SHOCK & metabolic response

This is a summary, so you have to go to the lecture to read the rest.

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Definition of Shock:

- Inadequate oxygen delivery to meet metabolic demands.

- Results in global tissue hypoperfusion and metabolic acidosis.

- Shock can occur with a normal blood pressure and hypotension can occur without shock.

COMPENSATED PHASE:

Inadequate systemic oxygen delivery activates autonomic responses to maintain systemic oxygen delivery

1- Sympathetic nervous system (NE, epinephrine, dopamine, and cortisol release):

Causes vasoconstriction, increase in HR, and increase of cardiac contractility (cardiac output).

2- Renin-angiotensin axis: → hypotension is the main stimulator

Water and sodium conservation and vasoconstriction causes Increase in blood volume and blood pressure.

UNCOMPENSATED PHASE:

- Cellular responses to decreased systemic oxygen delivery.

*ATP depletion → ion pump dysfunction.

*Cellular edema.

*Hydrolysis of cellular membranes and cellular death.

-Goal is to maintain cerebral and cardiac perfusion.

- Vasoconstriction of splanchnic, musculoskeletal, and renal blood flow.

- Leads to systemic metabolic lactic acidosis that overcomes the body's compensatory mechanisms.anaerobic metabolism and ultimately to lactic acidosis

- Ultimately, Global Tissue Hypoxia:

*Endothelial inflammation and disruption

*Inability of O2 delivery to meet demand

Result:

- ✓ Lactic acidosis →due to converting to anaerobic.
- ✓ Cardiovascular insufficiency
- ✓ Increased metabolic demands

Signs and symptoms of compensated and decompensated shock:

Table 10-3 Progression of Shock

Compensated Shock
- Agitation
- Anxiety
- Restlessness
- Feeling of impending doom
- Altered mental status
- Weak, rapid (thready), or absent pulse
- Clammy (pale, cool, moist) skin
- Pallor, with cyanosis about the lips
- Shallow, rapid breathing
- Air hunger (shortness of breath), especially if there is a chest injury
- Nausea or vomiting
- Capillary refill of longer than 2 seconds in infants and children
- Marked thirst

Decompensated Shock
- Falling blood pressure (systolic blood pressure of 90 mm Hg or lower in an adult)
- Labored or irregular breathing
- Ashen, mottled, or cyanotic skin
- Thready or absent peripheral pulses
- Dull eyes, dilated pupils
- Poor urinary output

Approach to the Patient in Shock:

- ABCs
- Cardiorespiratory monitor.
- Pulse oximetry.
- Supplemental oxygen.
- IV access.
- ABG, labs.
- Foley catheter.
- Vital signs including rectal temperature.

First approach to any patient comes to the ER with shock is ABC

A= airways:

I should ask the patient anything like What's your name or How are you if he did answer, that means his airways are patent and no need for intubation, if he didn't we do INTUBATION immediately.

B= breathing: (it helps me in confirming other diagnosis).

Remember "listen, feel and see"

DR mentioned this Scenario regarding a trauma patient in the ER:

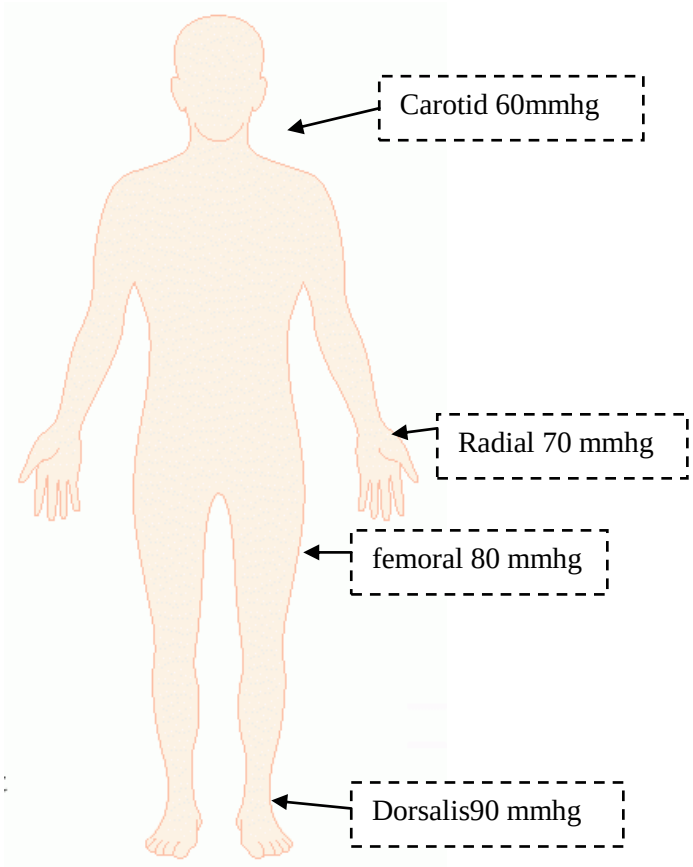
I put the stethoscope (listen) on patient's chest no breath sound on right side while on the left side there is breath sound, then I put my palm (Feel) on his chest no movement in right side while in the left side there is, and I noticed (see) his neck veins are dilated. Diagnosis is tension pnuemothorax and treatment is needle in secondary or primary hospitals or chest tube in tertiary hospitals.

C= circulation:

We need to know HR, BP, pulse oximetry and oxygen saturation as well as asking the nurse immediately to put two large IV lines (18 gauge) in both arms.

How to quickly estimate blood pressure by pulse??

- If you palpate a pulse, you know SBP is at least this number:



1- Hypovolemic Shock:

- **Causes:**
  - **Non-hemorrhagic**
    - Vomiting, Diarrhea, Bowel obstruction, pancreatitis, Burns, Neglect and environmental (dehydration).
  - **Hemorrhagic**
    - GI bleed, Trauma, Massivehemoptysis, AAA rupture, Ectopic pregnancy and post-partum bleeding.
- **Signs and symptoms:**
  - Hypotension, tachycardia, with cool but dry skin.
- **Approach:**
  - ABCs
  - Establish 2 large bore IVs or a central line
    - Crystalloids
    - Normal Saline or Lactate Ringers
  - Up to 3 liters
  - PRBCs (packed RBC)
    - O negative we don't wait for cross match.
  - Control any bleeding
  - Arrange definitive treatment

2- Septic shock:

- Signs:

- Hyperthermia or hypothermia
- Tachycardia
- Wide pulse pressure.in hypovolmic shockit is narrow
- Low blood pressure (SBP<90)
- Mental status changes
- Beware of compensated shock!Blood pressure may be “normal”

- Approach:

- 2 large bore IVs.
- NS IVF bolus- 1-2 L wide open (if no contraindications) .
- Supplemental oxygen.
- Empiric antibiotics, based on suspected source, as soon as possible.

3-Cardiogenic shock:

-causes:

- AMI
- Sepsis
- Myocarditis
- Myocardial contusion
- Aortic or mitral stenosis, HCM
- Acute aortic insufficiency

- **signs:**
    - Cool, mottled skin.
    - Tachypnea.
    - Hypotension.
    - Altered mental status.
    - Narrowed pulse pressure.
    - Rales murmur.
- **Approach:**
    - Goals- Airway stability and improving myocardial pump function.
    - Cardiac monitor, pulse oximetry.
    - Supplemental oxygen, IV access.
    - Intubation will decrease preload and result in hypotension.Be prepared to give fluid bolus.

4-Anaphylactic shock: (IgE mediated)

- **Causes:**
    - exposure to drug, food, or insect.

-symptoms:

- First- Pruritus, flushing, urticaria appear.
- Next- Throat fullness, anxiety, chest tightness, shortness of breath and lightheadedness.
- Finally- Altered mental status, respiratory distress and circulatory collapse.

- **Approach:**
  - ABC's
    - Angioedema and respiratory compromise require immediate intubation
  - IV, cardiac monitor, pulse oximetry
  - IVFs, oxygen
  - Epinephrine
  - Second line
    - Corticosteriods
    - H1 and H2 blockers

5- Neurogenic shock:

- **Causes and signs:**
  - Occurs after acute spinal cord injury.
  - Sympathetic outflow is disrupted leaving unopposed vagal tone.
  - Results in hypotension and bradycardia
  - Loss of sympathetic tone results in warm and dry skin
  - Shock usually lasts from 1 to 3 weeks
  - Any injury above T1 can disrupt the entire sympathetic system
  - Higher injuries = worse paralysis

-Approach:

- A,B,Cs
  * Remember c-spine precautions
- Fluid resuscitation
  *Keep MAP at 85-90 mm Hg for first 7 days.
  *Thought to minimize secondary cord injury.
  * If crystalloid is insufficient use vasopressors.
- Search for other causes of hypotension
- For bradycardia
  *Atropine
  * Pacemaker

6- Obstructive shock:

-causes:

1- Tension pneumothorax:
Treatment is Needle decompression or chest tube.
2- Cardiac tamponade:
Treatment is Pericardiocentisis.
3- Pulmonary embolism:
Treatment is Heparin, consider thrombolytics.
4- Aortic stenosis: traeatment is valve surgery

MCQ

Which one of these parameters will appear first and can be diagnostic for shock?

A. Hypotension
B. Bradycardia
C. Decreased tissue perfusion
D. Tachycardia

The most sensitive tissue to ischemia is:

A. Muscle
B. Nerve
C. Skin
D. Adipose tissue

A 25 y/o driver sustained a car accident presented to the ER with flaccid paralysis, bradycardia, and hypotension. The most likely diagnosis is:

A. Nurogenic shock
B. cardiogenic shock
C. Hypovolemic shock
D. None of the above

Answers:

1- D 2- B 3- A