Shock

1st Course
Lecture : 3

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Learning Objectives

1. Define shock and understand its pathophysiology.
2. Classify the main types of shock.
3. Recognize clinical features, diagnosis, and management principles.
4. Understand anesthesia considerations in shock patients.

Definition

- Shock is an acute circulatory failure resulting in inadequate oxygen delivery to tissues.
- It leads to cellular hypoxia and multi-organ dysfunction.

Physiology of Tissue Perfusion

- Perfusion depends on cardiac output, blood volume, and vascular tone.
- MAP = CO × SVR
- **shock occurs when MAP < 65 mmHg.**

Pathophysiology Overview

- Decreased perfusion → cellular hypoxia → anaerobic metabolism → lactic acidosis → organ failure.

Classification of Shock

1. **Hypovolemic**

(↓ preload COP)

2. **Cardiogenic**

(pump failure)

3. **Distributive**

(vasodilation: septic, anaphylactic, neurogenic)

4. **Obstructive**

(block to flow: PE, Cardiac tamponade, tension pneumothorax)

1. Hypovolemic Shock

- **Causes**: hemorrhage, dehydration, burns.

- **Hemodynamics**: ↓ CVP, ↓ CO, ↑ SVR.

- **Anesthesia:**

A. avoid vasodilation
B. replace fluids cautiously before induction.

2. Cardiogenic Shock

- **Causes**: MI, arrhythmia, cardiac temponade.

- **Hemodynamics**: ↑ CVP, ↓ CO, ↑ SVR.

- **Anesthesia:**

A. use minimal myocardial depressants
B. consider invasive BP monitoring.

3. Distributive shock

I. Septic Shock

- **Mechanism**: vasodilation due to endotoxins.

- **Signs:**

A. warm skin
B. bounding pulse
C. hypotension.

- **Anesthesia:**

A. avoid vasodilation
B. use norepinephrine infusion.

II. Anaphylactic Shock

- **Mechanism**:
- IgE-mediated histamine release.

- **Causes:**
- drugs (muscle relaxants, antibiotics).

- **Treatment:**
- epinephrine, fluids, corticosteroids.

III. Neurogenic Shock

- **Mechanism:**
- loss of sympathetic tone.

- **Signs:**

A. Hypotension
B. Bradycardia
C. warm skin.

- **Treatment:**

A. fluids
B. Vasopressors
C. atropine.

4. Obstructive Shock

- **Causes:**
- pulmonary embolism
- Cardiac tamponade
- pneumothorax.

- **Signs:**
- distended neck veins
- muffled heart sounds.

- **Treatment:**
- relieve obstruction immediately.

Stages of Shock

1. **Initial:**

cellular hypoxia

2. **Compensated:**

tachycardia, vasoconstriction

3. **Decompensated:**

hypotension, metabolic acidosis

4. **Irreversible:**

multi-organ failure

Clinical Manifestations

1. **General signs:**

- hypotension, tachycardia, cold clammy skin, confusion

2. **Late signs:**

- cyanosis, oliguria, metabolic acidosis

3. **Specific features:**

- vary by type (e.g., warm in septic shock)

Diagnostic Workup

1. **Vital signs:**
- ↓BP, ↑HR, ↓SpO_2, ↓urine output
2. **Labs:**
- ↑lactate, ABG (metabolic acidosis), CBC
3. **Imaging:**
- CXR, ECG, echocardiography
4. **Monitoring:**
- invasive BP, central venous line

Management Principles

- **The 4 R's:**

1. **Recognize** shock early
2. **Resuscitate** (airway, breathing, circulation) **ABC**
3. **Restore** perfusion (fluids, vasopressors)
4. **Remedy** underlying cause

Fluid Therapy

1. **Crystalloids**

normal saline, Ringer's lactate

2. **Colloids**

used selectively

3. **Blood transfusion**

if hemorrhagic

- **Monitor urine output:**

target > 0.5 mL/kg/h

Vasopressors & Inotropes

1. **Norepinephrine:**
- first-line for septic shock
2. **Dopamine:**
- increases CO (used in cardiogenic)
3. **Epinephrine:**
- for anaphylactic

Anesthetic Considerations

1. Avoid agents that cause **vasodilation** or **myocardial depression**
2. Maintain **adequate preload and oxygenation**
3. Continuous **BP and ECG monitoring**
4. Be prepared for **rapid fluid and vasopressor support**

Operating Room Considerations

1. Pre-induction volume status assessment.
2. Use of invasive arterial line.
3. Be prepared for rapid hemodynamic changes.

Summary

1. Shock = inadequate perfusion.
2. Early recognition + prompt management = saves lives.
3. Understand anesthetic implications in shock.

Key Message

- **“In anesthesia, every drop in blood pressure may represent the first sign of shock — act early.”**