



# 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.
- $MAP = CO \times SVR$
- **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 tamponade.
- **Hemodynamics:**  $\uparrow$  CVP,  $\downarrow$  CO,  $\uparrow$  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<sub>2</sub>, ↓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.”**