

## Erector Spinae Plane Block as a New Treatment for Complex Regional Pain Syndrome in Upper Limbs: Two Case Reports

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## 1. Abstract

Complex regional pain syndrome (CRPS) can be divided into type I (absence of nerve damage) and type II (presence of nerve damage), its diagnosis is based on the Budapest criteria. Pain control in CRPS is a challenge, and for this reason new less invasive techniques are needed for the treatment of this chronic syndrome. We present the erector spinae plane block as a therapeutic option for better pain control in CRPS of the upper limbs.

## 2. Introduction

CRPS is considered a chronic disease, usually resulting from a traumatic insult, and can be divided into two subtypes; type I: absence of nerve injury, and type II: presence of nerve injury. It is accompanied by the presence of autonomic dysfunction, regional alterations of an inflammatory nature and does not follow the distribution in dermatomes [1]. Harden et al [2] developed a new diagnostic criterion for the diagnosis of the syndrome and involves the presence of symptoms such as allodynia, hyperalgesia, changes in skin color, edema and motor dysfunction, among other criteria [3]. With a prevalence of 5 to 26 cases per 100,000 people per year, this syndrome remains a challenge for both diagnosis and treatment. The main treatment options involve physiotherapy, medication for neuropathic pain, anti-inflammatories and interventional procedures, including sympathetic thoracic block and stellate ganglion block, which can lead to complications [1]. The erector spinae plane block (ESP block), since its description in 2016 [4] has been increasingly popular, but the literature is still scarce on its use as a therapeutic option for complex regional pain syndrome

for upper limbs.

## 3. Case Reports

### 3.1. Case 1

Female patient, 56 years old, hypertensive and diabetic, with a history of falling from standing height 10 years ago with fracture of the right radius and ulna, evolved with weakness and claw hand, suggesting possible injury to the ulnar nerve. In addition, she had a cyst on her left forearm. Submitted to surgical correction without improvement of symptoms. She still had weakness, hyperalgesia, allodynia, sweating, paresthesia, and upper limb edema, fulfilling diagnostic criteria for complex regional pain syndrome type II. The patient reported pain with an intensity of 10/10 on the Verbal Numerical Scale (VNS), which prevented her from performing daily activities. Patient sought pain group in 2019 and despite treatments such as neuromodulation, physiotherapy, oral drug treatment with gabapentinoids, antidepressants and optimized opioids, the patient did not show significant improvement. With this context in mind, after two years of clinical treatment, it was decided to carry out a treatment attempt, in December 2021, the erector spinae plane block (ESP block), on an elective basis, in a surgical center with ropivacaine at 0.5% total of 30ml, without the use of a catheter, with total remission of pain minutes after the procedure. About 6 months after each procedure, the blocks were repeated, as the pain had returned, but with only 50% of the previous intensity. Three months after the last block, the patient was evaluated again and reported total absence of pain in the upper and left limbs and pain of maximum intensity VNS 5/10 in the right upper limb, but not

continuously and now responsive to treatment with analgesics and opioids.

### 3.2. Case 2

Male patient, 52 years old, overweight, without other comorbidities, victim of polytrauma due to a motor vehicle accident with a motorcycle in 2020, with a fracture of the 1st, 2nd and 3rd fingers of the left hand, who underwent surgical treatment. Evolved with intermittent neuropathic pain in the left hand, associated with paresthesia, local redness, reduced finger flexion and allodynia, had slight improvement with rest and local heat and worsened with mobilization and cold, referred pain VNS 8/10. The electroneuromyography examination showed a pattern suggestive of diffuse postganglionic axonal injury, with intense involvement of the upper, middle and lower trunk of the brachial plexus, classifying the patient in the diagnosis of complex regional pain syndrome type II. Due to disabling pain, the patient sought help from the pain group in January 2021, undergoing treatment with neuromodulation,

physiotherapy, sympathetic venous blockade, in addition to oral medication with gabapentinoids, optimized antidepressants and opioids. The patient reported that he maintained the pain with the same characteristics and without a decrease in intensity. Considering the clinical treatment failures and the patient still maintaining it due to intense pain, it was decided to perform a left erector spinae plane block (ESP block) guided by ultrasound, electively in a surgical center, using 0.5% ropivacaine with volume of 30 ml. Two applications were performed, the first in January 2022, without the use of a catheter, with an interval of 3 months, and the patient reported a significant improvement in pain shortly after the first application. After the second application, he evolved with VNS pain 3/10, associated with a decrease in allodynia, and with pain that responded satisfactorily to analgesics and opioids. Six months after the last ESP block (August 2022), the patient evolved with a significant improvement in quality of life, managing to return to his daily activities and maintaining follow-up with the pain group to monitor the evolution of the case.

**Table 1:** Proposed new diagnostic criteria for clinical diagnosis of complex regional pain syndrome.

#### General definition of the syndrome:

CRPS describes an array of painful conditions that are characterized by a continuing (spontaneous and/or evoked) regional pain that is seemingly disproportionate in time or degree to the usual course of any known trauma or other lesion. The pain is regional (not in a specific nerve territory or dermatome) and usually has a distal predominance of abnormal sensory, motor, sudomotor, vasomotor, and/or trophic findings. The syndrome shows variable progression over time

#### 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.

## 4. Discussion

The patients in the reported cases fit into the classification of complex regional pain type II, due to a probable associated nerve injury of the brachial plexus. These patients had been submitted to several types of conventional treatments such as physiotherapy, medications and neuromodulation without pain improvement. An option for patients with clinical treatment failure is to perform a stellate ganglion block (SGB), which is formed by the junction of the inferior cervical ganglion and the first thoracic ganglion, participating in the sympathetic innervation of the upper body region (head, neck and beginning of the trunk). Since studies have demonstrated the role of sympathetic innervation in chronic pain syndromes, BGS has been widely used for treatment [5]. However, in some cases BGS alone is not enough, which may occur due to the presence of an anatomical variation in the Kuntz fibers in which the innervation emerges from the second and third thoracic ganglia and innervates the brachial plexus without passing

through the stellate ganglion, leading to treatment failure [6]. The complications associated with the SGB are also a concern for the procedure, such as pneumothorax, accidental puncture of vessels such as the carotid artery and internal jugular vein, phrenic nerve block, possible to occur due to the proximity of the structures to the stellate ganglion [7]. In view of the technical difficulty, the risks inherent to the procedure and the possibility of failure, a new therapeutic option, less invasive for the treatment of CRPS of the upper limbs, was proposed to the patients: the erector spinae plane block.

The ESP block is an interfascial block guided by ultrasound, first described in 2016 for the treatment of chronic neuropathic chest wall pain [4] and aims to deposit local anesthetic in the sheath of the erector muscle, the path to this point involves the trapezius muscle, the rhomboid and finally, the erector spinae, which is composed of three branches: iliocostal, longissimus dorsi and spinal. The main point of reference for performing this block is

the transverse vertebral process [8]. This block has a low probability of complications, as it is less invasive, and has already been described for use in abdominal surgeries, thoracic surgeries, major burns and other indications [9]. After a literature review, only one study was found citing the use of continuous ESP block for the treatment of CRPS, which was performed with ultrasonography (USG) and fluoroscopy, keeping the catheter in patients for 14 days [10]. The explanation for the good result obtained with the use of ESP block is based on the fact that the local anesthetic injection is dispersed through the ventral and dorsal branches of the spinal nerves, which guarantees analgesia [11]. The blocks were performed at the T2 level with 0.5% ropivacaine 30ml, without the use of a catheter and with the aid of ultrasound. After a few minutes of blockade, both patients reported pain improvement and remained so for a few months. When the pain returned, it no longer had the intensity of before the procedure and was no longer disabling, in addition to being responsive to analgesics, which resulted in a significant improvement in the patient's quality of life. The patients had no complications in any of the blockade procedures, and are being followed up with the pain group. At the presenting date, two studies have been found reporting the use of ESP block for the treatment of CRPS of the upper limbs, however, they were performed using a continuous catheter guided by fluoroscopy [5], which differs from the technique used in our patients, in which an injection was performed single, without the need for fluoroscopy and enabling almost immediate improvement, hospital discharge on the same day, greater practicality (USG) and easy execution. The use of this technique for the treatment of CRPS of the upper limbs can be a promising alternative in relation to refractory clinical treatments and more invasive blocks, however, more studies are needed to evaluate the costs and benefits of performing this procedure.

## 5. Conflicts of Interest

None.

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