Acute Compartment Syndrome

- Common complication of a fracture, but can occur after prolonged tourniquet times as part of a re-perfusion injury
  - Causes by bleeding, oedema or inflammation/infection
  - Raises pressure within an osteofascial compartment to reduce capillary or venous return
  - This provokes further ischaemia, muscle death and further oedema
  - Results in irreversible muscle and nerve death in < 12 hours
- Nerves may regenerate slowly, but muscle infarction is replaced by inelastic fibrous tissue = Volkmann's ischaemic contracture

- Common sites:
  - Elbow fracture
  - Forearm fracture
  - Proximal 1/3 of tibia
  - Multiple fractures of hand or foot
  - Crush injuries or circumferential burns

- Symptoms:
  - PAIN (disproportionate) incl. at rest or passive stretch (“bursting sensation”)
  - Paraesthesias
  - Tight compartment on palpation
  - Pallor, paralysis & pulseless → too late!

- If unsure compartment pressure can be measured
  - Use a split catheter to allow side measurement, and not allow blocked ends to interfere with results. (e.g. venflon with hold cut on side of plastic sheath)
  - Connect to tubing, three-way tap and pressure transducer (e.g. CVP monitor)
  - Fill with saline and hold by skin and “zero”.
  - Insert venflon into each compartment, and remove needle

- Diagnosis = clinical diagnosis, or…
  - Compartment pressure – Diastolic pressure = 30mmHg for 8 hours
  - If differential pressure < 30 mmHg → indicates acute compartment syndrome
  - Clinical features and differential pressure hovering over 30 mmHg

Treatment

- Remove all casts, bandages and dressings (not a thread left on limb)
- Elevate initially, but beware may precipitate ischaemia
- Fasciotomy of all compartments, with open wound
  - 2nd look after 48 hours with debridement of persisting muscle necrosis
  - Direct closure, or involvement of plastic surgeons
- If a graft is used, then splint the limb for minimum 5 days to allow graft to take. Leave the donor site dressing intact for 14 days.
- Then mobilise with physio supervision to prevent adhesions or stiffness
- Night splints for 4-6 weeks to prevent contractures
  - Abducted thumb, 30° wrist extension, 60° MCPJ flexion & fingers straight
  - Ankle splinted in dorsiflexion
Compartments of Hand

- 10 compartments:
  - Dorsal interossei (4)
  - Palmar interossei (3)
  - Adductor pollicis compartment

- **Dorsal Fasciotomy:**
  2 incisions over dorsal aspect, between 2\textsuperscript{nd}/3\textsuperscript{rd} and 3\textsuperscript{rd}/4\textsuperscript{th} metacarpals, to access 4 compartments of *dorsal* interossei – try to avoid superficial branch of radial nerve when dividing fascia over 1\textsuperscript{st} dorsal interosseous
  - Run tenotomy scissors down the ulnar side of the 1\textsuperscript{st} MC to pierce compartment of 1\textsuperscript{st} palmar interosseous and adductor compartment
  - Go deep along radial side of 4\textsuperscript{th} and 5\textsuperscript{th} MC to piece compartments for 2\textsuperscript{nd} and 3\textsuperscript{rd} palmar interossei

- **Palmar fasciotomy**
  - Single incision to decompress median & ulnar nerves, and thenar + hypothenar compartments
  - Lazy-S incision from distal wristcrease to proximal palmar crease (running over carpal tunnel and in between thenar/hypothenar prominences in the midline)
  - Deepen through the flexor retinaculum, avoiding the median nerve and its thenar motor branch which passes radially in the distal part of the carpal tunnel
  - Incise fascia over thenar compartment
  - Deepen incision in ulnar direction to decompress Guyon’s canal and hypothenar compartment

- **Finger incisions** made on ulnar side of index, middle and ring fingers, and the radial side of the thumb and little finger
  - Flex fingers into palms and place dots on apex of creases of MCPJ, PIPJ and DIPJ. Then join these dots with fingers in extension
  - Deepen incision dorsal to neurovascular bundle (NVB), volar to flexor tendon sheath, and dorsal to contralateral NVB.

Forearm Compartments

- **Flexor incision**
  - Extend previous lazy-S incision of hand along distal wristcrease from the midline to the ulnar border
  - Then 5cm along the ulnar border of the forearm, before taking it radially and proximally towards the radial side of the ACF
  - Examine long flexors of wrist and digits, as well as pronator quadratus
  - Explore the median and ulnar nerves at the wrist and forearm
  - Avoid:
    - Palmar cutaneous branch of median nerve arising 5 cm proximal to wrist crease on radial side
    - Dorsal sensory branch of ulnar nerve arising 5 cm proximal to pisiform
  - Release any constriction caused by lacertus fibrosis between biceps aponeurosis and FDS + Pronator Teres ← can compress median nerve at ACF

- **Extensor incision**
  - Single longitudinal incision on the extensor aspect of the forearm
  - Deepen to examine extensor muscle bellies
**Lower Leg Compartments**

- **Anterior compartment**
  - Tibialis anterior, EHL, EDL, peroneus tertius
  - Deep peroneal nerve
  - Anterior tibial arter

- **Lateral Compartment**
  - Peroneus longus and tertius
  - Superficial peroneal nerve
  - Peroneal artery and short saphenous vein

- **Posterior Compartment**
  - Gastrocnemius, soleus ± plantaris = *superficial*
  - Tibialis posterior, FDL and FHL = *deep* (Tom, Dick & Harry)
  - Tibial nerve (branch of sciatic nerve)
  - Posterior tibial artery

- **Medial incision**
  - Follows a line 2cm posterior to medial subcutaneous border of the tibia
  - Longitudinal from the knee to ankle
  - First incise fascia of superficial posterior compartment
  - Retract gastrocnemius and soleus bellies posteriorly away from tibia
  - Then incise the fascia of the deep posterior compartment beneath

- **Lateral incision**
  - Follows a line 2cm lateral to anterior subcutaneous border of tibia (in between tibia and fibula)
  - Incise deep fascia of anterior compartment and examine soft tissue
  - Follow laterally the under-surface of this deep fascial layer until it meets the vertical septum of the peroneal compartment → incise this.