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Complex Regional Pain Syndrome of the Foot and Ankle

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Ankle Trauma

- 25 year old female twisted her ankle while walking down stairs.
- Immediate pain and swelling
- Went to the Emergency Department

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Ankle sprain

- Initial x-ray revealed no fractures.
- “Your Fine”
- Allowed to Walk

Ankle Sprain

- 3 weeks later
- Ankle remains painful
- Not improving, still on cructhes
- Swelling
- Unexpected amounts of pain
- CT scan
- Anterior process calcaneus fracture

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Anterior Process Calcaneus Fracture

- Placed in a CAMBOOT
- Appropriate at 3 weeks?
- Fracture treatment?
- Continues to have intense pain
- Swelling persists

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One Month since Fracture Presents to ME

- Ongoing Pain
- Walking with crutch
- Swelling
- Exam: Nonfocal tenderness out of proportion to touch
- Cold to touch compared to opposite side

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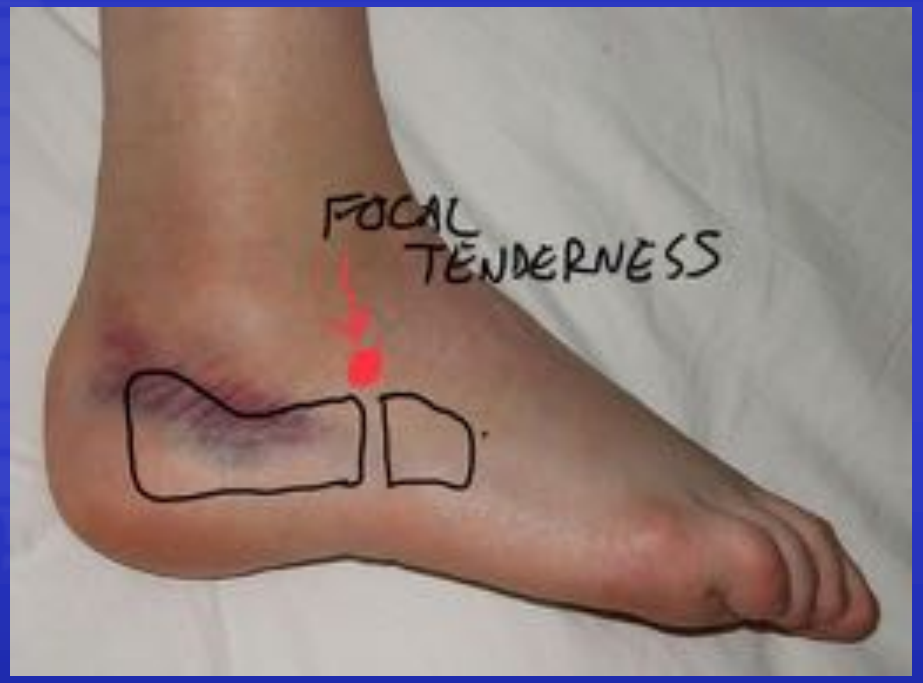
Expected Course for Fracture

- Initial CAMBOOT 3-4 weeks, then wean.
- Early Motion
- Early Weight bearing
- Swelling should reduce
- Focal tenderness improves over time
- Normal walking 4 weeks



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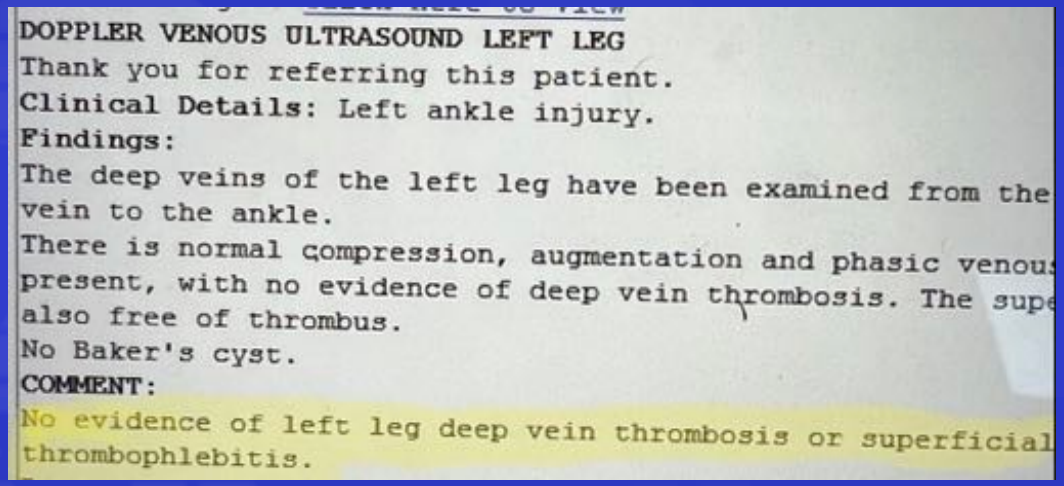
Possible causes of Symptoms

- DVT
- Other Fractures
- Complex Regional Pain Syndrome
- Sent for Duplex Doppler – rule out DVT
- Immediate treatment if positive for DVT



DOPPLER VENOUS ULTRASOUND LEFT LEG
Thank you for referring this patient.
Clinical Details: Left ankle injury.
Findings:
The deep veins of the left leg have been examined from the
vein to the ankle.
There is normal compression, augmentation and phasic venou
present, with no evidence of deep vein thrombosis. The supe
also free of thrombus.
No Baker's cyst.
COMMENT:
No evidence of left leg deep vein thrombosis or superficial
thrombophlebitis.

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Possible Causes of Symptoms

- MRI
- Expected oedema at fracture
- Generalised bone oedema
- Subcutaneous oedema
- No other findings
- CAUSE??

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COMPLEX REGIONAL PAIN SYNDROME (CRPS)

- How to identify
- Defining terms
- Mechanism of action?
- How to manage and treat
- Prevention?

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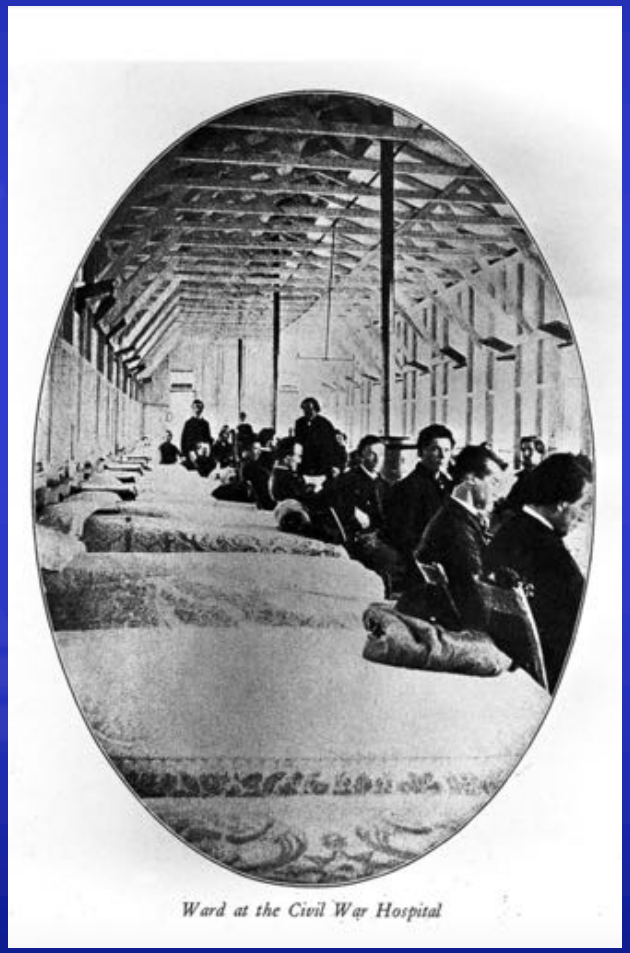
Silas Weir Mitchell

- First described Complex Region Pain Syndrome (CRPS)
- Physician from Philadelphia.
- Employed as a contract Surgeon for the Union Army during the Civil War 1860s.

Silas WeirMitchell

- Took interest in Nervous disease
- Poorly understood and unsatisfactory results
- Created a ward for wounded of Civil War Soldiers
- Treated all nerve injuries from gunshots, artillery shells, sabre swipes.
- Used electricity to stimulate nerves and muscles



Ward at the Civil War Hospital

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David Shively

- A private in the 114th Pennsylvania infantry injured in the battle of Gettysburg 1863
- 2nd day, rose to fire musket and an enemy fire smashed through his right shoulder, and shot in the face losing his right eye
- “Burning pain in the palm and fingers” of his right hand

David Shively

- Pain so intense that only remedy for relief was to keep both hands covered with loose cotton gloves, wetting periodically.
- The pain had made him so “nervous and hysterical” that his “relatives supposed him to be partially insane”

Silas Weir Mitchell

- New treatments for nerve damaged men
- Rest, along with massage and over feeding.
- “Rest Cure”
- After war treated middle class women with depression and anxiety
- Treated Virginia Woolf and Jane Addams, who rejected his treatments

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What is CRPS?

- Reflex Sympathetic Dystrophy (RSD)
- Post-Traumatic Dystrophy
- Causalgia
- Sudek Atrophy

- 1993 the International Association for the Study of Pain (IASP) came up with Complex Regional Pain Syndrome
- Two Types
  - CRPS I
  - CRPS II
- Same Criteria for both types

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CRPS I

- Development of symptoms after an initial event
- May or may not be traumatic
- Trauma 73% of cases
- Surgery 27% of cases

- Key Features
  - Spontaneous pain-nonfocal
  - Out of proportion to expected
  - Abnormal vasomotor activity

CRPS II

- Same symptoms as CRPS I
- A Definable peripheral nerve injury
- Gun shot wound
- Knife stabbing
- Blunt trauma to nerve
- Surgery
- “Causalgia”

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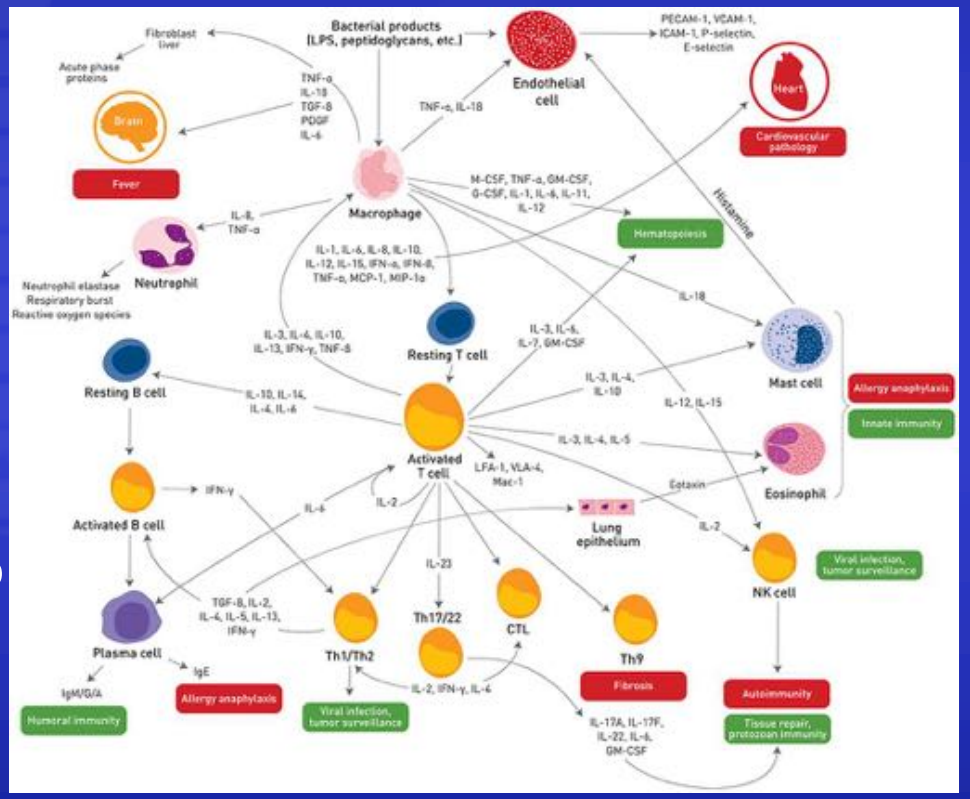
Pathophysiology

- Triad of dysfunction
  - Sensory
  - Motor
  - Autonomic
- Not fully understood
- Seems to be not one mechanism
- Not one solution, difficult to treat

- Sympathetic Nervous System dysfunction
  - Disrupts regulatory mechanisms
  - Colour changes
  - Swelling
  - Sweating

Pathophysiology

- Circulating Catecholamines
  - Norepinephrine levels low in affected limb
- Inflammatory Factors
  - Increases in TNF alpha, Inerleukin (IL)1Beta, IL-2 and IL-6, in Plasma
- Increased systemic levels of pro inflammatory neuropeptides
  - Calcitonin
  - Bradykinin
  - Substance P



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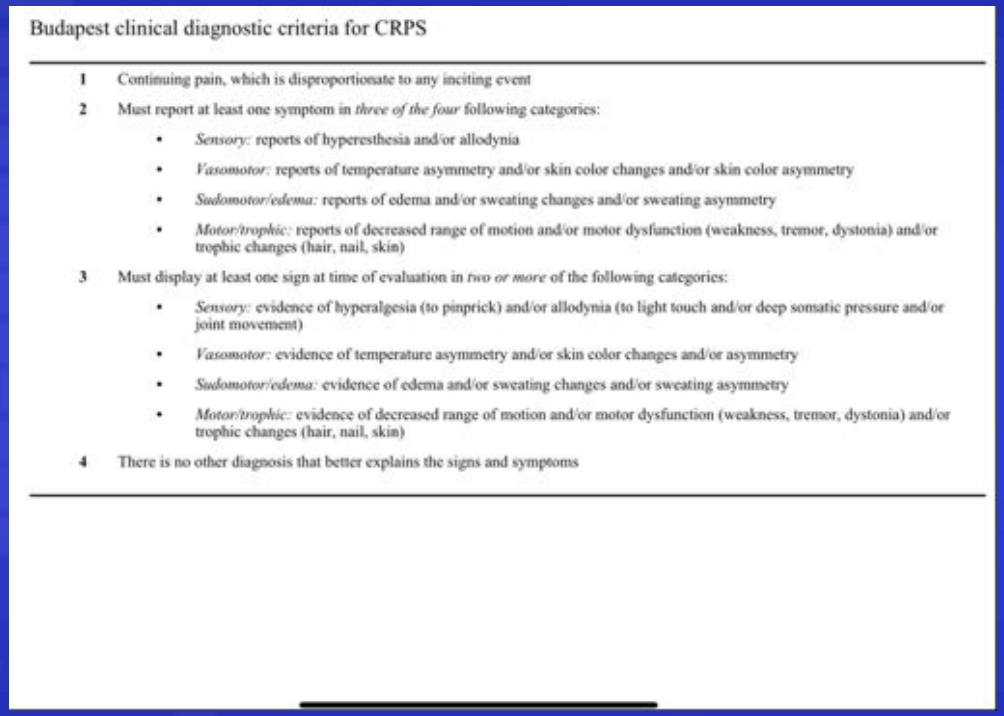
Establish Diagnosis

- Budapest Criteria
  - Established in 2003
  - Felt IASP criteria was too broad based on symptoms only
  - More strict criteria
    - 3 symptoms
    - 2 SIGNS
      - Present at physical examination



Budapest clinical diagnostic criteria for CRPS

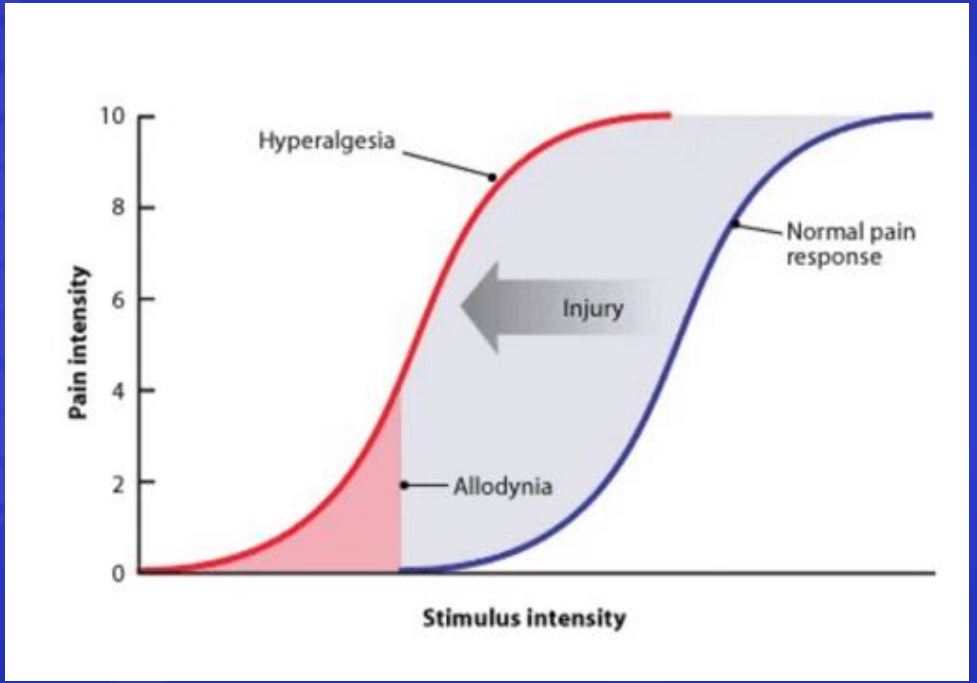
1. Continuing pain, which is disproportionate to any inciting event
2. Must report at least one symptom in *three of the four* following categories:
   - *Sensory:* reports of hyperesthesia and/or allodynia
   - *Vasomotor:* reports of temperature asymmetry and/or skin color changes and/or skin color asymmetry
   - *Sudomotor/edema:* reports of edema and/or sweating changes and/or sweating asymmetry
   - *Motor/trophic:* reports of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin)
3. Must display at least one sign at time of evaluation in *two or more* of the following categories:
   - *Sensory:* evidence of hyperalgesia (to pinprick) and/or allodynia (to light touch and/or deep somatic pressure and/or joint movement)
   - *Vasomotor:* evidence of temperature asymmetry and/or skin color changes and/or asymmetry
   - *Sudomotor/edema:* evidence of edema and/or sweating changes and/or sweating asymmetry
   - *Motor/trophic:* evidence of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin)
4. There is no other diagnosis that better explains the signs and symptoms

Budapest Criteria

- Continuing Pain disproportionate to any inciting event
- Symptoms in ¾ categories
- Physical Signs in 2 or more categories
- There is no other diagnosis the better explains symptoms

First Criteria- Sensory

- Hyperalgesia
  - An abnormally increased sensitivity to pain
  - Pin Prick
- Allodynia
  - Feeling pain from a non-painful stimuli
  - Light touch
  - Joint Movement



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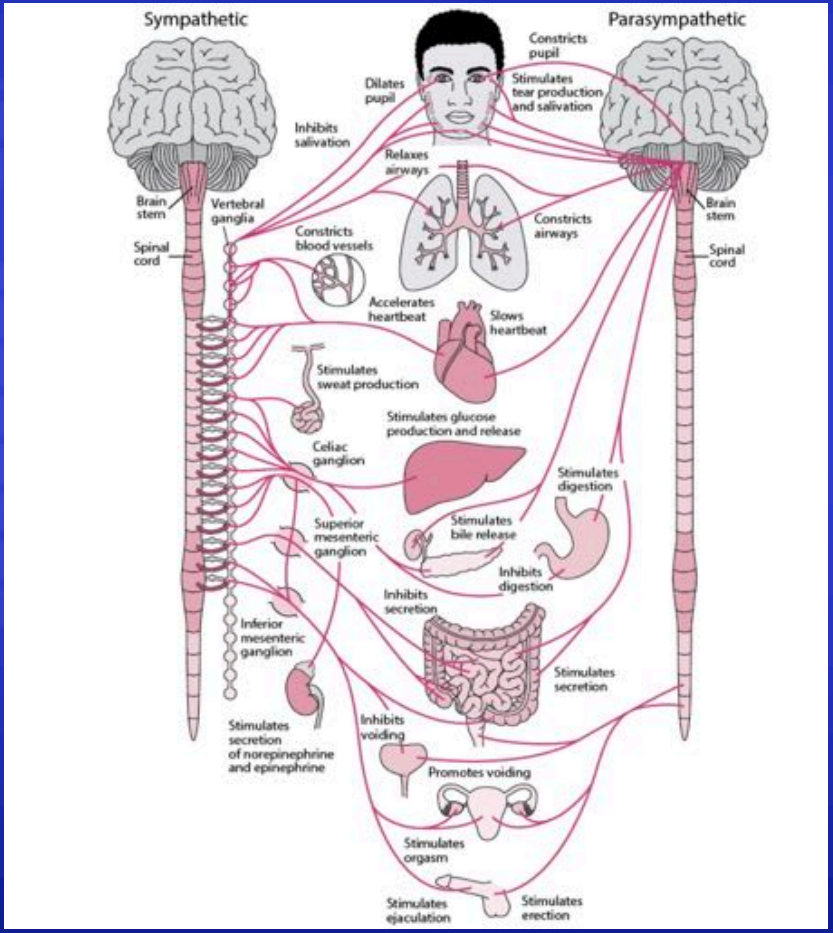
Second & Third: Vasomotor & Sudomotor Sympathetic Nervous System

- Autonomic nervous system supplies regulatory mechanisms.
  - Blood pressure
  - Regulate Body temperature
  - Production of body fluids (sweat)
- Nerves in brain stem and autonomic ganglia.
  - Ganglionic Blocks by Pain Specialists
- Norepinephrine
  - Neurotransmitter that stimulates the sympathetic response



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Second Criteria- Vasomotor

- Symptoms due to constriction or dilation of blood vessels
- Due to abnormal sympathetic function or norepinephrine

Second Criteria- Vasomotor

- Temperature asymmetry
  - 1^0 C difference is significant
- Skin colour changes
- Skin colour asymmetry

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Sudomotor

- Autonomic nervous system control of sweat gland activity
- Oedema
  - Asymmetrical swelling randomly
- Sweating- hyperhidrosis
  - Asymmetrical excess sweating not related to heat or exercise

Motor/Trophic

- Decreased range of motion
  - Loss of active motion
  - Loss of passive motion
  - Can also be caused by traumatic injury
    - Loss of ankle motion
    - Painful movement of joints
    - Investigations to rule out other causes.

Motor/Trophic

- Motor dysfunction
  - Weakness
  - Tremor
    - Involuntary muscle contraction
    - Oscillation or twitching
  - Dystonia
    - Movement disorder that causes muscles to contract involuntarily

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Motor/Trophic

- Trophic changes
  - Hair
    - Loss of hair
  - Nail
    - Discolouration
    - Brittleness
    - Lines in nail bed
  - Skin
    - Glossy appearance

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No Other Diagnosis Explains Symptoms

- Investigations to rule out other causes
  - X-rays
  - MRI
  - Bone Scan
  - EMG/NCS
  - Blood tests

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X-rays

- Usually normal
- May show mottled appearance of bones on affected side.
- Generalised Osteopaenia

MRI

- Should be normal
- May be bone marrow oedema or patchy appearance
- No stress fractures
- No arthritis

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Bone Scan

- Three Phase Bone Scan
  - Increase blood flow, pooling, and delayed periarticular uptake to the affected limb
  - May also be normal

EMG/NCS

- Rule out nerve injury
- Rule out peripheral neuropathy
- For CRPS I should be normal
- For CRPS II can be abnormal for the nerve injured.

Blood Tests

- ESR
- CRP
- Inflammatory markers
- Should be normal
  - No infection
  - No inflammatory disease

Clinical Course

- Three Phases
- Acute
  - 0-3 months
  - Warm, red, edematous, burning pain, no joint con tractures
- Dystrophic
  - 3 to 6 months
  - Cool, cyanotic, shiny, fixed contractures
- Atrophic
  - 6-12 months
  - Loss of hair, fixed contractures, muscle wasting

- Time frame to recovery varies greatly

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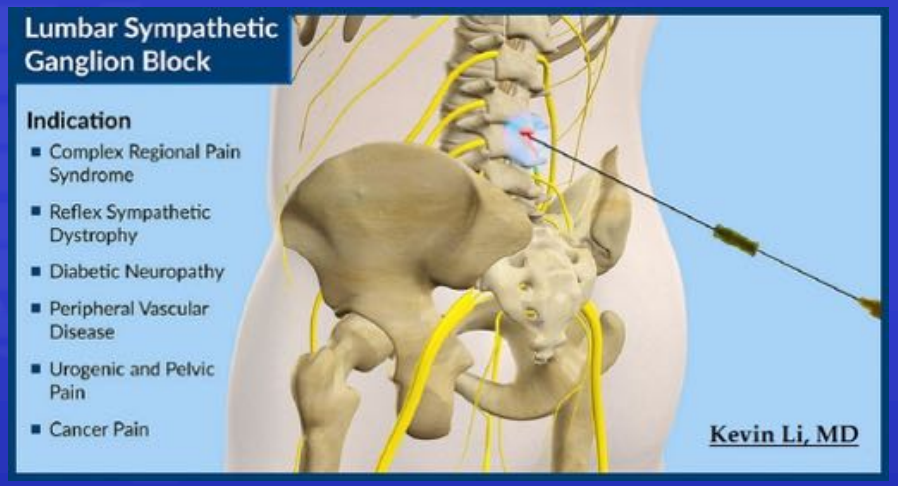
Physiotherapy

- Desensitisation
  - Different textures to try to alter reaction to painful stimulus
- Gentle movement to regain flexibility
- Control oedema
- Not aggressive so as not to exacerbate symptoms

Pain Management Specialist

- Medical Management
  - Analgesia
  - Gabapentin
    - Treat neuropathic pain
- Nerve Blocks
  - Lumbar sympathetic blocks
  - Radiofrequency ablation



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Prevention

- Meta-analyses indicated that Vitamin C after surgery is effective in preventing CRPS.
- 500mg or 1gm per day
- Can start just after injury or surgery
- One week prior to surgery

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Case Study- 25 yo female

- Doppler ultrasound- DVT negative
- MRI- trabecular oedema
- Wean the boot ASAP
- Physiotherapy- brace, ROM, desensitisation
- Referred to Pain Management

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CRPS Case

- Still symptoms 8 months since injury
  - Pain OOP
  - Swelling
- Took long time to see Pain Management- get them involved early
- Walking improved
- Swelling reduced
- Joint movement good
- Overall improvement

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SUMMARY

- Early detection of CRPS is essential for early treatment to optimise outcome
- Clinical diagnosis, symptoms different from expected course
- Use of Vitamin C with all injuries and surgeries
- Tests done to rule out other causes
- Treatment is ACTIVE
  - Physiotherapy
  - Pain Management
  - Psychology

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Thank you for Listening

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