



Rehabilitation in Conflict FRACTURE



World Health
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What we will cover:

- Management in Humanitarian Settings
- Common Complications
- Adapted Clinical practice

Quick Overview

- Hugely varied depending on nature of event
- Typically lower limb > upper limb
- Open > closed
- Comminuted > simple
- Polytrauma
- Involvement of nerve, vascular and soft tissues...

Surgical Management

- May only be damage control surgery initially
- NOT to use internal fixation in most emergency setting
- Initial conservation management or ex-fix
- Delayed definitive management
- Delayed primary closure

External Fixation – Pros (1)

Mechanical:

- Quick, flexible applications
- Good outcomes
- Early recognition and treatment of complications
- Minimally invasive
- Either a temporary or definitive stabilisation device
- Reconstructive and salvage applications
- Stable enough to allow loading through the bone, with micromotion



External Fixation - Cons



Mechanical:

- Component failure
- Inadequate immobilization
- Pin-bone interface failure
- Weight/bulk

Biological

- Infection
- Pin loosening
- Neurovascular injury
- Tethering of muscle
- Soft tissue contracture
- Mal and Non union

Implications for rehabilitation

- Pain (inc pins through the tissue – pain on muscle contraction)
- Loss of ROM at surrounding joints
- Muscle contracture
- Our Role:
 - Maintain soft tissue length – prescribe stretches/passive movements
 - Maintain muscle strength as able
 - Keep skin from sticking to pin sites using gentle AROM exercises
 - Maintain venous return/swelling management
 - Adapt ADLs
 - Positioning
 - Identify complications

External Fixator Care

- Clean pin sites at least once a week – more often if infected
- Clean using non-shedding gauze and either chlorhexidine or saline.
- Bathing is not permitted. Showering of the limb is normally only allowed prior to dressing changes.
- Emollient can be applied to skin but not immediately around pin sites.

Source: <https://www.rcn.org.uk/-/media/royal-college-of-nursing/documents/publications/2011/november/pub-004137.pdf?la=en>

External Fixator Care (teach to patient)

1 Before you start, wash your hands thoroughly with soap and water, dry your hands on a clean towel that is for your use only.

2 Prepare your equipment on a clean surface.

3 Remove the existing dressings: check the pin sites for any redness, tenderness, swelling or leakage.

4 Wash your hands again.

5 Clean around each pin using a new piece of gauze dipped into saline solution, use each piece of gauze only once on each pin site as you have been shown and discard afterwards.

6 Do the above as many times as necessary for all pins to be clean and crust free. If the pin is stuck to the skin gently massage until it is free.

7 Dry well with a clean piece of gauze.

8 When the pin sites are dry, wrap a clean piece of gauze around the pin site and secure with the tape.

9 If you have an external fixator you must also clean the frame using the same technique as for the pin sites.

10 Finally, wash your hands again thoroughly.

Teach the patient to seek support if:

- If the discharge becomes thick, coloured or smells
- If the pin sites become red, swollen, tender or painful.
- If any of the pins or other parts of the external fixator become loose

Weight bearing

*****for successful bone healing – early weight bearing and functional activity*****

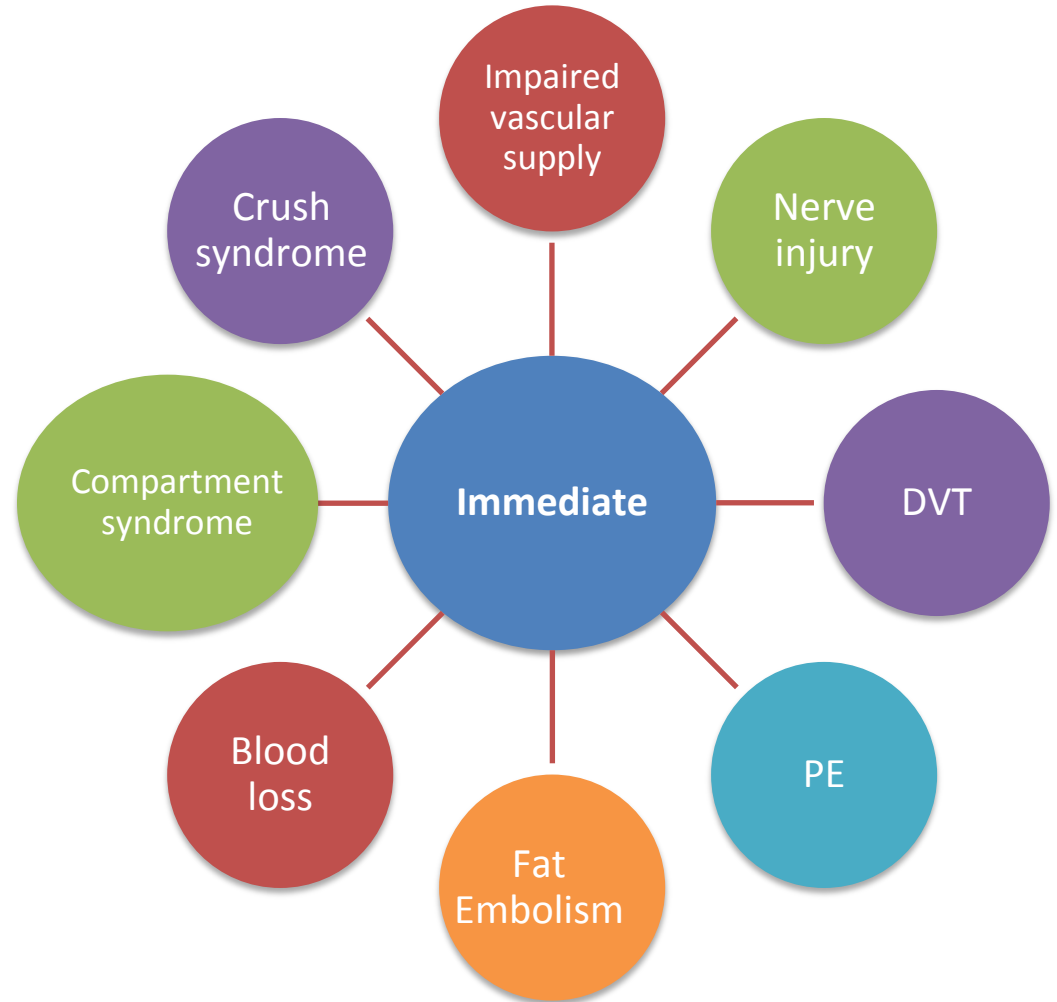
- Loading of a fracture, non-union or osteotomy site stimulates OSTEOGENESIS
 - (along with sufficient blood supply and bony stability)
- Surgical opinion, fracture stability and ExFix design will determine weight bearing status
- In emergencies there is often less confidence around fracture stability and less clarity around weight bearing status. Not normally the role of the rehabilitation professional to determine this!
- Common exceptions to full weight bearing;
 - **Those with bone defects**
 - **Patients at risk of pin loosening/infection**
 - **Patients with Unilateral frames unless otherwise stipulated**

Traction

- Most commonly used for closed femoral fractures but also may be used for open femoral fractures in adults:
- Skin Traction – Thomas Splint– normally temporary (48-72 hours) unless paediatric – can be definitive.
- Skeletal Traction – Using Bohler-Braun frame, Thomas or Hamilton-Russel splint for proximal Femoral or acetabular fractures.
- Pay particular attention to preventing equinus deformity of ankle and preventing pressure injury to heel and sacrum.



Acute Fracture complications



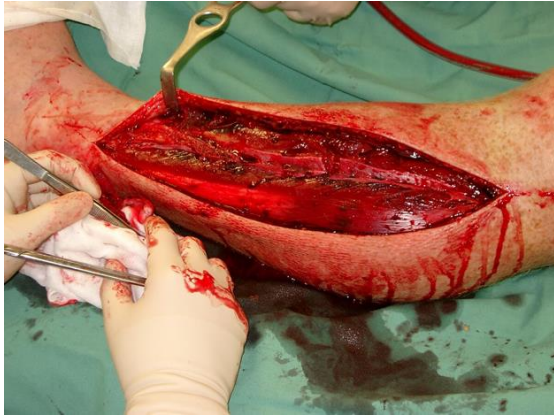
Compartment syndrome

Symptoms:

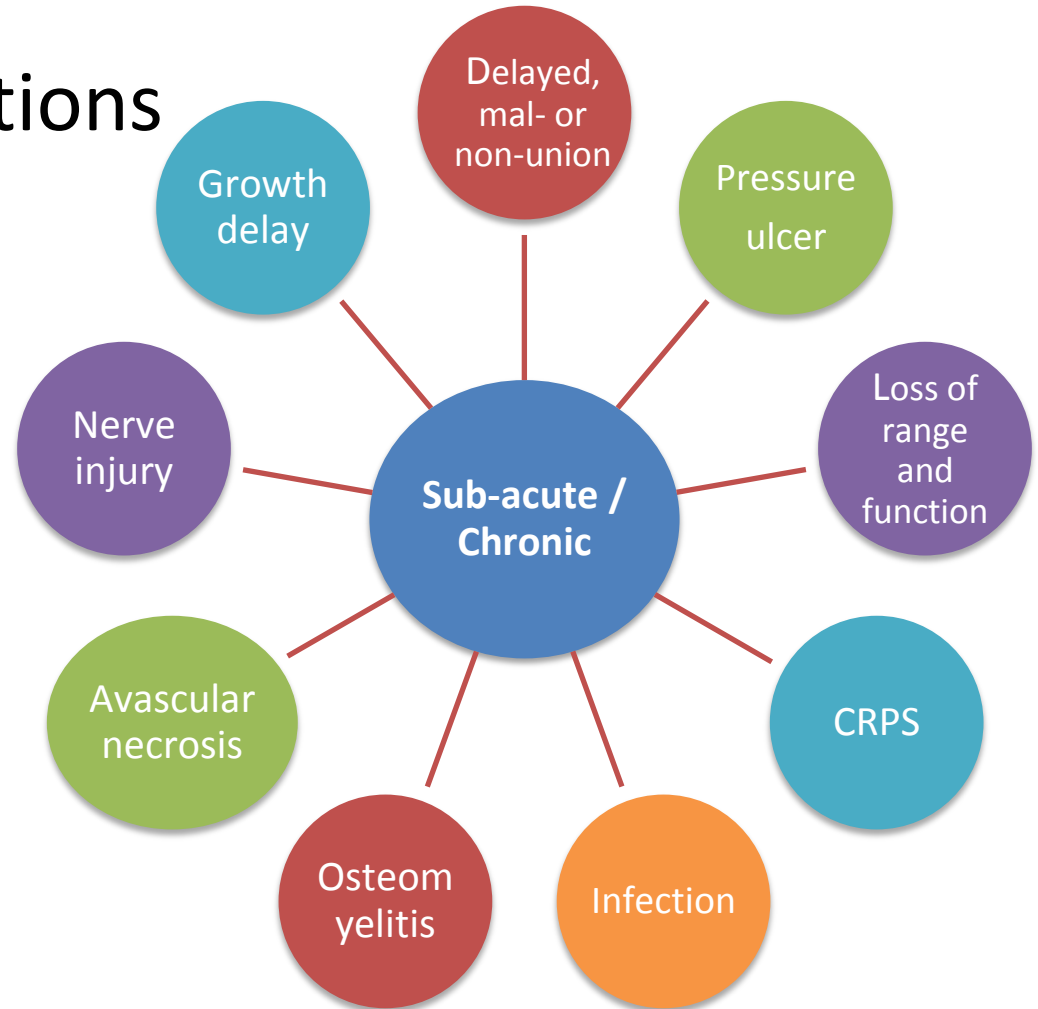
- Intense pain (disproportional to injury)
- Pain worsened on passive stretch of the muscle involved
- Muscle might feel tight or full
- Altered sensation (numbness +/- paralysis usually indicate permanent tissue damage)

Treatment:

Fasciotomy within 3 hours (can be left open for 48-72 hours in UK, longer in Humanitarian context often involving a skin graft)



Delayed complications



Common Challenges

- Polytrauma
- Uncertainty of weight bearing status
- Complications +++++
- Missed fractures or other injuries
- Rehab for patients on traction

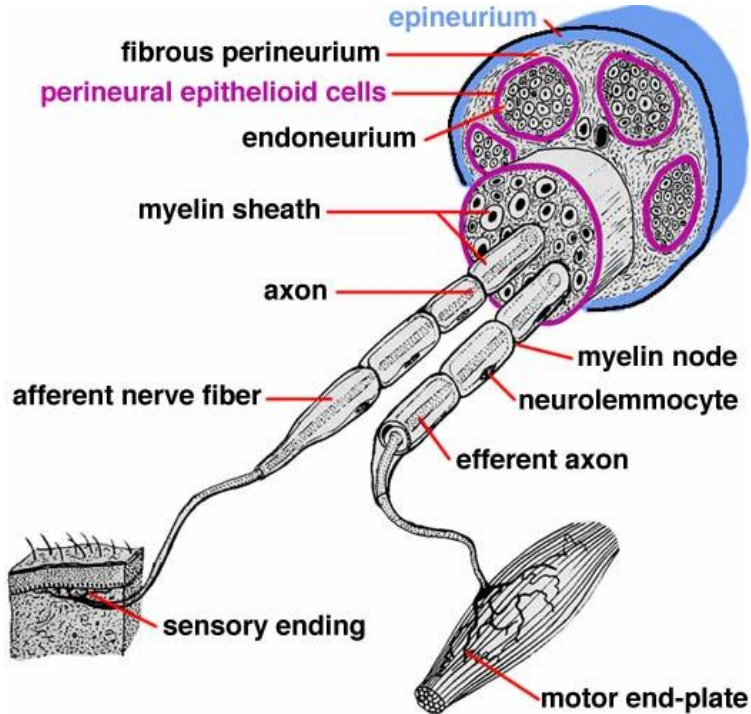
Adapted Practice

- Know how to manage ex-fix and traction
- ++ Education on self management
- Be clear re weight bearing status and progression
- Rehab itself is normally simple
- Rehab professional and patient must know when to seek follow up



Rehabilitation in Conflict

PERIPHERAL NERVE INJURY



What we will cover:

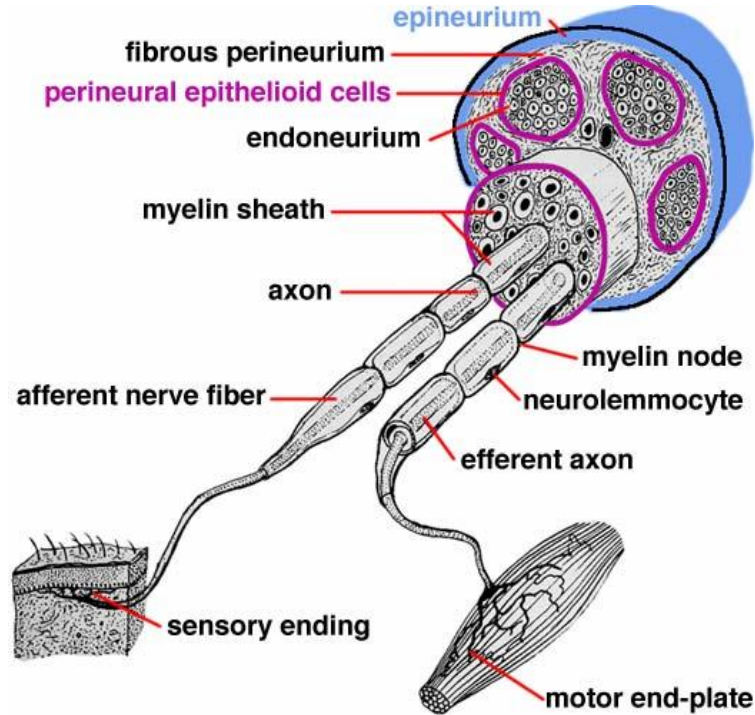
- Management in Humanitarian Settings
- Common Complications
- Adapted Clinical practice

Quick Overview

- Nerve injuries are very common in emergencies and often missed or neglected as part of initial clinical management
- Most frequently seen as part of a picture of a complex injury
- Mechanism may be direct trauma, or secondary injury due to traction or compression.
- Can result in significant disability
- Repair options may be limited in humanitarian environments

Signs of a missed nerve injury?

Quick Anatomy



Nerve Properties

Nerves cannot be stretched to lengthen in the same way that muscles can.

Under stretch, a nerve can lengthen by up to 6%, but will then recoil.

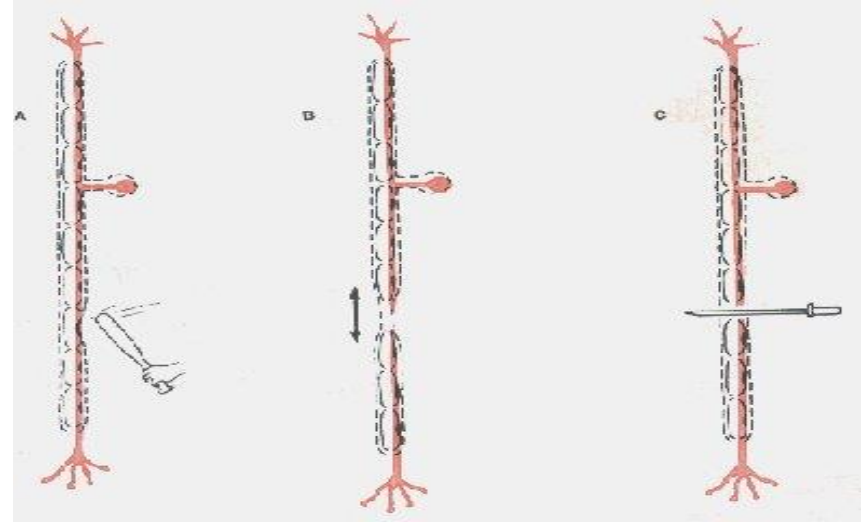
Beyond 10%, stretch results in damage to the nerve

Causes of Peripheral Nerve Injury

Lesion	Characteristic	Cause
Open	Tidy	Knife, glass etc
	Untidy	Blast, bullet, shrapnel, severe burn, open fracture.
Closed	Compression –ischaemia	Compartment syndrome, trapped limb, Bone/foreign body, Sustained posture
	Traction-Ischaemia	Fracture-dislocation

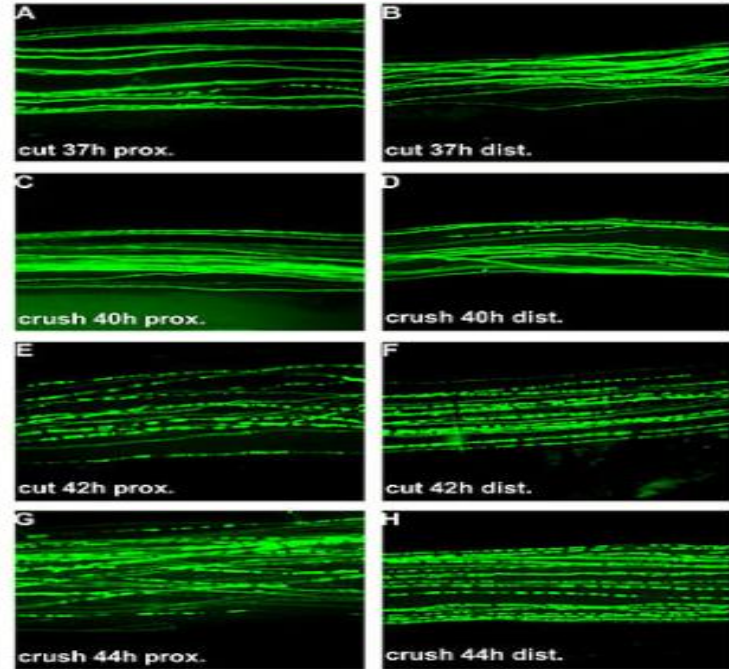
Seddon's Basic Classification of Nerve Injury

- A) Neuropraxia – nerve is intact but unable to signal – normally from compression - normally full recovery between days – months.
- B) Axonotmesis – axon damaged but structure of the nerve intact (**further divided by Sutherland** depending on intact structures) – recovery takes several months and may not be complete, especially if the injury is proximal, leading to distal endplate degeneration prior to nerve regeneration.
- C) Neurotmesis – axon and connective tissue damaged – complete cut of the nerve. Some regeneration but without surgery function will very rarely return. Surgery normally required.



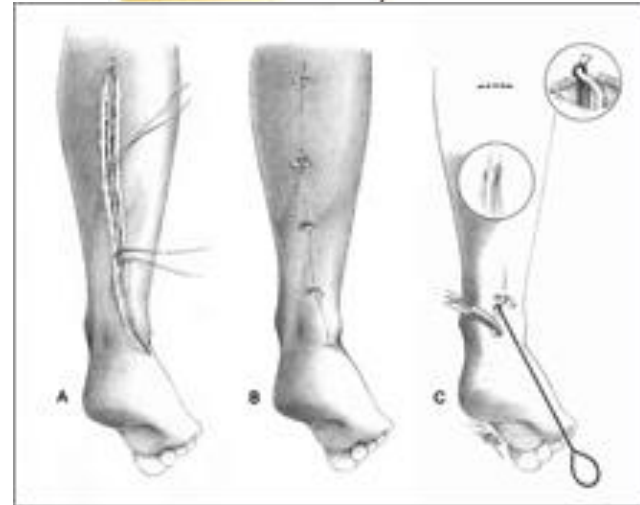
Wallerian Degeneration

- Following axotomy or neurotomy, a process called Wallerian degeneration begins where the distal axon degenerates, leaving in its place a hollow tube.



Surgery?

- **Primary (Neurorrhaphy)** – stitching the two ends together – only possible in first few days, with skeletal stability, clean cut and no significant nerve tension. Normally at the time of definitive management of an injury.
- **Grafting: Up to 2 years post injury.**
 - **Autograft:** usually taken from sural nerve
 - **Allograft** – from a donor – less successful.



Outcome of surgery

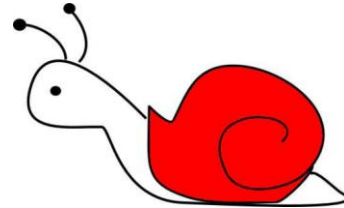
- Functional (useful) recovery in only approximately 50% of cases.

Positive indicators are:

- young age
- early repair
- single function nerves
- distal location of the repair.

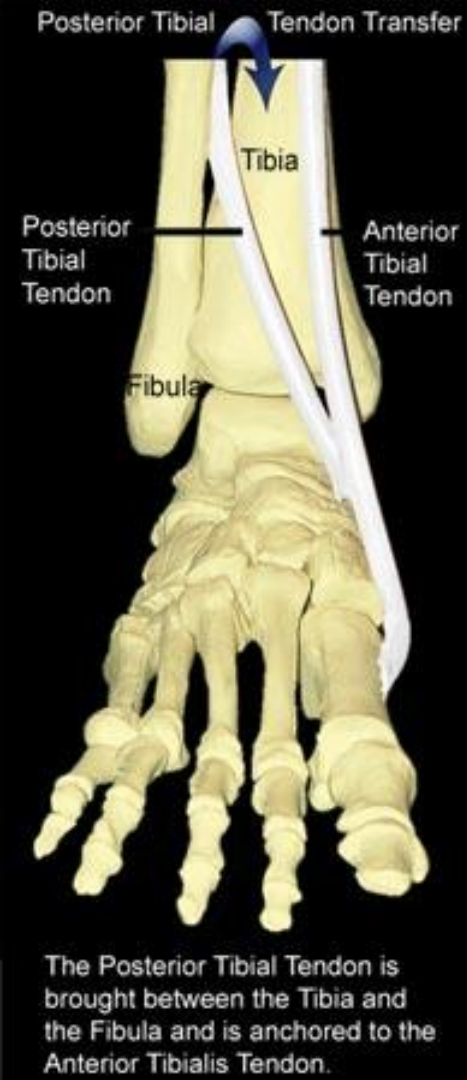
Nerve regeneration

- Nerve regeneration: at a rate of 0.5-2mm day and is proximal – distal.
- Motor endplates must be re-innervated within 18 months of injury (some say 1 year) to achieve motor recovery.
- Maximal recovery from nerve injury can take 24 months.



Other (later) options

- Tendon transfer – e.g.
- Pronator teres can act as wrist extensor if tendon transfer is completed to extensor carpi-radialis.
- Tibialis posterior can act as a dorsiflexor with peroneal nerve damage.
- Not often an option in low income settings.



Common Complications

As with other traumatic injuries, plus:

- Contracture due to loss of movement
- Injury due to loss of sensation
- Neuropathic pain



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Complex Regional Pain Syndrome II*

- Following nerve lesions – approx 5% of peripheral nerve injuries will develop CRPS type 2.
- Unknown cause
- Chronic, progressive condition causing pain that is disproportionate to the injury.
- Symptoms include severe pain, allodynia, stiffness, swelling, autonomic dysfunction (sweating, blood flow change etc)
- **Treatment:** pain control, encourage range, handling, and maintain function. Do not allow to avoid use!

**If seen without “major nerve damage” diagnose CRPS I; if seen in the presence of “major nerve damage” diagnose CRPS II*

Diagnostic criteria for complex regional pain syndrome II (CRPS)

1. The presence of an initiating noxious event, or a cause of immobilization (Otherwise CRPS 1)
2. Continuing pain, allodynia, or hyperalgesia in which the pain is disproportionate to any known inciting event
3. Evidence at some time of edema, changes in skin blood flow, or abnormal sudomotor activity in the region of pain (can be sign or symptom)
4. This diagnosis is excluded by the existence of other conditions that would otherwise account for the degree of pain and dysfunction

Adapted Clinical Practice

Essentials:

- Advice & education
- Appropriately graded exercise
- Sensory re-training
- Splinting

Nightmare scenario

- Infection
- Poor wound healing
- Secondary injury
- Late identification
- Joint contracture
- Lack of regeneration
- Hypersensitivity
- Trick movements
- Complex Regional Pain Syndrome (CRPS)

Advice & Education

1. Realistic recovery timescale
2. They can't feel ANYTHING.....the risks
3. Why a splint is important and how to care for it
4. Why the exercises are important even if it feels like nothing is changing
5. Why smoking is bad.....not just the obvious

Exercise

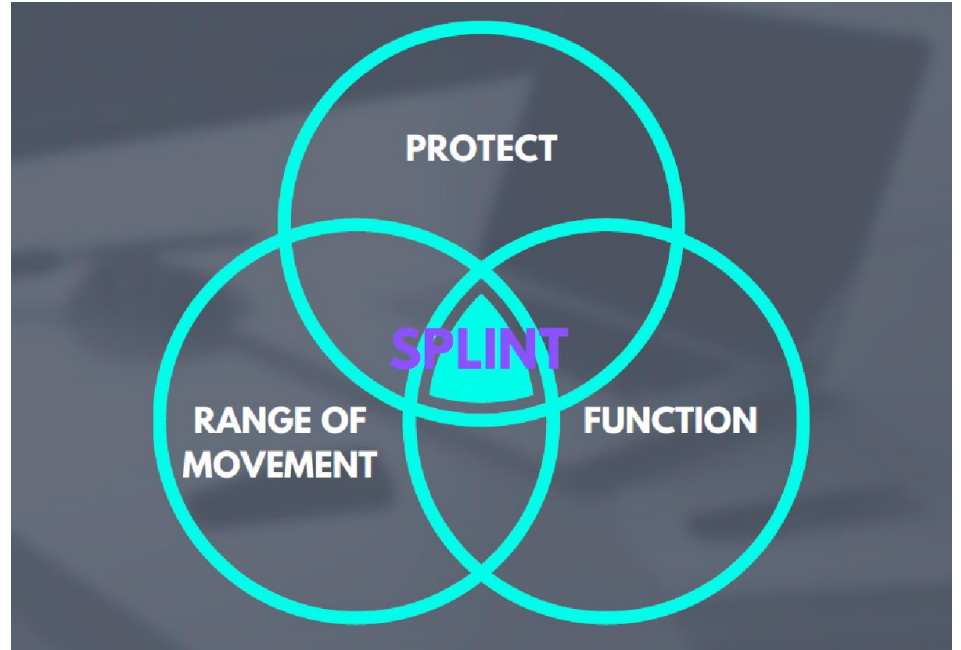
- 4-6 times daily, passive, active if able, unless contraindicated. Avoid over-stretch/traction to the affected nerve.
- Weight bear if able
- Encourage use of affected limb and normal movement patterns

Sensory Re-education

- Initial acute advice essential
- Maintain cortical representation
- Bilateral influence
- Overlay of other senses
- Texture retraining
- Grading
- Dexterity and differentiation
- Moberg pick-up test

Splinting

Reminder!



Thank you!
Any questions?