

# Compartment Syndrome



# What is compartment syndrome?

occurs when there is *increase in osteofascial compartment pressure* and eventually reduce its blood flow and leads to ischaemia

*(vicious cycle)*



# Compartment syndrome

**Acute**

A severe irreversible form of abnormally elevated intramuscular pressure that leads to tissue necrosis and permanent loss of function if left untreated.

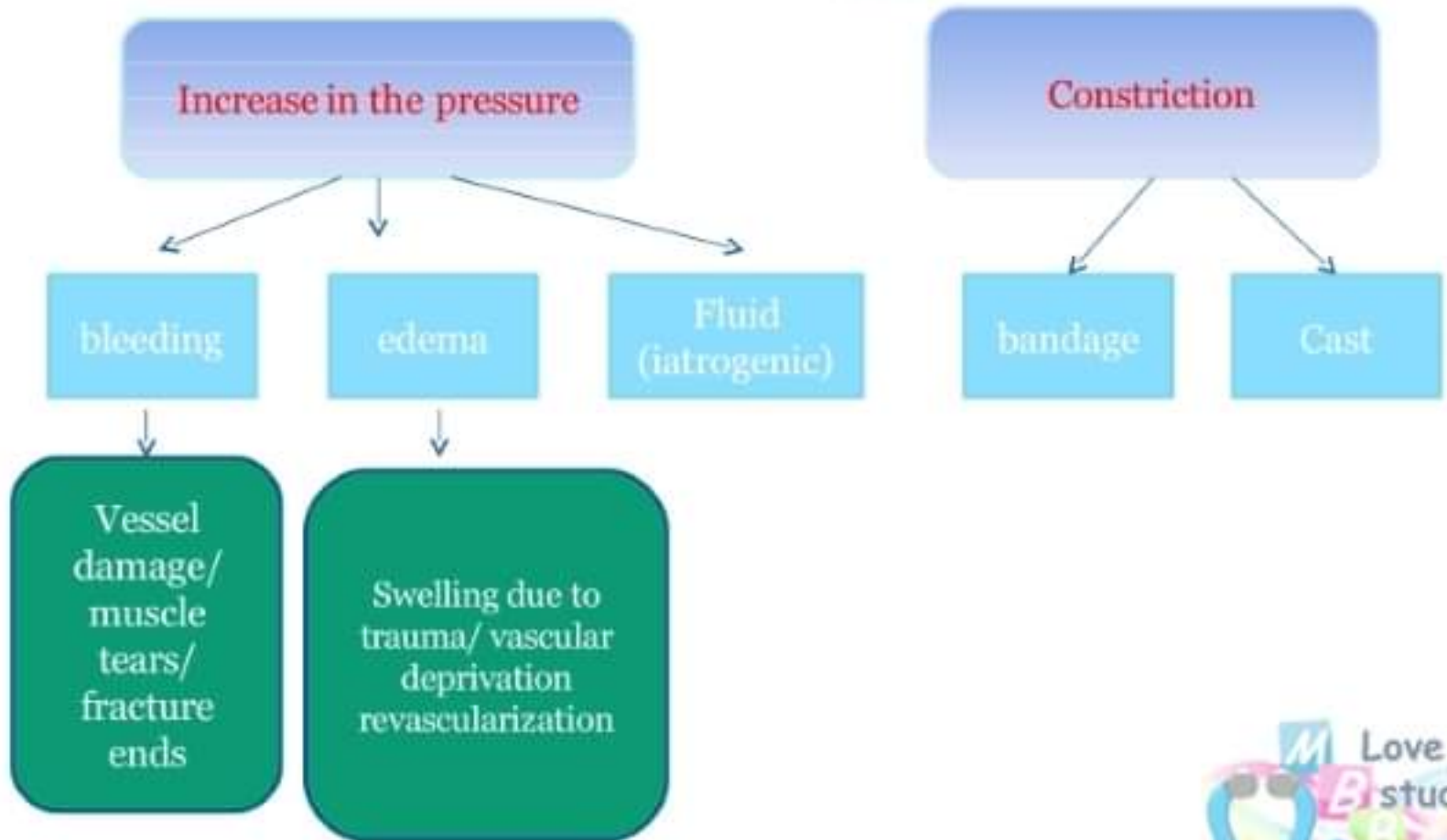
**Chronic**

Painful conditions in which increased intramuscular pressure during exercise impedes local muscle blood flow and impairs the neuromuscular function of the tissues within a compartment.

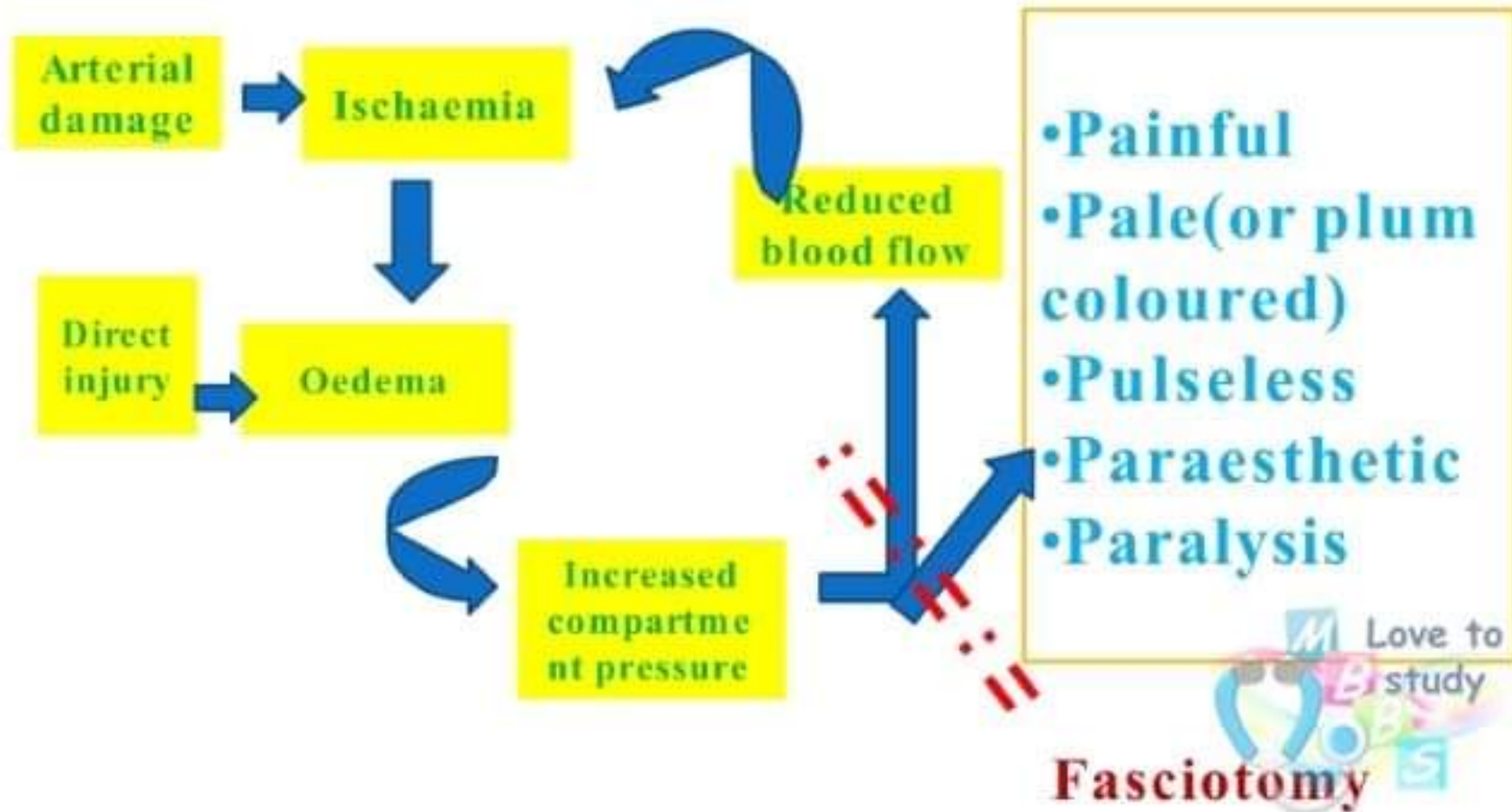
Reversible when stop exercise but if exercise continues beyond the pain limit and muscle continues to swell

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# Etiology



# The vicious cycle of Volkmann's ischaemia





# After 12 hours or less

Necrosis of nerve and muscle within the compartment



**Nerve**

Capable of regeneration



**Muscle**

Once infarcted, never recover and is replaced by inelastic fibrous tissue

Volkmann's ischaemic contracture

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Most commonly at **calf** and **forearm** but also may occur in **thigh, buttock, abdomen, foot, hand and upper arm.**



# Clinical features

## 5 P's

- (P)ain
- (P)araesthesia
- (P)allor
- (P)aralysis
- (P)ulselessness

## • Signs :

9. tight swelling
10. Loss of strength
11. Loss of sensation
12. Blister

- *(presence of a pulse does not exclude the diagnosis)*





# High risk

- ❑ Tibia fractures
- ❑ Tibia plateau fractures
- ❑ Patients casted after injury
- ❑ Polytrauma patients
- ❑ Drug overdose/unconscious patients



# Complications

- Leads to muscle death
- Leads to nerve death
- Contracture
- Paralysis
- Chronic pain
- Numbness

## sequele

- Acute renal failure secondary to rhabdomyolysis
- Disseminated intravascular coagulation
- Volkmann's contracture (where infarcted muscle is replaced by inelastic fibrous tissue)
- Amputation



# The earliest sign : **PAIN**

Pain that out of proportion to the injury

Describe as 'bursting' sensation

Pain that is not responsive to the normal dosage of pain medication

Severe pain with passive stretch

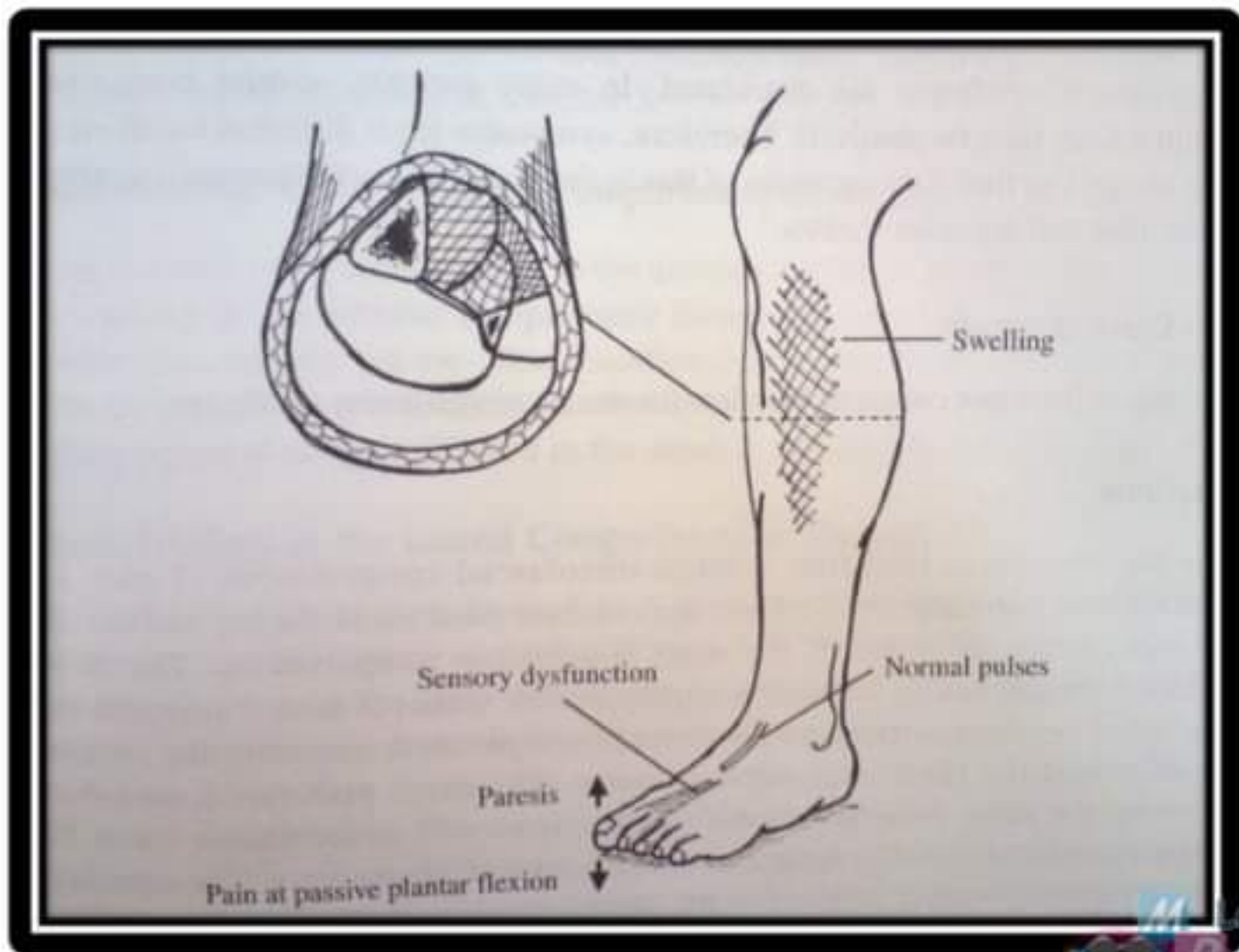
**why?**

During passive stretch of a muscle, there is increased intramuscular pressure.

Pressure in a volume-loaded compartment increases more during passive stretching than in a normally hydrated compartment.

Passive stretching is a form of stretching in which an external force exerts upon the limb to move it into the new position





Clinical findings in patients with acute anterior compartment syndrome of the leg. These patients have calf pain at passive flexion of the ankle joint and the big toe.

Compartment syndrome is a

*clinical diagnosis*

**High level of  
suspicion**





For obtunded, intubated, or unreliable patients who have a swollen extremity but who otherwise cannot be evaluated

Confirmed by  
measuring  
intra-compartmental  
pressures



# Intracompartmental pressure measuring



A split catheter is introduced into the compartment & the pressure is measured closed to the level of the fracture.

Differential pressure ( $\Delta P$ )  
= diastolic pressure - compartment pressure  
=  $< 30 \text{ mmHg}$

**Immediate  
compartment  
decompression**

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# TREATMENT

- ❑ COMPLETELY remove the casts, bandages and dressings.
- ❑ The limb should be **nursed FLAT**.  
(elevating the limb → further ↓ in end capillary pressure → aggravates the muscle ischaemia)
- ❑ Fasciotomy



# Fasciotomy

- ❑ Surgical incision to the fascia to relieve tension or pressure.
- ❑ Complete opening of **all fascial** envelopes.
- ❑ The wound should be left open and inspected 2 days later.
- ❑ If there is muscle necrosis → **debridement**.
- ❑ If the tissues are healthy, the wound can be
  - **sutured (without tension) OR**
  - **skin-grafted OR**
  - **allowed to heal by secondary intention**



If  $\Delta P < 30\text{mmHg}$



**FASCIOTOMY**

If no facilities for compartmental pressure measurement, the decision to operate will make on clinical grounds



Examine the limb at 15 minutes intervals. If no improvement within 2 hours of removing the dressings

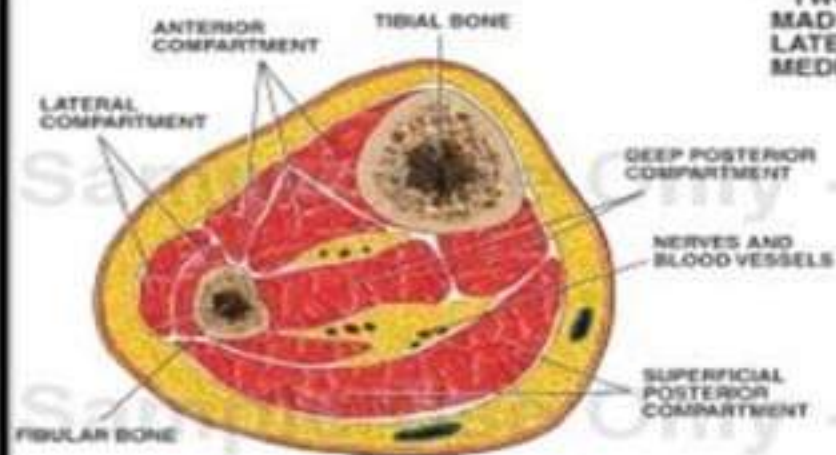


Muscle will be dead after 4-6 hours of total ischemia





## Compartment Syndrome with Fasciotomy Procedure



CROSS-SECTION THROUGH NORMAL CALF SHOWING MUSCLE COMPARTMENTS



COMPARTMENT SYNDROME: SWELLING OF MUSCLES CAUSING COMPRESSION OF NERVES AND BLOOD VESSELS

TWO LONG INCISIONS ARE MADE IN THE LOWER LEG. ONE LATERAL TO THE TIBIA AND ONE MEDIAL.



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