



AGENCY FOR
**CLINICAL
INNOVATION**

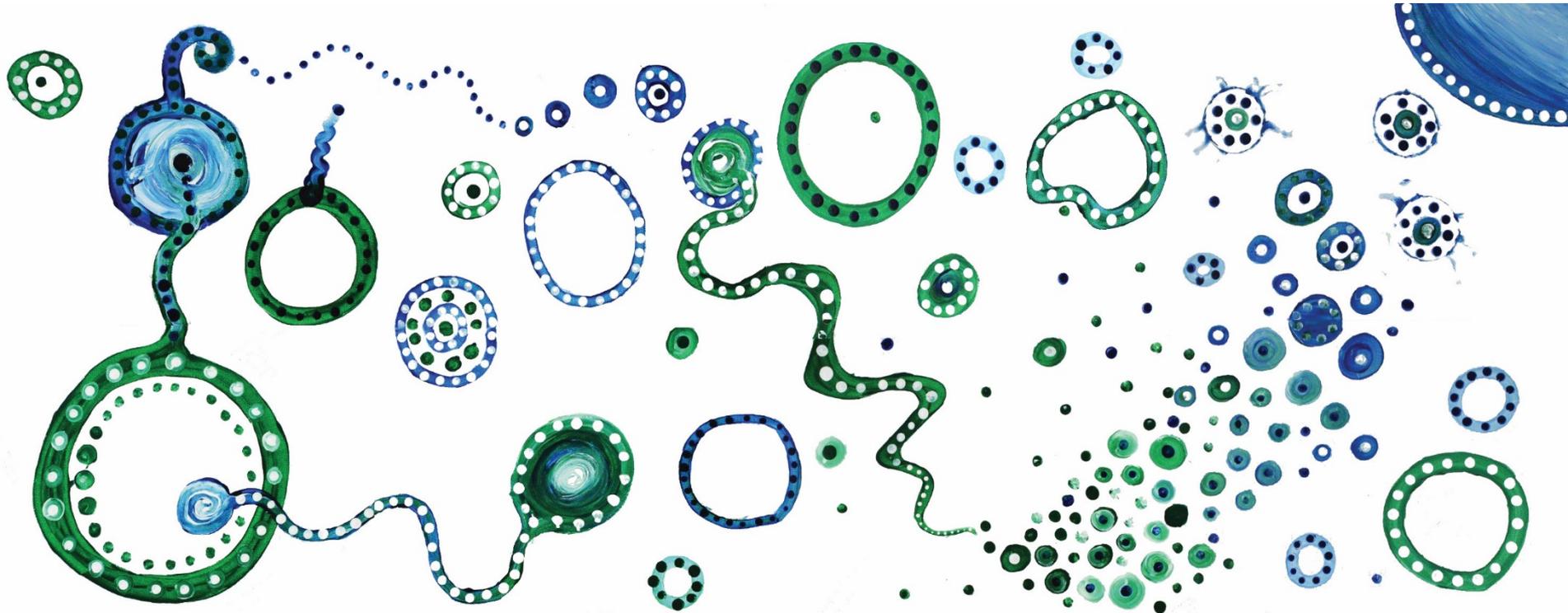
Neurovascular Assessment

A guide to using the NSW electronic observation form

August 2018

Musculoskeletal Network

The ACI acknowledges the traditional owners of the land that we work on
– the Cammeraigal People of the Eora Nation. We pay our respects to
Elders past and present and extend that respect to other Aboriginal peoples
present here today.



The ACI thanks the following Working Group members for their contribution to the development of this guide and supporting resources, including the form.

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- Involves the evaluation of the neurological and vascular integrity of a limb (Judge 2007:39).
- Evaluates sensory and motor function (Blair & Clarke 2013; Turney, Raley Noble, & Kim 2013; Shreiber 2016).
- Detects signs and symptoms of potential complications such as compartment syndrome.

- To recognise subtle changes that need to be reported promptly to the medical team and senior nursing clinicians (Shreiber 2016).
- To help nursing staff assess neurovascular status and use critical thinking to interpret findings (Shreiber 2016).

- Limb fractures
- Vascular injuries and procedures
- Trauma or surgery to limbs or joints
- External fixators
- Casts, splints and constrictive dressings to limbs
- Traction
- Burns
- Crush or gunshot injury
- Procedures that may cause limb thrombosis or emboli, e.g. cardiac catheterisation
- Interstitial oedema of limbs or massive intravenous fluid infusion
- Prolonged immobility caused by drugs or alcohol induced coma
- Snake envenomation
- Anticoagulation therapy, e.g. warfarin

- Always check the contralateral limb first.
- Assessment needs to be performed in full light.
- Use a separate form for each limb which is being assessed.
- Ensure the correct form is used for the affected limb.

Components of neurovascular assessment



- Pain
- Circulation
- Sensation
- Motor function

- Pain is assessed by asking the patient to rate pain on a scale from zero to 10.
- Assess the pain score at rest and on passive stretch.
- Assess whether the pain is disproportionate to the injury.
- Any compromise to neurovascular status will result in pain due to sensory nerve damage and diminished blood flow (Shreiber 2016).

- Colour
- Temperature
- Capillary refill
- Pulse



- Natural
- Pale/white – diminished arterial blood flow (Shreiber 2016)
- Flushed/red
- Dusky
- Cyanosed – venous insufficiency (Shreiber 2016)



Temperature

- Warm
- Hot
- Cool – diminished arterial flow (Schreiber 2016)



Capillary refill

- Press on the nailbeds or skin (using your thumb and forefinger until blanching occurs) to assess peripheral vascular perfusion (Wiseman and Curtis 2011)
- < 2 seconds – normal
- > 2 seconds – abnormal perfusion (Wiseman and Curtis 2011)



- Strong
- Weak
- Absent
- Doppler used
- Unable to assess/comment



Dorsalis pedis



Posterior tibialis

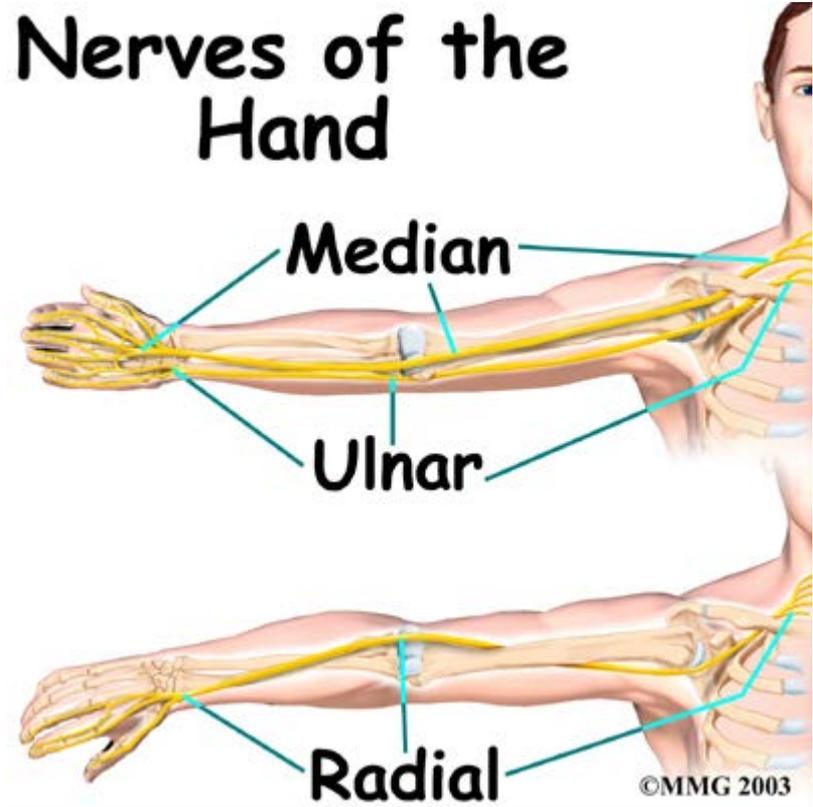


Radial

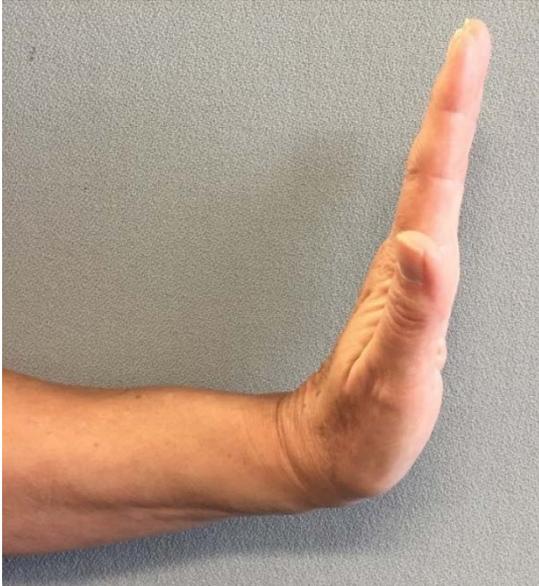
- When testing sensation ask the patient to close their eyes.
- Sensation changes may include:
 - Pins and needles
 - Tingling
 - Numbness
- Changes in sensation need to be reported.

- Radial nerve
- Ulnar nerve
- Median nerve

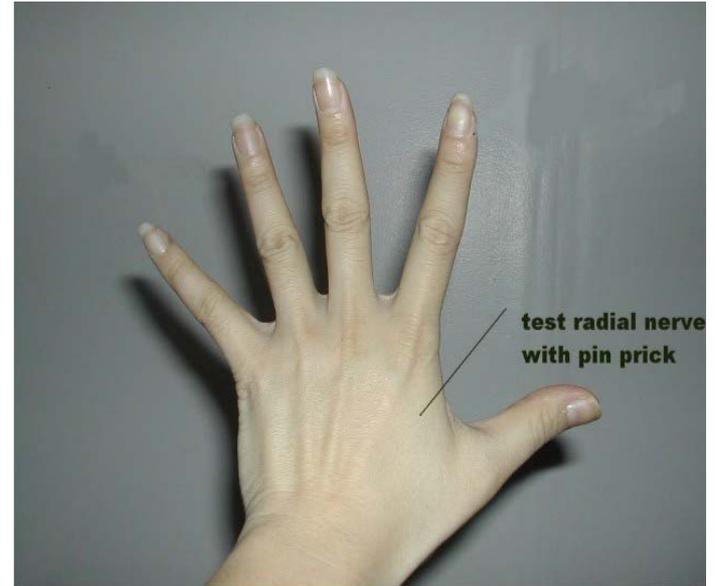
Nerves of the Hand



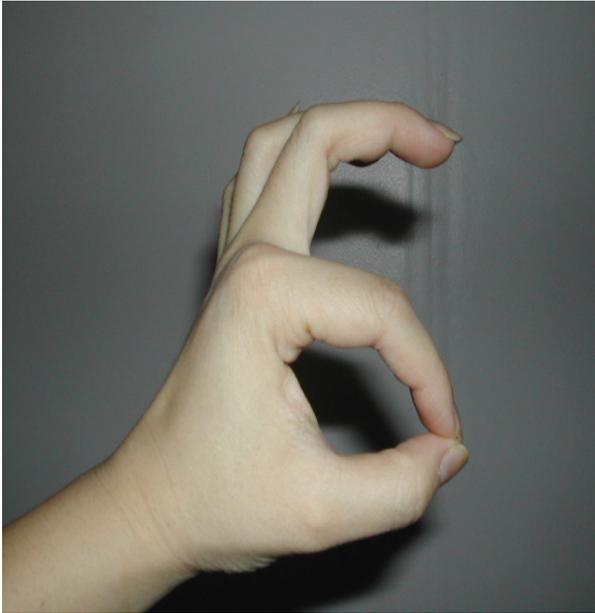
- Movement – wrist dorsiflexion



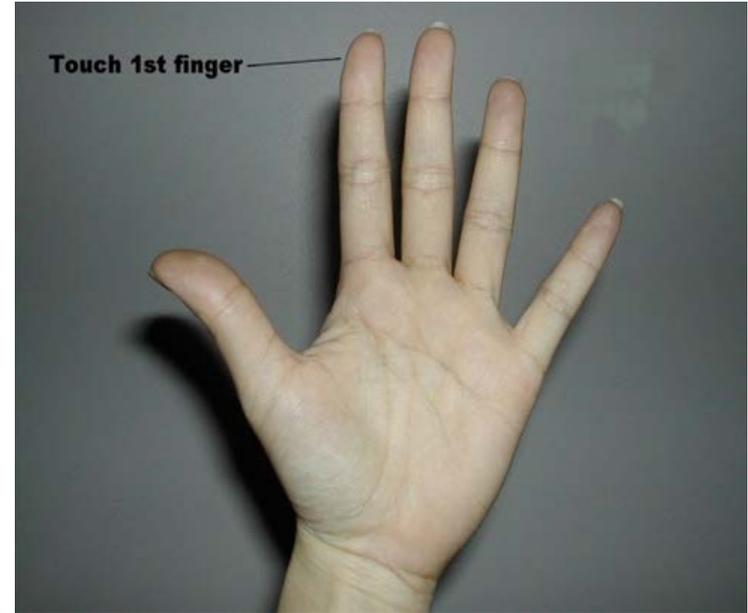
- Sensation



- Movement – thumb opposition



- Sensation



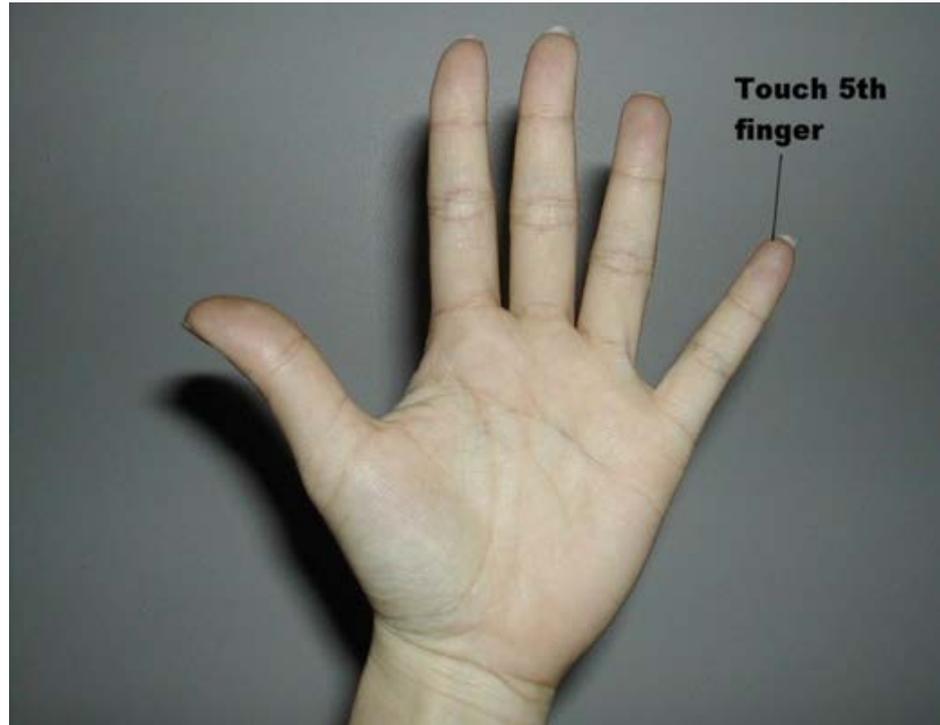
- Abduction



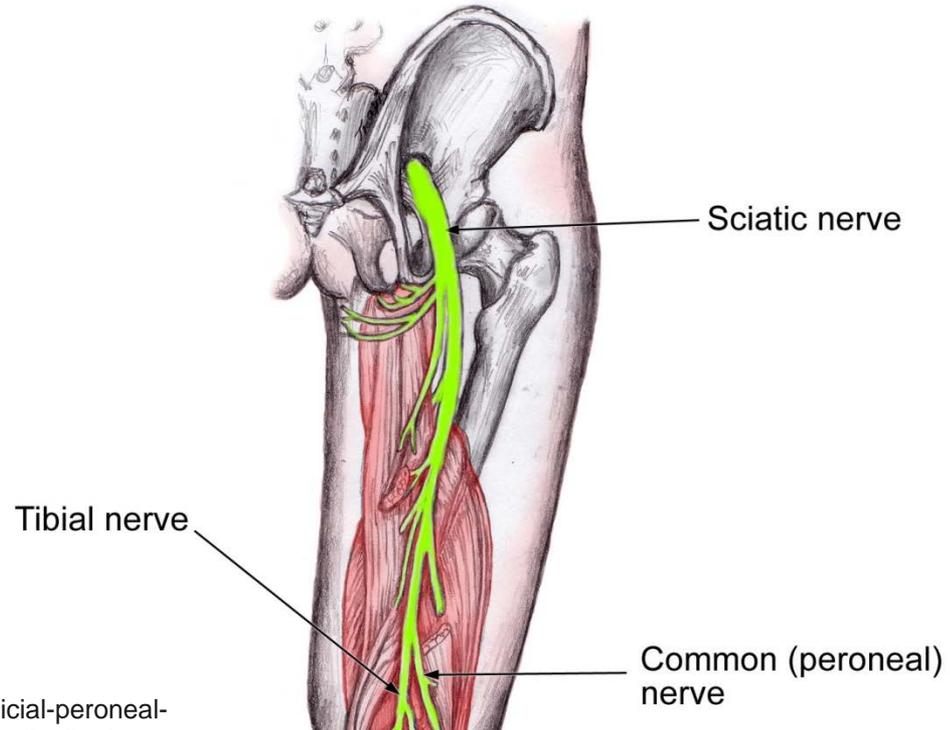
- Adduction



Ulnar nerve sensation



- Common (peroneal) nerve
- Tibial nerve



- Movement – plantarflexion (point toes)

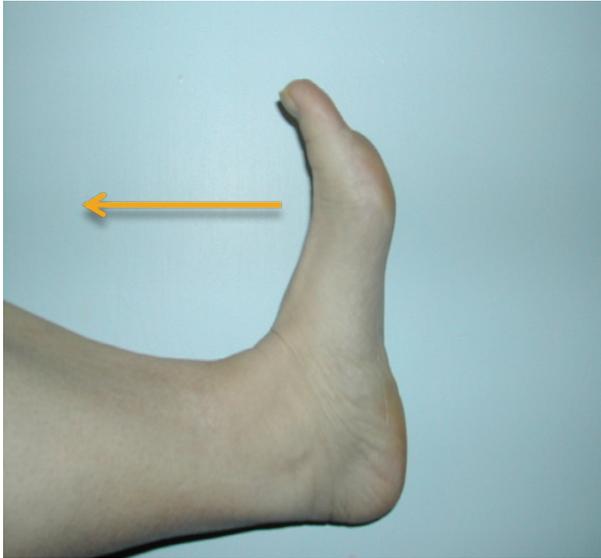


- Sensation

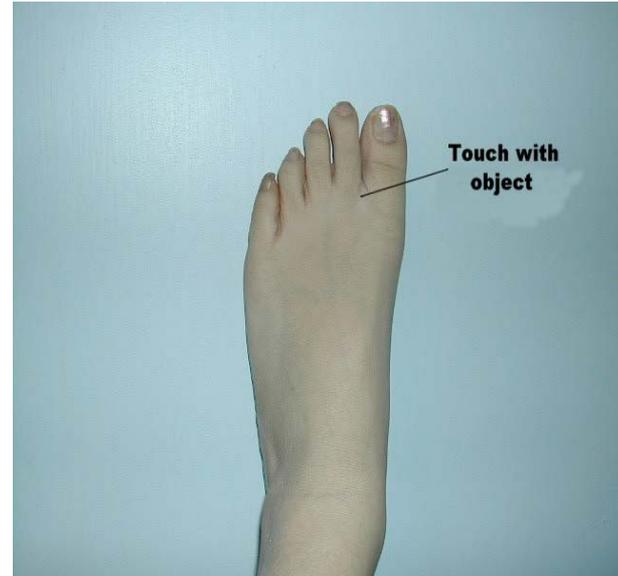


Common (peroneal) nerve

- Movement – dorsiflexion



- Sensation



- Nil
- Mild
- Moderate
- Large

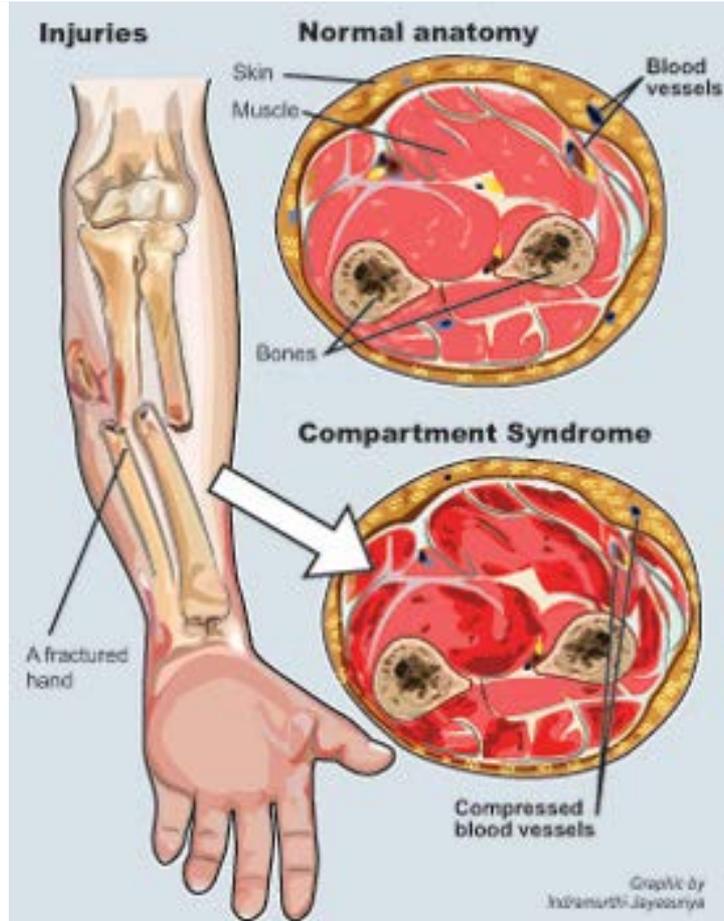
Blood loss

- Nil
- Small
- Moderate
- Large



- May occur in an extremity from fractures, injuries and/or procedures on a limb (Benche 2010).
- Can be described as increased pressure within a muscle compartment from swelling and/or bleeding (compressing nerves and blood vessels) (Duckworth and McQueen 2011).
- Leads to compromised tissue perfusion and ischaemia (Duckworth and McQueen 2011).

Compartment Syndrome



- If left untreated, irreversible damage to the muscles and nerves can begin after six hours.
- In 24-48 hours, ischaemia of the muscle will occur leading to death of the muscle and in extreme cases, the patient will require an amputation.
- Acute Compartment Syndrome is a medical emergency.

Pathophysiology

Increased pressure within compartment

Vascular compromise

Blood flow through capillaries stops,
oxygen delivery stops

Muscle ischemia (2-4 hours)

hypoxia

Histamine & serotonin release, dilated capillaries

vasodilatation

Increased pressure in compartments

Increased swelling

Nerve damage (6-12 hours)

Nerve conduction slows

Anaerobic metabolism
Tissue pH falls
Muscle necrosis
develops

Permanent nerve scarring & paralysis (24-48hours)

Cell death, contractures, limb death

Irreversible tissue damage

NO RECOVERY AFTER 8 HOURS OF
TOTAL ISCHEMIA

Signs and symptoms of acute Compartment Syndrome



- Pain – out of proportion to the injury.
- Pallor – skin colour change.
- Paralysis – decreased or loss of movement (motor).
- Paraesthesia – altered sensation.
- Pulselessness – late sign.

Suspected Compartment Syndrome



- Elevate the affected limb to heart level (Altizer 2004; Judge 2007).
- Loosen any restrictive bandages or dressings.
- Notify the orthopaedic/specialty registrar immediately without hesitation.
- Place the patient nil by mouth until review.
- Increase frequency of neurovascular assessment – every 15 minutes until review.
- Make the patient comfortable and reassure them.
- Ensure analgesia is administered.

May be caused by:

- Emboli (cardiac and non-cardiac)
- Iatrogenic and non-iatrogenic injury to blood vessels and joints
- Chronic peripheral arterial occlusive disease
- Occlusion of a bypass graft conduit
- Hypercoagulable state
- Outflow venous occlusion

Source: Fahey and Schindler 2004; Ouriel 2000

The Six Classic P's:

- Pain – sudden and severe
- Pallor – commonly mottled
- Pulselessness – loss of peripheral pulses
- Paraesthesia – decrease in sensation or loss of sensation
- Paralysis – failure of dorsiflexion
- Poikilothermia – coolness of the affected limb

Source: Fahey and Schindler 2004; Ouriel 2000

If suspected Acute Limb Ischaemia

- Elevate the affected limb to heart level (Altizer 2004; Judge 2007).
- Loosen any restrictive bandages or dressings.
- Notify the specialty registrar immediately without hesitation.
- Place the patient nil by mouth until review.
- Increase frequency of neurovascular assessment – every 15 minutes until review.
- Make your patient comfortable and reassure them.
- Ensure analgesia is administered.

- Timely communication is **vital**. Small or subtle changes need to be escalated and correctly documented.
- Detailed documentation of your assessment and actions needs to be correctly recorded in the patient's medical record.
- Assessment and actions need to be handed over between all shifts. When handing over a patient or receiving a patient from theatre, neurovascular assessment should be completed by both clinicians.

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Thank you.



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