# Shock and Hyperalimentation

# SHOCK

- SHOCK can be defined as an imbalance between oxygen delivery and oxygen consumption such that the delivery of oxygen does not meet the needs of the tissues.

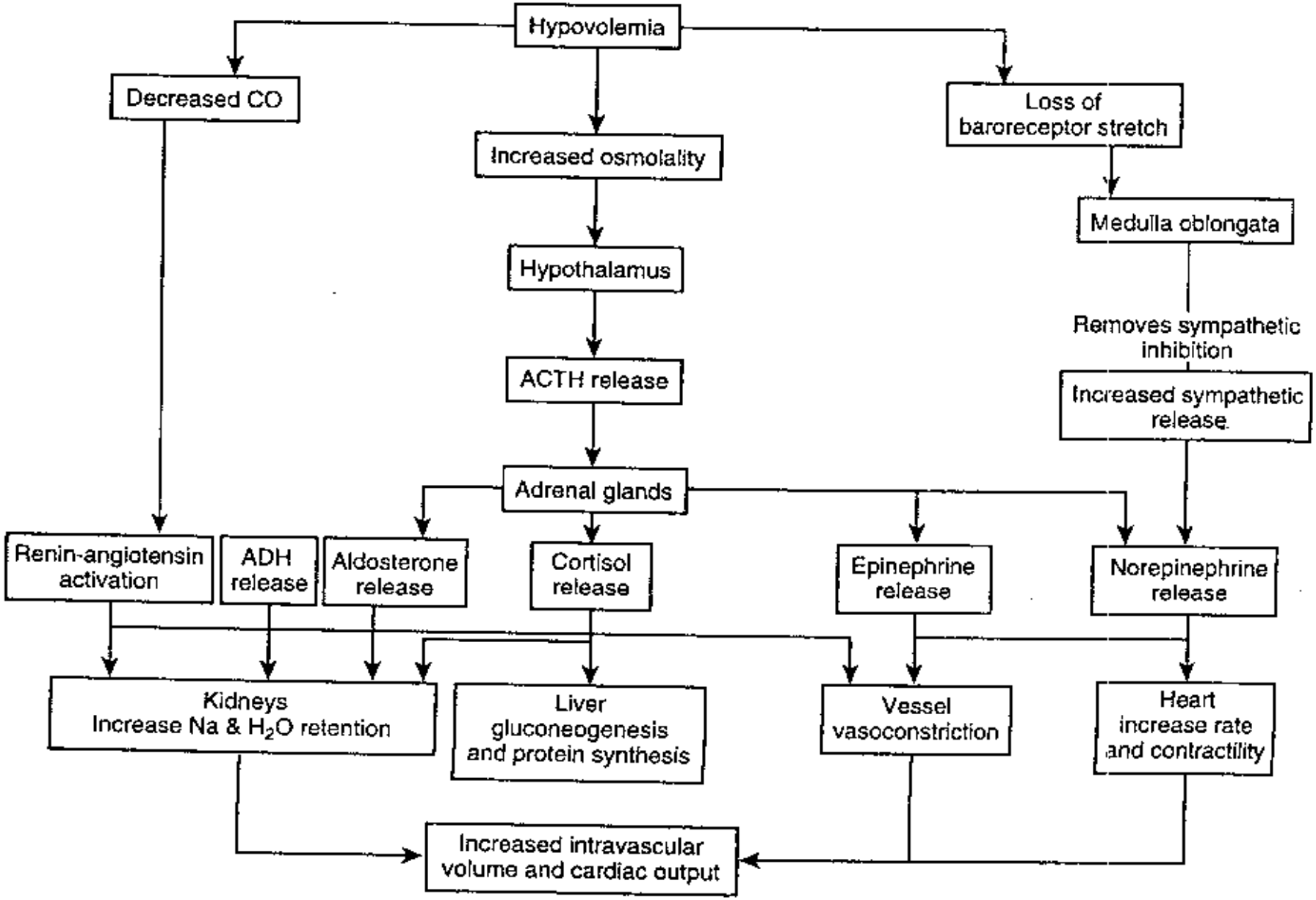
- The underlying problem of all causes of shock is a decrease in effective blood flow and oxygen delivery to tissues that does not meet demand of tissues.

- **Poor tissue perfusion** initiates a complex series of events that eventually result in:

- ✓ Altered cellular metabolism
- ✓ Cellular death
- ✓ Organ failure and ultimately Death.

# PATHOPHYSIOLOGY

- The initiating event of shock is *poor tissue perfusion.*




Neurohormonal responses to a decrease in intravascular volume.

In early shock, blood flow is maintained to the brain and heart at the expense of intestinal tract ,liver ,kidney and other organs.

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The neurohormonal response cause vasoconstriction of major arteries and veins and of capillaries

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Both precapillary and postcapillary vessels constrict

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Precapillary consriction results in decreased perfusion to tissue=➔ anaerobic metabolism

↓

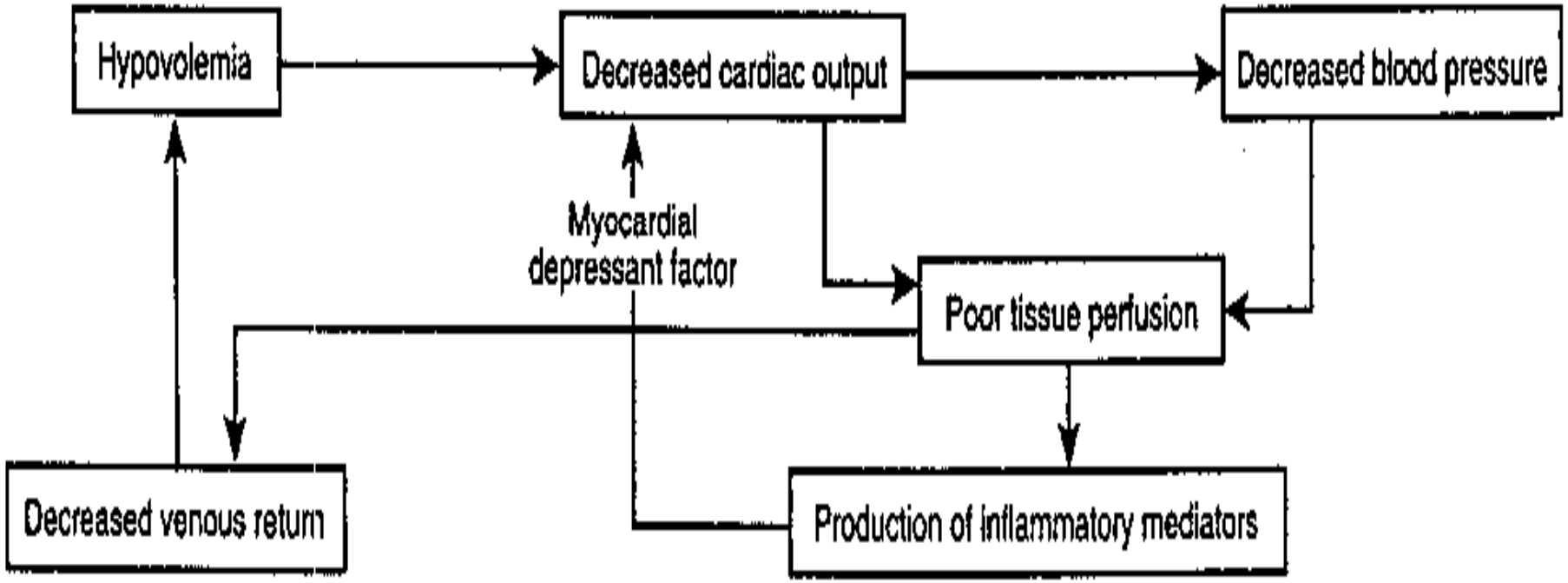
Precapillary vessels dilate and postcapillary vessels remain constricted

↓

Increased blood flow to the capillary system and pooling in venules (maldistribution of blood flow)

- Shock also interferes with other regulatory systems that influence normal homeostasis

  *ie* endorphins,enkephalins,neuropeptides and cytokines( IL-1 ,IL-6 ,TNF ,Platelet activating factor ,NO) lead to shock.




Circulatory events that lead to the vicious circle (circulus vitiosus) of shock.

# Clinical Signs and Stages of Shock

| Clinical Stage of Shock | Characteristics | Clinical Signs |
|---|---|---|
| Compensatory stage | Increases in CO, HR, and SVR<br>Neurohormonal response<br>Hypermetabolic hyperdynamic state | Mild increases in HR, RR<br>Normal mentation and blood pressure<br>"Brick" red MM CRT <1 sec |
| Early decompensatory stage | Redistribution of blood flow to heart and brain<br>Consumption of oxygen dependent on oxygen delivery<br>Development of lactic acidosis | Tachycardia, tachypnea<br>Pale MM<br>Poor CRT, weak pulse, poor mentation<br>Usually hypothermia, hypotension |
| Decompensatory (terminal) stage | Autoregulatory escape<br>Sympathetic center lost<br>Chronotropic and inotropic response lost | Low heart rate despite low CO<br>Absent CRT<br>Severe hypotension |

# CLINICAL SIGNS

1) Compensatory stage

- ✓ Tachycardia, tachypnea
- ✓ Injected mucous membranes(red)
- ✓ *More rapid CRT*(<1 sec)
- ✓ Normal mentation
- ✓ Normal to high BP
- ✓ Fluid therapy is immediately warranted

## 2)Early decompensatory stage

- ✓ Tachycardia
- ✓ Hypotension, hypothermia
- ✓ Pale mucous membrane
- ✓ Prolonged CRT
- ✓ Depressed mentation

➢ Aggressive fluid resustication reqd.

CATS do not show tachycardia as do dogs and are more likely to be hypothermic

## 3)Decompensatory stage (terminal)

- ✓ Bradycardia despite low CO
- ✓ Severe hypotension
- ✓ Pale and cyanotic mucous membrane
- ✓ Absent CRT
- ✓ Profound hypothermia
- ✓ Anuria
- ✓ Comma and cardiac arrest

➢ **Does not respond to aggressive fluid resustication**

# Classification of Shock

1) **Hypovolemic shock**

- Severe hemorrhage
- Severe dehydration
- Loss of I/V volume

- Decrease in oxygen delivery

Clinical presentation of *hemoperitoneum* and coagulopathies etc

## 2) Cardiogenic shock

- Respiratory distress
- Exercise intolerance
- Crackles
- Cardiac murmurs

**Obstructive shock**– Pericardial tamponade

Heartworm disease,pulmonary thrombo-embolism,intracardiac neoplasia,CHF

*In GDV ,caudal venacava obstruction lead to decreased ventricular filling*

- In *Cardiogenic shock* there is decrease in myocardial contractility and decreased oxygen delivery

- ***In Cardiogenic shock aggressive fluid therapy may be fatal***

# 3)Vasogenic / Distributive shock

- *Septic shock*--cytokines----vasodilation--
  ------affect capillary circulation

- *Traumatic shock(neurogenic injury)-----*
  pain induced vasoconstriction


- *Anaphylactic shock*--IgE mediated
  massive dilation

# 4) Metabolic shock

- ✓ Cellular metabolic machinery disturbed

- ✓ Hypoglycemia
- ✓ Cyanide toxicity

# 5)Hypoxemic shock

- ✓ Decrease in oxygen content in arterial blood

- ✓ Anemia , severe pulmonary disease
- ✓ CO Toxicity
- ✓ methemoglobinemia

# DIAGNOSIS AND MONITORING

- Clinical signs
- Continous ECG monitoring
- BP measurement
- Blood lactate levels

  (normal less than 2.5 mmol/lit)
- Respiration rate
- Temperature etc

# TREATMENT

The goal of Rx in early shock is to *restore effective tissue perfusion* and *oxygenation*

A---Airway-----patent airway

B---Breathing—oxygen supplimentation @5 litre/minute

C---Circulation----circulatory support------fluid therapy in all shock syndromes

(except cardiogenic)

D----Drugs----drugs to support CO and BP

1) INOTROPES like

Dobutamine @2-15 microgram/kg/min

Dopamine @ 1-5microgram/kg/min

2)VASOPRESSORS like

Epinephrine@ 0.1-0.3 microgram/kg/min

3)OPIOD analgesics like

Butorphanol@ 0.2-0.6mg/kg IV

4)Antiarrythmic drugs like

Lidocaine @ 2mg/kg IV bolus

## 5)Broad spectrum antibiotics

if external trauma is there

## 6) Glucocorticoids

- ✓ Anti inflammatory
- ✓ Improve microcirculation

Prednisolone @ 10-20 mg/kg IV

# 7)FLUID THERAPY

a) ISOTONIC CRYSTALLOIDS

- **TO INCREASE EFFECTIVE CIRCULATORY VOLUME**

The rate of admistration of isotonic crystalloids

- ✓ dogs----@90ml/kg
- ✓ Cats-------@55ml/kg
- ✓ Cattle----@100ml/kg

- ➢ Entire fluid should be administered within 10-25 minutes.

## b) Hypertonic solutions

7% NaCl @ 4ml/kg in 5 mins

- ✓ For acute volume resustication in normally hydrated animals

## c)Colloids

- ✓ Whole blood @ 22ml/kg/hr
- ✓ Plasma @10-20 ml/kg---restore OP
- ✓ Packed RBC---hemolytic anemia
- ✓ Hetastarch @10-20ml/kg bolus

## NOTE

- Fluid administered subcutaneously or in peritoneal cavity is not considered adequate for shock therapy.

- The IV fluid adminstered distribute into ECF compartment so only about ***25%*** of the delivered volume remains in the IV space by 30 minutes after infusion

# HYPERALIMENATION

- **Hyperalimentation** refers to a state where quantities consumed are greater than appropriate.

- It includes overeating, as well as other routes of administration such as in parenteral nutrition.

- This is a procedure in which nutrients And vitamins are given to a person in liquid form through a vein.

- It is a medical procedure used for individuals who cannot get nutrients from food.

- This is done mainly due to impaired gastrointestinal (GI) conditions such as severe malabsorption, progressed eating disorders, etc, (since tube feeding is often preferred for non-GI related conditions).

- In patients with active colitis, significant protein calorie malnutrition with low serum protein and albumin levels is indicative of severe disease that may require hospitalization and intravenous hyperalimentation therapy (total parenteral nutrition).

# Parenteral Hyperalimentation Fluid, Dog

- **Composition:**

| *Ingredient* | *Amount* |
|---|---|
| Lactalbumin Hydrolysate Enzymatic | 30.00 gm |
| Glucose | 200.00 gm |
| Sodium Chloride | 2.90 gm |
| Potassium Chloride | 2.24 gm |
| Thiamine Hydrochloride | 0.20 mg |
| Pyridoxine Hydrochloride | 0.30 mg |
| Cyanocobalamin (0.1% in Mannitol) | 4.70 mg |
| Riboflavin | 1.00 mg |

- Directions: 235.2 grams of diet are sufficient for one liter of Hyperalimentation Fluid.

- THANKS