A B C of Trauma Care

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***Abstract**:Primary objective of trauma care is rapid assessment, resuscitation and stabilization of trauma victim. Early management involves understanding mechanism of injury, physiology as well as pathophysiology, assessment and simultaneous resuscitation. The steps involved in trauma care have been divided into primary survey, secondary survey and definitive care.*

INTRODUCTION

Goals of acute trauma care include prompt evaluation of life threatening injuries with simultaneous resuscitation. For optimal outcome, care of trauma victim begins at the site of injury and should continue during transportation to hospital.

PREHOSPITAL CARE: "Keep the Patient Alive- Open the Airway"

Prehospital care has a definite impact on trauma management. Immobilization of the patient, airway management and haemorrhage control are some of the keystones. Hypoxia and airway mismanagement contribute for upto 34% of prehospital deaths in trauma victims so airway management is always a priority[1]. Chin lift, jaw- thrust and bag- mask ventilation, if available can be used for airway management in prehospital setup. The concept of "The Golden Hour" proposes that trauma patients benefit from rapid transport (within an hour) to dedicated trauma centers with specialized trauma teams[2] or to the closest appropriate facility because dedicated trauma care centres might be far and few.

PREPARATION IS THE "KEY TO SUCCESS"

Fundamental elements of emergency management include mitigation, preparation, response and recovery[3]. Preparation includes making protocols, delegating resposiblities and ensuring adequate supplies in Emergency department (ED). Trauma team with defined roles helps in avoiding confusion and initiating timely management. Appropriate monitors and equipment (resuscitation and procedural) should be tested and placed where they are easily accessible. Warmed crystalloid fluids should be kept ready for infusion.

INITIAL ASSESSMENT

Information regarding time of injury and mechanism of injury is relevant as it provides clues to the potential injury patterns. Regardless of initial presentation, the patients with history of high energy trauma are always at risk for occult injuries[4]. Past history, co-morbidities, medications and last meal intake are also significant in acute trauma management. But this is done only after a quick primary survey for identification of life threatening injuries and managing them simultaneously to stabilise the patient.

ABCDE of trauma resuscitation includes Airway, Breathing, Circulation, Disability and Exposure/Environment. The purpose of initial assessment also termed as "Primary survey" is to identify and treat any life-threatening condition immediately[4]. Throughout the evaluation, the patient should be monitored with continuous cardiac rhythm, pulse oximetry and end-tidal carbon dioxide monitoring.

AIRWAY MANAGEMENT IN EMERGENCY DEPARTMENT

Early preventable deaths from airway mismanagement can occur due to failure to recognize the need for airway management or due to inability to establish an airway. Displacement of a previously established airway can also be fatal if not recognised in time. Therefore, if trachea is already intubated, confirmation of proper placement of the endotracheal tube is essential.

The airway should be assessed for patency and protective reflexes.Common causes of airway obstruction include secretions, foreign bodies (including loose teeth, dentures), faciomaxillary and neck injuries. Suctioning of the oral cavity under vision helps in removal of blood and foreign bodies[5].

All trauma victims are considered to be having cervical spine injury unless proved otherwise. Cervical spine protection using cervical collar is an integral part of early trauma management in prehospital setting and early course in ED.

An agitated or obtunded patient with laboured breathing could be having an obstructed airway. Chest retraction and use of accessory muscles of breathing provide additional evidence of airway compromise. Pulse oximeter is very useful to detect airway obstruction. Techniques used for relieving airway obstruction include chin lift, jaw thrust, airways (oropharyngeal and nasopharyngeal) and supraglottic airway devices. All trauma victims should receive supplemental oxygen with a fitting mask at the rate of 8-10 liters per minute.

Definitive airway like endotracheal intubation is indicated in patients with inadequate oxygenation or ventilation. These include unconscious patients, cervical spine (extreme care needs to be exercised) or faciomaxillary injury. Risk of impending airway obstruction is another indication for endotracheal intubation. Managing trauma airway can be difficult. Stylette, bougie, supraglottic airways and endotracheal tubes of various sizes should be available. In cases of anticipated difficult airway, it is recommended to call for expert help early. It is advisable not to make numerous attempts at intubation by the same person, it is highly recommended to call for help and in the mean time, bag-mask ventilation should continue.

BREATHING AND VENTILATION

Breathing can be assessed by determining respiratory rate and depth. It is essential to expose the chest for adequate examination. Look for any abnormal chest movements, bruises or penetrating injuries. Tracheal position and jugular venous distension should also be noted. Tenderness and crepitus due to surgical emphysema or fractured ribs can be detected on chest palpation. Auscultate for bilateral equal air entry, any abnormal sounds in the chest and heart .

Most of the chest injuries are blunt injuries and can be managed with simple techniques like placement of thoracostomy tube in 5th Intercostal space, anterior to mid-axillary line and endotracheal intubation. Pain alleviation by adequate analgesia improves the outcome in chest trauma, specially in patients with multiple rib fractures.

CIRCULATION AND HAEMORRHAGE CONTROL

After stabilising airway and breathing, assess the adequacy of peripheral circulation. One of the most common errors in trauma management is to assume that normal vital signs indicate normal circulation[6]. Parameters of circulatory assessment include mentation, skin colour, capillary refill, respiratory rate, pulse rate, blood pressure and urine output.

Shock is defined as inadequate perfusion to vital organs. Most common

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cause of shock in trauma victim is bleeding. Depending on the blood loss, there are four classes of shock. Class1 shock is equivalent losing less than 750 ml and there are no physiological changes. As the patient loses blood, there is an increase in heart rate, respiratory rate and decrease in systolic blood pressure, pulse pressure and urine output. In class II shock, patienthas lost 750 to 1500 ml of blood and appears mildly anxious with. Class III and class IV require urgent resuscitation. In class III shock, the patient has lost upto 2 litres of blood and may appear disoriented. In class IV shock, more than 40% (approximately 2 litres) of blood volume, there is marked tachycardia (heart rate more than 140 bpm), significant hypotension with negligible urine output. The patient is lethargic, confused, pale and sweaty. Unless treated aggressively, it can be fatal.

Patients with class 1 and II shock can be managed with crystalloids. Patients with class III might require blood transfusion after crystalloids and patients in class IV will require blood and blood products after crystalloid infusion. It is prudent to arrange blood for all bleeding trauma victims regardless of the class of shock. It is important to remember that it is a dynamic process so patients must be reassessed frequently. Immediate surgical consultation is warranted.

If we compare damaged circulation with a bucket of water having a hole in it, the management principles become simple-plug the hole (s) and refill t he bucket[6]. Establish two large bore intravenous cannula (No.16 &18) and infuse 1.0 to 1.5 litres of warm crystalloid fluid. Special care should be taken while infusing fluids in children and elderly patients. The elderly should be transfused fluid in boluses of 150-200 ml with constant monitoring of urine output and breath sounds. There is a controversy regarding haemoglobin level for optimal oxygenation. However, some studies recommend haemoglobin level of atleast 10 gm/dl. As 25-30% of major trauma victims have associated coagulopathy so “Balanced resuscitation” with packed RBCs, fresh frozen plasma, platelets and cryoprecipitates prevents further deterioration[7]. In the presence of class IV shock, massive transfusion protocol must be put in place (RBC: FFP: Platelet in the ratio 1:1:1).

Simultaneously, the site of blood loss should also be looked for and managed.External haemorrhage can be managed by direct pressure. Large dressings and firm bandages can be applied over the wound to control rapid external bleeding.The sites for potential blood loss include chest, abdomen(retroperitoneum), pelvis and long bones. Depending upon the mechanism of injury and physical examination, the site for blood loss can be identified. Chest X-Ray is a useful adjunct for locating blood loss in the chest. Thoracostomy tube should be inserted in patients with suspected haemthorax. If the chest tube output is more than 1500ml or 200ml/hour, surgical consultation and exploration is warranted. For diagnosing free fluid in the abdomen and pericardial collection, Focused assessment with sonography for trauma (FAST) is increasingly used in ED. Pelvic instability indicates pelvic ring disruption and this can be confirmed by pelvic X-Ray. Orthopaedic consultation should be sought and a pelvic binder or similar device can be applied to minimise blood loss.

Over the past few years, an alternative to high volume resuscitation termed “permissive hypotension” or hypotensive resuscitation has been used for penetrating trauma. In this strategy, the fluid is transfused to maintain a balance between tissue perfusion and blood loss. In patients with shock and head trauma, higher blood pressure (systolic pressure of atleast100mm Hg) is aimed to prevent secondary injury[4]. However, it is not recommended in blunt trauma (RTA and falls). Nonhaemorrhagic causes of shock in trauma include tension pneumothorax, cardiac tamponade, cardiogenic, neurogenic and septic shock.

DISABILITY (NEUROLOGICAL EVALUATION)

Initial neurological examination includes Glasgow coma scale, pupillary size and reaction, lateralizing signs. Glasgow coma scale (GCS) is a quick method for determining the level of consciousness and gross motor status of all four limbs. History of loss of consciousness, ENT bleed, vomiting, dilated or unequal pupils are signs of head injury. GCS of 8 or less indicates severe traumatic brain injury (TBI) and is a predictor of poor outcome. Urgent neurosurgical consultation should be sent if head injury is suspected. Hypotension,

hypoxia, hyperthermia and increased intracranial pressure should be avoided to prevent further damage. Mild hypothermia is beneficial. Early endotracheal intubation is helpful and it is preferable to keep $PaCO_2$ approximately 35 mm Hg. Aggressive and prolonged hyperventilation can cause cerebral vasoconstriction and ischemia. Glucose containing solutions should be avoided to prevent hyperglycemia and hypotonicity. Hyponatremia worsens outcome so serum sodium levels should be carefully monitored in head injury patients. Steroids have no role in TBI[8]. Drug therapy to reduce raised intracranial pressure includes mannitol, hypertonic saline and barbiturates.

EXPOSURE /ENVIRONMENTAL CONTROL

Exposure is important in trauma patients to identify missed injuries. The patient should be exposed to facilitate a thorough examination and evaluation. Care should be taken to avoid hypothermia as it exacerbates coagulopathy and acidosis. Passive warming includes preventing further heat loss by covering the patient and increasing the ambient temperature. Active warming includes warming the patient using warming blankets, infusing warm fluids and even, body cavity lavage with warm fluids to maintain core temperature.

E refers to environment control also. It does not mean maintaining warm environment only but also taking care of the victims exposed to hazardous agents. These are thermal, chemical, radiation and biologic agents. Environment control involves early isolation of these patients, removal of their clothes followed by irrigation of skin. Thus, by controlling the environment further injury can be prevented. Regardless of the agent, basic principles of management remain the same.

RESUSCITATION ENDPOINTS

The resuscitation endpoints are used as markers of adequacy of resuscitation. Traditionally, the return to normal heart rate, blood pressure and urine output was used as the endpoint of resuscitation. However, this may leave a few patients in the state of compensated shock which can lead to death, if not corrected. Metabolic markers of hypoperfusion include bicarbonate, base deficit and lactic acidosis are considered to be better than the traditional end points[9].

Lactic acidosis and arterial base deficit can both be used at the time of initiating resuscitation and also as end points of resuscitation. But, these laboratory variables should be interpreted along with the clinical examination.

To summarise, ABC approach forms the basis of acute trauma care. Timely, organized and protocol based care of a trauma victim can improve the outcome and also reduce the burden of injury in society. It can help save many lives and limbs. However, we also need to reduce the burden of injury in society adhering and enforcing injury prevention strategies.

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