

# SHOCK

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# HYPOVOLAEMIA : Definition

- Loss of blood or plasma from the circulatory system

Causes:

1. Haemorrhage - trauma
2. Plasma loss – Burns
3. Fluid sequestration – intestinal obstruction, peritonitis

# HYPOVOLAEMIA

1. Minimal
2. Mild
3. Moderate
4. Severe

# HYPOVOLAEMIA-MINIMAL

- Blood loss – 10%
- Volume loss – 500mls
- Heart rate – Normal
- Arterial BP – Normal
- Urinary output – Normal 1ml/kg
- Mental state – Normal
- Peripheral circulation - Normal

# HYPOVOLAEMIA-MILD

1. Blood loss – 20%
2. Volume loss – 1000mls
3. Heart rate – 100-120 bpm
4. Arterial BP – Orthostatic hypotension
5. Urinary output – 20-30 ml/hr
6. Mental state – Normal
7. Peripheral circulation - Cool and pale

# HYPOVOLAEMIA- MODERATE

1. Blood loss – 30%
2. Volume loss – 1500 mls
3. Heart rate – 120-140 bpm
4. Arterial BP – Systolic < 100
5. Urinary output – 10-20 ml/hr
6. Mental state – Restless
7. Peripheral circulation – Cold,pale,slow CR

# HYPOVOLAEMIA-SEVERE

- Blood loss – Over 40%
- Volume loss – Over 2000mls
- Heart rate – Over 140bpm
- Arterial BP – Systolic below 80mmHg
- Urinary output – Nil
- Mental state – Impaired consciousness
- Peripheral circulation – cold,clammy,cyanosis

# SHOCK

- Blood loss – More than 30%
- Volume loss = more than 1500mls
- Hypotension = BP less than 80mmHg
- Tachycardia – more than 140
- Oliguria = very little or none
- Cold clammy extremities
- Reduced level of consciousness or coma



# TYPES OF SHOCK AND CAUSES

1. Hypovolaemic shock – bleeding, burns, intestinal obstruction, peritonitis
2. Cardiogenic shock – MI, tamponades, cardiac stab wounds
3. Obstructive shock – PE, trauma
4. Anaphylactic shock – drugs, fluids, foods, latex
5. Septic shock – any cause of infection

# HYPOVOLAEMIC SHOCK

Clinical signs of shock:

- Inadequate tissue perfusion
  - Skin – cold, pale, blue, slow capillary refill
  - Kidneys – oliguria, anuria
  - Brain – confusion, restlessness
- Increased sympathetic tone
  - Tachycardia, narrow pulse pressure

# HYPOVOLAEMIC SHOCK

- Sweating
- BP –maintained initially but later hypotension takes over
- Metabolic acidosis

# CARDIOGENIC SHOCK

## Additional clinical features

- Signs of cardiac failure
- raised JVP
- pulsus alternans
- gallop rhythm
- basal crackles
- pulmonary edema

# OBSTRUCTIVE SHOCK

- Additional clinical features
  - Elevated JVP
  - Pulsus paradoxicus and muffled heart sounds in cardiac tamponade
  - Kussmaul's sign(JVP rises on inspiration) in cardiac tamponade
  - Signs of pulmonary embolism if present

# ANAPHYLACTIC SHOCK

## Additional clinical features

- Profound vasodilatation with warm peripheries and low BP
- Erythema, urticaria, angioedema, pallor, cyanosis
- Edema of face, pharynx, larynx
- Pulmonary edema
- Hypovolaemia due to capillary leak



# ANAPHYLACTIC SHOCK

- Nausea, vomiting, abdominal cramps and diarrhoea

# SEPTIC SHOCK

## Additional clinical features

- Pyrexia, rigors or hypothermia
- Nausea, vomiting
- Vasodilatation, warm peripheries
- Bounding pulses
- Rapid capillary refill
- Hypotension



# SEPTIC SHOCK

- Occasionally cutaneous vasoconstriction
- Other signs
- Jaundice
- Coma
- Bleeding due to coagulopathy
- Clinical sepsis can occur without bacteraemia in pancreatitis or trauma

# MONITORING IN SHOCK

- HR
- NIBP –sphygmomanometer, automated
- Respiratory rate
- Urine output
- Oxygen saturation
- CVP
- LAP

# MANAGEMENT OF SHOCK

- Preload and volume replacement
  - Blood and blood products
  - Colloid – Gelatins, HES, human albumin
  - Crystalloid – ringer's soln, n/saline – need 2-4x volume of colloid for same haemo-dynamic response. Quickly lost into extra-vascular space. Avoid large volumes in the critically ill
- Oxygen administration

# CARDIOVASCULAR DRUGS

- Inotropes
  - Epinephrine – alpha and beta adrenergic activity
  - Norepinephrine – alpha adrenergic activity
  - Isoprenaline – beta adrenergic inotropic and chronotropic effects. Rarely used
  - Dopamine – natural precursor of nor-epinephrine and has alpha,beta,dopaminergic

# CARDIOVASCULAR DRUGS

- Dobutamine – dopamine analogue, no alpha
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- Enoximone – Phosphodiesterase inhibitor both inotropic and vasodilator
- Diuretic therapy
- Vasodilators – Hydrallazine, SNP, GTN

# INVESTIGATIONS

- FBC- Hb, WCC, Platelets etc
- Clotting screen with INR +/- FDPs
- Urea and electrolytes
- Liver function tests +/- lactate
- Arterial blood gas
- Blood glucose
- Blood cultures

# ADDITIONAL MANAGEMENT

- Treat underlying cause – bleeding, infection
- Identify source of infection
- Treat complications – coagulopathy, kidney failure
- Administer analgesia – small IV doses
- Ventilation – non-invasive or invasive therapy