Management of Traumatic Shock

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Abstract: Trauma is the leading cause of death in the pediatric age group. About 25,000 children die each year and one million children are injured each year in the USA. Aggressive resuscitation determines the outcome of these injured children. The initial hour following the traumatic injury is referred to as the "golden hour" during which we have an opportunity to intervene and improve the outcome. It is not only the first hour which is important but every minute in trauma resuscitation is important. The outcome of traumatic children has a direct correlation to resuscitation. In order to manage traumatic shock there are four basic principles: (a) control of active hemorrhage, (b) assessment of circulatory status, (c) rapid intravascular access, and (d) aggressive fluid resuscitation. Following the four principles of management of traumatic shock and aggressive resuscitation improves the outcome. (Indian J Pediatr 1998; 65 : 495-501)

Key words: Traumatic shock; Resuscitation.

Trauma is the leading cause of death in the pediatric age group. About one million children are injured each year in the USA and 25,000 children die each year from trauma. Because an injured child has significant potential for a full recovery, resuscitation must begin as soon as possible after the injury. The initial hour following the traumatic injury is referred to as the "golden hour" during which one can intervene and improve the outcome. In trauma, resuscitation, it is not only the first hour which is important but also every minute thereafter. The outcome of traumatic patients has a direct correlation with the resuscitation. Once ventilation and oxygenation are established, then evaluation and management of circulation are the next priorities. Inadequate circulation presents as shock.

Shock is a clinical state characterized by inadequate delivery of oxygen and metabolic substrate to meet the metabolic demand of the cell. The steps in the management of hemorrhagic shock are (a) control of active hemorrhage, (b) assessment of circulatory status, (c) rapid intravascular access, (d) aggressive fluid resuscitation. Crucial in the management of shock is aggressive fluid resuscitation before the child becomes hemodynamically unstable.

Control of Active Hemorrhage

One of the key goals in the management of an injured pediatric patient is to stop the bleeding. Virtually, all traumatic conditions are complicated by ongoing blood loss regardless of the magnitude. Bleeding may be external or internal and can produce...
profound shock. External hemorrhage generally is easy to recognize but internal hemorrhage may at times be difficult to recognize. In order to control the external hemorrhage, immediate application of direct pressure over the wound is needed. Thin dressings applied with pressure are more effective than bulky dressings which may absorb large quantities of blood and may also dissipate the amount of pressure actually applied on the wound. Blind application of haemostatic clamps is contraindicated and tourniquets should not be used except in cases of traumatic amputation associated with uncontrolled bleeding from a major vessel. Open or closed long bone fractures may also bleed extensively and should be immobilized in an anatomic position using appropriate splints.

Assessment of Circulatory Status

Assessment of circulatory status is very important in pediatric patients because signs and symptoms of shock are frequently more subtle in pediatric patients than in adults. Even when as much as 25% of the blood volume has been lost, the heart rate, sensorium, and capillary refill time may be the only parameters that are helpful in detecting shock. Hypotension would not be present until 25-30% or more of the child's blood volume is lost. Hypotension, confusion, decreased urine output and acidosis are indicative of irreversible vascular collapse and are associated with poor outcomes.

The assessment of circulatory status begins with the palpation of peripheral pulses. The pulse should be assessed for rate, rhythm and character. Some assessment of systolic blood pressure can be obtained by palpation of pulses. Simultaneously, general skin condition and mental status should also be assessed. The seriously volume depleted trauma patient will have decreased mentation and have cool, moist, and cyanotic skin especially at the distal extremities. The pulses may be weak and thready and difficult to palpate depending on the volume status. Although tachycardia is a normal hemostatic response to hypovolemia in both children and adults, the response is more pronounced in children. An increase in heart rate is the earliest response of a young child to hypovolemia and weak and thready pulse associated with tachycardia is an indication of cardiovascular instability and impending collapse.

The assessment of perfusion is the basis for early diagnosis and recognition of shock and assessment of peripheral perfusion is done by capillary refill time. Normally, the capillary refill time is less than two seconds and if it is greater than five seconds, it is indicative of hypovolemia. Mental status and urine output are sensitive indicators of nervous system and renal perfusion. Normally, we would like to maintain a urine output between 0.5 to 1 cc/kg/hr. Poor mental status and decreased urine output are indicative of shock.

Measurements of vital signs including heart rate, respiratory rate and blood pressure are also important. No single measurement is more important but serial trend of the above vital signs is important. Hypotension in pediatric patients is a poor prognostic sign as blood pressure is generally maintained in pediatric patients for a long period, unless there is 25-30% loss in blood volume because blood pressure is dependent on cardiac output and peripheral vas-