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# Efficacy of Strain Counterstrain Techniques in the Management of Complex Regional Pain Syndrome: A Detailed Case Study of a 42-Year-Old Female Patient

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**ABSTRACT**

Complex Regional Pain Syndrome (CRPS) is a challenging condition associated with severe pain and functional impairment. This case study provides an in-depth examination of the treatment of a 42-year-old female diagnosed with CRPS following a traumatic injury to her left hand. The treatment protocol employed strain counterstrain techniques, followed by progressive resistive exercises (PRE) aimed at restoring functional capacity in the hand.

Over a three-month period, the patient received weekly physical therapy sessions, with the treatment plan adjusted at the six-week mark to include PRE. Assessments were conducted at baseline, 3 weeks, 6 weeks, and 12 weeks, focusing on pain levels, grip strength, and range of motion. The results indicated a significant reduction in pain from 8/10 to 2/10 on the Numerical Rating Pain Scale (NPRS) and an improvement in grip strength from 5 kg to 28 kg. The patient's active range of motion also improved, and there was a noticeable reduction in muscle atrophy and swelling. These findings suggest that strain counterstrain, in combination with PRE, can be an effective intervention for CRPS. This case study contributes to the limited body of research on physical therapy interventions for CRPS and highlights the need for further studies to explore the broader applicability of these techniques.

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## Introduction

Complex Regional Pain Syndrome (CRPS) is a chronic and debilitating condition characterised by severe pain, sensory disturbances, and autonomic dysfunction. It typically develops following an injury, surgery, or trauma, with the pain often disproportionate to the initial injury [1]. The syndrome is classified into CRPS Type I (without nerve damage) and CRPS Type II (with confirmed nerve damage) [2]. The pathophysiology of CRPS involves a combination of inflammatory, autonomic, and maladaptive neuroplastic processes, which contribute to its persistent and often refractory nature [3].

The treatment of CRPS is complex, requiring a multidisciplinary approach that includes pharmacological, physical, and psychological interventions. Physical therapy is a cornerstone of CRPS management, aimed at reducing pain, improving function, and preventing disability [4]. Despite its importance, there is no standardised physical therapy protocol for CRPS, and treatment outcomes can vary widely depending on the techniques used and the individual patient's response [5].

Strain counterstrain is a manual therapy technique that involves positioning the patient's body in a position of comfort and applying gentle pressure to specific tender points. This technique is believed to alleviate pain by reducing abnormal muscle tension and modulating the autonomic nervous system [6]. Although strain counterstrain has been used for various musculoskeletal conditions, its application in CRPS is not well-documented. This case study aims to fill this gap by detailing the use of strain counterstrain in conjunction with progressive resistive exercises (PRE) in the treatment of a patient with CRPS.

## Case Presentation

The patient is a 42-year-old female who presented with severe pain and functional limitations in her left hand following a motor vehicle accident. The injury resulted in significant trauma to the hand, leading to the development of CRPS. The patient's primary symptoms included persistent, burning pain, increased sensitivity to touch (allodynia), swelling, temperature asymmetry, and muscle atrophy in the affected limb. These symptoms were consistent with CRPS Type I, as there was no evidence of direct nerve injury.

At the initial assessment, the patient's pain was rated as 8/10 on the Numerical Rating Pain Scale (NPRS), indicating severe discomfort that significantly interfered with her daily activities. Her grip strength was measured at an average of 5 kg using a handheld dynamometer, reflecting a substantial reduction in muscle function. Additionally, the patient exhibited marked stiffness and a limited range of motion in her wrist and fingers. Clinical examination revealed the presence of seven tender points localised over the

flexor compartment of the left forearm, which were assessed using palpation.

The patient had a history of unsuccessful pain management with pharmacological treatments, including nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids. Given the refractory nature of her symptoms and the lack of significant improvement with medications, the decision was made to initiate a physical therapy regimen focused on strain counterstrain techniques.

**Assessment and Diagnosis**

The diagnosis of CRPS was confirmed based on the Budapest Criteria, which require the presence of continuing pain that is disproportionate to the inciting event, along with at least one symptom in three of the four categories (sensory, vasomotor, sudomotor/edema, and motor/trophic) and at least one sign in two or more of these categories during clinical examination [7]. The patient's persistent pain, allodynia, temperature asymmetry, and muscle atrophy met these criteria, confirming the diagnosis of CRPS Type I.

Diagnostic assessments included the use of the NPRS to quantify pain intensity and a handheld dynamometer to measure grip strength. Additionally, the active range of motion of the wrist and fingers was assessed using a goniometer, and the extent of muscle atrophy was visually and manually evaluated. These objective measures provided a baseline for tracking the patient's progress throughout the treatment course.

**Treatment**

The physical therapy regimen was designed to address the patient's pain and functional limitations through the application of strain counterstrain techniques, followed by the introduction of progressive resistive exercises (PRE) as her condition improved. The treatment protocol was divided into two phases:

**Phase 1: Strain Counterstrain (Weeks 1-6)**

During the first six weeks, the patient received weekly sessions of strain counterstrain. This technique was performed by positioning the patient's arm in 90 degrees of elbow flexion and approximately 25 degrees of wrist flexion to achieve a position of comfort. Gentle pressure was applied to each of the seven identified tender points on the left forearm for 90 seconds, followed by a gradual release. The goal of this phase was to reduce pain and tenderness, improve circulation, and prepare the muscles for subsequent strengthening exercises.

The rationale for using strain counterstrain as the initial intervention was based on its ability to alleviate pain through the reduction of abnormal muscle tension and the modulation of the autonomic nervous system [6]. By placing the affected limb in a position of comfort, the technique aimed to reset the muscle spindle fibres and reduce the nociceptive input contributing to the patient's pain.

**Phase 2: Combined Strain Counterstrain and Progressive Resistive Exercises (Weeks 7-12)**

From week 7 onwards, the patient's treatment was modified to include both strain counterstrain and progressive resistive exercises (PRE) targeting the intrinsic muscles of the hand. PRE was introduced to enhance the strength and endurance of the muscles involved in pinch, grip, and wrist movements. The exercises included resisted finger flexion and extension, thumb opposition, and wrist curls using light resistance bands. The intensity of the exercises was progressively increased based on the patient's tolerance and improvement.

The combination of strain counterstrain with PRE aimed to build on the pain relief achieved in the first phase by improving the functional capacity of the hand. The goal was to restore the patient's ability to perform daily tasks and reduce her reliance on pain medications.

**Outcomes**

The patient's progress was monitored through regular assessments at 3, 6, and 12 weeks. The outcomes demonstrated significant improvements in pain, grip strength, and range of motion:

1. Pain Reduction: The patient's NPRS score decreased from 8/10 at baseline to 7/10 at 3 weeks, 4/10 at 6 weeks, and 2/10 by the end of 12 weeks. This gradual decline in pain intensity was associated with an improved ability to perform daily activities and a reduction in her dependence on pain medication.
2. Grip Strength: Grip strength, as measured by the handheld dynamometer, showed a marked improvement from an average of 5 kg at baseline to 12 kg at 6 weeks and 28 kg at 12 weeks. This increase in strength reflected the patient's enhanced muscle function and endurance, particularly in tasks requiring grip and pinch.
3. Range of Motion: The active range of motion in the wrist and fingers improved significantly over the course of treatment. At baseline, the patient's wrist flexion was limited to 20 degrees, and finger flexion was severely restricted. By the end of the treatment period, wrist flexion had increased to 45 degrees, and the patient regained nearly full flexion in the fingers.
4. Reduction in Muscle Atrophy and Swelling: Visual and manual assessment revealed a noticeable reduction in muscle atrophy and swelling in the affected limb.

The patient's hand appeared less edematous, and the muscle bulk in the forearm had improved, contributing to her overall functional gains.

These outcomes suggest that the combination of strain counterstrain and PRE was effective in managing the symptoms of CRPS and restoring functional capacity in the patient's hand.

**Discussion**

The results of this case study support the use of strain counterstrain as an effective intervention for managing CRPS symptoms, particularly in reducing pain and improving function. The significant improvements observed in pain levels, grip strength, and range of motion are consistent with the hypothesised benefits of strain counterstrain, which include the modulation of muscle tension and autonomic function [6, 8]. The addition of PRE exercises in the later stages of treatment further enhanced these outcomes, suggesting that a multimodal approach may be particularly effective in the management of CRPS.

The success of strain counterstrain in this case may be attributed to its gentle, non-invasive nature, which makes it suitable for patients with severe pain and hypersensitivity, such as those with CRPS. By positioning the limb in a position of comfort and applying minimal pressure, strain counterstrain minimises the risk of exacerbating pain, which is a common concern in the treatment of CRPS.

Despite the positive outcomes observed in this case, it is important to acknowledge the limitations of this study. As a single-subject case study, the findings may not be generalizable to all patients with CRPS. Additionally, the absence of a control group or comparison with other treatment modalities limits the ability to draw definitive conclusions about the relative efficacy of strain

counterstrain. Further research, including larger-scale randomised controlled trials, is needed to confirm these findings and explore the broader applicability of strain counterstrain in the treatment of CRPS.

## Conclusion

The application of strain counterstrain techniques, initially as a standalone intervention and later in combination with progressive resistive exercises, proved beneficial in the treatment of a 42-year-old female patient with CRPS. The patient experienced significant reductions in pain, improvements in grip strength, and enhanced range of motion, which contributed to her overall functional recovery. This case study suggests that strain counterstrain, when integrated into a comprehensive physical therapy regimen, can be an effective tool in managing the complex symptoms of CRPS. Future research should aim to further investigate the efficacy of strain counterstrain in diverse patient populations and explore its integration into standardised CRPS treatment protocols [9-15].

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