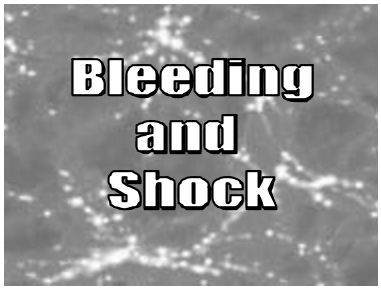


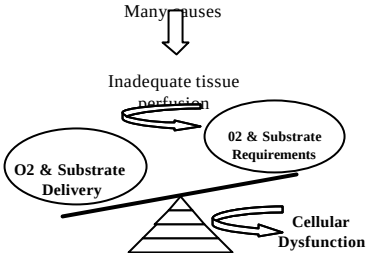
Shock

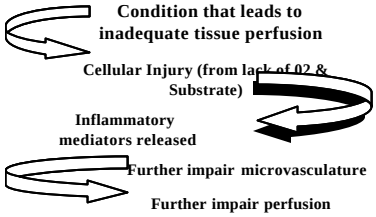
- Sometimes difficult to define by words or numbers alone
- Many practitioners “know it when I see it”

Shock

Definition

The clinical syndrome that results from inadequate tissue perfusion





WHAT ?

THE BODY NEEDS PERFUSION !!

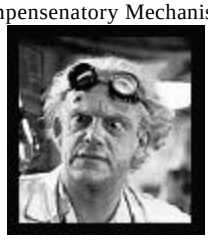
Please Understand…..

- When shock is persistent and/or severe, inadequate O2 delivery leads to irreversible cell injury
- Only rapid restoration of O2 delivery can reverse the progression of the shock state
- Treatment must start, regardless of the cause, as soon as the condition is suspected

Goal

- Intervene emergently and in a timely fashion to restore perfusion
- Except in cases of cardiogenic shock, the expansion or reexpansion of blood volume is crucial
- Control of any inciting pathological process (hemorrhage, infection) must occur simultaneously

Shock Pathophysiology and Intrinsic Compensenatory Mechanisms



Vascular Response

Vasoconstriction

- Arterioles: Increases total peripheral resistance & BP
- Venous capacitance system: Improves venous return to RA
- Arteries: diastolic BP rise

Cerebral Response

- As shock progresses, the primary goal of the body is to maintain pefusion to the brain, heart, and lungs
- This is done at the "expense" of lower blood flow to the liver, kidneys, skin, bowel
- If BP < 50mm Hg, cerebral ischemia ensues as CO2 accumulates
- Altered levels of consciousness

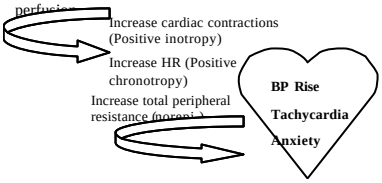
Renal Response

- Renin-Angiotensin-Aldosterone System
  - Vasoconstriction of arterioles and some veins
  - Stimulates sympathetic nervous system
  - Retention of water by kidneys
  - Stimulates aldosterone release (adrenal cortex) which is a sodium retention hormone
  - Takes 10-60 minutes to fully activate

•Decreased UO may be a sign of renal hypoperfusion

Adrenal Gland Response

- Catecholamines (epinephrine and norepi.) are released to increase CO, BP, and tissue perfusion



Effects of Sympathetic Nervous System

Organ	Effect
Heart (muscle)	Increased Force
Heart (rate)	Increased Rate
Peripheral vessels	Vasoconstriction
Pupils	Dilation
Sweat gland (cholinergic)	Increased secretion
Adrenal glands	Increased secretion
Bronchi	Dilation
Kidneys	Renin secretion increased
Liver	Glycogeneolysis (glycogen breakdown)

Pulmonary Response

- Tachypnea: Body tries to maintain acid-base balance and to maintain an increased supply of oxygen
- Metabolic acidosis from anaerobic metabolism will be a stimulus for the lungs to increase the rate of ventilation
- Thus, the body is attempting to both correct the acidosis maximize O2 delivery by being tachypneic

Irreversible Shock

- Patients die from shock when it becomes irreversible
- Some causes of death are:
  - Acidosis
  - Increased capillary permeability
  - Vasomotor failure (dilation)
  - Cardiac failure
  - MSOF

Classification of Shock Etiology and Underlying Defect

Classification	Etiology	Underlying Pathology
Hypovolemic	Hemorrhage	Whole blood loss
	Burns	Plasma loss
	Diarrhea	
Cardiogenic	MI	
	Blunt Cardiac Injury	Loss of cardiac contractility
	Dysrhythmias	Reduced CO
Obstructive	Cardiac Tamponade	Compression/mediastinal shift
	TPTX /THPTX	With obstruction to atrial filling
Distributive	Neurogenic shock	Venous pooling-maldistribution
	Anaphylactic shock	Shunting in microcirculation
	Septic shock	Poor distribution of blood flow

Hypovolemic Shock

- Affects trauma victims most commonly
- A decrease in amount of circulating whole blood (hemorrhage) or leakage of plasma and protein from the intravascular to interstitial space (loss of semi permeable integrity of the cellular membrane) as in burns

Class % Blood Loss	Pulse	BP	LOC	RR	UO
Class One To 15% (up to 750 ml)	< 100	WNL	Slightly Anxious	14-20	>30 ml/hr
Class Two 15-30% (750-1500 ml)	>100	WNL	Mildly Anxious	20-30	20-30 ml/hr
Class Three 30-40% (1500-2000 ml)	>120	Dec.	Anxious, confused	30-40	5-15 ml/hr
Class Four > 40% (> 2000 ml)	>120	Dec.	Anxious, confused	30-40	5-15 ml/hr

Physiologic Responses to Hemorrhage 70 Kg.

Hypovolemic Shock

- Hypothermia in the patient with hypovolemic shock has serious sequealae:
  - Decreased tissue extraction of O2 from hemoglobin
  - Impaired cardiac contractility and decreased CO
  - Coagulopathies because of disruption of cellular enzymatic function, platelet disturbances, and increased fibrinolysis
- Hypothermia, coagulopathy, and metabolic acidosis predispose the patient to severe consequences

Characteristics of Bleeding

- Arterial
  - Blood is bright red and spurts.
- Venous
  - Blood is dark red and does not spurt.
- Capillary
  - Blood oozes out and is controlled easily.

Controlling External Bleeding

- Follow BSI precautions
- Ensure patient has an open airway and adequate breathing
- Provide oxygen if necessary
- There are several methods to control bleeding

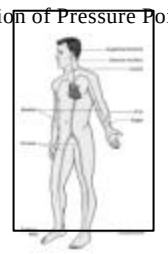
Direct Pressure and Elevation

- Direct pressure is the most common and effective way to control bleeding.
- Apply pressure with gloved finger or hand.
- Elevating a bleeding extremity often stops venous bleeding.
- Use both direct pressure and elevation whenever possible.
- Apply a pressure dressing.

Pressure Points

- If bleeding continues, apply pressure on pressure point.
- Pressure points are located where a blood vessel lies near a bone.
- Be familiar with the location of pressure points.

Location of Pressure Points



Controlling a Nosebleed

- Follow BSI precautions.
- Help the patient sit and lean forward.
- Apply direct pressure by pinching the patient's nostrils.
  - Or place a piece of gauze bandage under the patient's upper lip and gum.
- Apply ice over the nose.
- Provide transport.

Bleeding from Skull Fractures

- Do not attempt to stop the blood flow.
- Loosely cover bleeding site with sterile gauze.
- If cerebrospinal fluid is present, a target sign will be apparent.

Internal Bleeding

- Internal bleeding may not be readily apparent.
- Assess patient's
  - Mechanism of Injury
  - Nature of Illness

Signs and Symptoms of Internal Bleeding (1 of 2)

- Ecchymosis: Brusing
- Hematoma: Bleeding beneath the skin
- Hematemesis: Blood in vomit
- Melena: Black, tarry stool

Signs and Symptoms of Internal Bleeding (2 of 2)

- Hemoptysis: Coughing up blood
- Pain, tenderness, bruising, guarding, or swelling
- Broken ribs, bruises over the lower chest, or rigid, distended abdomen

Signs of Hypoperfusion

- Change in mental status
- Tachycardia
- Weakness
- Thirst
- Nausea or vomiting
- Cold, moist skin
- Shallow, rapid breathing
- Dull eyes
- Dilated pupils
- Weak, rapid pulse
- Decreased blood pressure
- Altered level of consciousness

Emergency Medical Care

Follow BSI precautions.

Maintain airway and administer oxygen.

Control external bleeding and care for any internal bleeding.

Monitor and record vital signs.

Elevate legs and keep patient warm.

Transport immediately to hospital.

Cardiogenic Shock

- A syndrome that results from ineffective perfusion caused by inadequate contractility of the heart muscle
- Causes: MI, dysrhythmias, cardiac failure, blunt cardiac injury,mitral valve insufficiency

Obstructive Shock

- Results from an inadequate circulating blood volume because of an obstruction or compression of the great veins, aorta, pulmonary arteries, or the heart itself
- Causes: Cardiac tamponade, tension PTX, air embolus

Distributive Shock

- Results from either poor distribution of blood flow or blood volume
- Neurogenic and anaphylactic shock are examples of shock because of a change in the distribution of blood volume
- Septic shock and spinal shock are also classified under forms of distributive shock

Distributive Shock

- **Neurogenic Shock** results from upper spinal cord injury
- Autonomic sympathetic functions are lost, resulting in: ⇒ ⇒
  - Loss of vasomotor tone vasodilation hypotension ⇒
  - Loss of cutaneous control of sweat glands ⇒ inability to sweat warm and dry skin
  - Increased parasympathetic control of HR, resulting in bradycardia

Distributive Shock

- Spinal Shock: describes areflexia and flaccidity associated with the lower motor neuron involvement in complete cord injuries—(reflexes return once spinal shock resolves)

Distributive Shock

- Septic Shock: from bacteremia, whereby the blood flow is poorly distributed because of shunting in the microcirculation and venous dilation

Shock

- Often there are combinations of varying degrees of the different forms of shock…..

Care of the Patient in Hypovolemic Shock

- ABC
- O2
- C-spines, backboard
- Control bleeding-direct pressure
- Splint pelvis (Backboard), longbones
- IV: 2 large bore, NS or LR (short, large bore)
  - LR is near-physiologic (to body's extracellular fluid)
  - NS is second choice
  - 1-2 liters as rapidly as possible
  - Warmed IVF is ideal to prevent hypothermia

Care of the Patient in Hypovolemic Shock

- Raise legs (Trendelenburg)
- Monitors (oximetry, cardiac)
- Treat cardiac dysrhythmias, PTX
- PASG (to increase afterload and blood flow to brain, heart, lungs)
  - Controversy: do you "restore" BP before you control bleeding since the increase in pressure may increase the rate of bleeding and loss of O2-carrying RBCs
  - Indications are controversial as well

Care of the Patient in Hypovolemic Shock

- Foley: to monitor response to resuscitation
  - The ability of the kidneys to form urine is a reflection of the patient's overall perfusion status
- Maintain body temperature