# Compartment Syndromes

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# What to expect !

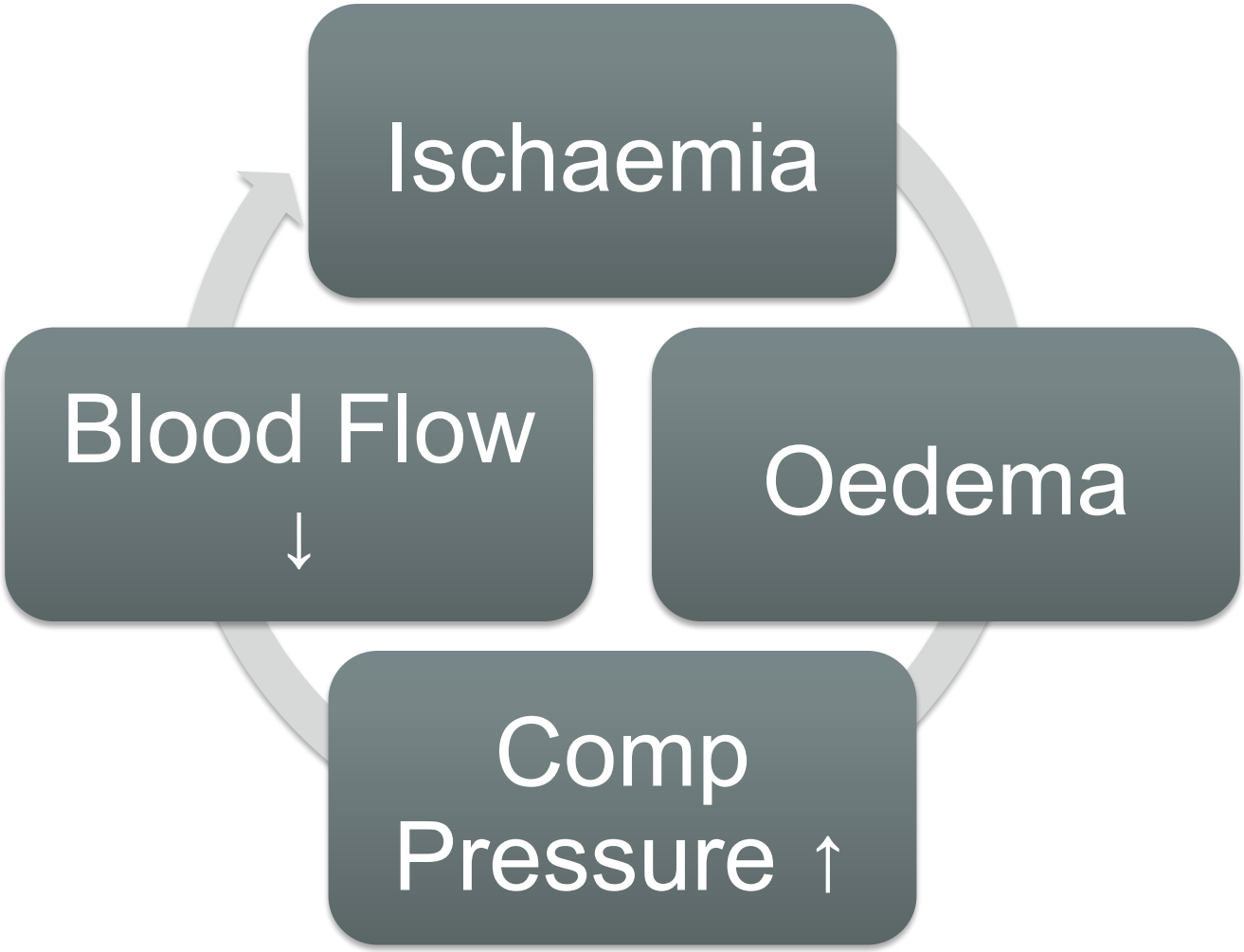
- Definition
- Pathophysiology
- Acute Rx
- Volkmann's Contracture
- Delayed presentation
- Chronic CS

# What is Compartment Syndrome

- Swelling within a Confined space
- Pressure ↑
- Capilllary flow ↓
- Oedema ↑

- It is **NOT** like an ischaemic limb.

# Vicious Cycle



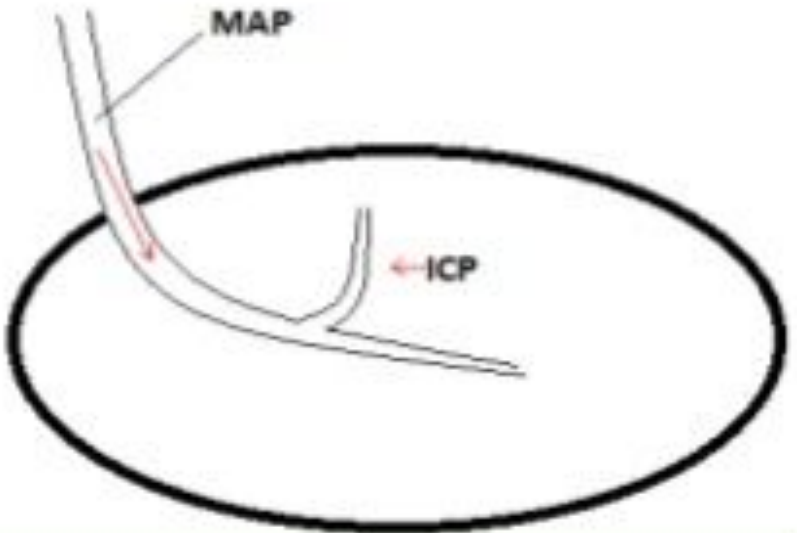
# Tissue Perfusion

- Compartment Perfusion Pressure CPP
- Mean Arterial pressure MAP
- Intra-compartment pressure ICP

CPP= MAP – ICP ☒

CPP=MCapP-ICP ☑

CS= ICP >30mmHg



# Tissues affected:

- **Nerve :**
  - Early involement (2-4hrs)
  - Potential for regeneration

- **Muscle**
  - Longer ischaemia time (6-8hrs)
  - Poor recovery . Fibrotic replacement.
  - Myofibroblast contracture

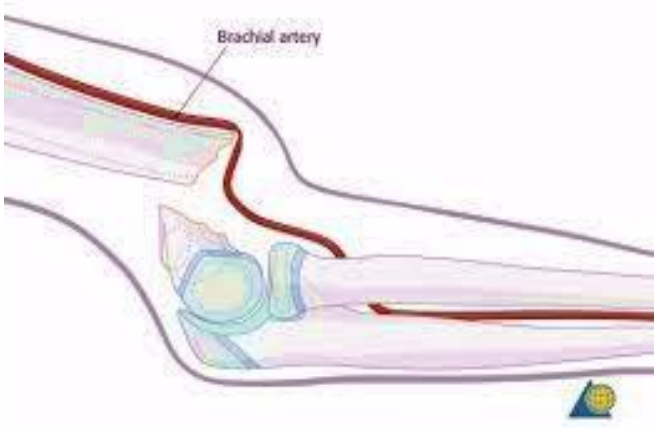
# Causes (Holden)

## Proximal Artery

- Brachial artery repair
- Supracond Fract Hum
- Revascularisation

## Direct Compression

- Tight cast
- Crush injury / coma
- Muscle swelling/ haematoma




# Presentation

- **PAIN** :
  - Severe, constant, not resolved by analgesia
  - Exacerbated by Passive stretch
  - Exacerbated by Active muscle contraction
  - Exacerbated by external compression

# Presentation

**PAIN**

**PAIN**

**PAIN**

**PAIN**

# Presentation: 6x **P**'s

- Skin : **P**ale / normal / cyanosed.
- Sensory Deficit distally: **P**araesthesia
- Compartment : **P**alpably tense muscles
- Passive movement : **P**assive stretch pain
- Active Movement: **P**aralysis

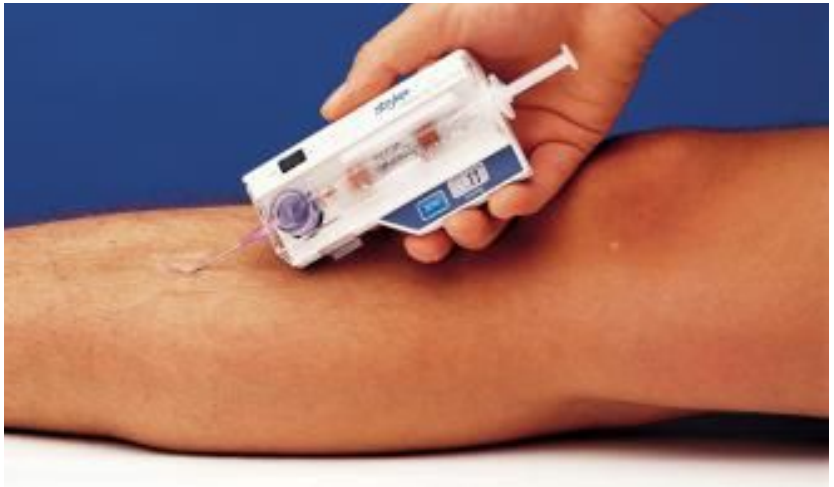
# 6th P

- **P**ulselessness

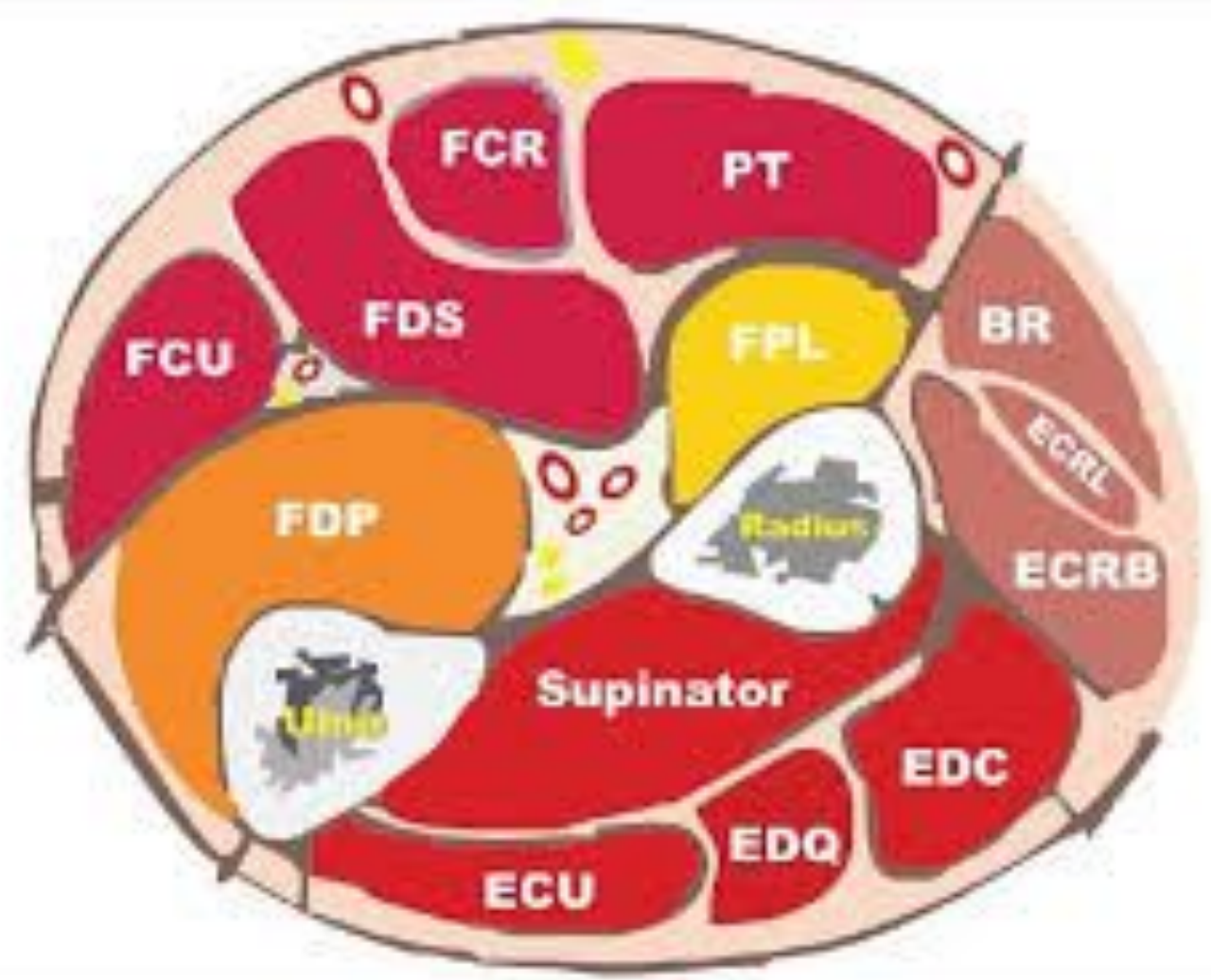
= M**P**S

# Initial Management

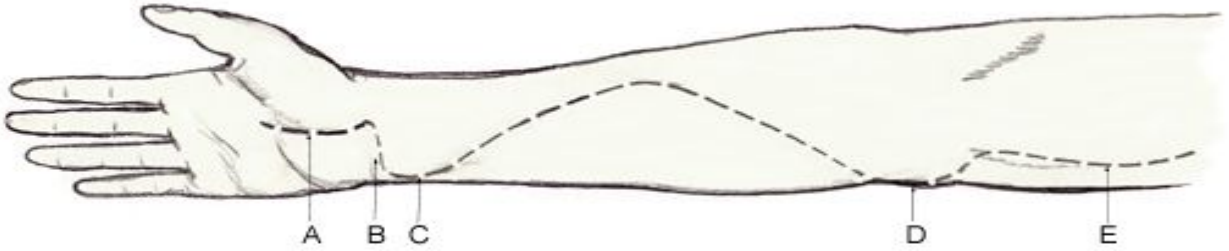
- Remove dressings / splints / cast.
- Elevate to chest level
- IC pressure measurement / monitoring
- IV Mannitol

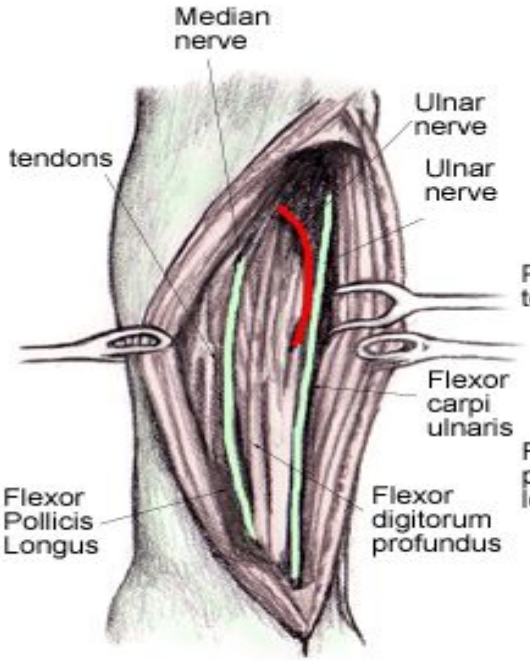


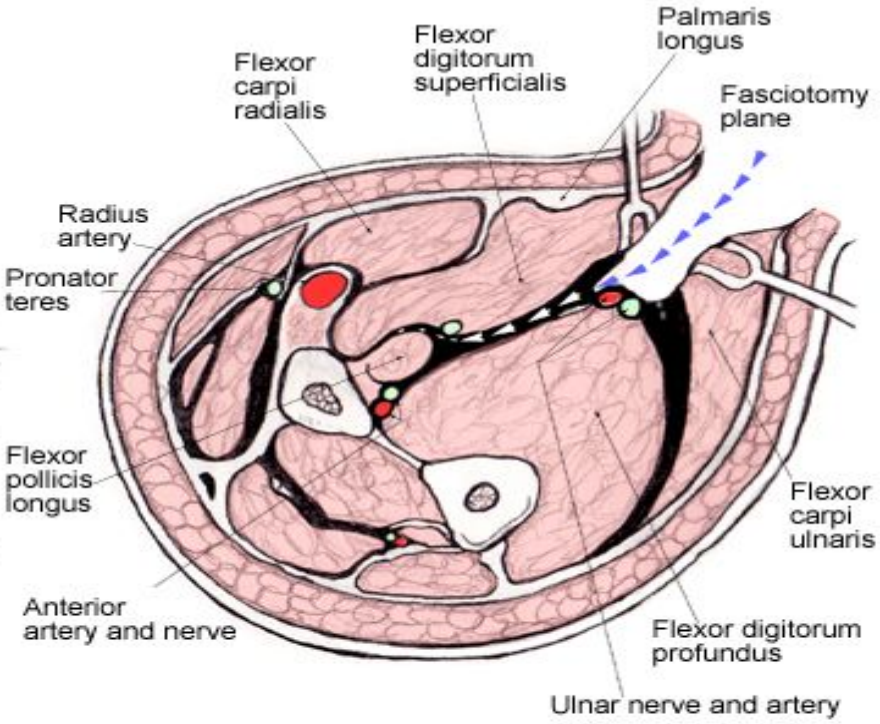
# Forearm compartments x4



# Fasciotomy


A
B
C
D
E


Median nerve
Ulnar nerve
tendons
Ulnar nerve
Flexor carpi ulnaris
Flexor Pollicis Longus
Flexor digitorum profundus


Flexor carpi radialis
Flexor digitorum superficialis
Palmaris longus
Fasciotomy plane
Radius artery
Pronator teres
Flexor pollicis longus
Flexor carpi ulnaris
Anterior artery and nerve
Flexor digitorum profundus
Ulnar nerve and artery

# Delayed Presentation

**Controversy:**

- *Surgical Release* : Salvage muscle

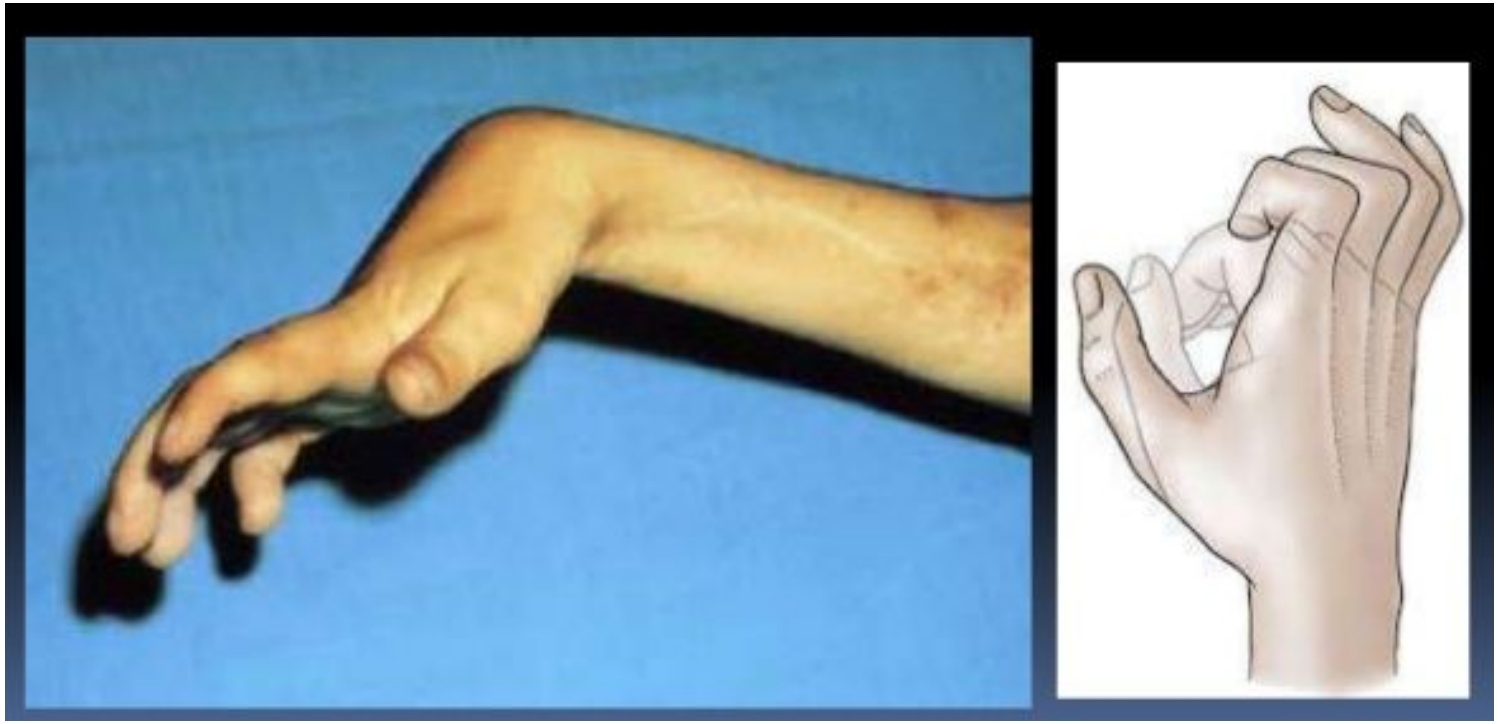
  Vs

  ↑Infection

- *Non-operative* : Splint and Stretch

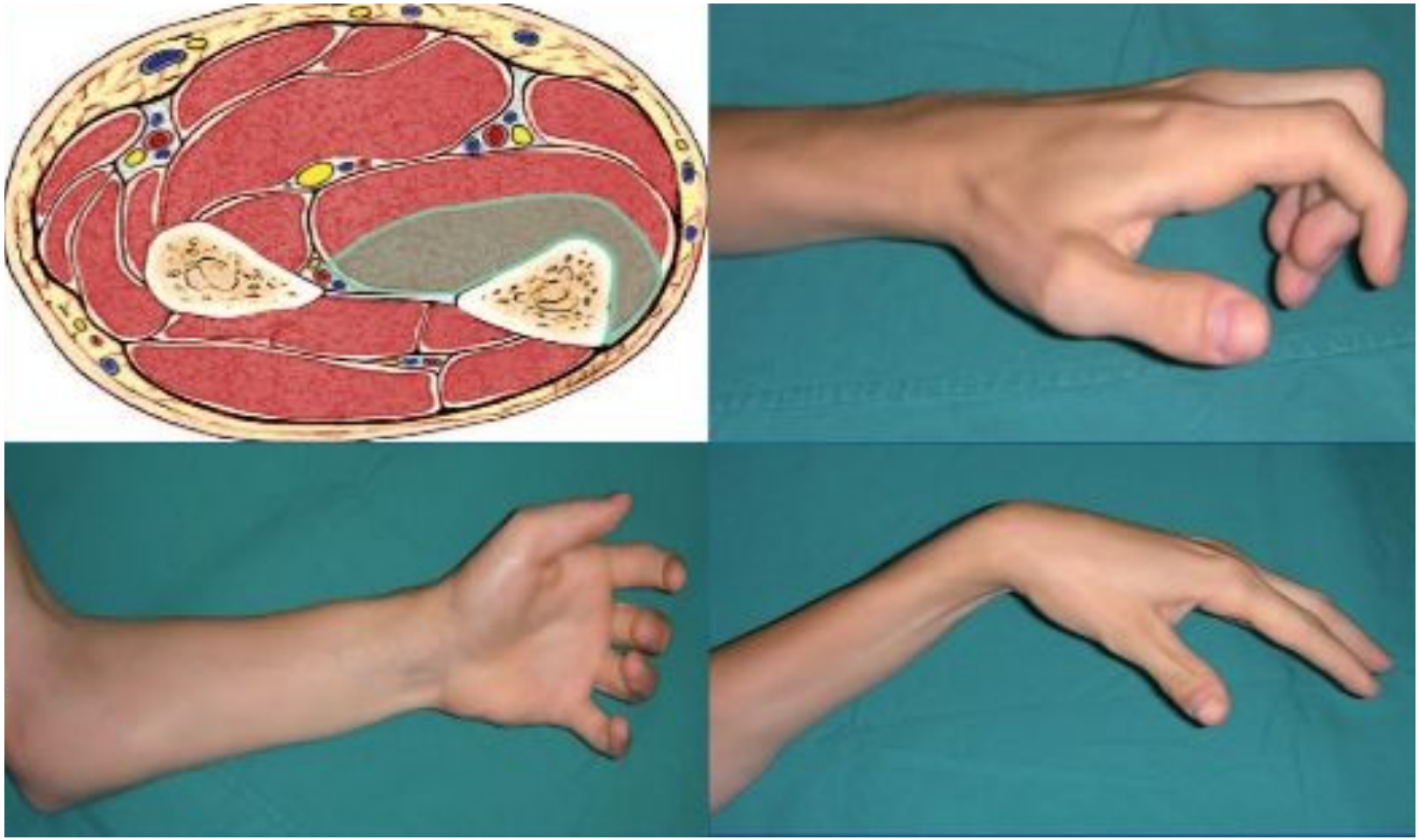
  Mobilise joints

# Volkman Ischaemic contracture

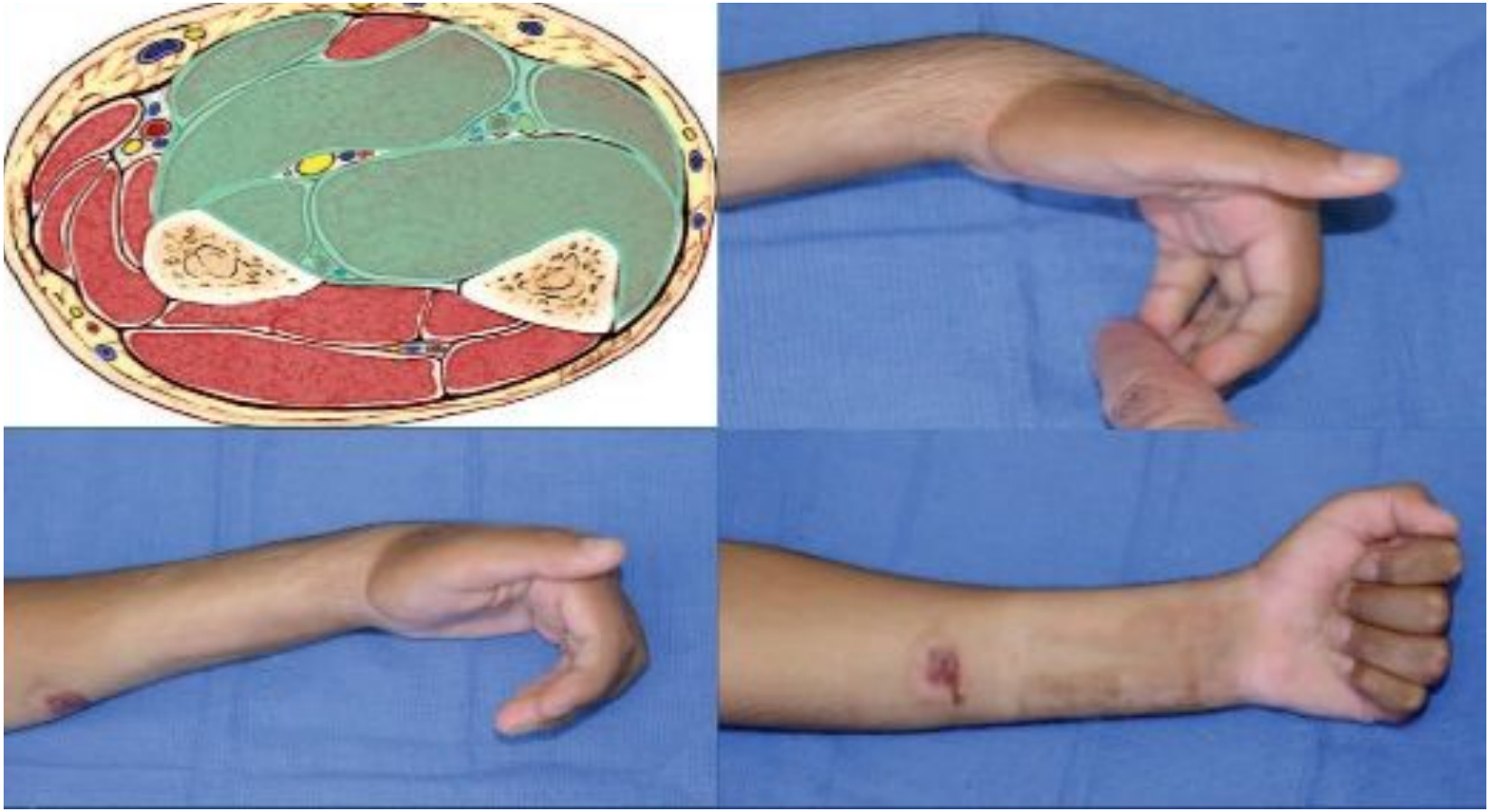


Dynamic contracture

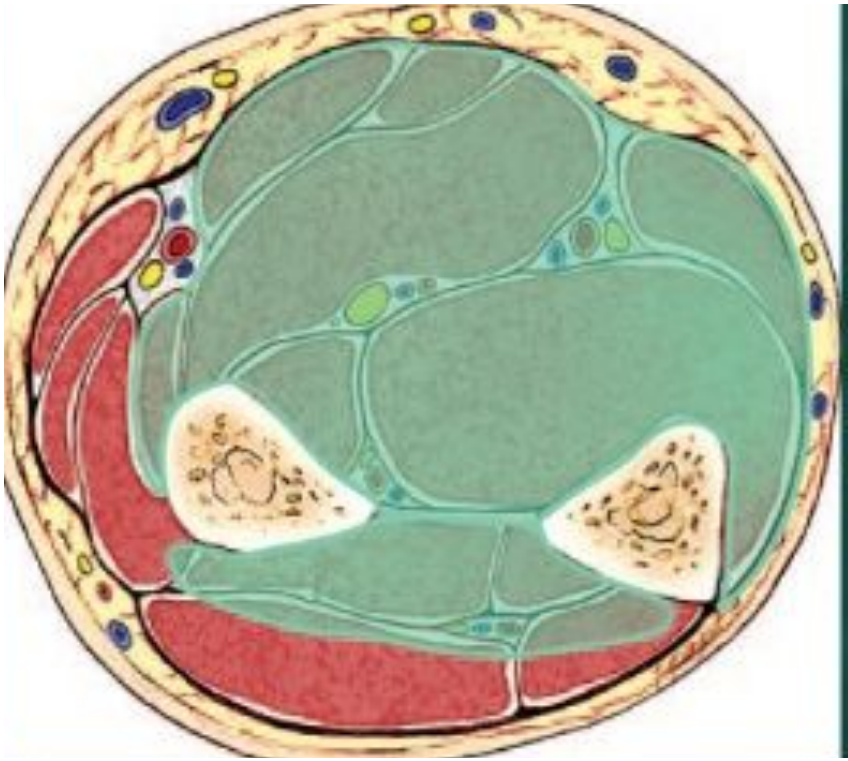
# Tsuge : Mild : splint / tendon lengthening

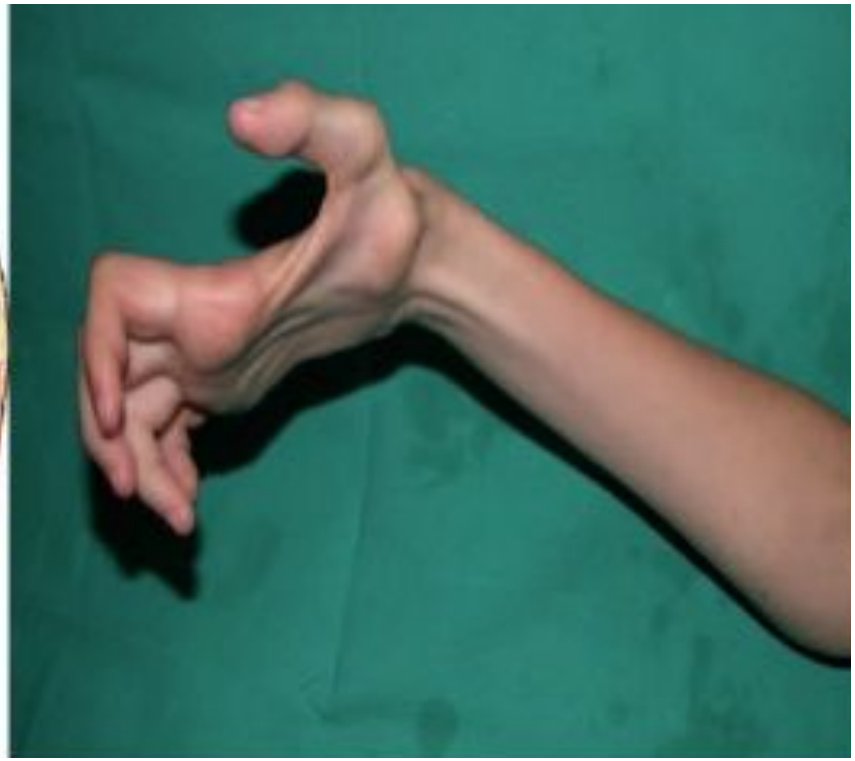


# Tsuge: Moderate: Excise/ proximal slide/ TTransfer



# Tsuge: Severe : Free vasc muscle transfer





# Late Pain

**Nerve involvement:**

- Ischaemic
  - *Regeneration*
- Mechanical:
  - *Primary injury (crush)*
  - *Secondary Fibrosis*

# Clinical Case

- 32 yr female :
- Left Wrist:  Midcarpal Instability
- Total Wrist Fusion :GA.
- Post op pain O/N stay x2
- Review Consultant : Reassured.
- Day 3 : pain started to improve.
- 3m FU : Fusion confirmed, Stiff fingers.
  Diagnosed : Post immobilisation Stiffness

# 2nd Opinion

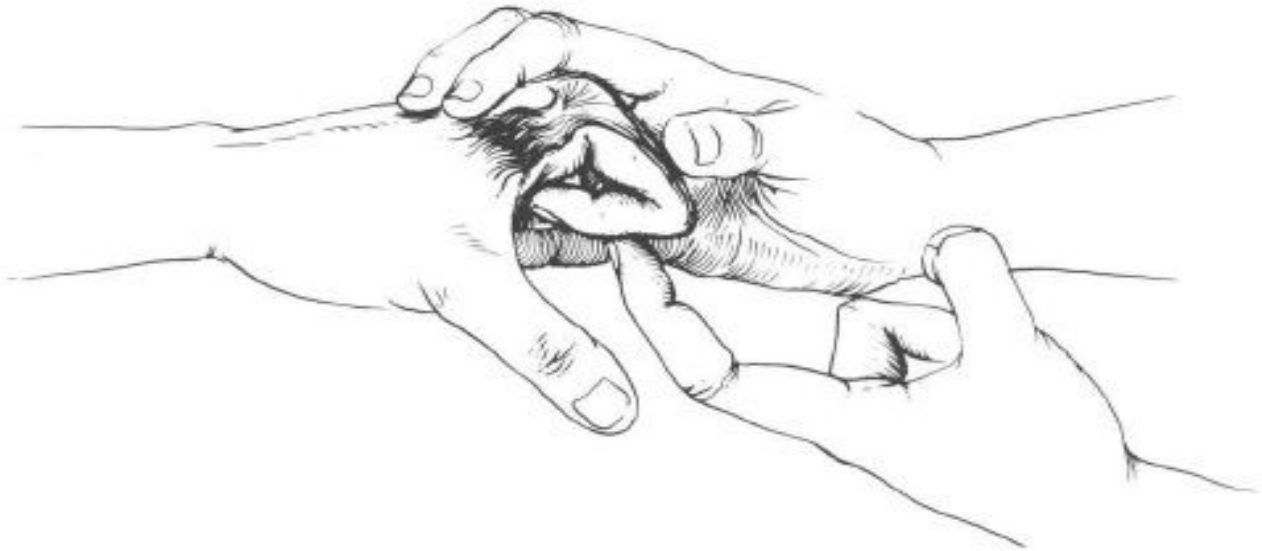
- Difficulty in making fist esp MF & RF
- Sensation intact
- Poor finger abduction

- Bunnell test

# Bunnell-Lister Test for Intrinsic Tightness: Step 1

- MCP joint held in slight extension will therapist moves the PIP joint into flexion – if can't be flexed, intrinsic or joint capsule tightness

# Bunnell-Lister Test for Intrinsic Tightness: Step 2

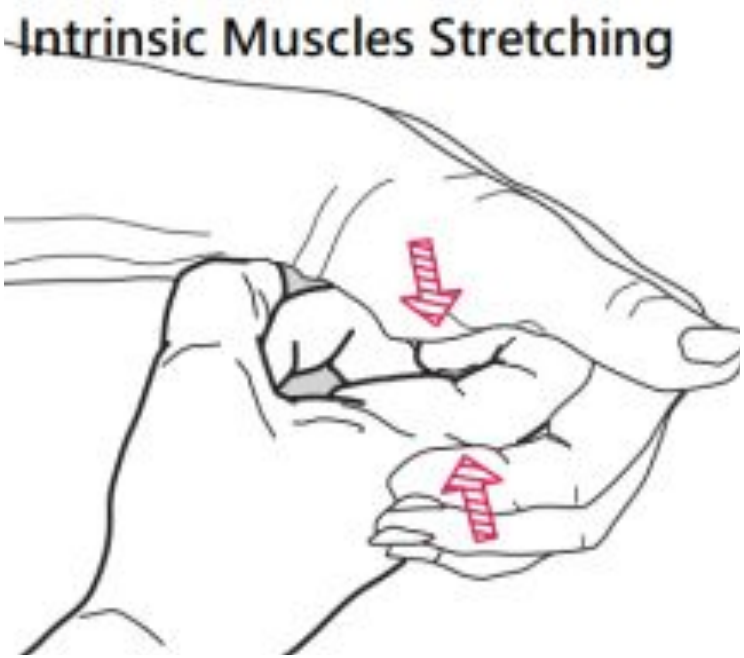


- Place MCP joint in a few degrees of flexion to relax intrinsics – if joint can now flex, then it was intrinsic tightness

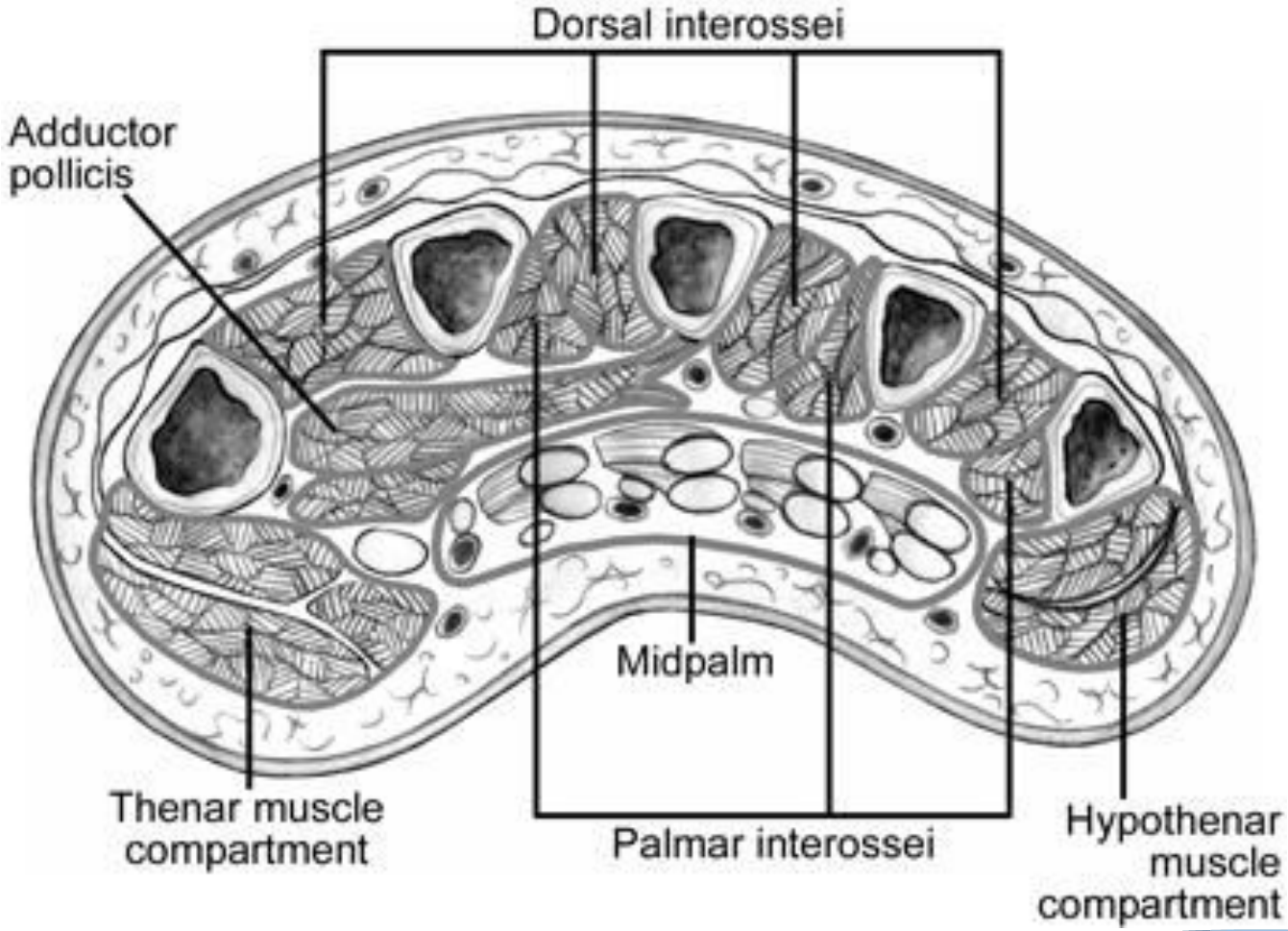
# Diagnosis

- Intrinsic tightness

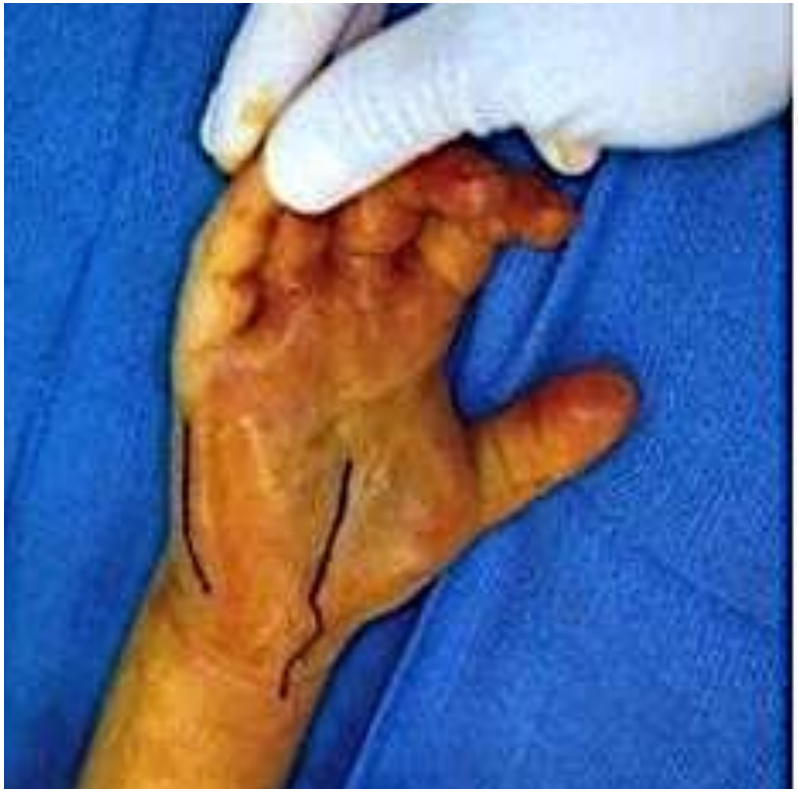
- Cause :
  - Possible vascular injury
    → compartment synd
    → interosseous fibrosis

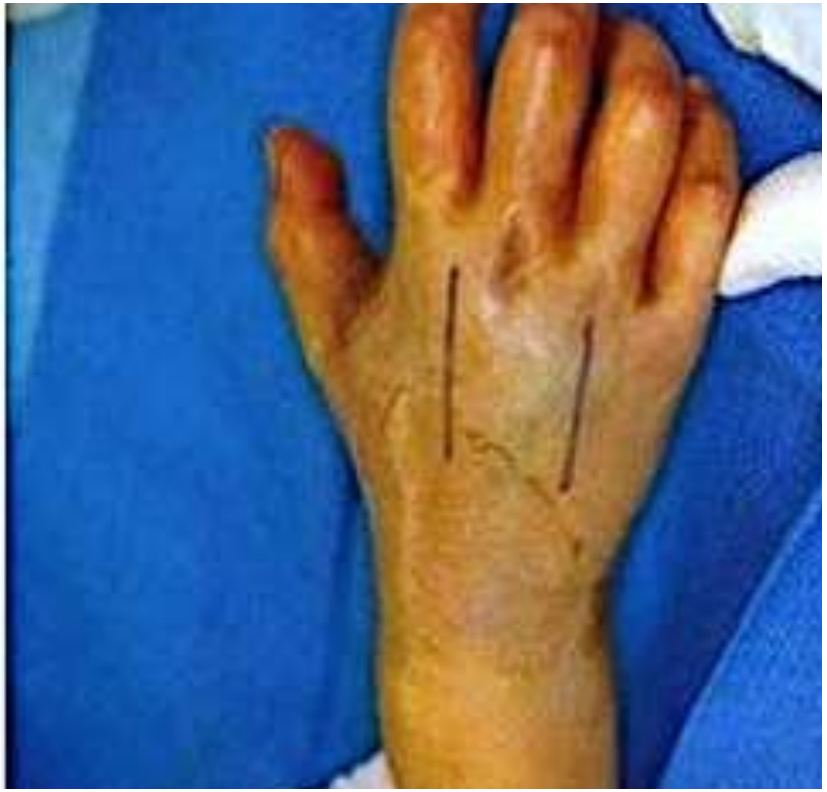


# Surgical Intrinsic Release

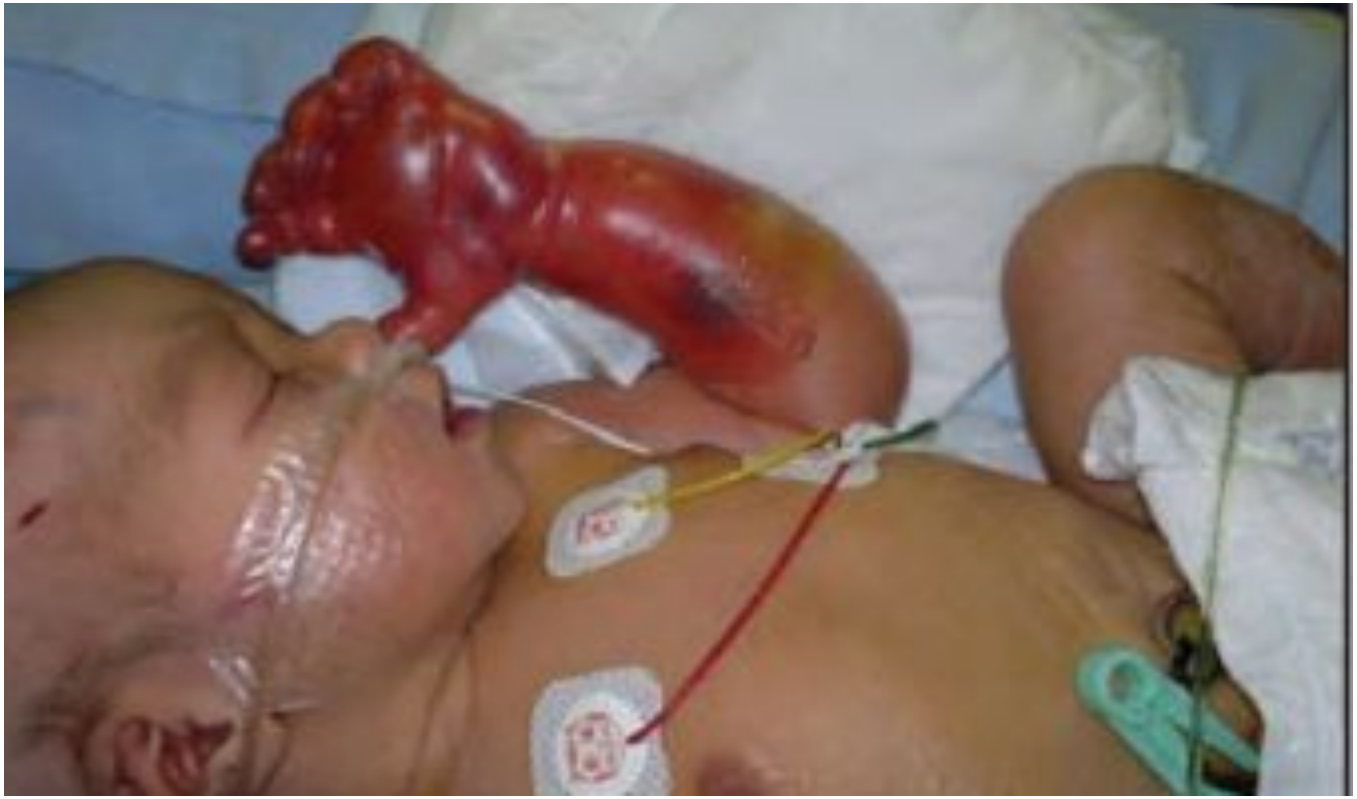


# Hand Fasciotomy (x5 Incisions)



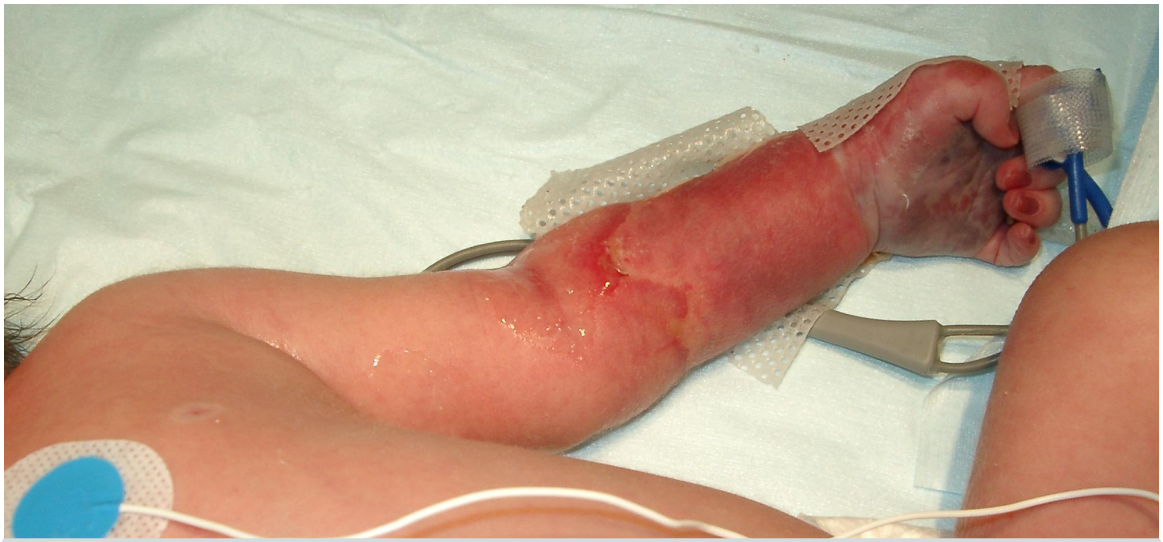


# Neonate Ischaemia



# Foetal Distress

Caesarean section. Transfer To UHS.
Arteriogram : Arterial cannula
IA Tissue Plasminogen Activator



Improvement: Fasciotomy
Subsequent A/E Amputation

# Young age insult - ↓growth

# Chronic Forearm Compartment Synd

- Pump Arm – weight-training
- Adolescent Tennis players

- Burning pain
- Onset after similar amount of exercise
- Settles after 10-20 min

# Chronic excertional CS

**Investigations**

- Compartment pressures
- Exclude stress fracture

**Treatment**

- Rest /Avoidence
- Fasciotomy (subcutaneous)

# Wimbeldon

# “If”

If the fracture site is painful, or the skin is coloured plum;

If the radial pulse is absent, or the fingers feeling numb;

If the flexors don’t like stretching, or the forearm feels too tense;

You must take off all the splints , and ring the Medical Defense.

(Alan Apley with apologies to Rudyard Kipling)