Complex Regional Pain Syndrome

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Silas Weir Mitchell

- Born in Philadephia PA February 15, 1829 – January 4, 1914
- received the degree of M.D at Jefferson Medical College in 1850
- During the Civil War (1861-1865), he was in charge of treating nerve injuries at Turners Lane Hospital, Philadelphia

Causalgia: CRPS type II

- Turner's lane hospital was the first neurological research center J Hist Neurosci. 1993 Apr;2(2):135-42.
- The term *causalgia* was first used by SL Mitchell in 1867.
- "Causalgia: the most terrible of all tortures which a nerve wound may inflict."

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CRPS: The Challenge

Of all the chronic neuropathic pain syndromes, none has perplexed patient, clinician, and scientist more than the complex regional pain syndromes (CRPS).

Bonica's Management of Pain 3rd Ed. Lippincott Williams & Wilkins; 2001:388.

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Complex Regional Pain Syndrome

- Disease overview
  - History
  - Epidemiology
  - Diagnosis
  - Pathophysiology
- Interdisciplinary treatment

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History of CRPS

- The term *causalgia* was first used by SL Mitchell in 1867.
- The first reported descriptions of a non neuralgic chronic pain disorder associated with localized vasomotor changes were in 1895,
- Bonica suggested the term *reflex sympathetic disorder* in 1953.

•Bonica's Management of Pain 3rd Ed. Lippincott Williams & Wilkins; 2001 P389.

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History of CRPS

- International Association for the Study of Pain (IASP) renamed RSD as CRPS in 1993
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  - Complex: varied clinical features
  - Regional: majority of cases involve a region of the body, usually an extremity
  - Pain: essential to the diagnosis

Bonica's Management of Pain 3rd Ed. Lippincott Williams & . 2001 P389

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CRPS Type *I*

- The presence of an initiating noxious event , or a cause of immobilization
- Continuing pain, allodynia, or hyperalgesia with which the pain is disproportionate to any inciting event
- Evidence at some time of edema, changes in skin blood flow (Skin color changes, skin temperature changes more than 1.1º) or abnormal sudomotor activity in the region of pain
- Diagnosis is excluded by the existence of conditions that otherwise would account for the degree of pain and dysfunction

Bonica's Management of Pain 3rd Ed. Lippincott Williams & Wilkins; 2001 p 389

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CRPS Type *II*

- CRPS Type II is differentiated from Type I by a definable nerve lesion.

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Epidemiology

- Age at evaluation: 41years (range, 4-84)
- Gender: 3:1, female-to-male ratio
- Location:
  - Majority cases are unilateral in a distal extremity with relatively equal distribution between the upper and lower extremity.
- Number physician evaluations prior to referral: 4.8(1-20)

Allen G and Schwarz et al. Pain. 1999; 80:539-544.

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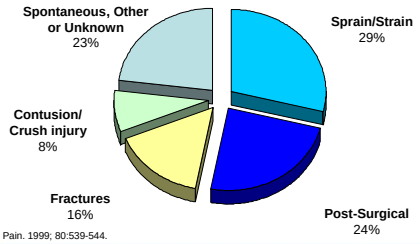
Majority of Patients Develop CRPS After Injury or Surgery



Allen G et al. Pain. 1999; 80:539-544.

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Patterns of Spread in CRPS Type I

- Retrospective analysis of 27 CRPS Type I patients who experienced a significant spread of pain
- Results: 3 patterns of spread defined
  - Contiguous (n=27): gradual and significant enlargement of the area affected naturally
  - Independent (n=19): appearance of CRPS I in a location that was distant and non-contiguous with the initial site
  - Mirror image (n=4): symptoms on the opposite side in area that closely matched the site of initial presentation
- Conclusion: Spread may not be a unitary phenomenon
  - Contiguous – local spread of pathology
  - Independent – generalized susceptibility
  - Mirror image – abnormal neural functioning spread via commissural pathways
  - Three kinds of spread – may be aberrant CNS regulation of neurogenic inflammation

Maleki J et al. Pain. 2000;88:259-266.

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CRPS Signs/Symptoms

- Allodynia: Pain due to a stimulus which does not normally provoke pain.
- Hyperalgesia: An increased response to a stimulus which is normally painful.
- Hyperesthesia: Increased sensitivity to stimulation.

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CRPS Signs/Symptoms

- **Sensory**
- Pain 'Burning'
- Hyperesthesia
- Hyperalgesia
- Allodynia

- **Motor**
- Decreased ROM
- Weakness
- Tremor
- Dystonia

Harden RN et al. Pain. 1999;83: 211-221, Birklein F, Pain. 2001;94:1-6.

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CRPS Signs/Symptoms

- **Sudomotor/Edema**
- Edema
- Sweating changes
- Sweating asymmetry

- **Vasomotor**
- temperature asymmetry
- Skin color changes

Harden RN et al. Pain. 1999;83: 211-221, Birklein F, Pain. 2001;94:1-6.

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CRPS Signs/Symptoms

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Diagnostic Criteria for CRPS: Balancing the Needs of Clinicians and Investigators

- Scientists need specificity
  - Strict criteria to reduce sampling errors (non-cases designated as cases)
  - Could confound the results of an clinical trial
  - Lead further investigations astray
- Clinicians need sensitivity
  - More relaxed boundaries to avoid the clinical sin of missing cases that might benefit from a particular treatment trial

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Diagnostic Criteria for CRPS: Balancing the Needs of Clinicians and Investigators

- 2003 closed consensus workshop
  - Budapest, Hungary
  - 35 professionals, 7 countries, invitation only
  - Discussion of
    - Diagnostic criteria
    - Review of criteria and terminology
    - Treatment

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Proposed New Diagnostic Criteria for Complex Regional Pain Syndrome

- **Table 3** Proposed clinical diagnostic criteria for CRPS (2003)
- **To make the clinical diagnosis, the following criteria must be met:**
- 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 temperature sensation and/or deep somatic pressure and/or joint movement)
- **Vasomotor**: Evidence of temperature asymmetry (>1°C) 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
- For *research* purposes, diagnostic decision rule should be at least one symptom *in all four* symptom categories and at least one sign (observed at evaluation) in two or more sign categories.

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Proposed New Diagnostic Criteria for Complex Regional Pain Syndrome

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Proposed New Diagnostic Criteria for Complex Regional Pain Syndrome

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4. There is no other diagnosis that better explains the signs and symptoms

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Laboratory Testing

- Diagnosis of CRPS based on clinical criteria
- Tests and procedures are available that can provide information about autonomic, sensory, and motor function and dysfunction
  - Bone scan
  - Thermography
  - Radiologic images
  - Electromyography/Nerve conduction studies
  - Sympathetic nerve blocks

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Differential Diagnosis

- Unrecognized local pathology
- Neuropathic pain syndromes
- Peripheral neuropathies
- Inflammatory and Infectious disorders
- Vascular disorders

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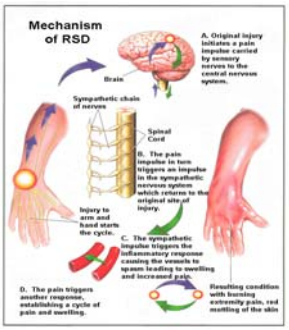
Pathophysiology

- Most likely CRPS is developed and maintained by abnormalities throughout the neuraxis including Central, Peripheral and Autonomic Nervous Systems



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Pathophysiology

- Pathophysiological considerations include:
  - Neurogenic inflammation
  - Impairment of sympathetic function
  - Coupling between sympathetic efferents and nociceptive afferents

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Treatments

- Rehabilitation
- Pain management
- Psychological treatment

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- Interdisciplinary treatment: simultaneous and time-contingent
- Therapeutic options in response to patient's clinical progress in rehabilitation pathway
- Failure to Progress necessitates more advanced pain management and psychological approaches

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Rehabilitation

- Mainstay of CRPS treatment
- Physiotherapeutic Algorithm based on:
  - motivation
  - desensitization
  - mobilization
- Pain management and psychological measures facilitate progression through rehabilitation pathway

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Psychological Treatment

Early in Disease Process:
(4-6 weeks of onset)
Education

Disease Progression:
(6-8 weeks of significant symptoms)
•Assessment and treatment of Axis I Disorders (e.g. depression, anxiety)
•Pain Coping Skills
•Biofeedback/Relaxation Training

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Pain Management

- Initial Treatment
  - Oral and topical medications
- Partial or Inadequate Response: Minimally Invasive
  - Sympathetic nerve blocks
  - Intravenous regional blocks
  - Somatic blocks
- Partial or Inadequate Response: More Invasive
  - Epidural/Plexus catheter blocks
  - Neurostimulation
  - Intrathecal drug delivery

Stanton-Hicks M et al. Pain Practice. 2002; 2:1-16.

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Pharmacotherapy

- Antidepressants (TCAs)
- Anticonvulsants
- NSAIDs, opioids, NMDA receptor antagonists

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Nerve Blocks

- Sympathetic
- Regional IV
- Somatic
- Epidural or plexus

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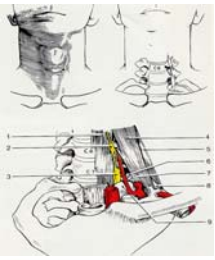
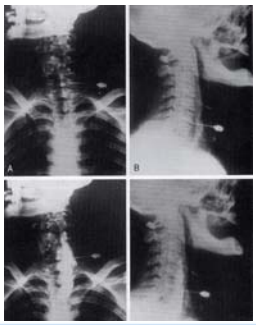
Sympathetic Blocks (Stellate Ganglion Block)





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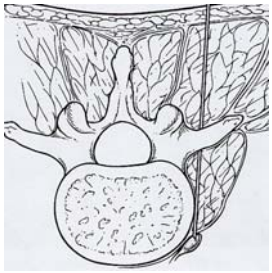
Lumbar Sympathetic Block



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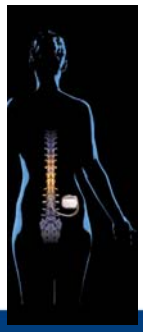
Neurostimulation

- Spinal cord stimulation (SCS)
  - Type I and Type II
- Peripheral nerve stimulation (PNS)
  - Consider in Type II if symptoms limited to single nerve distribution



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Study	Results	Complications
Kemler, 2000 Randomized, Controlled N=54, (36 SCS+PT – 24 received permanent implant, 18 PT) Follow-up = 6 months	·VAS scores decreased 2.4 cm in SCS+PT vs increased .2 cm in PT (p < .001) ·The proportion of patients with a score of 6 ("much improved") for the global perceived effect was much higher in SCS+PT vs. PT only (39% vs. 6%) (P=.01). ·The health related quality of life improved in the patients who actually underwent implantation of SCS. VAS decreased 3.6 cm in this group ·No improvement in function	6 of 24 patients had a total of 11 complications
Bennett, 1999 Retrospective multicenter N=101 (Grp I=30, Grp II=71) Avg follow-up: Grp I = 18.7 mos., Grp II = 23.5 mos.	·Group 1 single lead quad systems, II dual lead octapolar systems ·VAS decreased 3.7 in group I (p<.0001) and VAS decreased 6 in group II (p<.0001) ·Percentage overall satisfaction 70% in group I (p<.05) and 91% in group II (p<.05)	20 total complications, (12 in 30 grp I pts, 8 in 71 grp II pts)
Oakley and Weiner, 1999 Prospective, 2 center N=19, 10 Assessable Avg Follow-up: 7.9 Months	·VAS decreased from 6.7 pre-implant to 4.5 post-implant ·9/10 patients thought stimulation was worthwhile ·30% full relief, 70% partial relief-80% obtained at least 50% pain relief ·Sickness Impact Profile and McGill Pain Rating Index significantly improved (p<.05), Beck Depression Inventory showed trend toward improvement	4 patients had complications (lead repositioning or replacement and IPG implanted deeper)
Cavillo,1998 Retrospective N=36 (24 SCS, 5 PNS, 7 SCS+PNS) Follow-up: 35 months	·Pain (as measured by VAS) 45.3% better with SCS (p<.0001), 51.3% better with PNS (p<.0001), 63.5% better with both (p<.0001). ·50% decrease in narcotic intake in 44% of pts; in remainder, analgesic 80% more effective. ·QOL improved in "most" ·41% RTW on modified duty	5 patients had complications (2 infection at generator site, 2 lead migration, 1 psychosis)
Kumar, 1997 Retrospective N=12 Avg Follow-up: 41 months (range 6 - 89 months)	·100% of patients experienced good (50-74%) to excellent (75-100%) long term relief of pain (measured by VAS and modified McGill Pain Questionnaire) ·Only 17% of patients still required occasional narcotic medication	5 lead-related complications

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Intrathecal Drug Delivery

- Inadequate response to more conservative therapies
- Long-standing disease
- Multi-limb involvement
- Palliative care needed
- Psychological evaluation
- Absence of drug-seeking behavior

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Summery

- Early diagnosis and treatment.
- Interdisciplinary team care approach.
- Rehabilitation facilitated through pain management and psychological treatments.
- Interventional pain management measures are necessary to facilitate rehabilitation in certain cases.

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