

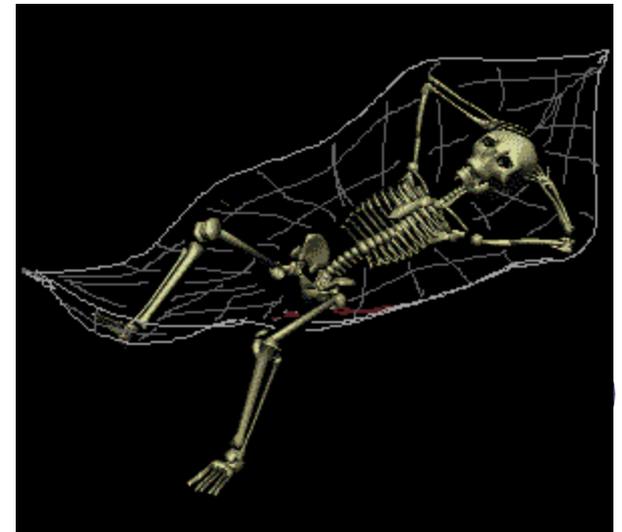


**SHOCK**



# CONTENT

- Definition
- Pathophysiology of shock
- Types of Shock
- Hypovolaemic Shock
- Traumatic Shock
- Cardiogenic Shock
- Neurogenic Shock
- Septic Shock
- Crush Syndrome



## DEFINITION

It is difficult to define shock in one sentence.

However,

It may be defined as a condition in which circulation fails to meet the nutritional needs of the cells and at the same time fails to remove the metabolic waste products.



Demand

Supply



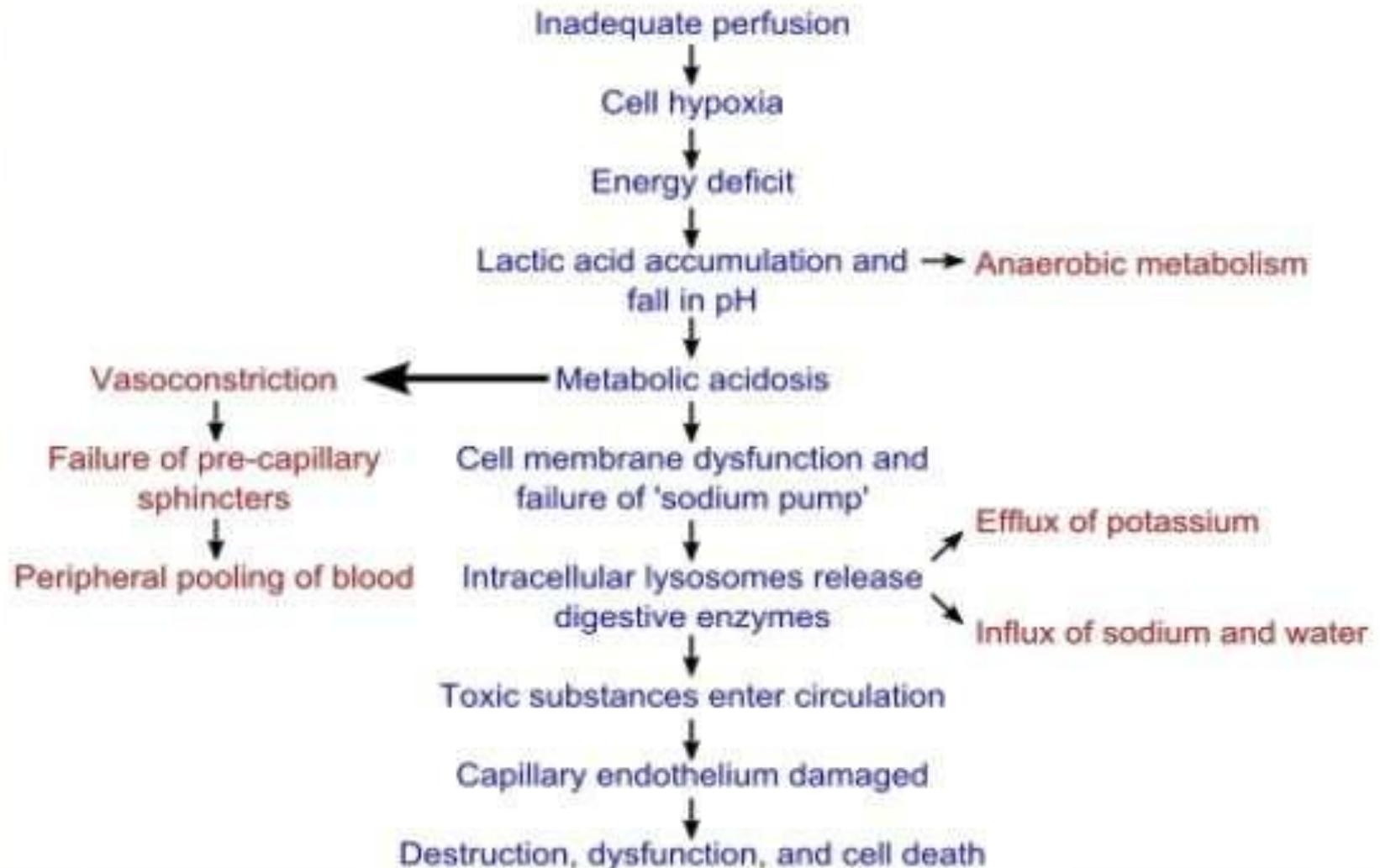
↑ Demand

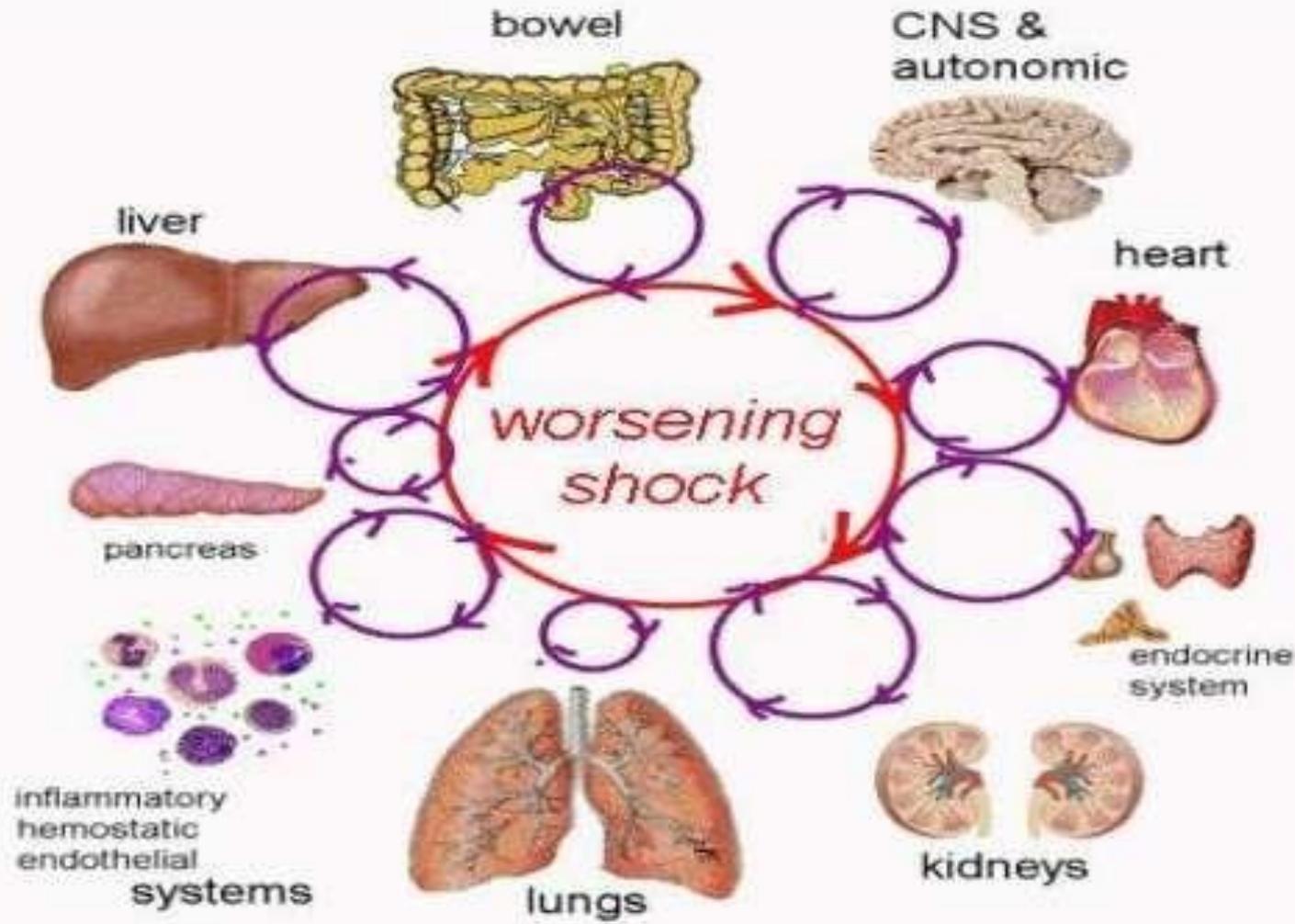
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# Shock



# Pathophysiology of Shock

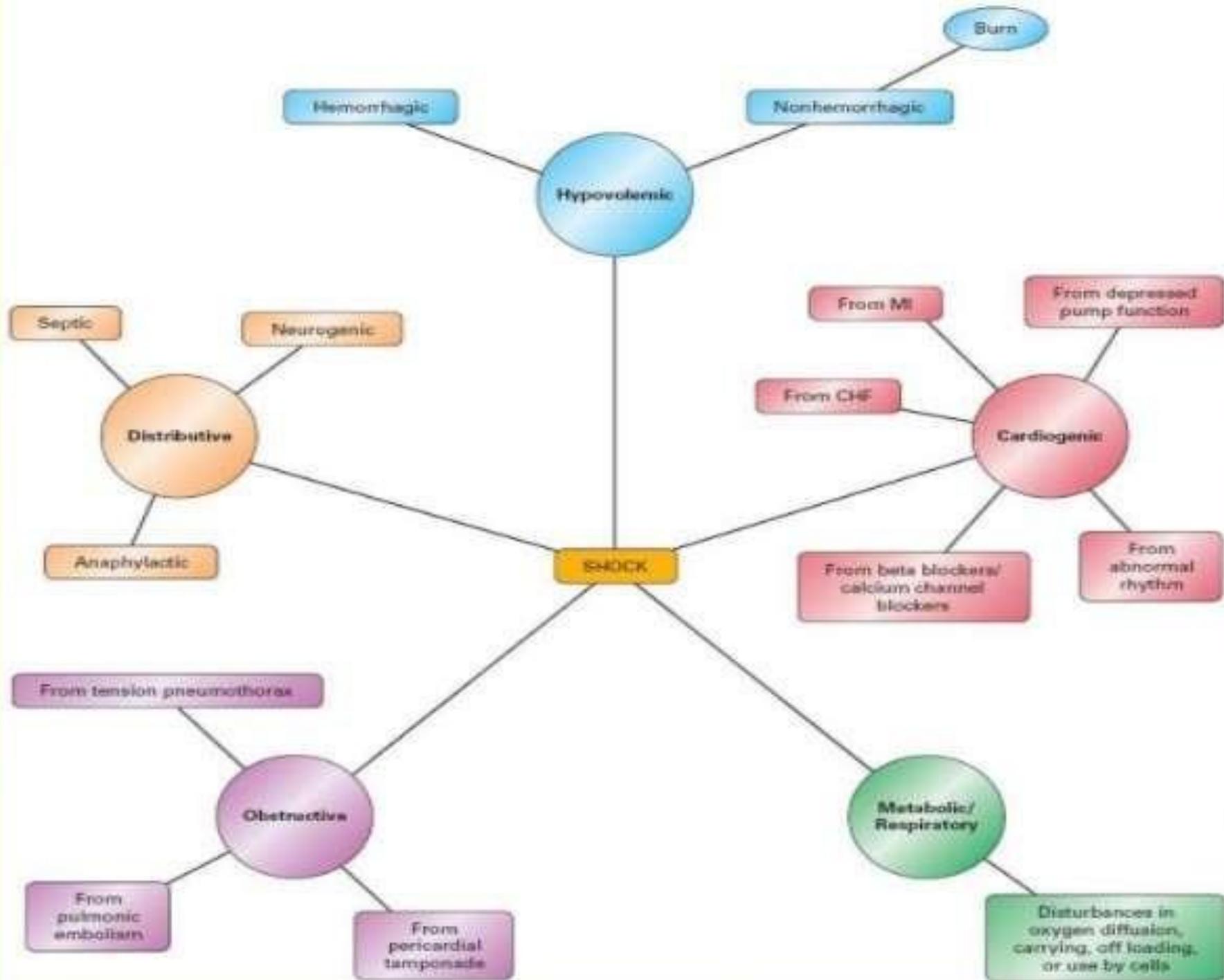




# TYPES OF SHOCK

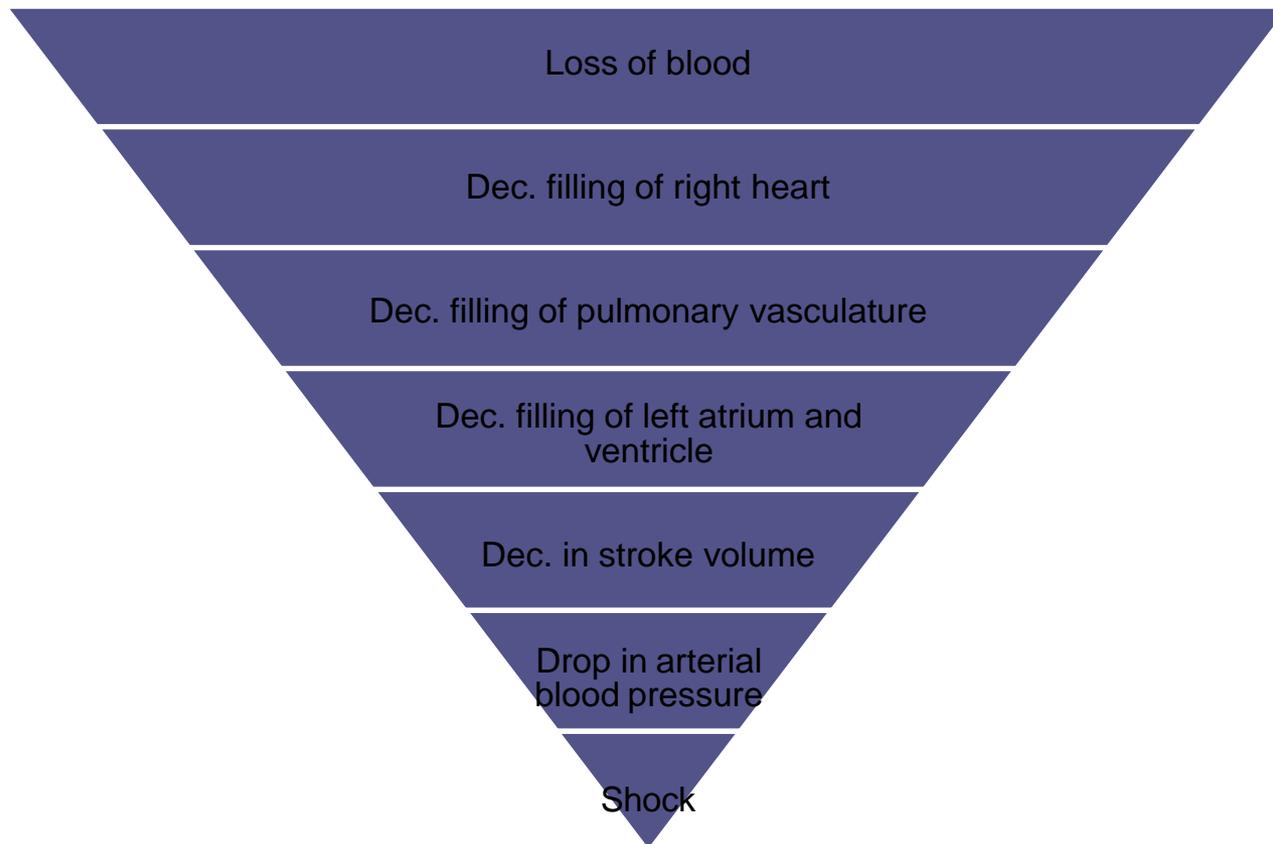
- There are various types of shock, of which haematogenic or hypovolaemic shock is the most common and important.
  
- Various types of shock are as:
  - Haematogenic or hypovolaemic shock
  - Traumatic shock
  - Neurogenic shock
  - Cardiogenic shock
  - Septic shock
  - Miscellaneous types





# HYPOVOLAEMIC SHOCK

- Pathophysiology – Such shock is usually due to sudden loss of blood volume or loss of fluid from the vascular space.



# COMPENSATORY MECHANISMS

- After hemorrhage this mechanism follows:
  1. Adrenergic discharge
  2. Hyperventilation
  3. Release of vasoactive hormones
  4. Collapse
  5. Resorption of fluid from the interstitial space
  6. Resorption of fluid from the intercellular to the extracellular space
  7. Renal conservation of body water and electrolytes.



# CLINICAL FEATURES

- Depends on the degree of loss of blood volume and on the duration of shock.
- MILD SHOCK: loss of less than 20% of blood volume is included in this category.
- Feet become pale and cool
- Sweating
- Urinary output pulse rate and blood pressure remain normal
- Thirst and cold.





- Moderate shock: Loss of blood volume from 20 – 40% cause this shock.
- Oliguria
- Pulse rate increased to 100 beats / min.
- Normal blood pressure.
  
- Severe Shock: Loss of blood volume more than 40% usually causes severe shock.
- Pallor occurs
- Low urinary output
- Rapid pulse rate
- Low blood pressure.



# INVESTIGATIONS

- Monitoring a shock includes:
- Blood pressure- measurement of blood pressure is very essential in shock
- Respiration: hyperventilation is an important indicator of shock.
- Urine- urine is affected quite early even in moderate shock. It is a good index of adequacy of replacement therapy.
- CVP: Measurement of CVP is quite important in assessing shock.
- In hypovolumic shock there is dec. in the blood volume and so is the CVP.
- ECG: in severe shock it may show signs of myocardial ischemia
- SWAN-GANG CATHETER:



# TREATMENT

1 Resuscitation: This should begin immediately as the patient is admitted with hypovolaemic shock.

- Establish clear airway
- Maintain adequate ventilation and oxygenation.
- Lowering of head to prevent peripheral pooling of blood and oedema.
- Increases cerebral circulation.

2 Immediate control of bleeding is highly important in case of haemorrhagic shock.

Raise the footend of the bed and by compression bandage to tamponade external haemorrhage

Bleeding can be stopped surgically as well.



- 3 Extracellular fluid replacement is probably the most important point in the treatment of hypovolaemic shock.
- Ringer's lactate, ringer's acetate or normal saline can be administered.
- A few points to be remembered in case of extracellular fluid replacement:
- The I.V fluid particularly the crystalloid, which should be given first, is administered with rapidly so that replacement is done as quickly as possible
- B.P, pulse rate, urine output, CVP and other laboratory tests should be performed.
- If there is blood loss, it is replaced by blood





- DRUGS: A few drugs are commonly used different shock.
- Sedatives: Morphine is quite good in this respect and should be given IV.

Injection pethidine can be also be used intramuscularly.

Chronotropic Agents: Atropine is the most widely used in this group Followed by isoproterenol.

Inotropic agents: Most commonly used drugs in this category are the dopamine and dobutamine these should be used in low dosages.

Other used agents are vasodilators, vasoconstrictors, betablockers, Diuretics.



# TRAUMATIC SHOCK



- Pathophysiology:
- The peculiarity of this shock is that traumatised tissues activate the coagulation system and release microthrombi into the circulation. These may occlude or constrict parts of pulmonary microvasculature to increase pulmonary vascular resistance. This inc. right ventricular diastolic and right atrial pressures. Inc. in capillary permeability. Loss of plasma depletion of the vascular volume to a great extent.



## CLINICAL FEATURE

- Presence of peripheral and pulmonary oedema in this type of shock
- Infusion of large volumes of fluid which may be adequate for pure hypovolaemic shock is usually inadequate for traumatic shock.



# TREATMENT

- Resuscitation: In this type of shock mechanical ventilatory support is more needed.
- Local treatment of trauma and control of bleeding: This is almost similar to hypovolaemic shock. Surgical debridement of ischaemic and dead tissues and immobilisation of fractures may be required.
- Fluid replacement: adequate fluid replacement should be done with a dose of 10,000 units of heparin seems to be effective.



- Place the victim in shock position
- Keep the person warm and comfortable
- Turn the victim's head to one side if neck injury is not suspected



# CARDIOGENIC SHOCK

- Pathophysiology:

Dysfunction of the right ventricle



Right heart unable to pump blood to lungs



Filling of left heart decreases



Left ventricular output decreases.

Dysfunction of the left ventricle



Unable to maintain adequate stroke volume



Left ventricle output and systemic arterial blood pressure dec.



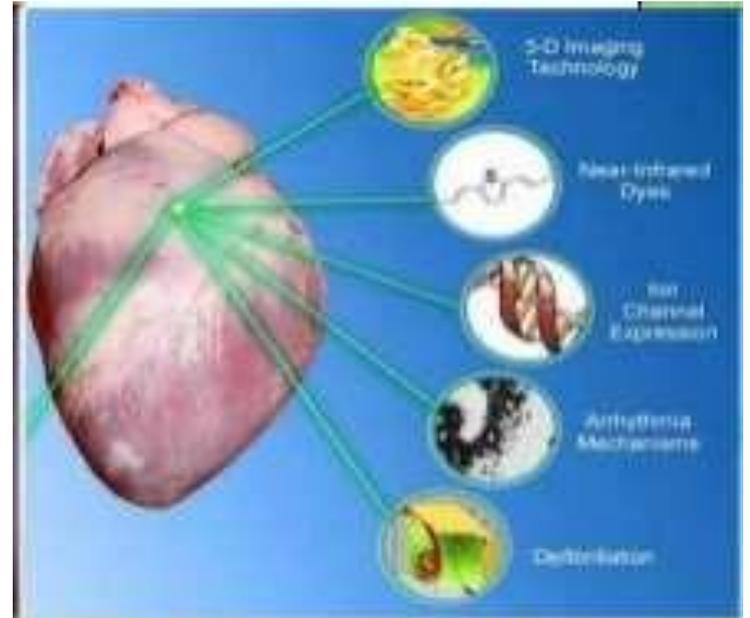
Engorgement of pulmonary vasculature results in failure of left heart.



# CARDIAC COMPRESSIVE SHOCK

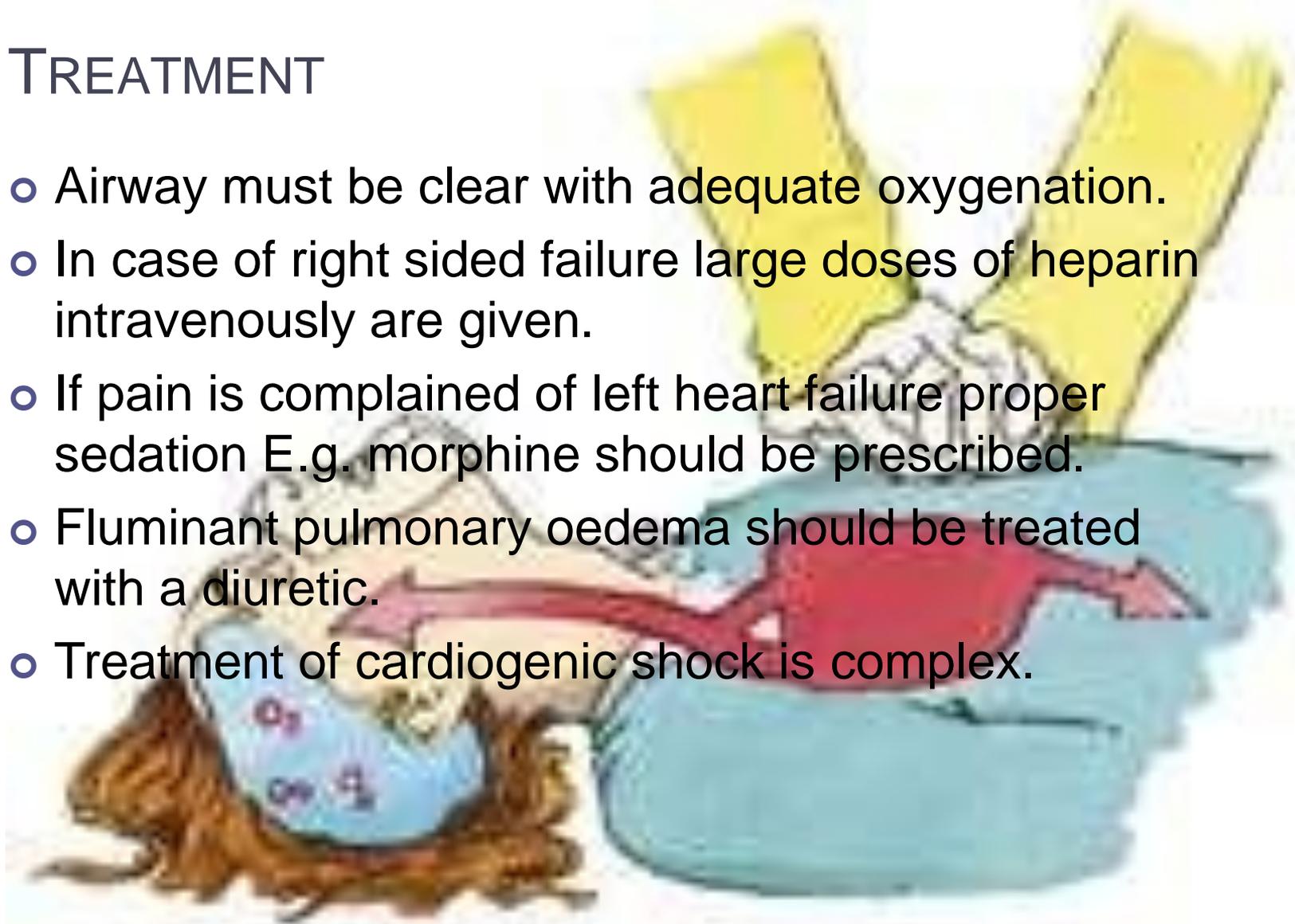
- This arises when the heart is compressed enough from outside to decrease cardiac output.
- Causes: Tension pneumothorax, pericardial tamponade and diaphragmatic rupture with herniation of the bowel into chest.
- Clinical features: In the beginning the skin is pale and cool and the urine output is low.
- Pulse becomes rapid
- Arterial blood flow becomes low
- Left ventricular dysfunction the patient has bronchial rales and a third heart sound is heard.
- Gradually the heart becomes enlarged and when the right ventricle also fails distended neck veins will be visible.





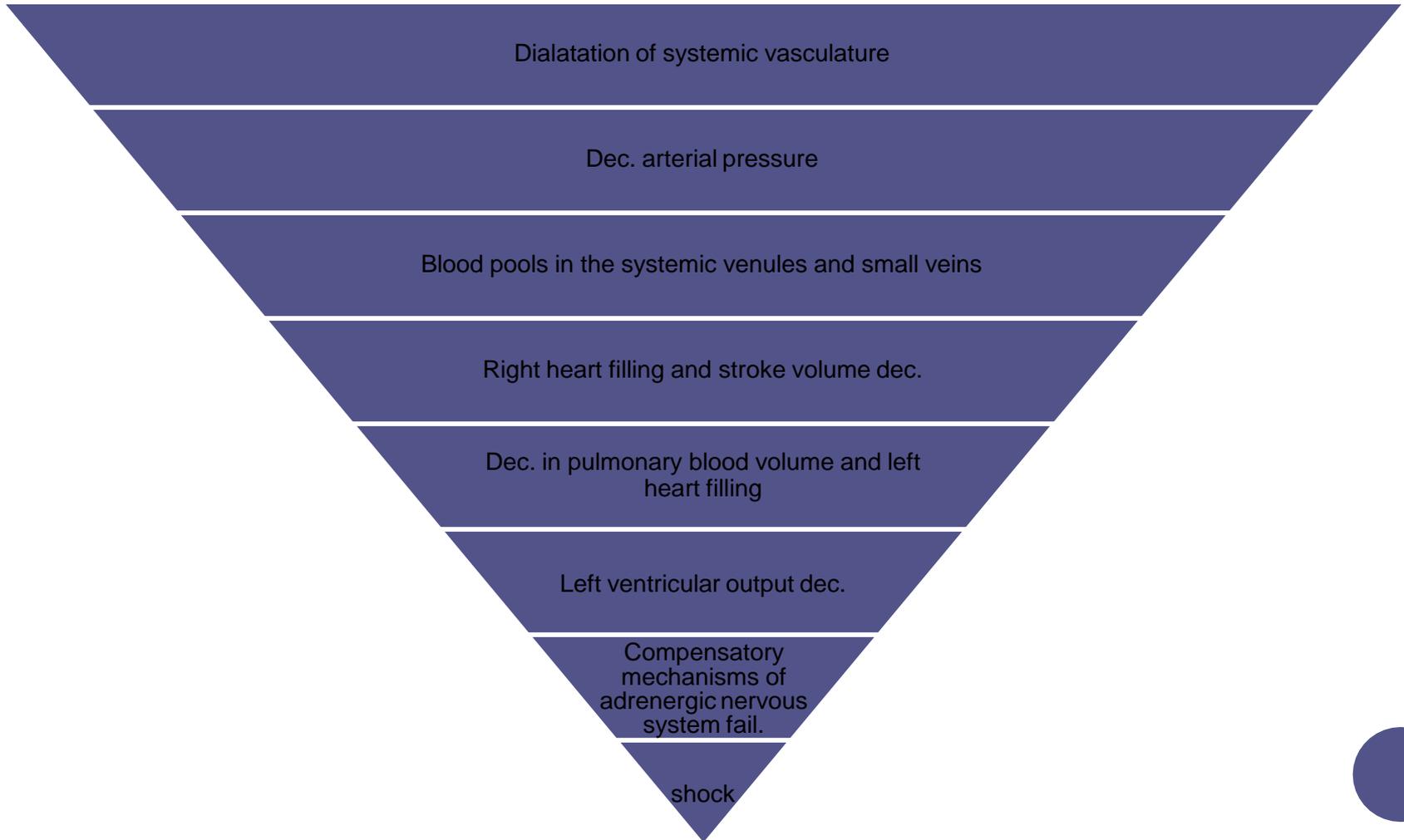
# TREATMENT

- Airway must be clear with adequate oxygenation.
- In case of right sided failure large doses of heparin intravenously are given.
- If pain is complained of left heart failure proper sedation E.g. morphine should be prescribed.
- Fluminant pulmonary oedema should be treated with a diuretic.
- Treatment of cardiogenic shock is complex.



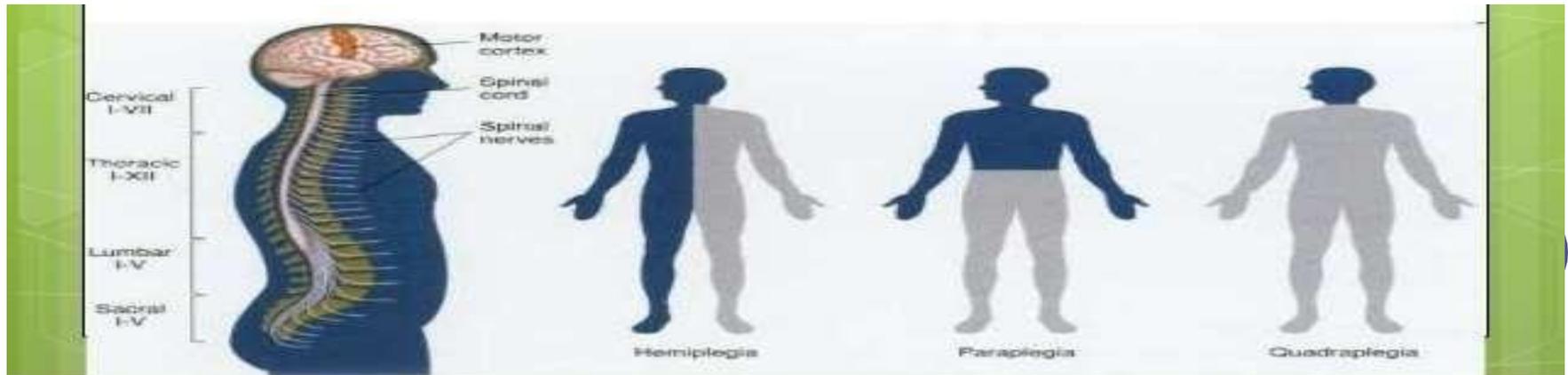
# NEUROGENIC SHOCK

## ○ Pathophysiology:



# CLINICAL FEATURES

- Skin remains warm
- Pink in color
- Well perfused in contarry to the hypovolumic shock
- Urine output may be normal.
- Heart rate is rapid.
- Blood pressure is low.



# TREATMENT

- Elevation of the legs is effective in treating patients with neurogenic shock.
- Assumption of Trendelenburg position displaces blood from the systemic venules and small veins into the right heart and thus inc. cardiac output.
- Administration of fluid is important though not so as in hypovolaemic shock. This increase filling of the right heart which in its increases cardiac output.
- Neurogenic shock is probably the only form of shock that can be safely treated with a vasoconstrictor drug.



# SEPTIC SHOCK

- Pathophysiology: High mortality rate
- Most frequently causative organisms are gram positive and gram negative bacteria,
- Because of effective antibiotic treatment available for most gram positive infections, the majority of cases of septic shock are now caused by gram negative bacteria.



# COMMON ORGANISMS CONCERNED WITH SEPTIC SHOCK

- E.Coli
- Klebsiella aerobacter
- Proteus
- Pseudomonas
- Bacterioids

Gram- positive sepsis and shock: Clostridium tetani or Clostridium perfringens, streptococcus, staphylococcus, pseudomonas.

Gram- negative sepsis and shock: Genitourinary system associated with instrumentation.



## CLINICAL FEATURE:

Recognized by development of chills and elevated temperature above 100 F.

Two types:

Early warm shock

Late cold shock

In early warm shock there is cutaneous vasodilation.

Inc. in body temperature.

Cutaneous dilation.

Pulse rate high

Intermittent spikes of fever alternating with bouts of chills.



  
Organism

Systemic Inflammation or  
Inflammatory Response

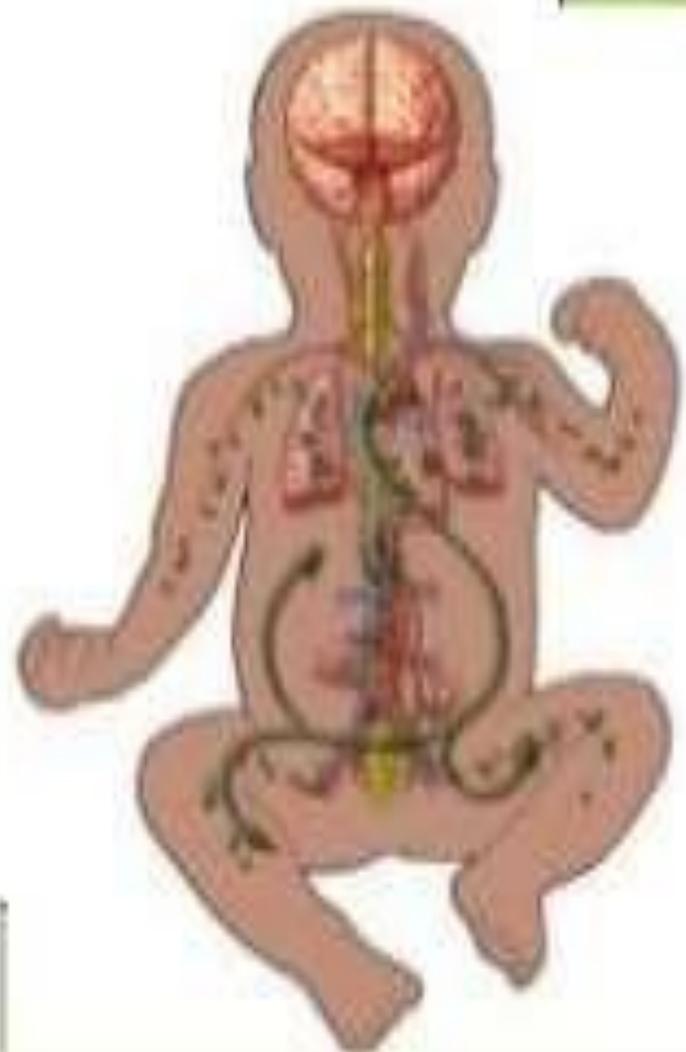
  
Diffuse Endothelial Disruption  
and Microcirculation Defects

Global  
Tissue  
Hypoxia and  
Organ  
Dysfunction

Severe  
Sepsis

Septic Shock

  
Multiple Organ  
Dysfunction and  
Refractory  
Hypotension



- Late cold Shock: inc. permeability due to liberation of toxic products into the center circulation. Clinically difficult to differentiate b/w hemorrhagic , traumatic shock.
- Only guide is the knowlegde of septic focus.
  
- Treatment:
- Treatment can be classified into two groups :
- Treatment of the infection by early surgical debridement or drainage and by use of appropriate antibiotics
- Treatment of shock which includes fluid replacement , steroid administration and use of vasoactive drugs.



- Cephalothin (6-8gm/day I.V in 4 -6 divided doses)
- Gentamicin (5mg/kg/day)
- Clindamycin (bacteroides)
- Chloromycetin
  
- Fluid replacement is of great importance.
  
- Mechanical ventilation along with endotracheal intubation.
  
- Steroids can be used sometimes.
  
- Use of vasoactive drugs with mixed alpha and beta adrenergic effects may be indicated.



# CRUSH SYNDROME

- It is a symptom complex in which a portion of the body becomes crushed due to a heavy weight falls on that portion of the body and is kept there for sometime to crush all the tissues in that portion of the body.
- This type of injury is come across after earthquakes, mine injuries, air raids, collapse of a building or use of tourniquet for longer period.
- In this syndrome oligoemic shock occurs due to extravasation of blood into the muscle in the affected portion of the body.
- Swelling of the muscles, myohaemoglobin enter the circulation
- At this stage the limbs fills tense and the patient complains of severe pain in the limb.
- Urine output will be obviously reduced if uraemia supervenes, the patient may show restlessness, mild delirium.



# TREATMENT

- As a first aid measure application of tourniquet to the affected limb above the crush injury is a good method to reduce admission of deleterious substances into the general circulation.
- Parallel incisions may be applied to relieve tension, through which muscles protruded.
- Low molecular weight dextran (40000) or Rheomacrodex is effective in this condition as it prevents sludging of red cells in small blood vessels and maintain circulation to the kidneys.



- Mannitol is also very effective in this condition  
1gm/kg body weight of mannitol is given IV as 20% solution in 12 hours.
- Catheterisation of the bladder should be performed before instituting mannitol.
- Tourniquet should be removed as scheduled, blood transfusion should be done.
- Haemodialysis should be used as life saving procedure in grave conditions.

