

INTERVENTIONAL PAIN CARE: How to decide what is right for you?

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Burning neuropathic pain that seemingly out of proportion to the degree of injury that significantly causes significant functional disability that are generally refractory to conventional medical treatment for pain syndromes.

**WHAT IS CRPS? | WHAT IS RSD?
CRPS TYPE I | CRPS TYPES II**

PAIN

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CRPS I

This is often known as reflex sympathetic dystrophy, or RSDS. This affects 90 percent of sufferers of CRPS. CRPS type 1 comes about after damage to a limb that didn't directly affect a nerve.

CRPS II

Causalgia. This version of CRPS occurs after direct damage to a nerve in the affected limb. In this type, the pain does not migrate from the affected limb, as it can do in Type 1.



Consequences

Severe Pain leads to guarding, disuse and ultimately contractures and or regional osteoporosis.



Source: American College of Rheumatology and Radiology ^{1,2}

Budapest Clinical Criteria

Continuing pain that is disproportionate to any inciting event.

At least 1 symptom reported in at least 3 of the following categories:

- Sensory: Hyperesthesia or allodynia
- Vasomotor: Temperature asymmetry, skin color changes, skin color asymmetry
- Sudomotor/edema: Edema, sweating changes, or sweating asymmetry
- Motor/trophic: Decreased range of motion, motor dysfunction (eg, weakness, tremor, dystonia), or trophic changes (eg, hair, nail, skin)

At least 1 sign at time of evaluation in at least 2 of the following categories:

- Sensory: Evidence of hyperalgesia (to pinprick), allodynia (to light touch, temperature sensation, deep somatic pressure, or joint movement)
- Vasomotor: Evidence of temperature asymmetry ($>1^{\circ}\text{C}$), skin color changes or asymmetry
- Sudomotor/edema: Evidence of edema, sweating changes, or sweating asymmetry
- Motor/trophic: Evidence of decreased range of motion, motor dysfunction (eg, weakness, tremor, dystonia), or trophic changes (eg, hair, nail, skin)

No other diagnosis better explaining the signs and symptoms

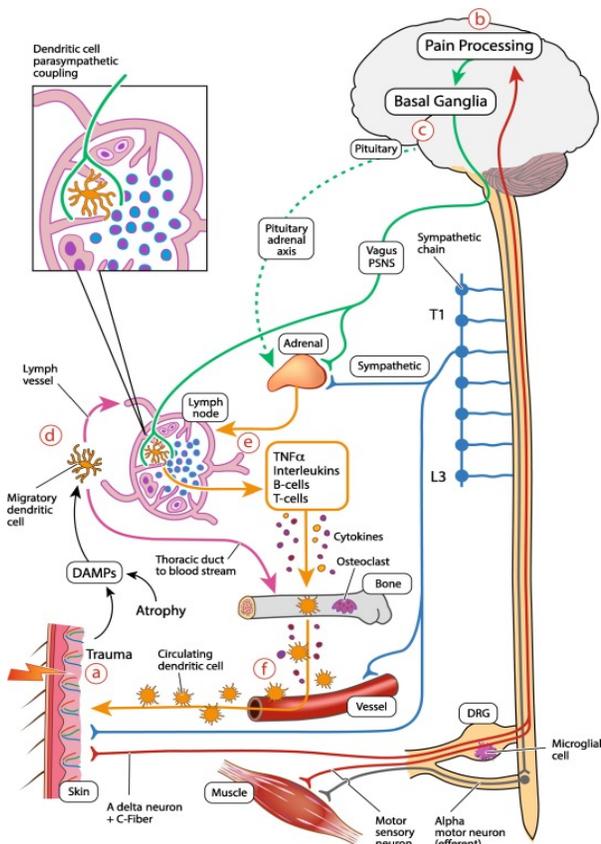
sensitivity was 0.85 and the specificity was 0.69



“There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know.”

- Donald Rumsfeld

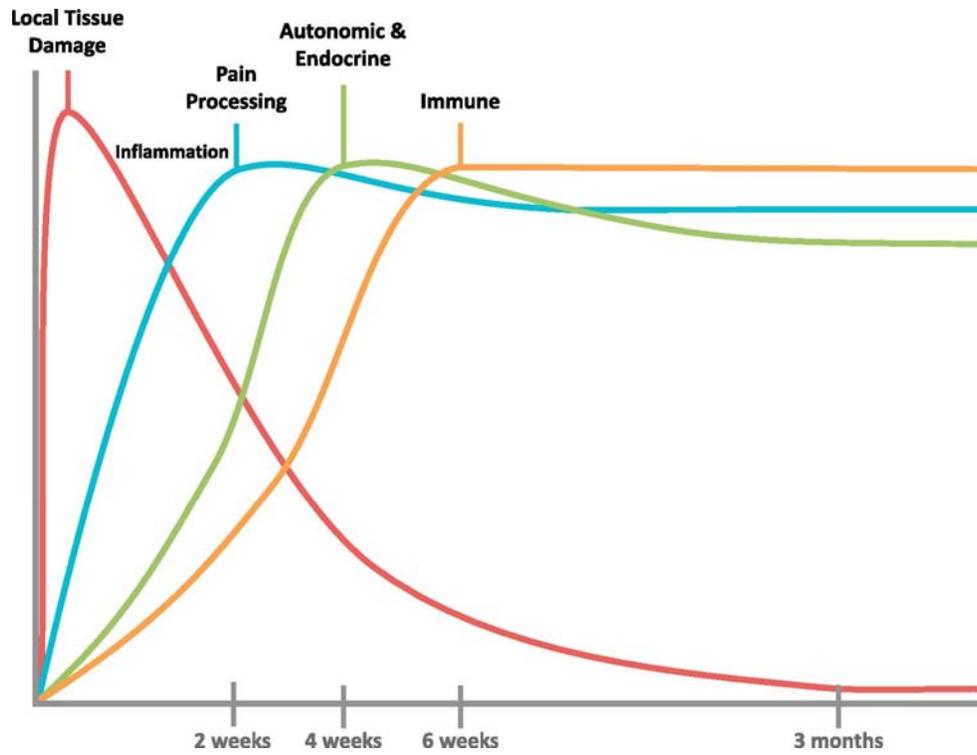
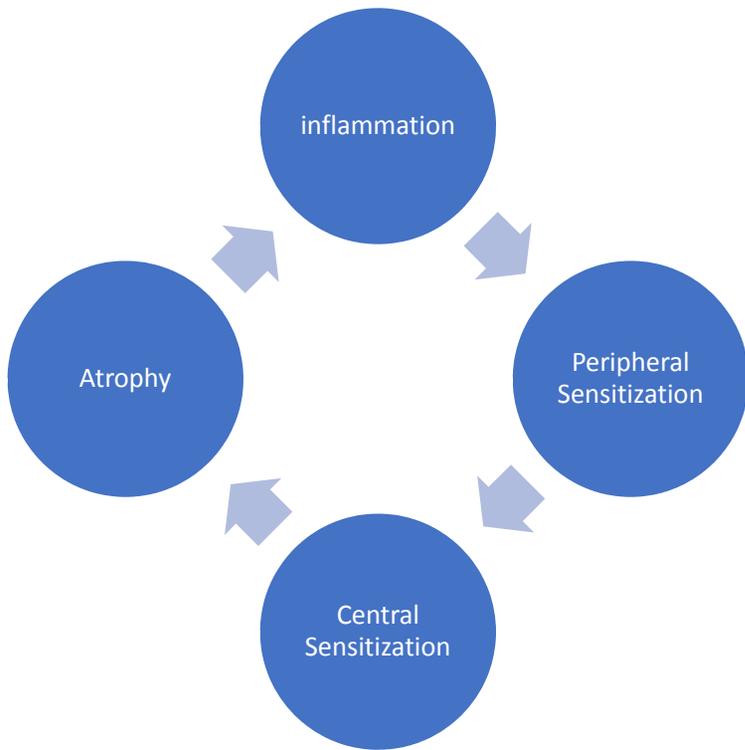




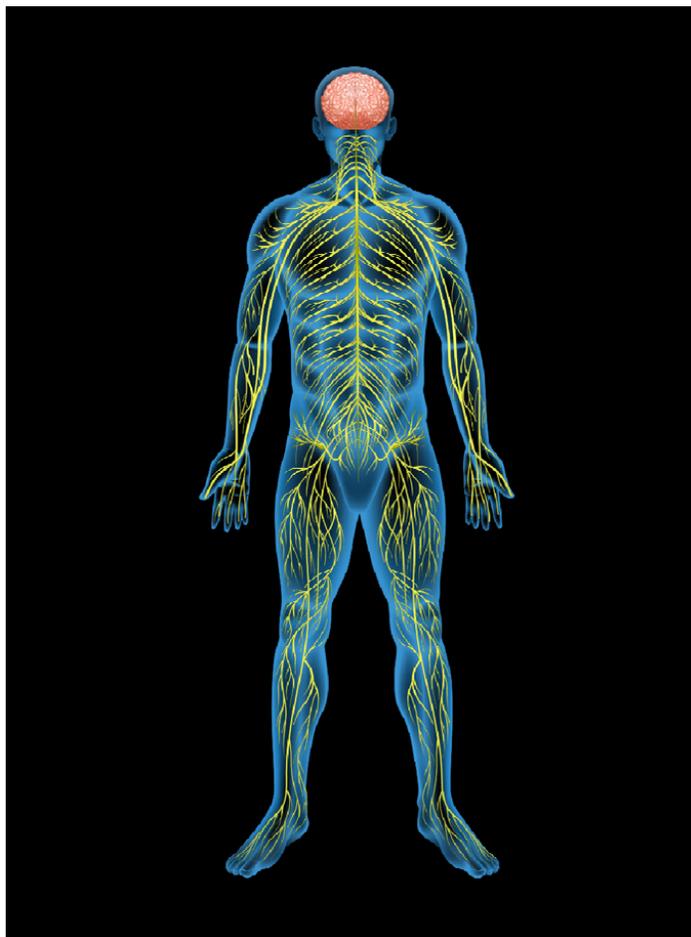
Proposed Mechanisms

- Injury
- Inflammation
- Peripheral Sensitization
- Central Sensitization
- Disuse and Atrophy

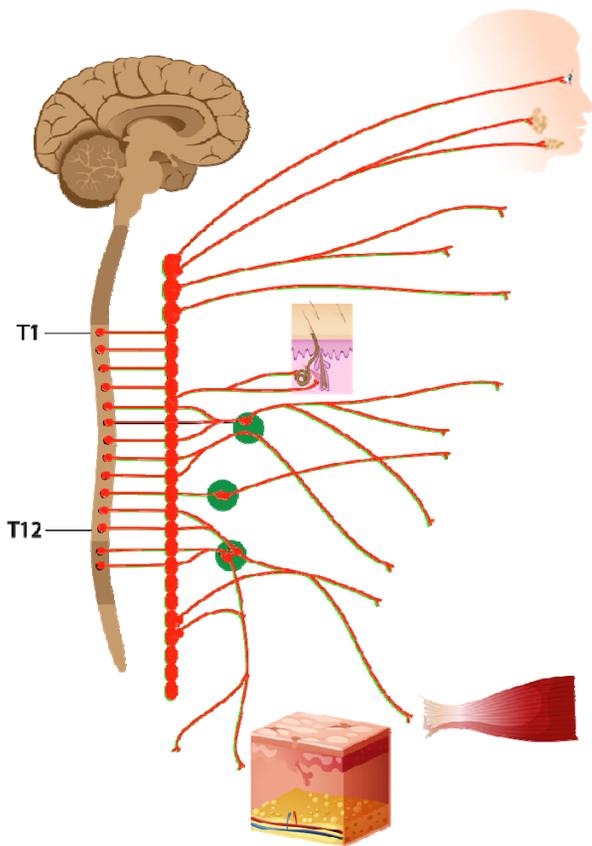
Source: Russo M et Al ³



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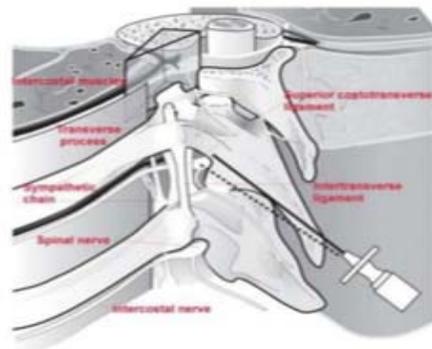
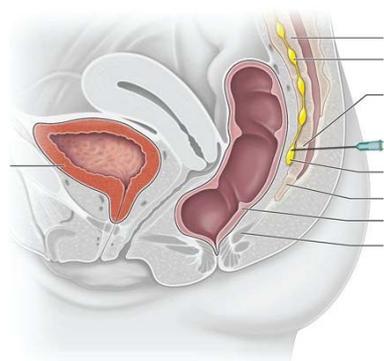
Interventional Treatments are directed at one more aspects of the self perpetuation of maintenance of CRPS with goals to break the pain cycle.



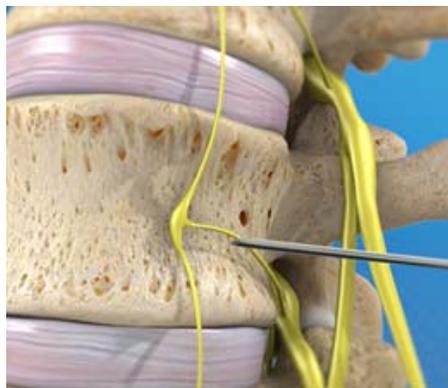
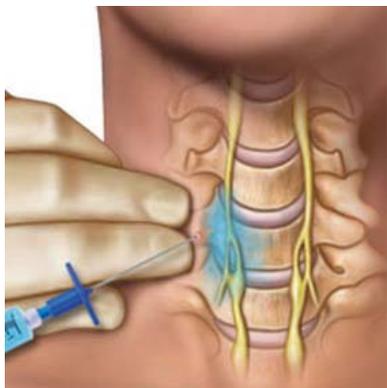
Sympathetic Nerve Blocks

- Aims to shut down the sympathetic system
- Works on patient with early CRPS with color changes, swelling, skin changes and pain, chance to put patient into permanent remission
- Maybe helpful in patients with late CRPS during flares
- Usually requires a series of 3 – 6 injections 1 – 2 weeks apart (1 treatment cycle)
- Injections are usually guided by ultrasound or fluoroscopy

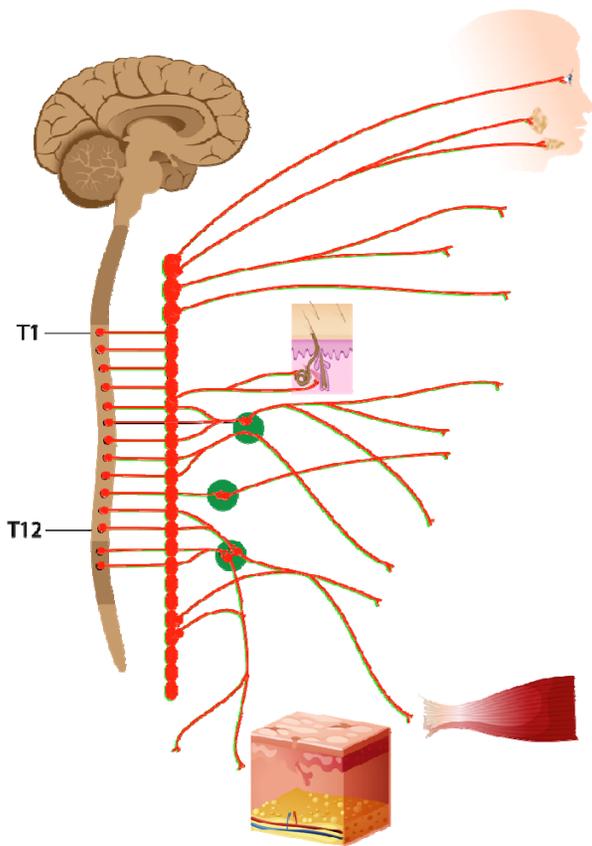
- **Stellate Ganglion**
Head and Neck CRPS, Upper extremity CRPS
- **Thoracic Sympathetic Blocks**
Truncal CRPS
- **Lumbar Sympathetic Blocks**
Lower extremity CRPS
- **Ganglion of Impar**
Pelvic CRPS



Injection of local anesthetics around the target causes sympathectomy and pain relief.



Due to rapid absorption of local anesthetics repeated injections are often needed to increase duration.



Radio Frequency Ablations

- Aims to shut down the sympathetic system.
- Works on patient with early CRPS with color changes, swelling, skin changes and pain, chance to put patient into permanent remission.
- Works on late CRPS if patient did get transient relief from local anesthetic blocks.
- Extend the duration of the sympathectomy if blocks with local anesthetics are transient.



STRAIGHT SHARP



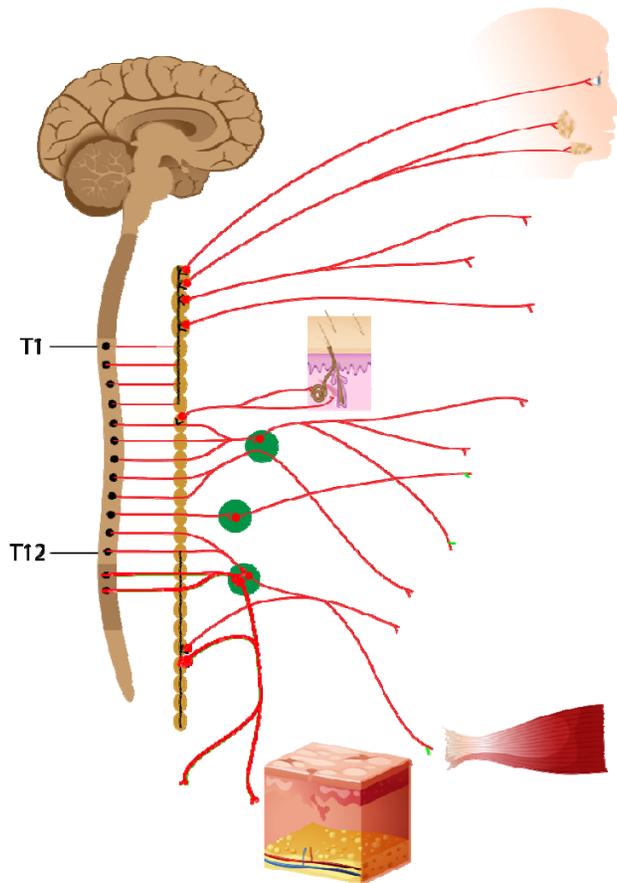
CURVED SHARP



CURVED BLUNT



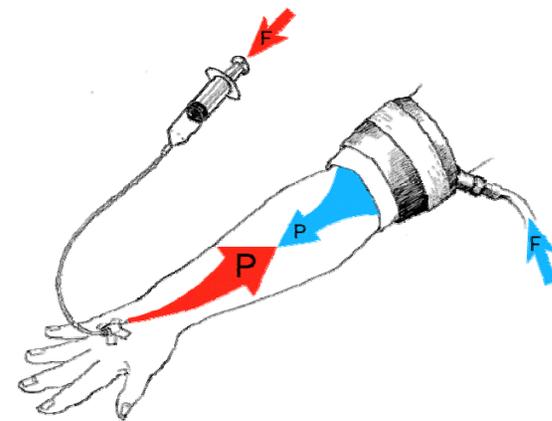
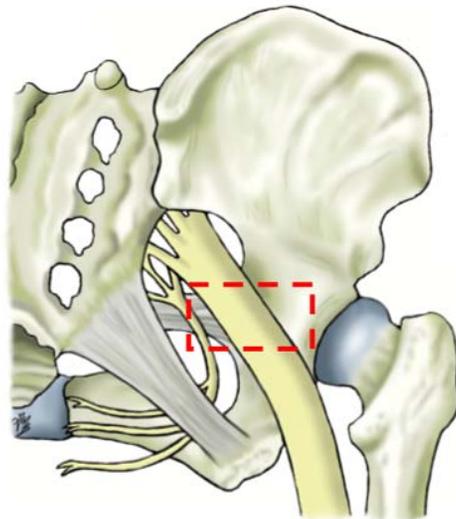
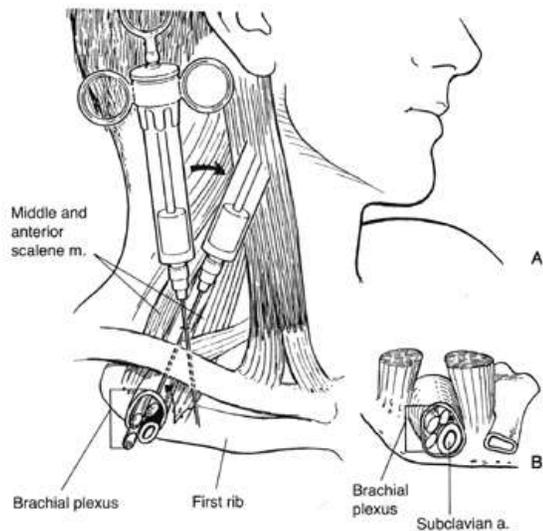
- Uses heat to lesion the nerves to cause prolonged duration of sympathectomy
- Efficacious if near the anatomical site
- Anatomical variances is a challenge
- Tissue damage around lesion maybe another source of pain



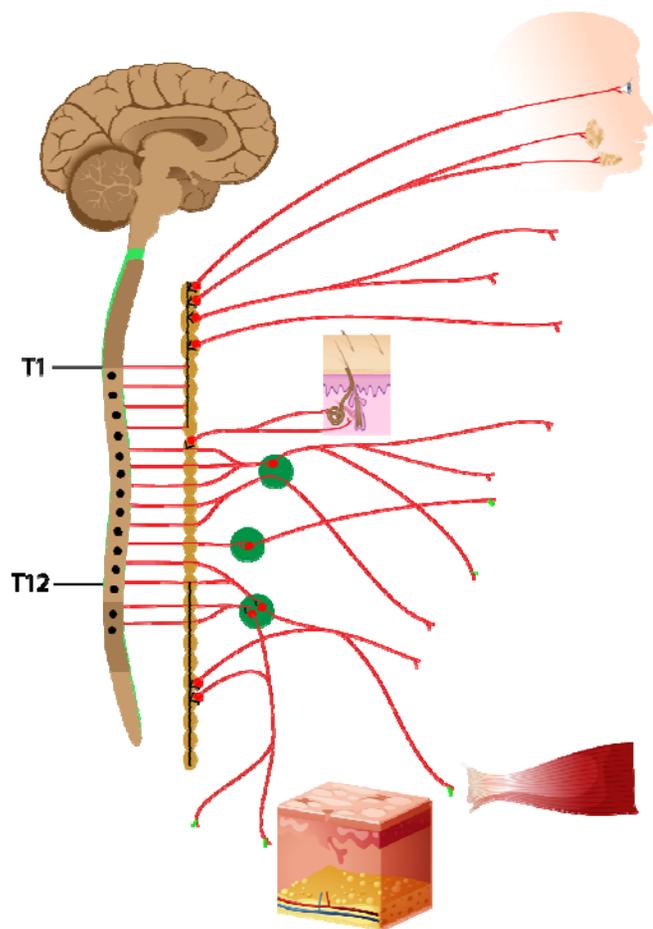
Peripheral Nerve Blocks

- Aims to shut down the pain fibers in the peripheral nervous system.
- Works on Patient with early CRPS < 6 month since diagnosis.
- May work to reduce flares in patients with late CRPS who are not good candidate for other targets, salvage therapy only.
- Injections are usually guided by ultrasound or fluoroscopy.

- Bier Blocks are indicated for upper and lower extremity CRPS.
- Sciatic and Brachial Plexus Blocks are indicated for upper and lower extremity CRPS.
- Few cases are described but not the main line of treatment.

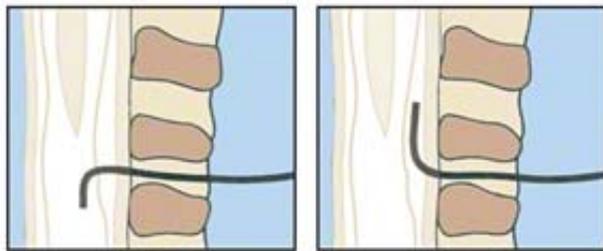
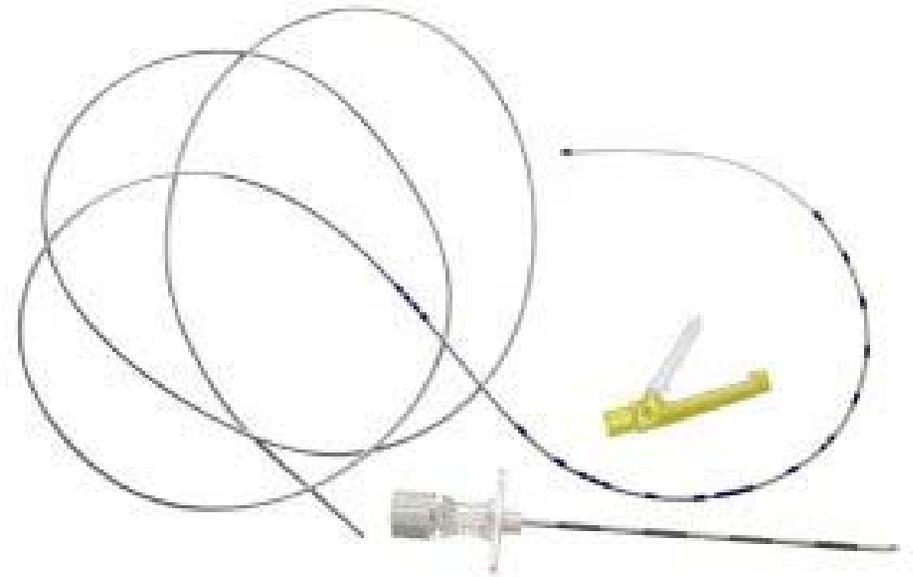


- Injection of Local anesthetic with or without clonidine to decrease spontaneous discharge of the affected nerves.
- Efficacious but usually requires sedation since the injections are on the same limb as CRPS.
- Usually Requires Multiple Blocks to achieve an acceptable duration of relief.

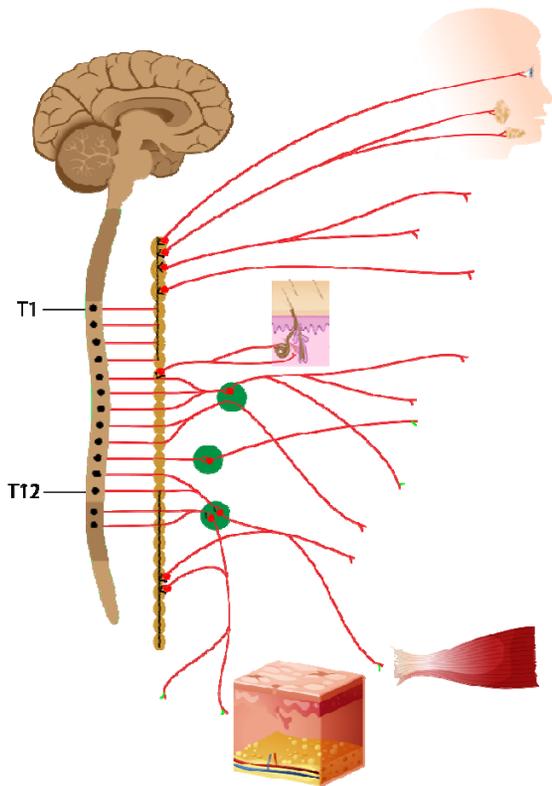


Epidural Infusions

- Useful in treatment of Early or Late CRPS.
- As an alternative to neuromodulation or pediatric cases.
- Infusions can be done either as an short term (5 – 7 days) as an inpatient or long term infusions as outpatient.
- Placed with fluoroscopic guidance.



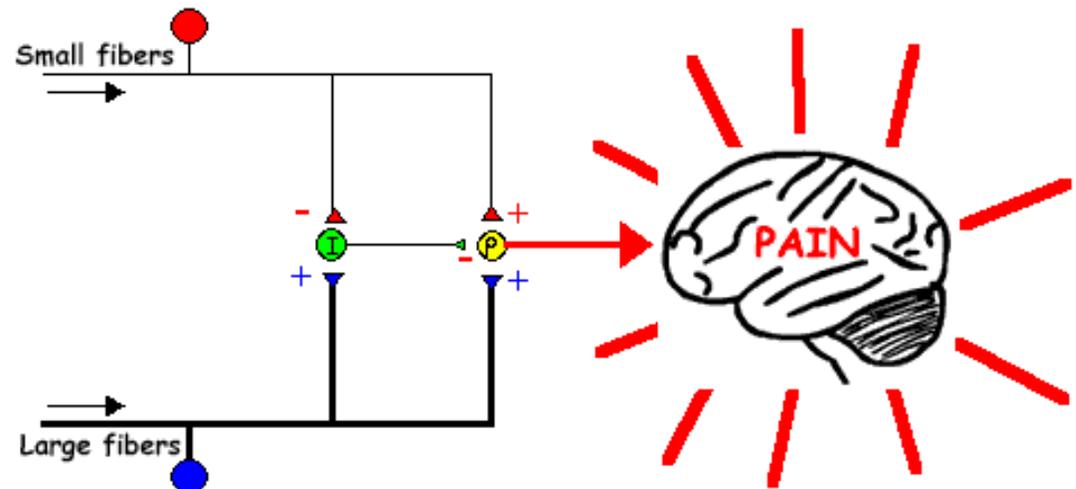
Spinal Cord Stimulation and DRG Stimulation



- Useful Early that has failed non surgical treatment or Late CRPS.
- Useful in patients who have nerve blocks and epidural infusion that had very transient benefit but without increases in duration.
- Trial phase involves placing percutaneous leads to test if the painful areas can be covered. Usually lasts about 5 – 7 days.
- If greater than 50% relief, then an more permanent system can be implanted for long term management.

Melzack and Wall's Gate Theory

Stimulation of the large fibers in the spinal cord can shut off the ability for the small fibers to convey pain.



Source: University of Washington ⁴

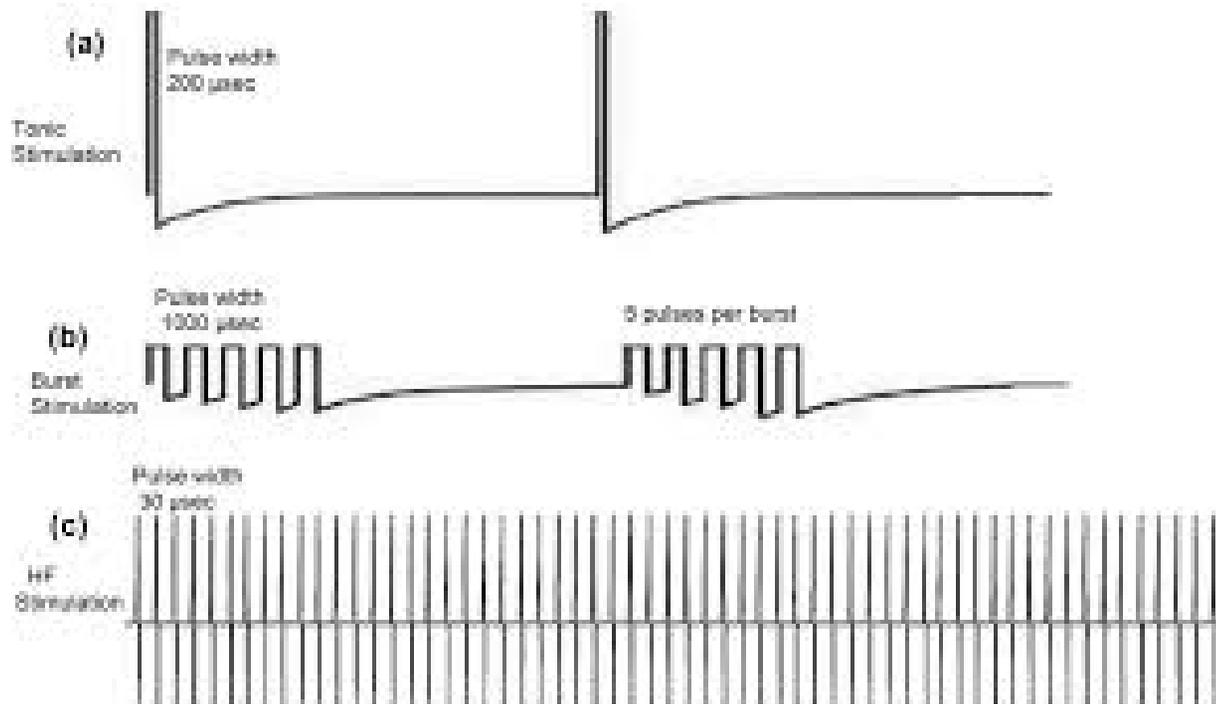


Proposed Reason of Failure of Therapy

- Lead Migration
- Increased pain at battery site
- Therapy Tolerance
- Spread of the disease beyond area of coverage

Solutions?

- Lead Migrations – Better Anchoring Devices
- Increased pain at battery site – Miniaturization of the battery
- Therapy Tolerance - ??
- Spread of the disease beyond area of coverage - ??

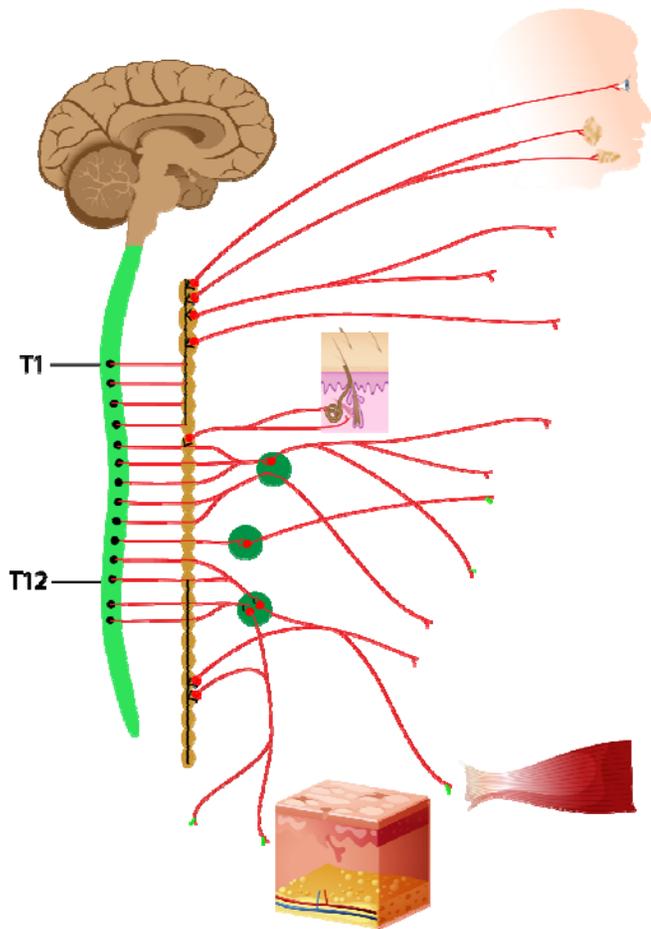




DRG Stimulation

- Less energy consumption leading to potentially better longevity in therapy due to decrease in tolerance.
- ACCURATE study showed DRG stimulation had a higher rate of treatment success (81.2%) compared with the treatment success rate for traditional SCS (56.7%) at 1 year.
- Only useful in covering focal area of CPRS bellow T10, not indicated for CRPS of the upper extremities. Maybe more technically challenging to place.

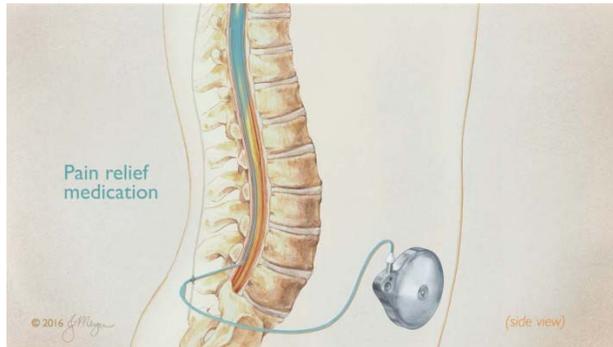
Spinal Drug Delivery Systems



- Useful Early that has failed non surgical treatment or Late CRPS.
- Used as salvage therapy for patients that has failed all other therapies including SCS with significant functional limitations.
- Trial phase involves single injection into the spinal fluid, patient usually goes home the same day.
- If greater than 50% relief, then an more permanent system can be implanted for long term management.

Different Medications can be placed in the device

- Morphine – 50% relief initially but over time lost efficacy over few years, possibly due to tolerance or CRPS disease progression.
- Baclofen – Useful in managing CRPS with significant dystonia only, not helpful in chronic CRPS without dystonia.
- Ziconotide – small case series, 7 patients total, 2 has complete pain relief at 3 years, 5 has greater than 50% pain relief.

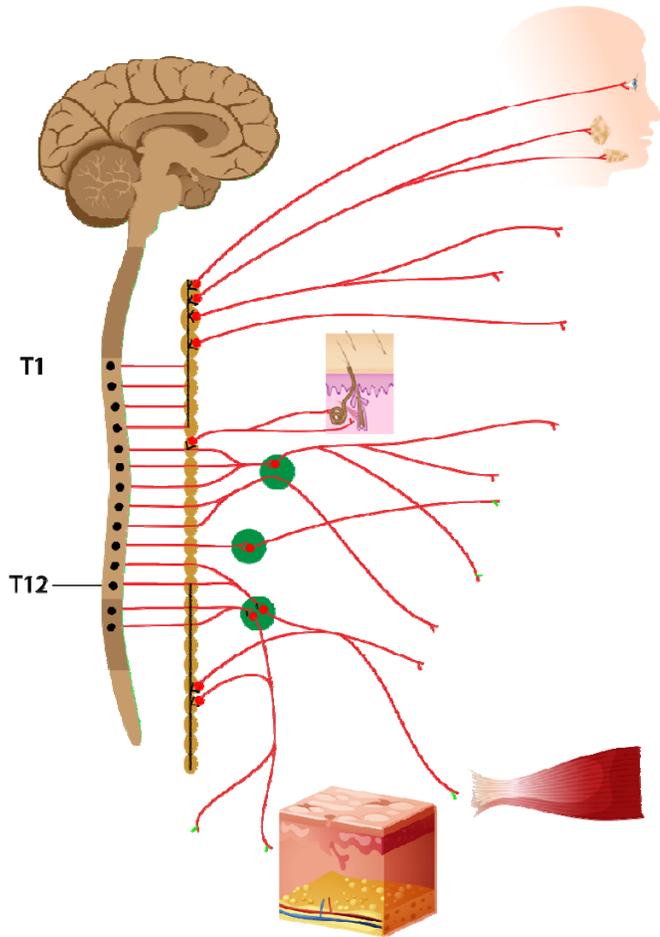


Challenges to Spinal Delivery Systems

- Requires monthly to quarterly visits for pump refills.
- Pump need to be replaced at end of life (5 – 7 years).
- More potential complications includes persistent spinal headaches, granuloma formation at the catheter sites.
- Larger and possible discomfort at the site of implantation.

Ketamine Infusions

- Useful Early CRPS as an adjunct to other modalities Late CRPS that has failed non surgical or surgical modalities
- Useful in Diffuse CRPS with multifocal involvement
- Useful in patients who are not good candidates for interventional management (anticoagulated, bleeding disorders or anatomically challenging

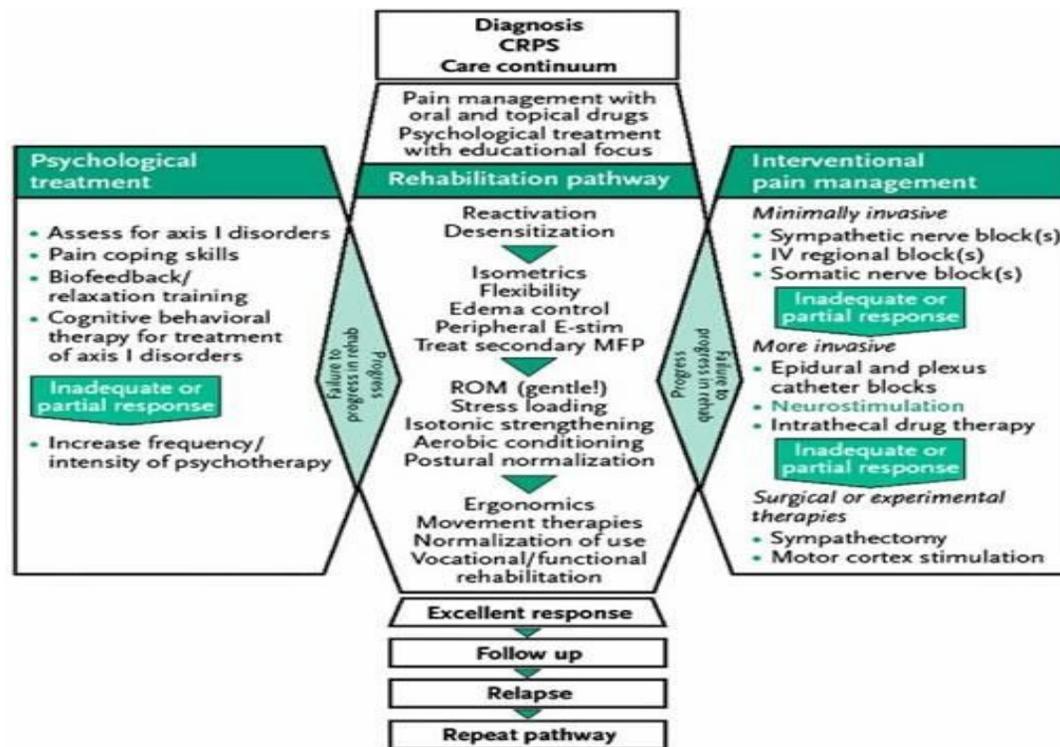




Challenges to Ketamine Infusions

- IV infusions is generally consecutive days.
- Requires IV sedation since the dose for CRPS is generally higher than for depression.
- Caution is recommended in patients with Hx of seizures, cardiac or psychiatric illness.
- Requires standard ASA Monitoring, Board Certified Anesthesia provider is recommended to manage complications.

Multimodal Management is Key to Success



Source: Stanton- Hicks et al ⁵




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References

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