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The science of the sympathetic nervous system in complex regional pain syndrome (CRPS)

THE MEDICAL EVIDENCE NECESSARY TO SUPPORT YOUR CLAIM OF CRPS – OR SHOULD YOU GO WITH "CHRONIC PAIN"?

A potential client comes to you with significant pain that has persisted despite what doctors have said should have resolved by now. The underlying trauma was there but cannot explain the intense complaints of long-term pain which your client describes. There have been various legal articles on this topic over the years detailing how to frame these cases. Focusing on the science behind sympathetic nerve disorders and proving up the case from a diagnostic and treatment standpoint is the focus of this article.

Due to the inherent complexity of a CRPS case, attorneys often have difficulty managing what seems to be conflicting medical evidence and struggle to find an appropriate damages and causation workup. Though the injury is complex, the damages workup must not be. Rather, consider managing these cases with a holistic approach, threading all the moving parts into one

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unified theme – your client suffers from chronic pain, period. Understanding the science behind chronic nerve pain and the available medical treatments for such injuries can greatly assist your client in recovery and proving up the case.

What is CRPS?

CRPS is a class of chronic pain that usually affects an arm, leg, hand, or foot. CRPS is classified as either Type I or Type II. CRPS I (formerly known as RSD) is a clinical pain syndrome of variable course and unknown cause characterized by pain, swelling, and vasomotor dysfunction of an extremity. This condition is often the result of trauma or surgery. CRPS I occurs in the absence of a definable nerve injury. CRPS II (formerly known as causalgia) has similar symptoms to Type I but stems from a direct injury to a nerve.

The National Institute of Health describes the typical CRPS pain as a "burning," and "pins and needles" sensation, or "electrical shock." Clinical studies of objective pain scales have concluded that CRPS is among the most severe pain disorders.

The cause of a CRPS injury is usually some kind of trauma to an affected limb. Complicating the diagnosis is the fact that CRPS can manifest after significant trauma, such as a fracture or laceration, or a minor soft-tissue injury. The underlying etiological mechanism of a CRPS injury is still heavily debated in the medical community. A holistic understanding of the nervous system is necessary to better understand how to manage a CRPS case.

CRPS and the nervous system

The nervous system consists of two main parts: the Central Nervous System ("Central") and the Peripheral Nervous System ("Peripheral"). The Central consists of the brain and spinal cord and is considered the body's master control unit. The Peripheral consists of nerves that connect the Central to every part of the body.

Within the Peripheral, there is both the autonomic nervous system and the somatic nervous system. The autonomic nervous system regulates involuntary bodily processes, including heart rate, digestion, body temperature, and respiration. The autonomic nervous system operates automatically, without requiring any conscious thought. Within the autonomic nervous system lies the sympathetic nervous system. The sympathetic nervous system, which we will focus much of our attention towards, prepares the body for action and stress, often referred to as "fight or flight." CRPS is described as a sympathetic pain disorder. In response to acute stress, the body's sympathetic nervous system is activated due to the sudden release of hormones. One way of thinking about it is that the body's fight or flight system is damaged and, as a result, the pain signals are firing on overdrive.

No specific test

When proving up a CRPS case, it is important to understand the diagnostic criteria that doctors and experts rely upon. There is no specific test that can be used to diagnose CRPS. As a result, the medical community has altered and adopted several different criteria for diagnosing a CRPS injury over the years.

In 1994, the International Association for the Study of Pain (IASP) came up with an agreed upon "diagnostic criteria," which practitioners still use today. The approach was based on the patient's symptoms and signs and accounted for the risk factor that symptoms may vary between patients, and that specific patients themselves may experience fluctuating symptoms. It is anticipated that this method will be contested by the defense and their experts. More likely, they will point to what is called the "Budapest criteria."

In 2003, an international consensus meeting was held in Budapest, to review issues related to CRPS diagnosis. Proponents of the Budapest criteria believe that its predecessor was overly broad and, although it accurately identified most cases of CRPS, the method also tended to misidentify non-CRPS conditions as CRPS, leading to over-diagnoses of the condition.

To make the clinical diagnosis using the Budapest criteria, the following criteria must be met:

- Continuing pain, which is disproportionate to any inciting event.
- Must report at least one symptom in all four of the following categories:
- Sensory – reports of hyperaesthesia and/or allodynia
- Vasomotor – reports of temperature asymmetry and/or skin color changes and/or skin color asymmetry
- Sudomotor/oedema – reports of oedema 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).
- 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/oedema – evidence of oedema 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)
- There is no other diagnosis that better explains the signs and symptoms.

The stages of CRPS

CRPS typically follows three stages of development:

Stage 1

This stage usually lasts one to three months and includes the following symptoms:

- Severe burning or aching pain that increases with even a very slight touch or breeze.
- Fluctuations in skin temperature between hot and cold.
- Rapid growth of hair and nails.
- Muscle spasms and joint pain.

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• Changes in the skin's color, appearance, and texture. The skin can become pale, red, purple, or mottled, and appears thin and shiny.

• Increased sweating.

Stage 2

Stage 2 typically lasts between three and six months, during which time the symptoms progress. The skin continues to change and the nails become brittle and cracked. The level of pain increases, and hair growth slows down. The joints stiffen and the muscles weaken.

Stage 3

If CRPS is allowed to progress untreated to this point, it becomes difficult to use the affected limb. This causes the muscles and tendons to atrophy and even contract, which can ultimately cause clawing of the affected hand or foot. These changes can become permanent.

Identifying a CRPS case

Though these cases are rare, it is important to properly evaluate clients who have chronic pain disorders with any of the above-listed CRPS symptomology. Due to the complexity of this disease and its potentially fluctuating nature, a CRPS injury may go undiagnosed. For many clients, they have seen a variety of medical professionals including orthopedists, neurologists, and even pain specialists, but it is not until someone looks at the complete medical history that the CRPS story begins to make sense.

Here are the factors that should be considered when evaluating whether a client potentially has CRPS: (1) an injury causing pain which is out of proportion to injury; (2) changes in skin texture or color on the affected area; (3) abnormal temperature or sweating pattern in the affected area; (4) changes in nail growth patterns; (5) stiffness in affected joints; (6) problems coordinating muscle movement, with decreased ability to move the affected body part; and (7) abnormal movement in the affected limb.

Each one of the symptoms above can be attributed to a change in the nervous system. For example, abnormal sweating patterns reflect a sudomotor abnormality, which means there has been a change in the sympathetic nervous system. This is an objective sign that is difficult for the defense to refute. Understanding and identifying these symptoms will guide your damage workup.

Using objective signs to build your case

As with any pain disorder, one of the common hurdles in proving the disorder is dealing with the inherent subjective nature of pain. However, with CRPS there are objective signs that can be documented as powerful and persuasive evidence.

***Motor function*:** If a client is suffering from a CRPS injury, they typically will exhibit some limitation in range of motion of that limb. The client may exhibit a loss of strength, a decrease in hand grip strength, or difficulty standing on their toes. An affected limb often has atrophy that can be objectively measured.

***Skin temperature and color*:** Common signs are unilateral differences in skin temperature, skin color, sweat, or edema. These changes should occur only in the affected limb or extremity. These unilateral symptoms provide an objective control measure, allowing to build up your case by comparing one limb to another. For example, proving that the affected limb has a consistent temperature reading several degrees higher than the unaffected limb is helpful in establishing a CRPS diagnosis.

***Hair and nails*:** Increased hair growth, increased or decreased nail growth, and skin atrophy. Again, these changes and symptoms should occur on the affected limb only.

Using objective diagnoses to build your case

There are objective diagnostic measures that can be taken to build up your CRPS case. However, it must be understood that CRPS injuries, their symptoms, and effects on a client vary and fluctuate. Since the underlying mechanism is unknown, it is difficult to make one standardized test for each injury. Further, due to the fact that this is an injury to the client's nervous system, different symptoms arise. Thus, your client may test positive to one measure and negative to another. That is why understanding your client's symptoms is crucial to choosing the correct diagnostic method.

The use of a three-phase bone scintigraphy is a commonly used technique. Bone scintigraphy is used to show abnormalities in the bone of the affected limb. This method, while useful, is controversial. A common defense argument to a scintigraphy finding that supports a CRPS diagnosis is that the bone abnormalities are due to the fact that the injured limb, an arm for example, is the non-dominant limb. Additionally, be aware that a negative scintigraphy finding does not rule out a CRPS diagnoses.

Additionally, the use of tests measuring autonomic changes may be useful. These tests include measuring resting sweat output, resting skin temperature, and even reflex tests. Measuring the skin temperature requires monitoring for at least five hours, with recording of the skin temperature at one-minute intervals. Do not allow for a defense medical examination to conduct such a test under lower time constraints. Beware of the defense expert taking advantage of the fact that the presentation of symptoms fluctuates.

Traditional imaging, such as MRIs may be useful in ruling out differential diagnosis. MRIs cannot be used to make an affirmative determination or finding of CRPS.

Working up damages — CRPS treatment

There is no cure for CRPS. Treatment for a CRPS injury involve consistent management, pharmacological use and operative intervention. Treatment is most effective when started early to slow the progression of the disease, and help sufferers cope with the pain. The severity of the injury and duration since the onset of initial symptoms will help guide the types of treatment necessary. Understanding the different types of

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treatment available will help with your client's recovery, and will greatly assist in establishing the damages.

To start, the most conservative type of treatment is managing the pain and the affected limb with physical and occupational therapy. This approach is helpful before more invasive measures are used and assists with countering the anticipated defense that plaintiff did not reasonably attempt to mitigate her injury by performing a standard course of therapy. Such physical and occupational therapy can sometimes help the client by improving functional strength, and providing edema control strategies. However, many times such therapy is intolerable or ineffective long-term.

Pharmacologic approaches are the primary method of providing treatment for this disease. Physicians often prescribe opioids and non-steroidal anti-inflammatories to treat these chronic pain disorders. Drugs initially developed to treat seizures or depression have been shown to be effective for neuropathic pain, such as Gabapentin and Amitriptyline.

Corticosteriods that treat inflammation can be used in the early stages of CRPS treatment and don't carry the risks associated with opioid prescription.

A more intense pharmacological approach includes the use of Ketamine, either in pill form or prolonged infusion therapy. Ketamine is an anesthetic agent that originally became a popular pain agent used in the field in Vietnam. Subsequently, it developed an off-label reputation for its psychotropic effects. Most recently, it has been used to treat neuropathic pain and even depression. There is a growing body of clinical evidence to support the use of Ketamine in the treatment of neuropathic pain, especially CRPS. A recent study suggested that Ketamine infusion can provide more than two-thirds of patients with immediate pain relief. However, the relief was noted to be short term (less than three months). Further studies are underway to determine the long-term efficacy of this new treatment.

Sympathetic nerve blocks to both treat and diagnose

Bearing in mind that CRPS is a sympathetic nerve pain disorder, a nerve block of an affected sympathetic nerve can be extremely helpful both for pain relief and diagnosing the injury.

For discussion purposes, allow us to consider the example of a client with neuropathic pain in the hand. There is a dispute about whether or not the client has CRPS. A common type of nerve block used in such a case would be a stellate ganglion block. The stellate ganglion is a collection of nerves (sympathetic) found at the level of the sixth and seventh cervical vertebrae (the last vertebra of the neck). They are part of the sympathetic nervous system and supply the face and arm. These nerves are not involved with feeling or movement. A stellate ganglion block (sympathetic block) is an injection of local anesthetic into the front of the neck. Sometimes, after a nerve is sensitized by trauma, the sympathetic activity can cause pain. A stellate ganglion block (sympathetic block) is an injection of local anesthetic into the front of the neck. Blocking the sympathetic activity by anesthetizing the stellate ganglion may stop the pain. If the client experiences pain relief in the affected limb, this is indicative of a sympathetic pain disorder (CRPS).

Psychological treatment

Psychological treatment is crucial in a chronic pain case for many reasons. The defense will most likely argue malingering. In doing so, they may make the argument that several sessions of treatment and pain medication would solve all of your client's problems. Your client receiving psychological treatment hedges for that argument. In a recent case, our client went through therapy for over two years. Not only did this help diffuse the defense argument, it also allowed for the client to be more in tune with his injury. The client was better able to explain and express what it was he was going through. No amount of treatment can mask a client who is unable to testify to the extent of their injury and the effect it is having on their life. The better they are, the better your case.

CRPS is not a simple injury. Symptoms vary and fluctuate in their presentation. For that reason, your client may not exhibit all of the symptoms mentioned above. Further, the presentation of those symptoms may fluctuate. All of this caters directly to the defense argument of malingering.

Framing the case as CRPS or chronic pain

Depending on your client's symptoms and the results of the tests listed above, a determination must be made on whether you will frame the case as a CRPS case or, in the alternative, a chronic pain case. If all the objective symptomology weighs in favor of an easily understandable CRPS injury (typically in a CRPS II case), then that is the way to go. Typically, it will not.

Simplifying the case as a chronic pain case may be the most effective way of presenting the case to a jury. Rather than get into a battle on the intricacies of CRPS, what it consists of, going into the different sets of criteria (Budapest, etc.), by building up your damages as expressed above, your client should have a medical history that presents one simple fact – pain. Of course, the more objective results to point to, the better; it will be difficult for a defense expert to argue that the client is not suffering from chronic pain. Thus, a determination must be made on whether the facts weigh heavier on a CRPS argument or a chronic pain argument.

In a recent CRPS case, we had retained one of the lead CRPS experts. That expert opined that our client had a clear cut case of CRPS. We did not present that expert in trial. Instead, since

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we could obtain concessions from all the defense experts that our client was suffering from chronic pain, the decision was made to frame the case as "chronic pain." Had we not, we may have got ourselves in a dangerous battle of medical minutiae – difficult to explain and understand – that may have proved fatal to our case.

From complex to simple

It is our job to turn a complex injury into a simple case. Making sure that your client has consistent treatment over a long period of time will allow you to paint a complete picture of the symptoms and how they are aligned with CRPS. That damages workup should also provide for a simple presentation of the case – your client is suffering from chronic pain, period.

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