



Approach for Emergency Traumatic Hemorrhagic Shock

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Received date: 25 October 2020; Accepted date: 02 November 2020; Published date: 07 November 2020

Citation: Elbaih A H, Abou EA (2020). Approach for Emergency Traumatic Hemorrhagic Shock. SunText Rev Surg 1(1): 105.

DOI: <https://doi.org/10.51737/2766-4767.2020.005>

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Abstract

Background: Trauma continues to be the leading cause of death; responsible for more than 5 million deaths worldwide each year. Uncontrolled hemorrhage is the leading cause of preventable death in such cases, attributing about 50% of trauma-related deaths within 24 h of injury. Deaths from haemorrhage represents a substantial global problem, with more than 60,000 deaths per year in the United States and an estimated 1.9 million deaths per year worldwide, 1.5 million of which result from physical trauma. Therefore, we aim to look into the common pitfalls that both medical students and new physicians face in the recognition, diagnosis, and Emergency Traumatic Haemorrhagic Shock Resuscitations.

Targeted population: Haemorrhagic Shock patients who are requiring urgent management in the ED, with Emergency Physicians for teaching approach protocol.

Aim of the study: Appropriate for assessment and priorities for Haemorrhagic Shock Patients Resuscitations by training protocol to Emergency Physicians. Based on Resuscitations guidelines by applying the ATLS protocol in traumatic Haemorrhagic shock.

Methods: Collection of all possible available data about the haemorrhagic patients' therapy in the Emergency department. By many research questions to achieve these aims so a midline literature search was performed with the keywords "critical care", "emergency medicine", "principals of urgent therapy in haemorrhage", "Resuscitations and ATLS". All studies introduced that the initial diagnosis of hypovolemia is a serious condition that face patients of the emergency and critical care departments. Literature search included an overview of recent definition, causes and recent therapeutic strategies.

Conclusion: Haemorrhage is the cause of shock in most trauma patients and Treatment of these patients requires immediate haemorrhage control and fluid or blood replacement. Initial assessment of a shocked patient involves careful physical examination, finding signs of life-threatening problems and other causes of shock. In case of, Shock does not respond to initial crystalloid fluid bolus. Think about an internal bleeding or a non-Haemorrhagic source of shock.

Keywords: Haemorrhagic shock, Emergency physicians; Skill approach; Management

Introduction (Epidemiology)

Trauma remains the leading cause of death; responsible for more than 5 million deaths per year worldwide. For these cases, uncontrolled haemorrhage is the main cause of preventable mortality, attributing nearly 50 percent of trauma-related mortality within 24 h of damage. A trauma center recorded 62.2

per cent over one year of massive transfusions in trauma settings. The remaining cases are classified into emergency surgery, critical care, cardiology, obstetrics, and general surgery, with injuries in excess of 75% of blood supplies used [1,2]. Road traffic accidents are in the top ten worldwide causes of death and the leading cause of death for people who are younger than 45 years. Furthermore, haemorrhage fatalities pose a

significant global epidemic with more than 60,000 fatalities per year in the United States and an estimated 1.9 million deaths per year globally, of which 1.5 million are the consequence of physical injuries. Moreover, bleeding is one of the most important causes of early death following an accident. Trauma became the third leading cause of death overall in the United States in 2001, with heavy rates of haemorrhage being the primary cause of death among people aged 1 to 44 years [1,2].

Despite considerable improvement in haemorrhage treatment, post-traumatic bleeding is the leading cause of preventable death (40 per cent of trauma-related deaths). Furthermore, approximately 25 percent of the critically injured trauma patients who suffered extreme haemorrhage associated with acute traumatic coagulopathy (ATC) are present. These patients have a 5-fold greater chance of mortality within the first 24 hours; even survivors are at risk of contracting organ failure and sepsis, indicated by a mortality rate of up to 67 percent associated with factors other than the original critical bleed. Survival of these patients requires intensive management to correct hypovolemic shock and prevent ATC [3-6].

Definitions, Indications and Contraindications

Shock refers to an improper tissue perfusion due to the disparity between tissue demand for oxygen and the capacity of the body to supply it. The consequence of the shock is hypoperfusion of the global tissue which is associated with a reduced amount of venous

oxygen and metabolic acidosis (lactic acidosis). Conventionally, there's four shock categories: hypovolemic, cardiogenic, obstructive, and distributive. Hypovolemic shock happens when intravascular volume is decreasing to the extent of cardiovascular failure [7,8].

The hypovolemic shock may result from extreme dehydration by a variety of mechanisms or from lack of blood. Haemorrhage is the most common source of shock following damage and there is a degree of hypovolemia in nearly any case with multiple injuries. Hence, where there are symptoms of shock, care is usually administered as though the patient is hypovolemic. Nevertheless, before instituting care, it is necessary to recognise the limited number of patients whose shock has a specific origin (e.g., a secondary disorder such as cardiac tamponade, tension pneumothorax, spinal cord damage, or blunt heart injury), which complicates haemorrhagic shock presentation [8].

Four of these six requirements will be met: Empirical standards for the treatment of circulatory shock irrespective of cause [9] (Table 1).

- Ill appearance or altered mental status.
- Heart rate >100 beat/min
- Respiratory rate >20 cycle/min. or paco₂ <32 mmhg
- Serum lactate level >4 mmol/L
- Arterial base deficit ≥-4meq/L
- Arterial hypotension >20 minutes duration

Table 1: Signs and symptoms of hemorrhage by class [8].

PARAMETER	CLASS I	CLASS II (MILD)	CLASS III (MODERATE)	CLASS IV (SEVERE)
Approximate blood loss	<15%	15–30%	31–40%	>40%
Heart rate	↔	↔/↑	↑	↑/↑↑
Blood pressure	↔	↔	↔/↓	↓
Pulse pressure	↔	↓	↓	↓
Respiratory rate	↔	↔	↔/↑	↑
Urine output	↔	↔	↓	↓↓
Glasgow Coma Scale score	↔	↔	↓	↓
Base deficita	0 to –2 mEq/L	–2 to –6 mEq/L	–6 to –10 mEq/L	–10 mEq/L or less
Need for blood products	Monitor	Possible	Yes	Massive Transfusion Protocol
A Base excess is the sum of base (HCO ³⁻ , in mEq / L) over or below the standard body range. A negative value is considered a deficiency basis (or base deficit) and demonstrates metabolic acidosis.				

Description of a problem, a lack of knowledge on a certain topic or a segment on WHY this is a problem

However, there are such medical problems which are might be faced during the emergency room when dealing with patients who are suspected to have a shock. For example, diagnosis of circulatory shock or other type of shock can be missed because of

depending on only a single parameter which is like a blood pressure. As an example, hypertensive emergencies with a compromised cardiac output can include blood pressure normal or elevated. Another one is when there is unobvious bleeding source (internal bleeding) and the unstable patient need CT scan to localise the source of bleeding. Moreover, the physicians on emergency room may they are not aware about specific

consideration in shock detection and care involves discrepancies in the responses to extreme age shocks, fitness, pregnancy and the involvement of other drugs [8].

WHY this study is necessary

The goal of studying and addressing these problems is to improve healthcare, decreasing the mortality rate, and highlight some of the wrong approaches applied by a physician in emergency cases. Any delay or missing diagnosis of a shock will have a dramatic effect on the patient's health and it can be led to death especially the patient with unobvious internal bleeding. Also, Physicians on emergency room should be aware about the special consideration or type of patient when they are trying to resuscitate them (This topic will be discussed below). Therefore, it is very important to apply the right approach of ATLS when dealing with such suspicion patients have signs and symptoms of shock [9].

Aim of study

This is a review study Aim to decreasing the mortality rate, improve the healthcare and highlight some of the wrong approaches applied by a physician in emergency room in aspect of traumatic haemorrhagic shock.

Study question

- How can we correct and prevent using of the single parameter (such as blood pressure) as not missing the diagnoses of shock?

We can correct and prevent this by [8]

- Application of all clinical knowledge regarding breathing rate, pulse rate, skin perfusion and mental status.
- If available, ask for pH, pO₂, PCO₂, oxygen levels and base deficiency measures of the arterial blood gas.
- End-tidal CO₂ and serum lactate tests may provide valuable diagnostic details.
- In case of unstable polytrauma patient with unobvious internal bleeding what should we do to detect the source of bleeding?
 - The ER doctors can't move the patient to a CT scan in this situation, since the individual is unstable. Hence, rapid ultrasound in shock and hypotension (RUSH) is the most effective method when working with unstable polytrauma patients with unobvious internal bleeding. This shows that the classification of unstable polytrauma patients was 94.2 percent sensitive; the precision of RUSH in shock patients was 95.2 percent. However, it is highly operator dependent and need expert. As well as Portable chest and pelvic X-ray should be used [10].
- What are the special considerations and types of patients that the ER physicians should know? And why?

The special types of patients and consideration are advance age, athletes, pregnancy, and Medications.

For advancing age, the ageing process causes a significant reduction in sympathetic function in the cardiovascular system. Therefore, cardiac compliance reduces with age, and in comparison to younger patients, older patients are reluctant to raise their heart rhythm or myocardial contraction capacity while distressed by lack of blood flow. Furthermore, the atherosclerotic vascular occlusive disorder allows certain important organs highly susceptible to even the smallest drop in blood flow. Additionally, often elderly patients suffer pre-existing volume loss attributable to long-term diuretic usage or slight malnutrition. For these factors, the elderly trauma patients display poor resistance to secondary blood loss hypotension. For e.g. in an elderly patient, a systolic blood pressure of 100 mm Hg may constitute a shock [8].

For athletes, Rough athletic fitness workouts change physiological processes of those patients. Blood volume will increase from 15% to 20%; cardiac output will raise 6-fold; stroke rate will rise by approximately 50%; and resting pulse may increase by an average of 50 BPM. The bodies of highly qualified athletes have a tremendous capacity to compensate for loss of blood, and even with substantial blood loss, the normal reactions to hypoperfusion will not be manifested [8].

For pregnancy, the normal hypervolemia that happens throughout pregnancy suggests that the development of mother's perfusion defects requires a greater volume of blood loss and can even be reflected in decreased fetal perfusion [8].

For Medications, Specific drugs can affect a patient's reaction to the shock. For eg, β -adrenergic receptor blockers and calcium channel blockers could drastically influence a patient's hemodynamic response to haemorrhage. Insulin toxicity may be the cause of hypoglycaemia, which could have led to the injury event. Long-term diuretic therapy may be causing unidentified hypokalaemia, and non-steroidal anti-inflammatory drugs (NSAIDs) that adversely influence the function of platelets and can speed up bleeding [8].

Describe steps of the right technic of this method point by point [8].

Initial Management of Haemorrhagic Shock: The detection and management of shocks will actually occur nearly simultaneously. Clinicians begin therapy in most trauma cases as though the patient were experiencing a haemorrhagic shock, unless another source of shock becomes apparent. The fundamental concept of management is to control bleeding, then replace the lack of volume.

Physical Examination



Physical examination concentrates on the rapid treatment of life-threatening conditions and the evaluation of ABCDEs. Baseline assessments are important for evaluating the patient's responsiveness to care, and frequent examinations of vital signs, urinary output, and awareness level are necessary [9].

Airway and Breathing

The first priority is the establishment of a patented airway with adequate ventilation and oxygenation. Provide enough oxygen to preserve oxygen saturation at more than 95 percent [10].

Circulation: Haemorrhage Control

- Priorities for maintaining circulation include preventing apparent bleeding, securing adequate intravenous access, and evaluating tissue perfusion.
- Bleeding from external wounds in the extremities may typically be managed by direct pressure to the bleeding location, while severe extremity blood loss can involve a tourniquet.
- Bleeding from pelvic fractures could be controlled with a sheet or pelvic binder.
- Internal haemorrhage may need surgical or angioembolization to control.
- The priority is not to quantify the amount of fluid loss, but to control the bleeding.

In patients with proof of Class III and IV haemorrhage, early resuscitation of blood and blood supplies needs to be addressed.

- Early administration of blood transfusions at a low ratio of red blood cells to plasma and platelets may prevent the production of coagulopathy and thrombocytopenia [11].

Uncontrolled high blood loss can result in patients receiving antiplatelet or anticoagulant medicine. Prevented by:

- Get the list of medications as quick as possible.
- Administer reversal drugs at the earliest moment.
- Where available, observe coagulation with thromboelastography (TEG) or rotational thromboelastometry (ROTEM).
- Consider prescribing the transfusion of platelets, also with regular platelet levels.

European and American military studies show increased recovery after tranexamic acid (TXA) is given within 3 hours of damage within 10 minutes.

- Follow up infusion TAX 1 gram over 8 hours at the hospital while needed in the field [12].

For emergency patient, the endpoints of fluid resuscitation are when heart rate, blood pressure, distal pulses and capillary refill, urinary flow, mental state return to regular level. As well as decrease of base deficit and lactate level.

RESPONSES TO INITIAL FLUID RESUSCITATION*			
	RAPID RESPONSE	TRANSIENT RESPONSE	MINIMAL OR NO RESPONSE
Vital signs	Return to normal	Transient improvement, recurrence of decreased blood pressure and increased heart rate	Remain abnormal
Estimated blood loss	Minimal (<15 %)	Moderate and ongoing (15%–40%)	Severe (>40%)
Need for blood	Low	Moderate to high	Immediate
Blood preparation	Type and crossmatch	Type-specific	Emergency blood release
Need for operative intervention	Possibly	Likely	Highly likely
Early presence of surgeon	Yes	Yes	Yes

* Isotonic crystalloid solution, up to 1000 mL in adults; 20 mL/kg in children

In case of, Shock does not respond to the initial bolus of crystalloid fluid.

- Check for a continuing cause of blood loss: (abdomen / pelvis, retroperitoneum, thorax and limbs).
- Think of a non-haemorrhagic shock trigger.
- Start replacing the blood and plasma elements.
- Obtain surgical consultation on precise management of haemorrhage [13].

Massive transfusion

- Massive transfusion, most generally described during the first 24 hours of admission as > 10 units of pRBCs or more than 4 units in 1 hour.
- Early and effective administration of balanced-ratio pRBCs, plasma, and platelets may enhance patient longevity to reduce unnecessary crystalloid administration.
- This technique has been called resuscitation "balanced," "haemostatic" or "damage control."
- Simultaneous measures are particularly necessary in these patients for rapid management of bleeding and the adverse consequences of coagulopathy, hypothermia and acidosis [14].

Disability: Neurological Examination

A simple neurological evaluation can evaluate the state of consciousness of the patient that is helpful in determining brain perfusion. Alterations in CNS function in patients with hypovolemic shock do not generally mean severe intracranial damage and may represent insufficient perfusion. Repeat neurological examination following the restoration of perfusion and oxygenation [15].

Exposure: Complete Examination



SUNTEXT REVIEWS

- After outlining life-saving priorities, fully undress the patient and closely check the patient from head to foot for possible injuries.
- That's also necessary to avoid hypothermia, a disease that may intensify blood loss by leading to coagulopathy and increasing acidosis when introduced to the patient [16].
- To prevent hypothermia, always use fluid heaters and the additional passive and active heating techniques.

Initial Diagnostic Studies to Evaluate a Patient in Shock*

CBC with differential
 Electrolytes, glucose, calcium, magnesium, phosphorus
 BUN, creatinine
 Serum lactate
 ECG
 Urinalysis
 Chest radiograph
 Coagulation studies: prothrombin time, PTT, INR
 Arterial blood gas (measured pH, carbon dioxide, and oxygen levels)
 Hepatic function panel
 Cultures: blood, urine, suspicious wounds, quantitative sputum culture
 Culture
 Cortisol level
 Pregnancy test
 CT of chest/abdomen/pelvis as indicated history, physical exam

*Ordering of the listed tests should be individualized by patient presentation and history.

Gastric Dilation: Decompression

- Gastric distention raises the possibility of aspiration of gastric material in unconscious patients, and is a possibly lethal complication [17].
- Start decompressing the stomach by inserting a nasal or oral hose in and suctioning it.
- Be conscious that careful positioning of the tubes will not reduce the possibility of aspiration.

Urinary Catheterization

- Continuous renal perfusion measurement is made possible by controlling urinary production.
- Blood in the urethral meatus or perineal hematoma / bruise may imply urethral injury and may contraindicate the insertion of a transurethral catheter without radiographic confirmation of an intact urethra [18].

Teamwork

- Some of the most difficult circumstances facing a trauma team is the handling of a trauma survivor who comes in deep shock. The team leader must resolutely and calmly direct the team, using the principles of ATLS.
- The team leader needs to ensure that even in challenging patients fast intravenous access is received. The decision to trigger the procedure for massive transfusion should be taken early in order to prevent the fatal triad of coagulopathy, hypothermia and acidosis [19].

- The team will be mindful of the volume of fluid and blood products given, and of the patient's physiological reaction, to make appropriate changes.
- The team leader maintains monitoring of the external haemorrhage areas and decides whether to conduct the treatment with adjuncts such as chest x-ray, pelvic x-ray, FAST, and/or peritoneal lavage (DPL).
- Choices regarding surgery or angioembolization should be made as early as possible, and the correct consultants should be needed.
- When appropriate services are not available, the trauma team arranges for a quick, safe transition to specialized care [20].

Conclusion

- Shock is an abnormality of the circulatory system that results in insufficient organ perfusion and tissue oxygenation.
- Haemorrhage is the cause of shock in most trauma patients.
- Treatment of these patients requires quick management of haemorrhage and replacement of fluid or blood. Control / Stop the bleeding.
- Choices regarding surgery or angioembolization should be made as early as possible, and the correct consultants should be needed.
- Clinical diagnosis of a shocked patient requires close physical inspection, detecting symptoms of tension pneumothorax, heart tamponade and other shock factors.
- In case of, Shock does not respond to initial crystalloid fluid bolus. Think about an internal bleeding or a non-haemorrhagic source of shock.
- Management of haemorrhagic shock includes rapid haemostasis and balanced resuscitation with crystalloids and blood.
- The specific consideration in shock detection and care involves discrepancies in the responses to extreme age shocks, fitness, pregnancy and the involvement of other drugs.

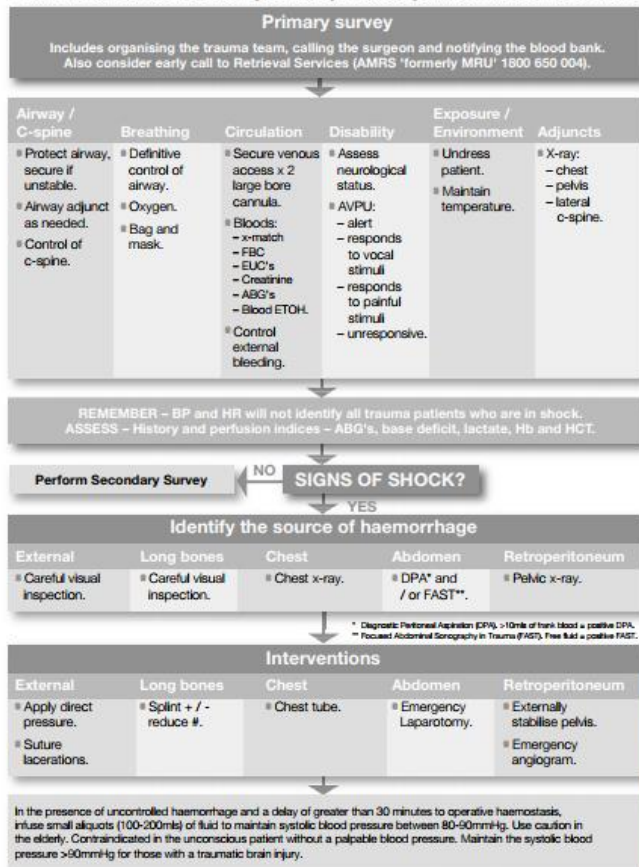
Take-Home Message

- For emergency cases haemorrhage is by far the most frequent cause of shock.
- The haemorrhage classes and the approach to treatments act as a resuscitation guide.
- The fundamental concept of management is to control bleeding, then replace the lack of volume.
- In the ED, inability to respond to crystalloid and blood administration determines the need for urgent, conclusive action (i.e., operation, or angioembolization) to manage exsanguinating haemorrhage.

- Coagulopathy, hypothermia, and deteriorating metabolic acidosis are deadly triads that trauma victims need to look out for.
- The choice to trigger the treatment for massive transfusion should be made early in order to avoid the fatal triad of coagulopathy, hypothermia and acidosis.
- If clinically suggested, negative FAST scan, this can't fully eliminate the risk of serious intraabdominal injury.
- CT scan is a gold standard for diagnosing intraabdominal injuries in patients with hemodynamically stable status.
- For emergency patient, the endpoints of fluid resuscitation are when heart rate, blood pressure, distal pulses and capillary refill, urinary flow, mental state return to regular level. As well as decrease of base deficit and lactate level.

The Management of Hypovolaemic Shock in the Trauma Patient

If definitive care is not available in your facility make early contact with retrieval services



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