CRPS Type I:
Reflex Sympathetic Dystrophy

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Complex regional pain syndrome type I (CRPS-I), formerly known as reflex sympathetic dystrophy (RSD), is a debilitating chronic neuropathic pain syndrome of the extremities. It is typified by pain, sensory, sudo- and vasomotor disturbances, trophic changes and impaired motor function. First described in 1864,[1] CRPS-I is unique in being the pain syndrome receiving the largest number of different names. Unfortunately, its diverse terminology indicates our ignorance of its pathophysiology and lack of efficient therapeutic modalities. Although still used often, the term RSD had to be changed since:

- Only a subset of patients present with sympathetically dependent pain
- The disease does not involve any known reflex mechanisms
- Not all patients eventually develop dystrophy

Although beyond the scope of this article, it is worth mentioning that there is no unitary pathophysiological mechanism that could explain CRPS-I. Whether mainly inflammatory, neuropathic, or both, with or without major contribution of the central nervous system, the mechanisms of CRPS-I have yet to be defined.

Meet Charlotte

Charlotte is a 36-year-old female who 2 years ago developed a "spontaneous" complex regional pain syndrome type 1 (CRPS-I) of the left hand that has resolved within a few weeks.

Her current CRPS-I developed with no clear history of trauma. She presented with swelling, discolouration and hyperhydrosis of the right palm and distal forearm, accompanied by throbbing pain. Examination showed deep-red discolouration of her right distal forearm and hand. These regions were cooler compared to the left side with severe allodynia to light touch. There were no trophic changes of the skin, hair or nails. The muscle power of the right wrist flexors and extensors was reduced to 3/5. Her 3-phase bone scintigraphy was compatible with CRPS-I.

Treatment efforts included physiotherapy, sympathetic blocks, IV lidocaine infusion and medications including anticonvulsants, antidepressants, opioids, nabilone and vitamin C.

During the ensuing 18 months, Charlotte reported a gradual improvement of her symptoms and showed increased functional capacity. Currently she presents no signs of CRPS-I, but her distal muscle weakness and limited finger flexion are still present. She reports a 70% improvement of her pain level and functional capacity.

Epidemiology

There is a paucity of epidemiological data on the incidence of CRPS-I. It is probably more prevalent in young adults and in women.[2] The incidence could be as high as 30% after specific injuries, like wrist fracture, but the true incidence in the general population is not entirely clear. Two recent cohort studies from the US and the Netherlands showed a CRPS incidence of 5.46[3] and 26.2 per 100,000 person years,[4] respectively. Up to 10% of patients recovering from CRPS-I could develop another episode, even

Table 1

Diagnosis of CRPS-I using the International Association for the Study of Pain criteria

- The presence of an initiating noxious event
- Spontaneous pain, allodynia or hyperalgesia disproportionate to the inciting event
- Evidence, at some time, of oedema, changes in skin blood flow, or abnormal sudomotor activity in the region of the pain
- This diagnosis is excluded by the existence of conditions that would otherwise account for the degree of pain and dysfunction

years later.

Etiology

The etiology of CRPS-I is not known in 10% of patients. In approximately 75% of patients there is a preceding noxious event without clear nerve lesion, mainly due to trauma and surgery. Other possible etiological factors include:

- Limb immobilization
- MI
- Stroke

Psychological factors, such as stress, are directly correlated to the severity of symptoms. However, in contrast to the general belief, no existing personality traits or psychological factors have been identified as risk factors or predictors for developing CRPS-I.[5]

Clinical presentation

CRPS-I comprises sensory, autonomic and motor symptoms of the affected limb. These could vary between patients but also within individual patients along time.

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Table 2

Diagnostic tools of CRPS-I

- Skin temperature changes
- Spotty osteoporosis in x-ray
- 3-phase bone scintigraphy (technetium-99m)
- MRI (for detecting deep-tissue oedema)
- No role for diagnostic blocks

Sensory symptoms

Spontaneous pain is usually intense, varying from deep ache to burning sensation. Pain could be aggravated by multiple stimuli including cold temperature, stress, smell and direct skin contact, even if innocuous (*i.e.*, tactile allodynia). Patients develop guarding behaviour of the involved limb. Many times it is impossible for them to keep the affected limb in good hygiene condition due to extreme touch sensitivity. Almost all patients present nondermatomal sensory deficit that could extend beyond the affected area.

Skin discolouration due to vasomotor changes is common, together with either an increase or decrease of skin temperature. The affected region could be edematous, giving the skin a glossy and smooth appearance. Some patients present hyperhydrosis whereas others suffer from extremely dry skin (sudomotor changes).

Motor changes

These could include tremor, weakness, spasms, decreased range of motion and dystonia.

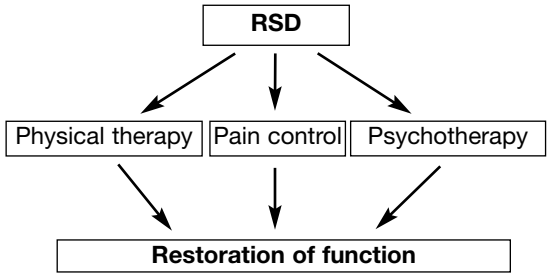
Trophic changes

These appear in > 50% of the patients[6] and

Table 3

CRPS-I: Therapeutic goals

- Increase function
- Decrease pain to levels enabling active physical therapy
- Reduce pain behaviour
- Improve psychological function/self-esteem
- Improve quality of life



RSD: Reflex sympathetic dystrophy

Figure 1. Therapeutic algorithm: CRPS type I.

include "plus symptoms" of increased hair and nail growth in the acute phase of the disease, changing to decreased growth and skin atrophy later on.

It is of note that in up to 15% of patients, symptoms could appear in the opposite limb, in a region similar to the site of the initial presentation.[7] Three distinct, sequential stages of CRPS-I have been described: early, intermediate (dystrophic) and late (atrophic). However, there is strong evidence today that these stages might designate three different subtypes of the disease, independent of the disease duration.

Diagnosis

CRPS-I should be suspected if the magnitude and/or duration of pain and sensory changes after trauma exceed the expected healing period. The International Association for the Study of Pain has established the criteria for CRPS-I diagnosis (Table 1), but it is still unclear how many symptoms and signs should be present in order to make the diagnosis. It is suggested that patients should have at least one symptom in each of the following categories:

- Sensory (*e.g.*, allodynia)
- Vasomotor (*e.g.*, colour change)
- Sudomotor (*e.g.*, edema)
- Motor (*e.g.*, decreased range of motion)[8]

Although they support the diagnosis of CRPS-I, none of the suggested diagnostic tools are specific (Table 2).

Table 4

CRPS-I: Therapeutic "tips"

- Avoid long-term use of NSAIDs
- Preferred adjuvants are tricyclic antidepressants, pregabalin, calcitonin and bisphosphonates
- Opioids: first try short-acting preparations just before physical therapy
- Although still debatable, simple nerve, sympathetic or regional blocks should be tried early

Treatment

Our major therapeutic goal in patients with CRPS-I is to quickly restore the function of the affected limb (Figure 1; Table 3). Treatment is directed at managing the symptoms and not the inciting event. There is strong evidence showing that earlier treatment increases the chances of recovery. Therefore, an aggressive therapeutic approach is mandatory from the start, with rapid escalation in treatment aggressiveness if necessary. Unfortunately, we lack good scientific evidence supporting most of the commonly-used therapeutic approaches. Treatment

is therefore mainly based on clinical experience. The following modalities are recommended:

- Rehabilitation (*e.g.*, occupational and physical therapy)
- Psychological therapy if the disease progresses beyond two-to-three months[9]
- Medications, including NSAIDs, adjuvant drugs like anticonvulsants or antidepressants, steroids, topical agents, vitamin C, opioids, calcitonin and bisphosphonates
- Invasive interventions including nerve and sympathetic blocks, IV regional blocks, spinal drug administration, spinal cord stimulation and neurolytic neural ablation

Whichever therapeutic modes are used, our major goal is functional restoration. Therefore, treatments delaying functional recovery should be stopped immediately (*e.g.*, opioids due to drowsiness). Some therapeutic tips are given in Table 4.

Treatment outcome

Unless started very early, treatment outcome is still dismal. Sixty per cent of patients diagnosed with CRPS-I still report residual pain, decreased motor function and persistent disability even years after treatment initiation.

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