheterization should only be attempted after an ascending urethrogram

2. The nasogastric tube needs to be inserted to avoid stomach distension and to reduce the risk of aspiration. When a base of skull fracture is suspected, the gastric tube should be inserted orally to prevent the intracranial passage
3. If available, obtain an ABG to assess the Haematocrit, PaO_2, and the degree of acidosis.

Mandatory radiology in trauma evaluation for all high-velocity accidents includes the chest, lateral cervical spine, and pelvis. Focussed assessment with sonography for trauma (FAST) is indicated if an intra-abdominal injury is suspected.[24]

Conclusion

- Early management of trauma is a well-defined protocol, which needs to be methodically followed
- The primary assessment provides basic data essential for the patient's survival when life or limb is threatened
- The airway is of primary importance. No other therapeutic assessment or intervention should take place before the airway is secured. The ABCs take priority in that order
- Resuscitation goes hand in hand with the primary assessment. It is performed when any component of the primary assessment appears unstable
- The secondary assessment is to be performed after the completion of primary assessment and resuscitation. It provides comprehensive information about the various organ systems
- Prehospital care plays a vital role in the early resuscitation of trauma victims. In India, prehospital care is almost nonexistent, and there is an urgent need to train paramedics in trauma management to improve mortality and morbidity associated with trauma.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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