

Trauma, Shock, Multiple Organ Dysfunction

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Class 14 Objectives

➤ Upon completion of this lesson, the student will be able to

- apply the previously learned concepts to a patient sustaining severe trauma and organ failure
 - Hypoxia, Reduced Cardiac Output, and DIC
- discuss patients at risk for renal failure, sepsis, hypovolemia, and hemorrhage.
- detect the early S & S of septic shock, circulatory collapse, respiratory failure, and decreased LOC.
- plan the major interventions for an individual experiencing respiratory and/or cardiac arrest.

Trauma

➤ Lacerations

- Tears, rips r/t forces > the strength of tissue
 - Skin, liver, spleen, kidneys, bowel, aorta, heart

➤ Stab wounds

- Deeper than longer
 - Blade dependent (serrated or double blade)

➤ Gun shot wound

- Penetrating or perforating wound?
- Entrance wound: depends upon range
 - Contact = searing
 - Intermediate range "tattooing"
 - Gunpowder
- Exit wound: varies depending on speed of bullet

Asphyxiations

- Suffocation
 - Oxygen is unable to reach the blood stream
 - Due to fire, suicide attempts, plastic bags
- Strangulation
 - Lack of blood flow to cerebrum and lungs
 - Due to hanging, homicide,
 - Petchiae, ligature mark, hematoma
- Chemical
 - Cyanide, Serin Gas, Carbon Monoxide, Ricin
 - Suicide attempts, homicide
 - Response to bioterror attack
 - <http://www.stanfordhospital.com/forPhysiciansOthers/bioterrorism/bioterrorism.html>
 - <http://www.survivalgeardirect.com/mainpages/seringas.html>
 - <http://www.bt.cdc.gov/>

Drowning

- Pathology involved is hypoxemia
 - Airway obstruction: most critical concept
 - Laryngospasm occurs & prognosis depends upon time of submersion, temperature of water, and age
 - Truly a drowning? Drug overdose? ETOH abuse?
 - Second leading cause of injury-related death for children
 - Swimming pools, lakes, ocean
 - <http://www.cdc.gov/ncipc/factsheets/drown.htm>

Shock

- *A clinical syndrome characterized by impaired cellular metabolism that results from inadequate tissue perfusion and oxygenation or cellular dysfunction. All body systems are affected.*
 - Impaired oxygen use
 - Glucose delivery and uptake impaired
 - Compensatory mechanisms fail

Cardiogenic Shock

- Commonly seen following an MI, cardiopulmonary bypass, arrhythmias, or tension pneumothorax
 - 80% mortality rate following a MI
 - An extensive loss of myocardium occurs (40% or more) leading to a drop in cardiac output ↓ CO & ↓ BP ↓ SNS & ↓ vasoconstriction (↑ afterload) and renin angiotension system activated ↑ preload. These occurrences further aggravate the problem.

Circulatory Shock

- **Hypovolemic**
- Circulating blood flow is not adequate to fill the vascular network
 - 15 - 25 % decrease in intravascular volume
 - Hemorrhage or shift of fluid from intravascular compartment
 - traumatic injury, major surgery, coagulation alterations, burns
- S & S
 - **Mild:** minimal tachycardia, cool hands and feet, slight drop in blood pressure
 - **Moderate:** 100-120 bpm, < pulse pressure, systolic = 90-100, sweating, pallor, restlessness, oliguria
 - **Severe:** HR > 120, BP < 60 mmHg systolic, anuria, acidosis, mental stupor

Circulatory Shock

- **Obstructive**
 - Inability of the heart to fill adequately
 - Cardiac tamponade?
 - Outflow from the heart is obstructed
 - Pneumothorax?
- **Distributive**
 - Normovolemic shock (↓ CO, but no ↓ volume)
 - Neurogenic: ↓ sympathetic control of blood vessel tone
 - Anaphylactic: caused by immunological reaction
 - Septic: associated with infection (e.g. bacterial)

Shock's Hemodynamic Patterns

Type of Shock	Description	Preload	Afterload
Cardiogenic	Myocardium damaged: □ pumping	increased	increased
Hypovolemic	□ Blood volume	decreased	increased
Early Septic	Action of endotoxins	decreased	decreased

Pathoplus reference: 2003

Multiple Organ Dysfunction Syndrome

- Acronym = MODS
- A common complication of severe trauma
 - Most frequent cause of death in ICUs in US
- Complication of systemic insults such as burns, trauma, and severe infection.
- Sustained inflammatory response to injury
- Hypothesis: cellular response to injurious stimuli can cause cellular & organ dysfunction □ death to the host (patient)
- Gene directed therapies are being tested to treat MODS (Cobb, J.P., 2003)

Treatment of Shock

- Correct the underlying cause!
 - Treat heart failure (enhance C.O.)
 - Stop the hemorrhage
 - Stabilize the spine and surrounding tissue
 - Remove or neutralize the antigen
 - Eradicate the infective agents
- Give IV fluids, oxygen, cardiotoxic drugs, steroids, stress ulcer prophylaxis

MODS

- Mortality
 - 50% for 2 organ involvement, 80% for 3, 100% if 3 organ failure > 4 days.
 - At risk population
 - Significant tissue injury, renal insufficiency, sepsis
 - Require intervention for homeostasis
- S & S
 - ARDS, DIC, encephalopathy
 - respiratory, renal, liver, and heart failure
 - Use of APACHE scores for adults
 - Prediction of outcomes for populations

Systemic Inflammatory Response System

- Begins with an infection and leads to bacteremia □ sepsis □ severe sepsis □ septic shock □ MODS
 - Acronym: “sepsis syndrome”
 - Infection is not the only cause of sepsis
 - Inflammatory response of the host is very crucial in the prognosis.
 - Please see McCance Table 45-1 p. 1490

References

- Cobb, J. P. (2003). Cellular injury and adaptation laboratory. Washington University School of Medicine.
- Hansen, M. (1998). *Pathophysiology: Foundations of disease and clinical intervention*. Philadelphia: Saunders.
- Huether, S. E., & McCance, K. L. (2002). *Pathophysiology*. St. Louis: Mosby.
- <http://www.pathoplus.com>
