

Complex Regional Pain Syndrome: Outpatient Pain Management in the Chronic Setting: A Case Report

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Abstract

Background: Complex Regional Pain Syndrome (CRPS), previously known as reflex sympathetic dystrophy and causalgia, is a neuropathic pain condition that usually develops after an injury to an extremity. CRPS can be a debilitating condition with high levels of pain and reduced function. **Aim:** This case report aims to discuss the multimodal approach in the management of a patient who presented with ongoing poorly controlled pain secondary to CRPS from an injury that happened years prior. **Case Presentation:** A 45-year-old female was involved in a motor vehicle accident where her right leg was injured. She underwent several surgeries and developed CRPS that significantly reduced her mobility and quality of life. She presented to the pain clinic years after her initial injury and a multimodal regimen was started for her resulting in significantly improved function. **Conclusion:** CRPS can be a severely debilitating condition. While early diagnosis and management are important, ongoing management in the outpatient chronic pain setting is important in maintaining a good level of function.

Keywords

Chronic Regional Pain Syndrome (CRPS), Multimodal Management, Chronic Pain, Sequelae

1. Introduction

Complex Regional Pain Syndrome (CRPS) is a chronic (lasting greater than six months) pain condition that most often affects one limb (arm, leg, hand, or foot) usually after an injury. It is believed to be caused by damage to and/or malfunc-

tion of the nervous system (both central and peripheral). CRPS is characterised by prolonged or excessive pain, changes in skin colour, temperature variability, and/or swelling in the affected area. The pain and disability caused by CRPS often lead to psychological comorbidities, such as depression and anxiety. CRPS has a prevalence of approximately 5.4 - 26.2 per 100,000 person-years [1]. In 1872, the American Civil War physician, Weir Mitchell, described a pain syndrome he termed causalgia, developing in the distal extremity following traumatic partial nerve injury [1] [2] [3]. We present here a case report detailing the management of a patient who presented to the pain clinic with long-standing CRPS after a motor vehicle accident that happened years prior.

2. Case Presentation

2.1. History

In 2013, a 45-year-old female patient was involved in a motor vehicle accident where she was a restrained driver. She was hit on the driver's side and her vehicle rolled several times before coming to a stop. Her right leg was pinned under the steering wheel. She was rushed to the emergency room and subsequent workup revealed that she had multiple injuries to her right knee: Tears to her medial meniscus, anterior and medial cruciate ligaments. After consultations with orthopaedic surgeons, the patient underwent surgery to repair the meniscus and medial collateral ligament tear. In the post-op period, she continued to experience knee pain and had subsequent repeat procedures to the right knee.

After discharge, she began physical therapy and was noted to have increased joint stiffness with knee swelling. Management included weekly arthrocentesis, where the patient reports that approximately 60 cc of fluid would be extracted during each session. The arthrocentesis procedures went on for a few months with no improvement and she sought a second opinion where additional surgery was recommended. She underwent a high tibial osteotomy procedure but unfortunately the post-op period was complicated by osteomyelitis managed with Intravenous antibiotics. Secondary to the osteomyelitis, our patient developed a non-union and sought further management to try to correct it with subsequent surgeries.

Unfortunately, her pain persisted and worsened, to a point where she was unable to move her leg. She subsequently developed increased sensitivity to touch and a constant burning sensation to her right leg and could not wear anything that went below her knees and was diagnosed with CRPS.

In total, the patient had 12 surgical procedures on the right knee between 2014 and 2020.

2.2. Present

Due to the increasing severity in her pain, she was referred to our pain management clinic in August of 2020. At presentation, her symptoms included:

- Inability to weight bear fully on her right leg.

- Constant burning sensation to her right leg.
- Swelling of her right leg and foot.
- Joint stiffness of her right knee, ankle and toes.
- Growths distortion to her toe nails (especially of the hallux).

Patient described her sensitivity to touch had increased exponentially over time with a constant sensation of what she described as “insects biting into her flesh”.

She described the pain as a burning and stabbing sensation, with the feeling of hot water and ants all over especially on the calf and knee areas, and a burning sensation in the heel. The pain waxed and waned in severity, where it suddenly increased in severity without prior warning and she was left screaming in pain.

After a thorough consultation that included detailed history and examination, a diagnosis of complex regional pain syndrome was established.

2.3. Management

Over the years since her initial injury, different modes of therapy had been used to try and control her pain. Injective modalities included adductor canal nerve blocks and even a neurectomy. Despite this, her high levels of pain persisted.

The patient presented to our clinic in August 2020 with ongoing severe pain. Due to the high levels of pain, she was unable to sleep and she self medicated with Benadryl every night and was not on any other medications.

After assessing the State prescription monitoring report, a urine drug screen as well as assessing for opioid risk using the opioid risk tool [4], the patient was placed on a multimodal regimen that included:

- Oxycodone/acetaminophen 5/325 mg BID for a morphine equivalent dosage of 15 mg per 24 hours (significantly lower than the recommended daily dosage of 50 mg MED).
- Gabapentin 100 mg TID which was titrated to 300 mg TID.

The patient developed a documented rash with use of acetaminophen and was switched to oxycodone 5 mg TID.

The patient reported improvement on the regimen and with titration settled on:

- Gabapentin 300 mg TID,
- Cymbalta 20 mg qday, and
- Oxycodone 5/325 TID PRN.

She was also started on a TENS (Transcutaneous Electrical Nerve Stimulation) unit for her heel pain with relief. She also used ice modality as needed.

With the medication regimen, her paresthesia abated and her functional status improved significantly allowing her to resume normal activities of daily living and work as a dog sitter.

3. Discussion

Complex Regional Pain Syndrome (CRPS), previously known as reflex sympa-

thetic dystrophy, is characterised by excessive and prolonged pain following injury to the extremity. Its pathophysiology is thought to be an exaggeration or a mal-processing defect of sensory information and thus a surplus of sympathetic outflow [5]. Early studies led to widespread acknowledgement that the sympathetic nervous system is majorly involved in the pathogenesis and maintenance of this syndrome.

Key to clinching the diagnosis lies in a detailed history inquiring about any preceding injury and the persistence of pain, as well as associated symptoms of atrophies, hyperaesthesia, skin temperature changes as well as edema [6]. Detailed account of any precipitating factors such as trauma (which accounts for approximately 80% of cases) and neurological disease (accounting for 20%) is paramount in also contributing to the diagnosis. Of note is that CRPS is distinct from other pain syndromes as it has no dermatomal distribution and has persistent regional inflammatory changes [7]. Criteria such as the Budapest Criteria for CRPS (see **Figure 1**) can be used to aid in diagnosis and distinction between the two types of CRPS [8].

It is crucial that the management of Chronic Regional Pain Syndrome be multimodal to allow that all aspects affected are addressed. In addition to symptomatic management, which includes neuropathic pain management, anti-inflammatory medication and interventional procedures targeting the sympathetic pathway [7] [8], the incorporation of physical and/or occupational therapy is necessary to rehabilitate patients' function and mobility.

· **Physical/occupational therapy**

Patients with CRPS tend to avoid using their affected limb due to the severity of the pain. The goal of treatment with PT and OT is to improve the function and range of motion of the affected extremity [7]. Movement of the limb improves blood circulation and therefore lessens the circulatory symptoms. As per the Cochrane review (2016), the two therapies that showed to improve the pain and function in CRPS include: graded motor imagery and mirror therapy [9].

Physical therapy with relaxation training also showed to have better limb temperature improvement. For optimal improvement, the use of PT and OT should be started early and is therefore considered a first line therapy for CRPS [7].

· **Pharmacological therapy**

Several classes of medications have been noted to be effective in the management of CRPS depending on the patient's severity of pain. Currently there is no FDA approved drug for the management of CRPS.

A multimodal pharmacological approach is recommended. Medications often used to manage CRPS include:

- 1) Anti-neuropathics such as pregabalin and gabapentin. These medications bind to voltage gated calcium channels on neurons inhibiting it [10] [11].
- 2) Opioids such as morphine, oxycodone and fentanyl are used at a low dose in select patients with severe pain after careful screening [11].
- 3) Anti-inflammatory medications, *i.e.* NSAIDS and Acetaminophen are used

in patients with moderate pain and inflammation [12] [13].

4) Antidepressants, *i.e.* amitriptyline, nortriptyline, duloxetine and doxepin have also shown to be effective in the management of comorbidities associated with CRPS [11] [13].

5) Topical anaesthetic ointments, creams and patches, *i.e.* lidocaine creams and fentanyl patches [13] [14].

6) Bisphosphonates, *i.e.* high dose alendronate are used to reduce bone changes [10] [15].

7) Corticosteroids are used to manage the inflammation and edema. Their use in the early stages has shown benefit [13] [16].

8) Botox injections used in severe cases are used to relax contracted muscles and restore normal extremity positions [17].

Nerve blocks/injections

9) Nerve blocks can also be used depending on the extremity affected and the severity of symptoms [18].

· Neuronal stimulation

Recent studies assessing the use of spinal cord stimulation and dorsal root ganglion stimulation have shown marked improvement in pain levels in patients with CRPS. The procedure entails using an electrical stimulus that is applied either to the dorsal column in the spine or directly on the Dorsal root ganglion and it is thought that the stimulation masks the sensation of pain and therefore any perceived pain is reduced. A 2013 review examining the pain care algorithm analysed that neuronal stimulation should be utilised earlier and not be used as a therapy of last resort.

Dorsal root Ganglion stimulation may prove to be the superior neuromodulation as it can target specific painful areas [19] [20] [21].

· Surgical interventions

There is controversial discussion on the use of surgery to manage CRPS. Surgical sympathectomy should be used only in patients whose pain is temporarily and dramatically relieved by the nerve blocks [22].

Our patient was diagnosed with Complex Regional Pain syndrome as per the Budapest Criteria [23].

- Sensory-patient reported allodynia to light touch and hyperesthesia.
- Vasomotor-patient reported skin colour changes in affected limb.
- Sudomotor-patient had edema to her affected limb.
- Motor-patient reported weakness, inability to weight bear, joint stiffness and trophic changed to nails in her affected limb.
- Ongoing pain that was disproportionate to her inciting injury.

Complex Regional Pain Syndrome (CRPS) is a diagnosis of exclusion. The accepted criteria for the diagnosis of CRPS is based on observed signs in two or more categories and reported symptoms in three or more of the listed categories [23].

Table 1 illustrates the patients' assessment in different areas pre- and post-multimodal treatment modalities.

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 deep somatic pressure and/or joint movement)
 - *Vasomotor*: evidence of temperature asymmetry 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

Figure 1. The Budapest Criteria [23].

Table 1. Pain and function before and after multimodal regimen.

	Before	Post-multimodal Regimen
Pain	10	5
Walking	6 feet	More than three blocks
Working	unable	Working as a dog sitter
Dysesthesia	Severe “ants crawling in her leg”	Improved, “ant” sensation abated
Stairs	Came down by sitting on the top steps and “bumping down on her buttocks”	Walked down stairs

We have presented a case here of a patient who developed CRPS after an initial injury and who presented to our clinic with severe ongoing pain that was reduced by a multimodal regimen that enabled the patient to go from having to sit when going downstairs to being able to work part-time as a dog walker.

4. Conclusions

Chronic Regional Pain Syndrome is a chronic pain condition often affecting one extremity usually after an injury. Diagnosis lies in detailed history inquiring of any preceding injury and the persistence of pain as well as associated symptoms of atrophies, hyperesthesia, skin temperature changes as well as edema [6].

The multimodal approach to pain management aims to decrease the emphasis on opioid analgesics by integrating several therapies, including a combination of

pharmaceutical and non-medication treatments, to effectively reduce pain and improve patient health. This patient is evidence that treatment of CRPS using the multimodal approach does work to relieve patients of their symptoms and allow them to regain some of their functionality.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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