

Chapter 28:

Complex Regional Pain Syndrome

Mark Walsh PT, DPT, MS, CHT

I. Introduction/Definition: no one accepted definition

- A. CRPS is a syndrome characterized by severe pain (out of proportion), swelling, stiffness, discoloration and decreased function. It can involve an entire extremity or a single finger.^[1]
- B. As established by the International Association for the Study of Pain in 1994, the current recommended nomenclature is Chronic Regional Pain Syndrome (CRPS) Type I and Type II. Type I develops after an initiating noxious event, and Type II develops after a nerve injury. Complex regional pain syndrome Type I corresponds to Reflex Sympathetic Dystrophy (RSD) in that it does not have an identifiable nerve lesion. Type II designates causalgia, which presents similarly but occurs with injury to the peripheral nerve or its branch. Within the CRPS categories pain is regarded as sympathetically independent pain (SIP) occurring in the initial onset of the syndrome. Sympathetically maintained pain (SMP) is defined as "a symptom of CRPS and not a clinical entity" occurring after a period of time of the onset of the syndrome^[2]. CRPS has strict inclusion criteria that do not encompass the presence or absence of SMP^[3]. The international Association for the Study of Pain diagnostic criteria for CRPS are listed in the box below^[4]. Also, the pain can be described as sympathetically maintained (SMP) or sympathetically independent (SIP) based on the response to treatment to the sympathetic system. (Figure 1A-C)

IASP DIAGNOSTIC CRITERIA

1. Presence of an inciting noxious event or a cause of immobilization.
2. Continuing pain, allodynia, or hyperalgesia with which pain is disproportionate to any inciting event.
3. Evidence at some time of edema, changes in skin blood flow or abnormal sudomotor activity in the region of pain.
4. This diagnosis is excluded by the existence of condition that would otherwise account for the degree of pain and dysfunction.

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1. Descriptive term – complex disorder or group of disorders resulting from trauma and affecting an area of the body with or without nerve lesions.
 2. Consists of pain or related abnormalities of one or more of the following^[5]
 - a. Sensation
 - b. Blood flow
 - c. Thermal regulatory mechanism
 - d. Motor control
 - e. Extremity anatomy
 - f. Physiology
- C. Common components to all definitions
1. Descriptive term
 2. SNS may or may not be involved
 3. Pain
 4. Sensory disturbance
 5. Multiple system involvement
 6. Loss of function
 7. RSD or SMP
- D. New diagnostic criteria has been proposed utilizing a factor analysis^[6-11]
1. In addition to pain there are four symptom and sign factors: Sensory, Vasomotor, Sudomotor/Edema and Motor/Trophic
 2. The patient must report the presence of at least three of the symptom factors and at least two of the sign factors must be evident at the time of evaluation. This would result in a sensitivity of 0.85 and a specificity of 0.69. Symptom and sign factors are highlighted in the box below.

	SYMPTOM	SIGN
SENSORY:	Hyperesthesia/Allodynia	Hyperalgesia (Pin Prick), Allodynia (Light Touch, Movement, Deep Somatic Pressure)
VASOMOTOR:	Temperature/Skin Asymmetry Color Changes/Asymmetry	Temperature Asymmetry, Skin Skin Color Changes
SUDOMOTOR/EDEMA:	Edema, Hyperhidrosis Sweating Changes/Asymmetry	Edema, Sweating Changes
MOTOR/TROPHIC:	↓ROM, Motor Dysfunction Trophic Changes	↓ROM, Motor Dysfunction Trophic Changes

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- | | |
|-----------------|--|
| 5. Synchronia | Stimulation Unaffected Limb Evokes Symptoms in Both Limbs |
| 6. Dysynchronia | Stimulation Unaffected Limb Evokes Symptoms in the Affected Limb |

C. Factor 1: Sensory^[4, 6, 8]

1. Reported Hypersensitivity to tactile stimulation anywhere from light to strong (light touch, movement, pressure etc.)
2. Hyperesthesia/Allodynia often a central area and peripheral area with decreasing sensitivity
3. Dysesthesia
4. Sensory disturbance may be intermittent and spontaneous

B. Factor 2: Vasomotor changes^[4, 6, 8] (Figure 2)

1. Vasoconstriction: dusky, pallor, cool- common patient complaint
2. Vasodilatation: redness, shiny skin, warm to hot –especially in the hypothenar eminence, dorsal MP’s and PIP’s
3. Varies in presentation; can see mixture of both even in same therapy visit
4. Vasomotor spasm
5. Prolonged capillary refill
6. Thermal Regulatory Control Dysfunction – cold intolerance

C. Factor 3: Sudomotor/Edema^[4, 6, 8] (Figure 3)

1. Often expected following trauma
2. Progresses beyond initial injured tissue
3. Progresses from pitting to brawny edema
4. Chronic in nature – progresses to fibrosis and adhesions limiting motion
5. Hyper/hypohidrosis, Anhidrosis (dry)

D. Factor 4: Motor/Trophic^[4, 6, 8] (Figure 4)

1. Stiffness/Limitation of Motion (Active or Passive)
 - a. Occurs partly due to chronic edema and to decreased motion secondary to pain
 - b. Protective posturing promotes contracture
 - c. Arthrofibrosis
2. Trophic changes
 - a. Abnormal hair growth
 - b. Loss of skin wrinkles; glossy shiny skin due to edema and subcutaneous atrophy
 - c. Penciling of tips due to atrophy of palmer pads
 - d. Nail changes: ridges, brittle, conform to shape of atrophied pulp
3. Osteoporosis
 - a. Demineralization of bone-commonly seen in metacarpals, phalanges, carpus
 - b. Can be due to increased blood flow – washes out calcium

Chapter 28 Figures

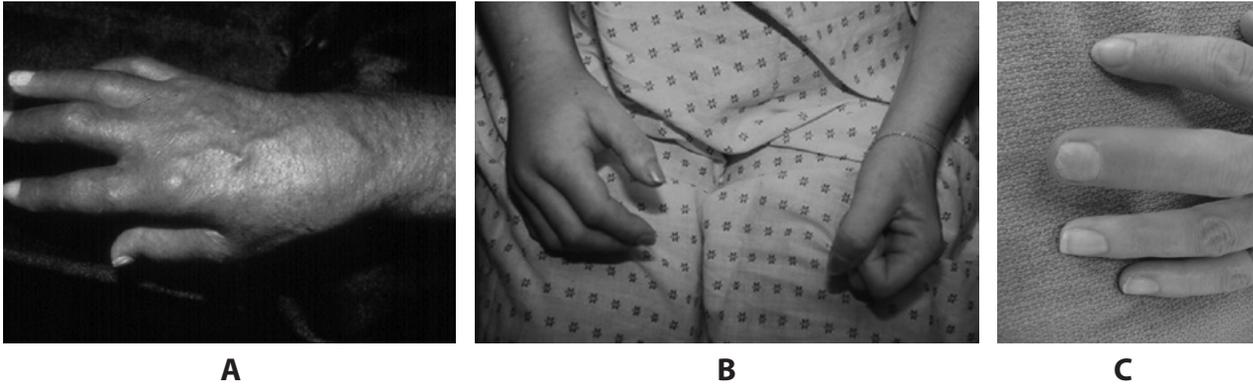


Figure 1. (A) Demonstrates a patient with CRPS in a vasodilated state. Note the shiny skin, the erythema about the entire aspect of the wrist and hand and MP extension and PIP flexion contractures. (B) A patient with CRPS in the vasoconstrictive state. You'll note that the hand is pale in color and edematous with limited AROM in comparison to the left non-involved side. (C) Isolated CRPS involving a single digit. Note the erythema of the entire distal portion of the middle finger edema and the loss of skin creases. This is the result of incision and drainage for a felon.

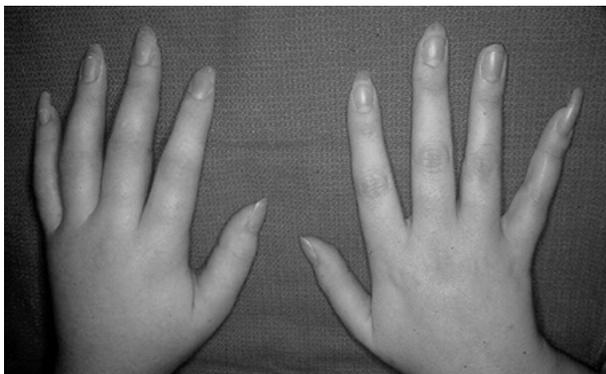


Figure 2. A patient with CRPS in a mixed vasomotor state. Note comparing the left involved to the right uninvolved side. The hand is edematous with aspects of vasodilatation (redness) over the PIP MP joints and vasoconstriction (pallor) over the dorsum of the metacarpals and phalanges.



Figure 3. An example of the Factor 3 Sudomotor/Edema in CRPS. Hyperhidrosis, note the beads of perspiration over the palmar aspect of the hand.



(LEFT) Figure 4. Factor IV Motor/Trophic is a patient presenting with focal dystonia 4 years post onset of CRPS. Note the significant flexed posture of the elbow, wrist and digits.

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- c. Can be due to immobilization
- 4. Palmer Fasciitis
 - a. Nodules; thickening of palmer fascia
 - b. Progressive: contributes to flexion contractures
- 5. Motor Dysfunction
 - a. Tremor
 - b. Myoclonic Movements
 - c. Dystonia
 - e. Bradykinesia

IV. Clinical Types and Stages – No longer utilized^[6, 13-15]

A. Types

1. Minor Causalgia
2. Minor Traumatic Dystrophy
3. Major Traumatic Dystrophy
4. Shoulder/Hand Syndrome
5. Major Causalgia

B. Stages: listed here for historical perspective as not used in current research

1. Stage I: average duration 1-3 months
2. Stage II: 3-9 months
3. Stage III: can last longer than 2 years

V. Incidence/Presentation

- A. Females greater than males
- B. Upper extremity greater than lower extremity
- C. After trauma: major or trivial
- D. Identifiable etiologic component less than 50%
- E. Children and adolescents rare but severe when present

VI. Medical Management^[16]

- A. Primarily a clinical diagnosis: pain, swelling, stiffness, discoloration
- B. Common Diagnostic Tests: Diagnostic testing should initially be geared toward ruling out other conditions. Some tests are used to aid in the diagnosis of CRPS, although they are not always positive.
 1. X-Ray- see osteoporosis
 2. Thermography
 - a. Reveals skin temperature changes
 - b. RSD varies in presentation in regards to temperature
 - c. Not specific; many feel has very little prognostic value
 3. Triple phase bone scan
 - a. Usefulness remains in question in terms of specificity and sensitivity

- b. Increased uptake especially in phase III around the carpus, metacarpals and PIP joints (supposed positive findings)
- 4. Cold stress test
 - a. Looks for abnormal response to cold stress indicative of abnormal sympathetic function
 - b. Looks at neurovascular response by quantification of thermoregulatory capacity by measuring digital temperature and blood flow
 - c. May be suggestive of RSD but is not specific

VII. Medical Treatment^[16]

Prevention and early recognition/treatment the most effective in resolving disorder.^[17]
Treatment must use team approach and include treating physician, anesthesia or pain management, therapy, and psychosocial treatment when appropriate.

- A. Elimination of inciting problem
 - 1. Nerve compression
 - 2. Nerve laceration or neuroma
 - 3. Tight cast
 - 4. Malunion
 - 5. Appropriate pain management
- B. Pharmacologic: drugs can be aimed at reducing sympathetic effects either by reducing sympathetic vasoconstrictive action of the peripheral vessels, blockade of the sympathetic nervous system or by vasodilatation of arterioles
 - 1. Corticosteroids or NSAID's
 - 2. Antidepressant agents- decrease pain, decrease depressive symptoms, cause sedation to assist with sleeping patterns
 - 3. Anticonvulsants- Neurontin, Topamax, Lamictal, Lyrica
 - 4. Topical analgesics- lidocaine transdermal patches
 - 5. Opiates- rarely effective in Neuropathic Pain
- C. Recommend cessation of smoking: smoking stimulates sympathetic nervous system
- D. Neurologic blocks: lack of successful relief not necessarily indicative that RSD incorrect diagnosis
 - 1. Somatic nerve blocks
 - a. Used more commonly for minor types of RSD (minor causalgia)
 - b. Uses a local anesthetic agent which produces interruption of abnormal sympathetic reflex because somatic nerves do carry sympathetic nerve fibers; prevents increased sympathetic activity from reaching involved area.
 - c. Median, ulnar, radial nerve block at wrist or at digital level

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- d. Can be done in clinic initially with lidocaine to see response; follow with Marcaine (longer acting)
- e. Can be given more proximally: axillary
- 2. Periodic perineurial infusion
 - a. Insert small catheter through which local anesthesia can be administered
 - b. Often used following a surgical procedure with patients with history of RSD
- 3. Stellate ganglion blocks
 - a. Aimed at interrupting the abnormal sympathetic reflex
 - b. Blockades all sympathetic efferent impulses into extremity
 - c. Does not produce anesthesia or paralysis as it does not affect peripheral nerves
 - d. “Successful block” shows warming, drying, more normal color and often improved motion and less pain
 - e. Should see Horner’s sign: drooping eyelid, conjunctiva vessels constriction of the pupil and drying/ warming of ipsilateral side of face
 - f. More effective in early stages
 - g. May require several blocks to see effect
 - h. Historically, has been used to confirm diagnosis and for treatment
- 4. Continuous Stellate blocks
- 5. Sympathectomy: usually removal of first four thoracic sympathetic ganglia; rare
- 6. Neuromodulation: is often beneficial if there is persistent pain, chronic in nature, not relieved by conservative measures
 - a. Includes use of spinal cord stimulation, peripheral nerve stimulation and intrathecal analgesia to decrease painful symptoms allowing therapy to focus on improvement of motion and function.

VIII. Therapist Evaluation^[18]

- A. Total System Review; assess or evaluate- be careful to avoid/delay/modify assessments that increase symptoms
 - 1. Skin: trophic changes, hyper/hypohidrosis
 - 2. Vascular: vasoconstriction, vasodilatation or mixed
 - 3. Neurological
 - a. Threshold tests – Semmes Weinstein, vibration
 - b. Innervation density: two point discrimination
 - 4. Skeletal: osteoporosis
 - 5. Connective tissue: periarticular thickening, soft tissue fibrosis, palmer nodules
 - 6. Edema: describe nature i.e. brawny, pitting
 - a. Quantify: Circumference or Volumetrics

7. Motion: active and passive- avoid passive testing if patient is painful or extremity is swollen and tender
8. Posturing: dystonia, co-contraction

B. Predictive Value of Symptoms^[19, 20]

1. Visual analog scale greater than 3 cm
2. McGill with greater than three words
3. A temperature difference of $>0.4^{\circ}\text{C}$
4. Volume difference $>6.5\%$
5. Range of motion limitation $>15\%$ could be used as diagnostic indicator of the presence of CRPS

C. Components of Pain/Pain Assessment

1. Descriptive: “fire”, “burning”, “intense stabbing”; nocturnal, hypersensitive, pain with motion^[21]
2. Spontaneous pain can be present in 75% of the patients.
3. Pain can be amplified in 93% of the patients by dependency, striking, or active range of motion of the effected extremity, greater at night, and with environmental temperature changes.
4. Sympathetic dysfunction occurs early in CRPS and normalizes with time. Early identification of vasomotor changes in conjunction with pain may lead to early diagnosis^[22]
5. Clinical evaluation of pain (Figure 5)
 - a. Spatial: body diagram indicating areas and type of pain
 - b. Intensity: use of a verbal or visual analog scale
 - c. Qualitative: McGill questionnaire
 - d. Temporal: relationship of pain over time
 - i. Constant versus intermittent
 - ii. Worse in evening
 - iii. Length of exacerbation (hyperpathia)
 - iv. Progression of pain: history of pain – past to present; has nature of pain changed since onset
6. Sensory Evaluation^[21]
 - a. Sensory evaluation is undertaken for the purpose of identifying allodynia, hyperalgesia, sensory loss, in order to establish a baseline for desensitization or identifying a nerve lesion.

IX. Therapy Intervention: Practical Approach to Pain and the 4 Sign/Symptom Factors^[10, 18] (Figure 6)

A. Efficacy of Therapy Intervention

1. There are limited randomized controlled trials examining the effectiveness of therapy intervention, adding to this confusion are the confounding variables that most of the literature also includes a medical intervention. This fact makes it difficult to specifically identify effective therapeutic interventions.

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HAND & ORTHOPEDIC PHYSICAL THERAPY ASSOCIATES, P.C.

PAIN ASSESSMENT

Name _____ Date _____ Date of Birth mm/dd/yyyy _____ Male Female

Therapist _____ Therapist Signature _____

PAIN INTENSITY: VeAS (Verbal Analogue Scale) **Scale:** 0/10 = Pain 10/10 = Worst Pain Ever
Score: Now _____ Best _____ Worst _____

VeAS (Verbal Analogue Scale) *Place a mark on the line describing your present pain level.*

NO PAIN		SEVERE PAIN		
Pain Qualifiers	Code	Pain Qualifiers	Code	Joint Pain
<input type="checkbox"/> Aching	1	<input type="checkbox"/> Stiffness	7	0 = No Pain
<input type="checkbox"/> Burning	2	<input type="checkbox"/> Swelling	8	1 = Mild Pain with Deep Palpation
<input type="checkbox"/> Cramping	3	<input type="checkbox"/> Throbbing	9	2 = Severe Pain with Deep Palpation
<input type="checkbox"/> Heaviness/Fatigue	4	<input type="checkbox"/> Tingling/Pins & Needles	10	3 = Severe Pain with Mild Palpation
<input type="checkbox"/> Numbness	5	<input type="checkbox"/> Weakness	11	4 = Hyperesthesia
<input type="checkbox"/> Sharp/Stabbing	6	<input type="checkbox"/> Other	12	

Location: Using the body diagram below, outline your pain/symptoms and qualify using code numbers.

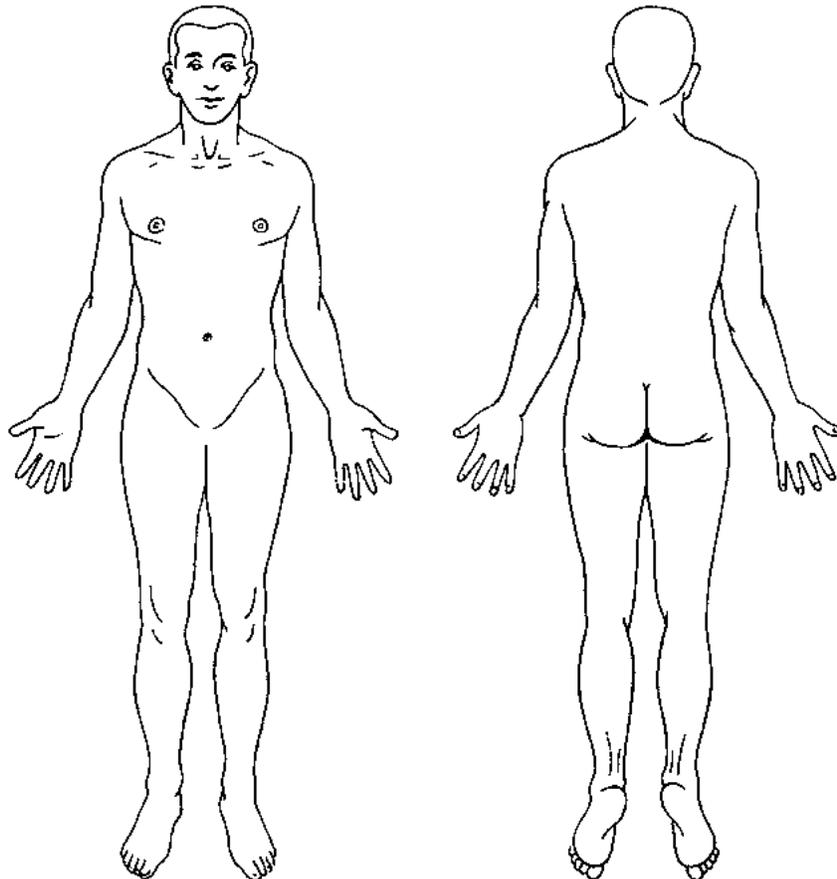


Figure 5. Sample pain diagram utilized in the evaluation of the patient with CRPS.

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2. Multiple case reports successful treatment of CRPS with therapy intervention however these lack successful outcome measures other than the pain analog scale and motion measurements.^[23-25]

3. Prospective randomized clinical study of CRPS has been reported in a series of four articles. PT and OT has resulted in a significant and more rapid improvement in impairment level sum scores, resulted in more rapid decrease in pain, increased range of motion, and was more cost effective.^[25-28]

4. A recent systemic review article has demonstrated the effectiveness of physical therapy when utilizing Graded Motor Imagery (GMI)^[29, 30]

5. There is no support in the literature to suggest an appropriate dosage or duration for treatment. It is only through ongoing evaluative process that these parameters can be determined.

B. Prevention/Early Detection

1. Often therapists detect early onset; communicate with physician immediately to begin early intervention
2. Provide appropriate post-op/post-injury management; don't ignore pain or other abnormal symptoms
3. Patient education to include symptom management, joint protection, work simplification/vocational rehabilitation, assistive devices to increase independence, support groups.

C. Pain: a meaningful reduction in pain of 50% is necessary for the patient with CRPS to report a successful treatment^[31]

1. TENS- little evidence to support the use of TENS in the treatment of CRPS.
 - a. Conventional TENS (transcutaneous electrical nerve stimulation)
 - i. Frequency 50 – 100 cps, width 40-75 uSec, amplitude 10-30 mAmp, sensory only
 - ii. Perceptible paresthesia
 - iii. Pain modulation based on gate control theory of pain stimulation of larger fibers
 - iv. Increases circulation
 - b. Motor Level Stimulation
 - i. Frequency 2-4 pps, width 100-200 μSec, amplitude 30-60 mAmp
 - ii. Pain modulation and vasodilatation
 - iii. Strong rhythmic contraction – increases arterial flow
 - iv. Background paresthesia
 - c. Brief Intense TENS
 - i. Frequency 100-250 cps, width 150-250 μSec, amp 30-80 mAmp; noxious
 - ii. Pain modulation and vasoconstriction: 10-15 minute duration

TYPE	RATE (Hz)	WIDTH (uSec)	AMP (mAmp)	CLINICAL RESPONSE	DESIRED EFFECT
CONVENTIONAL	50-100	40-75	10-30	Paresthesia	Pain Modulation
HIGH INTENSITY PULSE TRAIN	70-100 modulated @ 2 Hz	100-200	30-60	Rhythmic Contraction	Pain Modulation Vasodilatation
BRIEF INTENSE	100-250	100-200	30-80	Titanic Non-rhythmic Contraction	Pain Modulation Vasoconstriction

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- d. Electrode placement guidelines (Figure 7)
 - i. Proximal to pain and hyperesthesia
 - ii. Anatomical site
 - iii. Peripheral cutaneous nerve
 - iv. Motor trigger acupuncture point
 - v. Posterior primary ramus
 - vi. Dermatomal distribution
 - vii. Contralateral versus ipsilateral – TENS has been reported to be effective for pain modulation and creation of vasodilatation/vasoconstriction when used on contralateral side
2. Pain related fear of physical activity or re-injury identified in CRPS patients^[32, 33]
 - a. Fear Avoidance Model^[33-35]
 - b. Treatment model of graded exposure in vivo has been recommended.
 - c. Consists of educating the patient of the fear avoidance model to increase willingness to move (exposure) and graded exposure to those movements/situations that provoke pain related fear. Resulted in decreased pain related fear, pain intensity, disability and physiological signs and symptoms related to the autonomic and vasomotor disturbances in CRPS.
 - d. Quality of Life- In acute and chronic CRPS (greater than three years) there is a marked decrease in the use of the involved extremity demonstrating sided neglect. The decrease in limb activity tended to correlate with disability and handicap.
3. Graded Motor Imagery (GMI) - has been demonstrated to be effective in the treatment of CRPS and utilizes the mirror neurons located in the somatosensory cortex.^[30, 36]
 - a. Laterality: The ability of the individual to identify correctly right and left extremities. This is often lost in CRPS and is related to the sided neglect previously alluded to.^[37-39]
 - i. This is corrected utilizing flashcards for the patient to identify left and right.
 - ii. Recovery of laterality is required before moving on to the next step.
 - b. Graded Motor Imagery: The use of imagery to simulate movement without actually moving the affected extremity.
 - i. Utilizing the same flashcards or other photos of movement the patient imagines producing that movement without actually performing it. When the patient is able to perform these imagined movements without discomfort in the affected extremity they then progress onto mirror visual therapy.
 - c. Mirror Visual Feedback: this is the utilization of a mirror visualizing the unaffected extremity performing various activities. (Figure 8A and B)

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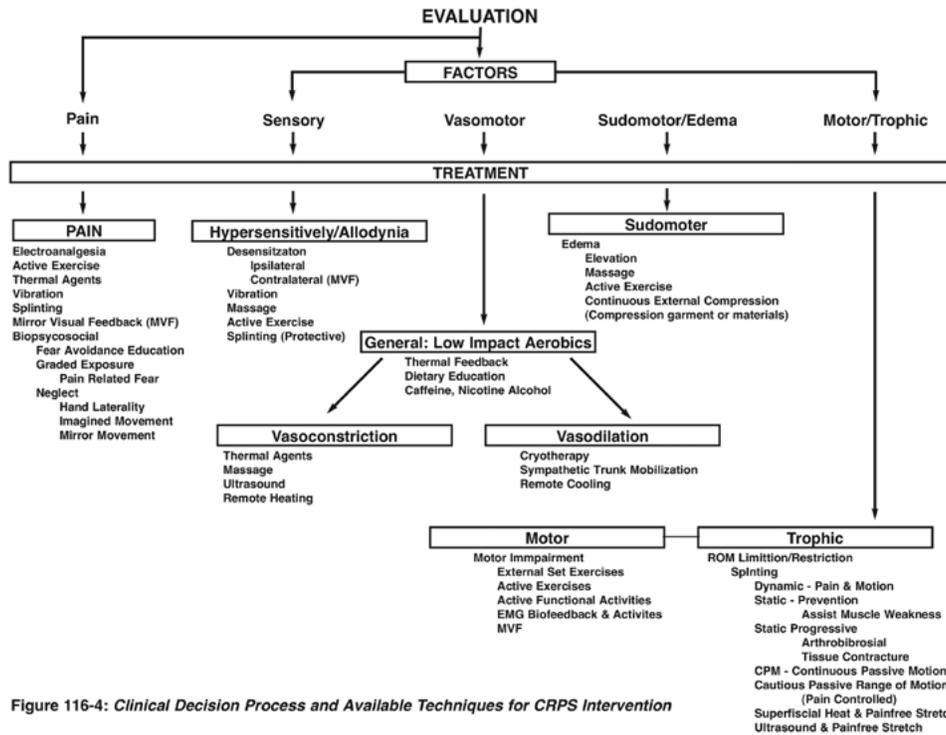


Figure 116-4: Clinical Decision Process and Available Techniques for CRPS Intervention

Figure 6. Treatment algorithm developed to assist in decision-making for potential interventions in patients with CRPS.

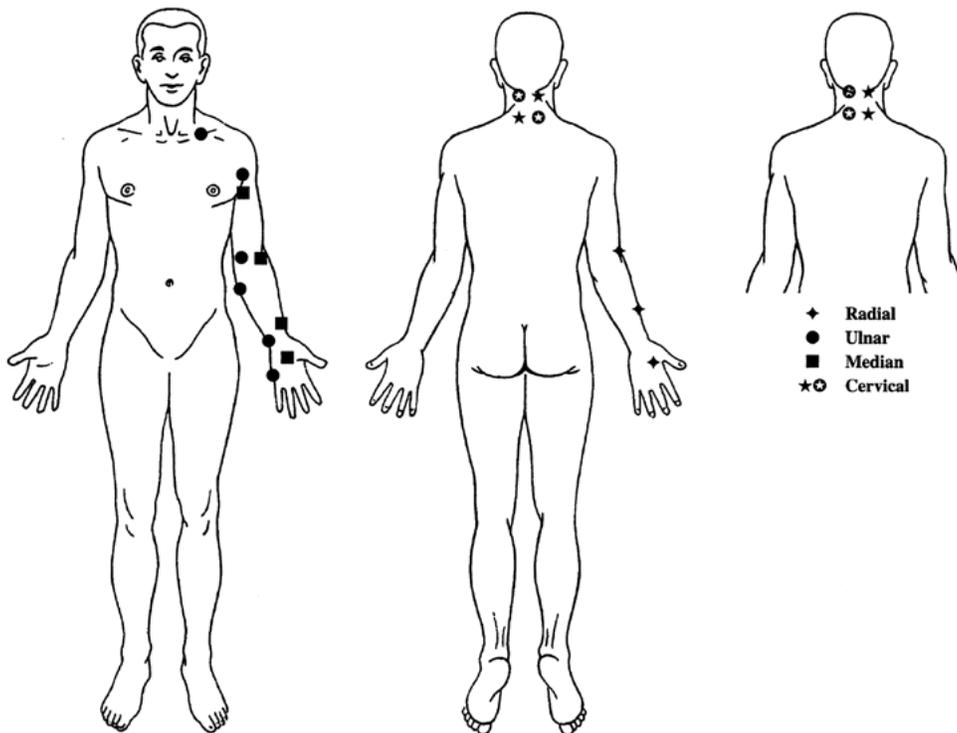


Figure 7. Potential electrode placement sites for use of TENS. These same sites could be used on the non-involved side to obtain contralateral effects.

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d. Graded motor imagery is also performed as a home program in addition to clinic activities.

D. Factor 1: Sensory Hyperesthesia/Allodynia (Figure 9) ^[40-44]

1. Desensitization: Specifically outlined for the patient including duration and frequency as well as stimulus to be utilized.
 - a. Progress from the peripheral area of hypersensitivity towards the central region.
 - b. Utilize (choose) the one stimulus of minimal threshold that just elicits the hypersensitivity.
 - c. After the patient accommodates to this stimulus progress to the next hierarchy of stimuli that evokes the hypersensitivity
 - d. Duration of 20 to 45 min. for a total time of 1 1/2 hours per day.
 - e. Vibration capitalize utilizes a 100 Hz to 200 Hz frequency of a 6 cm² radiating area for the same dosage and duration. This has been shown to be effective in reducing pain by 50%.
 - f. Desensitization Failure: occurs as the result of early abandonment of the program, inadequate time spent on each individual modality and inappropriate stimulus choice.

E. Factor 2: Vasomotor:

1. Reduce nicotine, caffeine
2. Increase general aerobic activities to assist in increasing cardiac output; increase peripheral outflow to affected extremity
3. Vasoconstriction: pale, cool
 - a. Patient education in regards to vasomotor state
 - b. Massage
 - c. Modalities: Fluidotherapy, moist heat, paraffin, remote or contralateral heating
 - d. Contrast baths: not supported in literature in terms of effectiveness may cause unstable vasomotor state
 - e. Whirlpool – although increases tissue temperatures it also increases edema due to dependent position^[45, 46]
 - f. TENS^[47-49]
 - g. Ultrasound^[50, 51]- Over peripheral nerve in affected area
 - ii. Over Stellate ganglion
4. Vasodilatation: red, swollen, warm
 - a. Superficial cryotherapy including cold packs
 - b. Cold emersion baths 18° C for 10-15 minute period
 - c. TENS^[52, 53]
 - d. Patient education – avoid alcohol
 - e. Biofeedback^[54]

F. Factor 3: Sudomotor/Edema^[10]

1. Assessment: volumetrics (preferred), circumferential (gross assessment)

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Figure 8. These two photographs, (A) and (B), demonstrate the use of mirror therapy as part of the GMI program. Note that the patient is attempting to perform active extension (A) and fisting (B) while observing the motion in the mirror.

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2. Elevation above heart level: decreases arterial hydrostatic pressure and assists in lymphatic and venous drainage ultimately decreasing interstitial volume
3. Judicious use of sling: avoid constant use - promotes stiffness and decreased functional use; monitor shoulder motion and maintain range
4. Retrograde massage and MEM (manual edema massage)
5. Active ROM (within pain limits) can elevate extremity while doing exercise to decrease edema further. Active range of motion should also be functionally directed, specific and be performed with low repetitions throughout the day.
6. Compression wraps: Coban, ace, elastic sleeve, bulky dressing, gloves
7. Pneumatic Compression Pump or Sequential Intermittent Compression
8. Contrast baths- be cautious as baths can worsen abnormal vascular changes and pain; never use extreme temperature
 - a. 3 min warm, 1 min. cool; 2 warm, 1 cool; 2 warm, 1 cool, 2 min warm
9. Neuromuscular electrical stimulation – active muscle contraction to aid lymphatic system
 - a. FES
 - b. Interferential current

G. Factor 4: Motor/Trophic-ROM Dysfunction

1. Movement Disorders (Dystonia): focal weakness, spasms, tremor, difficulty initiating movement (bradykinesia) increased tone, co-contraction^[55-64]
 - a. Movement disorders have been in the literature and now recognized as one of four factors required for diagnosis.
 - b. Mirror Visual Feedback (See GMI in Pain Treatment Section IX.C.3.)
 - c. External Set in the presence of Bradykinesia^[65]
 - d. Physiologic motion of the entire body such as: large amplitude multi-joint movements such as reaching, PNF patterns, stationary bike and walking are examples.^[66, 67]
 - e. Biofeedback (Figure 10)
 - a) Facilitate neuromuscular re-education
 - b) Inhibit or facilitate contraction
 - c) Use with functional activities
2. Often affected extremity has been immobilized before onset of CRPS
3. Active exercise: surrounding unaffected joints as well as affected
4. Specific Blocking Exercises to isolate tendon excursion and IP motion and abduction/adduction of digits.^[15]
5. Functional activities that are success oriented.
6. Modalities: moist heat, Fluidotherapy, contrast baths
7. Use of orthosis^[68]
 - a. Preventive: web space contracture, safe resting hand position orthosis.
 - b. Dynamic/static progressive: low load, prolonged stress well within tolerance to correct joint contractures
 - c. Incorporate function: wrist support so fingers can be used for ADL
 - d. Serial casting: e.g. PIP joint contracture
8. CPM: there is no evidence to support its specific use for CRPS.
 - a. Use in pain free range

Chapter 28 Figures



Figure 9. The process of desensitization utilizing vibration.
Note the cap is left on in order to maximize the irradiating surface of the vibrator.

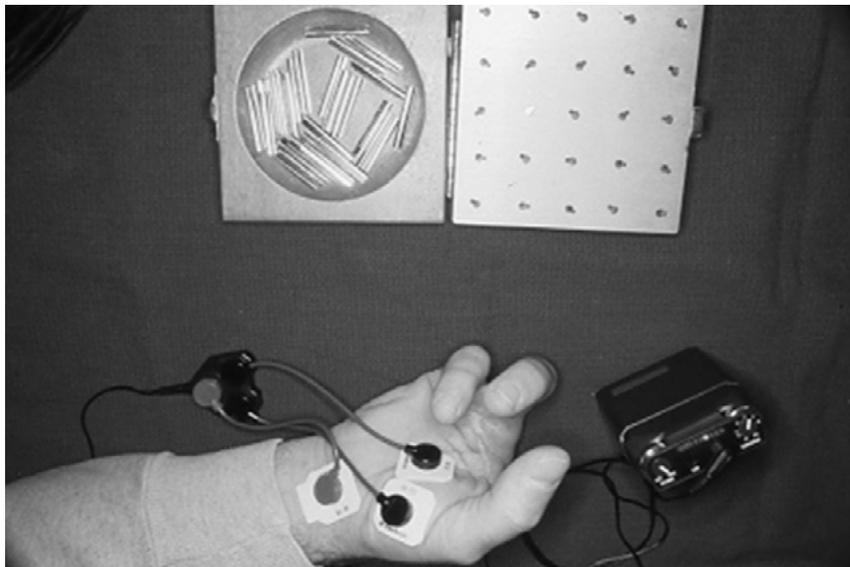


Figure 10. The use of biofeedback in the case of thenar motor bradykinesia in conjunction with functional activities to encourage muscle activation.

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- b. Periodically day/night as a supplement to functional activities/AROM
 - c. Provides pain relief
 - d. Can pause machine at end range as tolerated
 - e. May be difficult to don/doff; often not reimbursed
9. PROM
- a. Can be used in later stages when pain is controlled!
 - b. Contraindicated if hand placement of therapist is over hypersensitive area
 - c. Do not be overly aggressive or flare may result
10. Ultrasound with gentle stretch
- a. Used as a preconditioning technique for other activities
 - b. Temporarily increases tissue extensibility
11. Neuromuscular electrical stimulation: use in conjunction with activity, e.g. cone stacking

F. Stress Loading^[69]

- a. Compressive loading followed by distraction
- b. Home program: initially, 3-5 minutes of compression alternating with distraction for 2-3 week period of time until a total of 10 minutes of compression and distraction is achieved
- c. Distraction: start with 1-5 lbs and increase as tolerated. Encourage distraction whenever patient is ambulating or standing by carrying an object in the hand such as a milk jug filled with the appropriate amount of water.

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Chapter 28: Complex Regional Pain Syndrome

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Multiple Choice Questions

- Continuing pain, allodynia, or hyperalgesia with which pain is disproportionate to any inciting event, is one of the diagnostic criteria as described by the International Association for study of pain. Which one of the following statements is also one of the diagnostic criteria?
 - There is no need for the presence of an inciting noxious event or cause of immobilization.
 - Evidence at some time of edema, changes in skin blood flow or normal sudomotor activity in the region of pain.
 - There must be evidence of either sympathetically independent pain or sympathetically maintained pain.
 - The diagnosis is excluded by the existence of a condition that would otherwise account for the degree of pain and dysfunction.
- By definition CRPS is a _____?
 - Descriptive term
 - Exact term
 - Physiological term
 - Pathological term
- Which of the following is one of the four factors involved in the diagnostic criteria for CRPS?
 - Hyperesthesia
 - Motor/Trophic
 - Dystonia
 - Hyperhidrosis
- Which of the following statements is true and supported by evidence regarding the management of CRPS?
 - Early recognition and intervention provides the best opportunity for resolving CRPS.
 - The timeframe after the onset of symptoms or signs plays no role in the outcome of CRPS.
 - A delay in intervention will not alter the outcome of CRPS.
 - Pharmacologic intervention is of little value in the management of CRPS.
- Which one of the following interventions will result in a Horner's sign?
 - Stellate ganglion block
 - Somatic nerve block
 - The use of anticonvulsants medication
 - Neuromodulation
- Which one of the following could be used as a diagnostic indicator of the presence of CRPS?
 - Visual analog scale <3 cm
 - Range of motion limitation $<10\%$
 - A volume difference $>6.5\%$
 - McGill Pain Questionnaire is of no value

Multiple Choice Questions

7. Which one of the following is an important component to consider in evaluation of pain?
 - A. Qualitative such as the use of the McGill Questionnaire.
 - B. Vasomotor status.
 - C. Hypersensitivity.
 - D. Range of motion limitation.

8. Which one of the following statements is supported by the evidence for the efficacy of therapy intervention in CRPS?
 - A. There is no evidence that supports the use of therapy as an intervention for CRPS.
 - B. There is strong evidence that supports the use of TENS in the intervention of CRPS.
 - C. The use of Graded Motor Imagery has been demonstrated to be an effective therapy intervention for CRPS
 - D. Patriotism intervention is all that is necessary for therapy intervention for CRPS.

9. Which of the following value is a meaningful reduction in pain that results in the patient reporting successful treatment of CRPS?
 - A. 75% or greater.
 - B. 50% or greater.
 - C. 25%.
 - D. There is no meaningful value.

10. Which one of the following is a component of Graded Motor Imagery?
 - A. Laterality
 - B. Functional restoration
 - C. Desensitization
 - D. Stress loading

11. Which of the following statement is true regarding Graded Motor Imagery?
 - A. Mirror visual feedback is not utilized In Graded Motor Imagery.
 - B. The fear avoidance model is a component Of Graded Motor Imagery.
 - C. Graded Motor Imagery is only utilized in the clinic.
 - D. Establishing laterality is required before moving onto the next step.

12. Which one of the following would be an appropriate intervention for Factor 2 Vasomotor?
 - A. Institute or increase general aerobic activities and capacity.
 - B. The use of cryotherapy in the vasoconstrictive state.
 - C. The use of heating modalities in the vasodilated state.
 - D. Encourage upper extremity elevation.

Multiple Choice Questions

13. Choose the correct statement below regarding CRPS.
- A. There is no movement disorders associated with CRPS.
 - B. Dystonia and bradykinesia have been demonstrated to be present in CRPS.
 - C. The use of “Internal Set” is appropriate in the presence of bradykinesia.
 - D. Trophic changes are included in the Sudomotor/Edema factor of CRPS.
14. The intervention of stress loading requires which of the following components.
- A. Compression, Distraction and Home Program
 - B. Compression only and Home Program
 - C. Distraction only and Home Program
 - D. Either Compression or Distraction and Home Program

**Multiple Choice Question Answer Key
Chapter 28**

1-D, 2-A, 3-B, 4-A, 5-A, 6-C, 7-A,
8-C, 9-B, 10-A, 11-D, 12-A, 13-B, 14-A