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## **Proceedings of UCLA Health**

### **Title**

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### **Permalink**

<https://escholarship.org/uc/item/11w79156>

### **Journal**

Proceedings of UCLA Health, 20(1)

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### **Publication Date**

2016-11-08

## CLINICAL VIGNETTE

# Complex Regional Pain Syndrome After Knee Arthroscopy

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### Case

The patient is a 49-year-old male with chronic right lower extremity pain for 17 years. His pain began after he underwent an arthroscopy for a knee injury complicated by swelling and locking. Six months subsequent to his initial arthroscopic procedure, he underwent another knee surgery for patellar subluxation.

After the patient's second knee surgery, he had ongoing pain and swelling of the affected limb. He was felt to have complex regional pain syndrome (CRPS). Three phase bone scan was equivocal, and he underwent a Differential Spinal Procedure. During the procedure, a 24-gauge spinal needle was entered at the L3–4 space. There was no change in pain intensity with saline injection. Lidocaine was then injected, and, after recovery of sensation, there was resolution of his pain, confirming diagnosis of CRPS.

Over the ensuing years, the patient was treated with multiple modalities. Early on, he had extensive physical therapy. Medications included a bisphosphonate (alendronate), calcitonin, anticonvulsants (gabapentin, topiramate), antidepressants (amitriptyline, mirtazapine), muscle relaxants (tizanidine), narcotics (hydrocodone, oxycodone, morphine, hydromorphone, methadone and fentanyl), and ketamine infusions.

Surgical procedures included a lumbar sympathectomy and placement of a dorsal column stimulator. Nonsurgical treatments included physical therapy, a TENS unit and biofeedback.

Despite these treatments, the patient was essentially home bound and unable to tolerate even light touch to the affected limb. His pain was so intense that he required multiple spinal blocks just to provide routine foot care and range of motion. His limb became withered and atrophied with sloughing of the skin.

Ultimately, the patient sustained a tibial plateau fracture causing a varus angulation, which made simple transfers difficult. Splinting was impossible because of severe allodynia.

After failure of conservative management, the patient opted for above-the-knee amputation. His goals for the amputation were to increase mobility with or without pain relief. The patient underwent amputation without complication, and subsequently, he had the placement of a prosthetic limb. After rehabilitation,

he was able to ambulate without an assistive device, and within months, he was weaned off all narcotics and other pain medicines.

### Discussion

There are currently two recognized subtypes of CRPS. Type 1 is the most common type and represents those patients who did not have an injury to the peripheral nerve (as in this case). It was previously termed Reflex Sympathetic Dystrophy. Type 2, previously termed Causalgia, refers to those cases involving an injury to the peripheral nerve.

Various causes have been postulated as mechanisms for CRPS. These include inflammation and changes in pain perception. Multiple proinflammatory cytokines have been noted in the affected tissue and central nervous system in patients with CRPS. Another postulated modality involves central sensitization by way of increased synaptic transmission at the somatosensory neurons in the spinal cord. Genetic factors may also play a role with certain HLA antigens being identified as more likely to be seen in CRPS Type 1.<sup>1</sup>

CRPS symptoms will usually begin within weeks after the inciting injury. In the acute phase, which can occur up to three months after the injury, the limb becomes swollen and inflamed. There is an altered pattern of sweating, excess sensitivity of the skin, and stiffness of the joint without effusion or contracture.

Subsequent to the acute phase and up to six months after the injury, the limb enters the dystrophic phase, becoming cool and cyanotic with persistent hyperaesthesia and contractures. In the final phase of CRPS, the atrophic stage, the limb becomes permanently contracted, atrophic with weakness of all the muscles of the region. In this stage, the skin becomes hairless and creaseless. There can be tremors and postural dystonias also noted.

The diagnosis of CRPS is clinical based upon supporting data. Multiple modalities are used in the workup, frequently to exclude other etiologies of pain. Laboratory studies can help exclude systemic issues. Plain radiography can help exclude occult fractures and in the late stages can show a patchy, followed by diffuse osteopenia. Technetium-99 bone scan is sensitive but not specific and can also be normal in the late stages of the disease.

EMG and nerve conduction studies can be used to exclude entrapment neuropathies. Thermography can be used to supplement the bedside observation of a difference in temperature of the affected limb. MRI can reveal bone marrow edema in CRPS as well as reveal occult soft tissue abnormalities. Lastly sympathetic blockade is often helpful in solidifying the diagnosis of CRPS. Relief of pain for the duration of the block provides supporting evidence of the diagnosis of CRPS, while the lack of a response puts the diagnosis in some doubt.

The treatment of complex regional pain syndrome is multimodal, including physical therapy, pharmacologic therapy and procedural/operative interventions. Physical therapy, however, is often limited by pain. Initial PT is gentle with an effort to prevent contracture, control edema, and promote strengthening. Splinting may be sometimes used to prevent contracture. The use of transcutaneous electrical nerve stimulation (TENS) has had variable results in CRPS.

Pharmacologic agents in the treatment of CRPS include the use of analgesics (NSAIDS, steroids and Narcotics), medicines for neuropathic pain (gabapentin/pregabalin and tricyclic antidepressants), and calcium metabolism modulators (bisphosphonates and calcitonin).

When conservative management fails to achieve remission of symptoms, initial invasive management is aimed at sympathetic blockade. Regional intravenous guanethidine has been used with uncertain benefit. Multiple other procedures vary in levels of invasiveness and permanence. These include epidural spinal blocks, paravertebral sympathetic blocks, and surgical lumbar sympathectomy. Failure of these procedures will sometimes lead to the placement of a spinal cord stimulator.<sup>2</sup>

In the most extreme cases of refractory CRPS amputation of the affected limb is an (albeit controversial) option with concern for persistent disability and phantom limb pain after the amputation. In one study, 20 patients who underwent amputation for intractable CRPS were assessed for pre and post amputation quality of life measures including pain, disability and depression. In all domains, patients who underwent amputation showed consistent improvement reaching statistical significance or borderline significance.<sup>3</sup>

Another study identified patients more likely to benefit from amputation for intractable CRPS. Patients with high levels of resilience (the ability to deal with adversity in a positive manner) as measured by a standardized scale were more likely to have a higher quality of life post-amputation.<sup>4</sup>

Amputation is a controversial option for patients with intractable Complex Regional Pain Syndrome. However, like the patient described above, it can provide selected patients with significant pain relief and improvements in quality of life. Further research is needed to help clarify which patients are most likely to benefit from the procedure.

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*Submitted November 8, 2016*