

Treatment of Complex Regional Pain Syndrome by a Multidisciplinary Chronic Pain Program

Authors credentials and affiliations:

Carol McMenemy, MA, MSW, is Director of the Pain and Rehabilitation Center, Hospital Social Work, and Business Development, at Modesto Rehabilitation Hospital, 730 17th St, Modesto, CA 95350.

Norbert Ralph, PhD, MPH, is a neuropsychologist and epidemiologist, and on staff with the Pain and Rehabilitation Center, and in practice at 1155 E 14th St.#295, San Leandro, CA 94577.

Edward Auen, PhD, MD, is member of the American Board of Internal Medicine, and the American Board of Pain Medicine, and in practice at Pro Health Medical Group Inc., 1431 McHenry Ave.# 100, Modesto, CA 95350.

Louis Nelson, MD, is a member of the American Board of Neurological Surgery, is Medical Director at the California Neurosciences Center at Doctors Medical Center, Modesto, CA, and in practice at 1400 Florida Ave.#111, Modesto, CA 95350.

Abstract

The effects of a multidisciplinary day treatment program on Complex Regional Pain Syndrome (CPRS) were examined. Participants were 11 adults with a history of CPRS of 6 months or longer. A variety of measures were taken at admission, discharge, and follow up from six to 32 months. Multidisciplinary treatments used included physical therapy, occupational therapy, stress management, biofeedback, goal oriented cognitively based individual, group and family counseling, sympathetic blocks, medication management, behavioral modification, pain management and nutritional education, and case management. Variables assessed at admission and discharge included physical and occupational therapy ratings, thermal biofeedback levels, self reported pain levels, depression and somatic distress levels, narcotic use, and vocation status. At post discharge follow-up, which ranged from six to 30 months, pain levels, vocational status and narcotic use were assessed. It was hypothesized that results would show improvement across all measures at post treatment with maintenance of improvement at follow up. Results support the hypothesis that multidisciplinary treatment of CPRS is effective in the improvement of symptomatology.

Key Words: Pain, outcomes, treatment, RSD, CRPS, multidisciplinary.

INTRODUCTION

The symptoms of Complex Regional Pain Syndrome (CRPS) were first described as causalgia by Mitchell, Morehouse and Keen (1) in 1864 treating Civil War soldiers with gunshot wounds. Soldiers reported burning pain, progressive skin changes, and decreased function of the affected limb. Since that time, there has been much debate regarding a definition and cause of this syndrome (2,3). Vacariu (4), reports that, "Etiology and pathophysiological mechanisms of painful disorders, previously addressed as reflex sympathetic dystrophy (RSD) remain doubtful. The supposition of a sympathetic hyperactivity in the development of this syndrome could not be confirmed(p.435)." For these reasons, the term CRPS has supplanted the term RSD.

REVIEW OF THE LITERATURE

The Reflex Sympathetic Dystrophy Association of America, (5) defines the disorder as a multi-symptom, multi-system syndrome which usually affects one or more extremities, and can affect the entire body. CRPS may follow severe trauma to an extremity such as a crush injury, dislocation, fracture, or it may occur after minor events including strains, sprains, or small cuts (6,7).

Stage 1 of CRPS, the acute stage generally last three months, is characterized by severe burning, aching pain (8), redness, soft swelling, increased nail and hair growth, and warmth (2). Stage 2, which lasts approximately 3-6 months, the dystrophic stage, has diffuse pain, hair loss, spotty osteoporosis, increased joint thickness, muscle wasting, brittle, cracked and grooved nails, skin changes (9, 5), pale and cold skin (2), and reduction in range of motion (10). In stage 3, the atrophic stage, pain may spread to the entire limb or body, extreme weakness of joints, atrophy of muscles, and bone deossification (9). The symptoms can be irreversible in this stage.

Treatments for CRPS

The first stages of the disease may be treated with a combination of sympathetic blocks, and physical exercise (11, 3). Bonica (12) reported that this combination relieved pain and increased mobility in 80% of patients treated in stage 1. In case descriptions of 150 patients with CRPS physical and relaxation therapy was recommended in the context of building a trusting relationship, and success in treatment was reported (13).

Adjunctive therapies have included the use of Transcutaneous Electrical Nerve Stimulation (TENS), anti-inflammatory medication, biofeedback, and counseling (2). Robaina and Dominquez (14) report sixty-nine percent of the twenty-nine patients studied reported "good" to "sometimes excellent" pain relief when using the TENS unit. Thermal biofeedback, relaxation, and supportive psychotherapy were used for 20 patients with CRPS, and had decrease in hand temperature and pain ratings. At one year follow-up 14 of 20 patients returned to work (15).

Psychological assistance is often needed for adjustment difficulties associated with the disease (11, 16, 3). Geertzen, de Bruijn, de Bruijn-Kofman and Arendzen (17) found that depression, anxiety, stressful life events and/or emotional disturbances combined with physical injury can increase the probability of developing CRPS.

Perez, Kwakkel, Zuurmond, and de Lange (18) reported a meta analysis of 21 randomized clinical trials of treatments for CRPS assessing primarily analgesic effects. Studies were grouped into four treatment modalities: sympathetic suppressors, guanethidine, intravenous regional sympathetic blocks, and calcitonin. Only the later treatment showed statistically significant effect sizes (unweighted summary effect size =.313, $p=.004$). A number of methodological problems in the literature were reported including poorly defined diagnostic criteria, lack of specific description of therapeutic techniques used, and high drop out rates.

Dzwierzynski and Sanger (19) recommended the use of all available modalities for patients that do not respond to blocks. The treatment recommended included psychotherapy, relaxation therapy and biofeedback. Outcomes have not been reported for this treatment approach. Sullivan (20) reported on a case of a 38 year old female with a 3 year history of CRPS using a combination of physical therapy, medication detox through a methadone blind taper, family and cognitive therapy, vocational counseling, occupational therapy, and Trazodone. The patient was able to obtain improvement in hand functioning post treatment, but quantitative measures were not given. Roven (21) reported improvement with 5 patients with a diagnosis of CRPS attending an integrated pain clinic program, but quantitative results were not reported.

Surgical interventions have been evaluated, and while 7/7 (100%) patients who had a sympathectomy within 12 months of injury recovered, 4/9 (44%) who had a sympathectomy after 24 months of injury recovered (22).

Quantitative studies of multidisciplinary treatment approaches are recommended (17, 21, 20, 23), but have not been done. The present article investigates the quantitative effects of treatment of CRPS using a multidisciplinary treatment with second and third stage CRPS. The treatment included physical therapy, occupational therapy, stress management, biofeedback, goal oriented cognitively based individual, group, and family counseling, sympathetic blocks, medication management, behavioral modification, pain management, nutritional education, and case management.

METHODS

Subjects

Study participants were eleven adults 29 to 56 years old, with a mean age of 43. The first eleven patients to enter the program with CRPS were selected to participate. There were 4 males and 7 females. All participants were suffering from second or third stage CRPS of either a foot, leg, hand, arm or a combination of these areas.¹ All patients were evaluated prior to admittance to the program by a physician and psychologist to verify the diagnosis of CPRS, and to assess medical

¹ Patients referred to the clinic in stage 1 of CPRS are recommended for a regime of sympathetic blocks and physical therapy only since this treatment is usually adequate. Should this treatment fail, patients may then be considered for the multidisciplinary treatment program.

or psychological factors that would interfere with treatment, or indicate if another treatment was more appropriate.

Dependent Measures

Thirteen dependent measures were used as follows:

1. **Psychiatric Symptoms:** Depression and somatization levels were measured pretreatment and posttreatment using the depression and somatization scales from the Symptom Checklist 90 Revised (SCL-90R), a self-report inventory of psychological symptoms (24). Reliability for the scales ranges from .77 to .90.
2. **Temperature:** Temperature was measured on the affected site, using biofeedback equipment. A dual channel J and J Model M-53 E.G. and a J and J model D-200 digital integrator with an isolation pre-amplifier (J and J Model IP-5) were used. Thermal changes were used to measure progress.
3. **Functional Levels:** Pain related functional levels were measured pretreatment, daily, posttreatment and at follow up using an ordinal scale. Patient's functional level was emphasized rather than the subjective experience of pain. This was part of the program's emphasis of having patients pay attention to "what I can do", rather than "how much pain do I feel" (Appendix A).²
4. **Strength and Endurance:** Measures used were time reaching overhead, flights of stairs climbed, pounds lifted, walking distance, grip strength, and time to walk 120 feet.
5. **Patient Questionnaire:** A patient questionnaire was given to participants at the end of the program. One item measured overall program satisfaction and another measured whether the patient felt ready to begin a new lifestyle.

Program Procedures

Treatment length varied from fifteen to twenty-two days. Slower improvement rates increased the number of treatment days up to a maximum of 22 days, and treatment lasted three to six weeks. Treatment was given eight hours a day for five consecutive days weekly during the first three weeks, with the remaining seven days scheduled intermittently throughout the remaining three week period for those patients needing a longer program. Staff was available by pager during weekend or nontreatment days.

The physical therapy treatment used cardiovascular exercises, light weights, contrast baths, and pool therapy twice daily during treatment days. Home practice was emphasized and patients were given a gym membership following discharge. Some patients used TENS units. Occupational therapy administered a sensory stimulation program of five times during treatment days, and a home program was set up. Stress management was one hour per treatment day, and

²

Content/face validity was developed by presenting the scale to a group of 10 pain management experts and 10 chronic pain sufferers who evaluated and modified the tool. The test retest reliability was established by asking 10 patients to rate their pain, then two to three hours later patients rated their pain again. A Spearman-Brown formula was used and results show reliability $r=.9456$, and an associated p-value .0001.

covered autogenic relaxation, diaphragmatic breathing, and meditation. Relaxation tapes were sent home for patients for continued home practice.

Biofeedback was given a minimum of three times weekly. Thermal biofeedback in the affected area was used. EMG biofeedback was used to teach total body relaxation. Patients were given temperature sensitive bands to wear during the day.

Goal oriented cognitive based individual, group, and family counseling was conducted each treatment day for one hour to identify dysfunctional thinking and behavioral patterns. Pain related education and cognitive therapy were taught for one hour daily. Nutritional education was taught by a dietitian once weekly.

A Catapress patch was applied to the affected limb during the first half of the treatment program, and the patient was titrated down and discontinued the remaining half of the program. Antidepressants were administered to each patient according to clinical need. Patients currently using narcotic medication were titrated off the medication using a blind taper. Nonnarcotic anti-inflammatory steroidal replaced narcotic medication. Prior to or during the first week of treatment a sympathetic block was given to the patient, and up to a total of two additional blocks were given during the first three weeks of the program. Aggressive physical and occupational therapy were administered immediately following the block.

RESULTS

A Wilcoxon Matched Pairs test with a two tailed test of significance was utilized to examine the changes in participants' pretest (admission) and posttest (discharge) scores indicating improvement. The results are shown in Table 1. There was a significant change from pretest to posttest on all dependent variables. These results are consistent with the hypothesis that program participants' CRPS symptomatology decreased significantly from pretest to posttest.

A comparison of pretest to follow-up regarding vocational activity, and narcotic use was carried out using a Wilcoxon Matched Pairs test with a two tailed test of significance. The follow up time varied from six months to thirty-two months. The results are shown in Table 2. Vocational activity, and narcotic use decreased significantly from pretest to follow-up.

Pain levels were compared from posttest to follow up, and are shown in Table 3. Lower mean pain levels were reported at follow-up, but the difference was not statistically higher or lower.

Participants rated program satisfaction, and confidence to begin a new life at the end of treatment. Eight participants were "very satisfied", 2 participants were "mostly satisfied", and 1 participant was "indifferent or mildly dissatisfied". Results for confidence level showed that 9 participants felt confident with beginning a new life, and 2 did not feel confident.

It is important to note that with stair climbing and timed walked that all participants with RSD of the leg and/or foot had increases from pretest to posttest. With reaching 10/11 patients showed

improvement, and the 11th patient achieved the maximum score at both pre and post assessment on this test.

SUMMARY AND DISCUSSION

All dependent measures showed statistically significant improvement consistent with a reduction of CRPS severity from admission to discharge. Most but not all patients reported improvement. Previous research by Ralph, McMenemy, Auen, Nelson, and Elkins (25) indicate that demographic characteristics such as age, gender, payment type, personality and cognitive variables, did not have a significant effect on therapeutic outcomes for the chronic pain patients who participated in this program.

The present study has a number of limitations. Campbell and Stanley (26) describe this design as a single sample test/retest design which has limitations in ruling out rival hypotheses (pg.7). For example, a placebo effect or the expected improvement of this disorder cannot be ruled out with this design. Given the magnitude of the improvement of the patients over time, and the refractory nature of Stage 2 and 3 of this condition, in the author's view, a placebo effect or the natural history would not likely account for the changes of the size observed. However, a replication with a larger sample, randomized design, and use of control groups would better discern if the treatment described here, or particular aspects of treatment, related to therapeutic improvements.

If the program described above was in fact effective for treating stage 2 and 3 CRPS, what were the mechanisms of change? Our hypothesis is that the program had several characteristic that promoted change including: 1. the use of multiple modalities of treatment, 2. intensive monitoring, assessment and feedback of response to each modality, 3. flexible adjustments to treatment (including medication, OT, PT, biofeedback, etc.), 4.a prohealth therapeutic milieu, 5. small patient group size of 6 or less patients, and 6. frequent daily communication between staff. Flor, Fydrich, and Turk (27) reported that multidisciplinary pain programs produced at least twice the improvement of single modality programs (e.g., medical treatment or physical therapy alone). Daily rehabilitative discussion and directive feedback to patients were utilized at every opportunity by staff, thereby shaping adaptive prohealth behavior. Therapy regimes were adjusted based on results. The frequency of these interactive adjustments to treatment was an important component to success in our opinion. Difficulties in compliance were not viewed as simply "noncompliance" on the patient's part, but as a challenge to understand what obstacles the patient was experiencing, and what techniques would be successful with a particular patient. Compliance and motivation was increased with this type of intensive dialogue and treatment, and therapeutic improvement provided reinforcement for patients to continue use of techniques. Compliance was increased in our opinion because of these modifications. Future research may focus on determining which modalities are most effective, and what types of patients experience the most benefit. Further research would have to verify if these hypothesized factors were in fact contributory to improved outcomes.

Table 1 Results – Pretest to Posttest				
	z-score	2 tailed p-value	mean pretest	mean posttest
Depression (SCL 90-R) score	-2.6686	.0076	89.1818	51.6364
Somatization (SCL 90-R) score	-2.6679	.0076	95.2727	82.6364
Temperature (F)	-2.9370	.0033	75.7272	84.9091
Pain level (0-10)	-2.6717	.0071	6.0909	4.0909
Lifting (pounds)	-2.8067	.0050	10.8182	38.0000
Climbing (flights of stairs)	-2.2075	.0273	1.8182	2.8182
Reaching (seconds)	-2.8122	.0049	36.8182	105.4545
120ft speed walk (seconds)	-2.4907	.0127	34.6364	26.6364
(R)Grip strength (pounds)	-2.7562	.0058	67.0000	82.8182
(L)Grip strength (pounds)	-2.8031	.0051	52.1818	73.9091
Urban walk (blocks)	-2.9384	.0033	3.4000	15.2727
Narcotic use	-3.4641	.0061	63.6%	9.1%
Vocational interest	4.1833	.0001	9.1%	90.1%

Table 2 Pretest to Follow-up at 6 to 32 months				
	z-score	2 tailed p-value	mean pretest	6 to 32 months
Narcotic use	-3.4641	.0061	63.6%	9.1%
Vocational interest	4.1833	.0001	9.1%	90.1%

Table 3 Posttest to Follow-up at 6 to 32 months				
	z-score	2 tailed p-value	Mean pretest	6 to 32 months
Pain level (0-10)	.5523	.5807	4.090	3.5000

Appendix A: PARC Rating Scale

10. Worst pain imaginable: unable to talk, move, or respond; e.g., being on fire.
9. Very extreme pain: not able to move, only able to talk and respond with a few words; e.g., (for women having a baby, or for men kicked hard in the groin).
8. Extreme pain: only able to respond with very brief sentences, and very brief purposeful movement; e.g., a hard poke in the eye, or breaking an arm.
7. Very severe pain: able to respond in short sentences, not able to participate in group discussion, able to move only a very little; e.g., having stitches without anesthetic.
6. Moderately severe pain: able to talk in full sentences, briefly participate in group discussion, and do purposeful movements very slowly and just a little; e.g., severe sprained ankle.
5. Significant pain: able to talk, participate in groups, do purposeful movements slowly; e.g., moderate ankle sprain.
4. Moderate pain: able to do most activities, but slowly and cautiously; e.g., mild ankle sprain or severe sunburn.
3. Mild pain: able to do all activities, but slowly and cautiously; e.g., bruised shin or moderate sunburn.
2. Minimal pain: noticeable but it does not affect activities; e.g. paper cut.
1. Slight pain: barely noticeable; e.g. a small cut.
0. No pain.

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