Case Report/Case Series

Dermatological Findings in Early Detection of Complex Regional Pain Syndrome

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IMPORTANCE Complex regional pain syndrome (CRPS) is a chronic pain condition usually affecting the extremities. It mostly occurs in 3 distinct stages with intense pain being the hallmark feature in every stage. Skin abnormalities are common, and often necessary, in the clinical findings required to diagnose CRPS.

OBSERVATIONS A man in his 30s presented to the dermatology clinic with complaints of recurrent redness, swelling, and burning pain in his left arm. Based on this clinical presentation with normal findings from a neurological examination and unremarkable findings on diagnostic imaging, the diagnosis of CRPS was made.

CONCLUSIONS AND RELEVANCE It is important for dermatologists to understand and recognize CRPS as a neurological disorder with major dermatologic implications. The ability of dermatologists to identify and direct patients with this syndrome is a critical factor in determining the likelihood of favorable outcomes following diagnosis of CRPS. This report outlines and reviews a neurological condition presenting with clinically significant cutaneous changes. We illustrate the bias that dermatologists may have in exclusively associating patient complaints with dermatological implications. This stresses the necessity for dermatologists to perform comprehensive medical histories and physical examinations to minimize diagnostic error and improve patient care.

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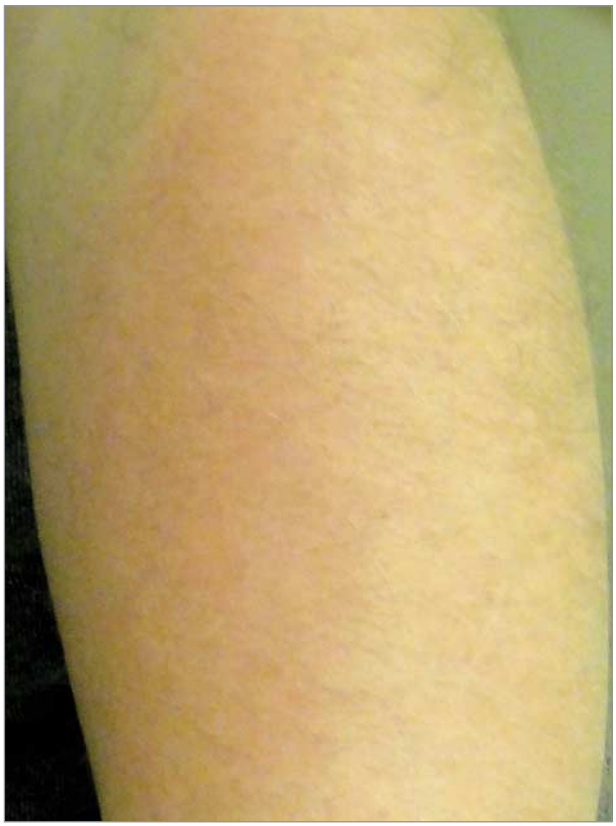
Complex regional pain syndrome (CRPS) is a chronic pain condition usually affecting the extremities.[1] The most common form of CRPS is type 1 (CRPS 1) and was previously referred to as reflex sympathetic dystrophy. The hallmark feature of CRPS is intense pain that gets progressively worse over time.[2] Additional characteristics include impaired motor function, localized redness and swelling, pain produced by harmless stimulation (also known as allodynia) and joint stiffness. Complex regional pain syndrome typically exists as a triphasic disorder with an early stage described as pain in a limb, with warm extremities that progressively cool followed by atrophy as the condition worsens.[3] Skin abnormalities usually increase in severity with later stages of the syndrome. No definable causes for CRPS have been agreed on, but patients commonly present with signs and symptoms following peripheral trauma, surgery, or vascular events, such as stroke and myocardial infarction.[4]

Herein, we present the case of a patient with chronic pain and redness of the left arm that can be attributed to type 1 CRPS.

Report of a Case

A man in his 30s complained of a year-long problem of recurrent redness, swelling, and burning sensation developing on his left arm. It occurred 20 to 30 times daily (**Figure**). He also described ongoing pain that was out of proportion if he was touched on his left elbow, wrists, and possibly left knee, with associated numbness and motor dysfunction of the hand. The patient had no family history of multiple sclerosis or any other neurological conditions. He did not correlate his symptoms with any relatable inciting events but did recall an uncomplicated minor trauma to his scalp 2 months prior to the onset of symptoms when an overhead door hit his head and possibly his left elbow. Initially, the patient had a normal findings from a skin examination. Ten minutes into the interview, he showed clear evidence of gradual, mild erythema, as well as swelling to the left forearm with an increased temperature to the area. A previous magnetic resonance image of the head showed no evidence of radiculopathy despite ongoing sensory loss in his left palm. Findings from a prior neurological examination and electromyography were both interpreted as normal by the neurology department. This patient's clinical history and presentation may, in part, be explained by conditions such as thoracic outlet syndrome, multiple sclerosis, or other neurological diseases. However, these possibilities were ruled out after the patient's initial workup and were not explored in any further detail. Therefore, based on these observations, the patient was diagnosed as having CRPS with the erythema presenting secondary to neurologic stimulation. The patient was referred to

Figure. Complex Regional Pain Syndrome: Confluent Erythematous Patch on the Left Forearm With Continuous Distribution and Associated Edema



A close-up view of the patient's affected arm. Erythema and edema are seen, and the continuous patch can easily be distinguished from the unaffected areas of the same arm.

a pain clinic to manage his condition. He was prescribed a combination of medications including tricyclic antidepressants, topical analgesics, local anesthetics, nonsteroidal anti-inflammatory drugs, and nitroglycerin, 0.1%, ointment to be applied to sore areas of his arm. The patient was advised to undergo a stellate ganglion block and desensitization therapy followed by assessment at a local CRPS program.

Discussion

Complex regional pain syndrome type 1[1] is a chronic pain condition that shows no apparent evidence of definable nerve lesions. It is increasing in prevalence among adolescents and young adults and has been seen to affect women 3 times more frequently than men, with the mean age at diagnosis being 42 years.[2]

Three stages have been defined during the course of CRPS.[3] Stage 1 (acute stage) is characterized by 2 to 3 months of localized pain in 1 or more limbs often described as burning or throbbing, diffuse aching, and localized edema. Vasomotor disturbances produce altered skin color and temperature. Radiographic imaging may show patchy bone demineralization during this stage. The second stage (dystrophic phase) shows progression of the soft-tissue edema, muscle wasting, thickening of the skin, and development of brawny skin. This stage lasts 3 to 6 months. The third and most severe stage (atrophic phase) includes limitation of movement, brittle ridged nails, and waxy trophic skin changes. Severe bone demineralization is seen on bone densitometry.

The onset of CRPS usually follows some sort of inciting event. One study of patients with CRPS found that 40% had developed the condition following soft-tissue injury; 25%, following fractures; 12%, following myocardial infarction; and 3%, following cerebrovascular insults.[4] Another study[5] reported the occurrence of CRPS in patients with hemiplegia, postoperative knee arthroscopy, arteriovenous graft for hemodialysis, and cyclosporine treatment. Also, 1 report[6] stated that no precipitating event was identified in 35% of patients.

Complex regional pain syndrome is a well described but poorly understood disorder with unclear pathogenesis. Central nervous system sensitization and, more specifically, sympathetic dysfunction involving the formation of reflex arcs have been identified as the main physiological abnormalities that induce and maintain CRPS.[7] Other factors involved in the pathophysiologic mechanisms of this syndrome include trauma-related cytokine release, amplified neurogenic inflammation, glial cell activation, and cortical reorganization.[8]

Complex regional pain syndrome presents as a constellation of nonspecific symptoms and thus is diagnosed clinically. However, diagnostic testing can provide the clinician with more confidence in the diagnosis and help eliminate other potential disorders related to the associated symptoms of CRPS. Autonomic testing has been shown to predict the diagnosis of CRPS with good reliability, but the results are not unique to CRPS.[9] Autonomic testing is performed by measuring a patient's autonomic response to specific stimuli. Autonomic variables, such as blood pressure, heart rate, and skin temperature, are measured, and the response to stimuli is recorded and interpreted. Imaging studies that may be useful in the investigation of CRPS include bone scintigraphy, plain film radiography, and magnetic resonance imaging. Preventative measures, such as early mobilization after injury and ascorbic acid administration following fracture, have been suggested in reducing the risk of developing CRPS.[10] Once a patient is diagnosed as having CRPS, treatment is supportive. Pharmacologic therapy has shown to be effective in pain relief and management of other symptoms of CRPS. Anticonvulsants, bisphosphonates, glucocorticoids, and calcitonin have shown to be more effective in pain management when compared with placebo.[11] Sympathetic blocks with antiarrhythmic agents and local anesthetics are examples of invasive pharmacological interventions that have some efficacy in CRPS-associated pain management. The prognosis of CRPS is quite good if treatment is started early. A population-based study illustrated that 74% of patients reported resolution of symptoms.[12] Nonetheless, without adequate therapy, CRPS can spread to other limbs and worsen in terms of symptoms and chance of recovery.

Skin changes are common and often-critical features required for the diagnosis of CRPS. Results from a retrospective

medical chart review determined that cutaneous manifestations of vascular origin were most prominent in patients with CRPS. Edema and erythema were found in most patients, while dermatitis, erythematous papules, folliculitis, cutaneous atrophy, ulceration, and bullae were also seen to a lesser degree among the individuals in the study.[13] The nonspecific nature of the associated skin findings makes it difficult to associate them with this syndrome because these patients are often misdiagnosed as having conditions that are more relevant to dermatology. Complex regional pain syndrome may be confused with a number of conditions with similar skin findings.[14] Some of these include erythema migrans, acrodermatitis chronica atrophicans, lipodermatosclerosis in chronic venous insufficiency, eosinophilic fasciitis, and scleroderma. Despite the prominent cutaneous abnormalities associated with CRPS, this condition has not gained much recognition among dermatologists. Araki et al[15] reported that of 319 articles that contained "reflex sympathetic dystrophy " or "complex regional pain syndrome" in the title from 2002 to 2007, only 1 was found in dermatological literature. This may indicate the failure of dermatologists to diagnose CRPS and suggest a necessary improvement in the recognition of skin abnormalities originating from unlikely sources, such as neurologic stimulation.

Conclusions

The early identification and management of CRPS are key factors that determine the likelihood of favorable outcomes following diagnosis and treatment. Although patients with CRPS are most often treated by specialists in the fields of neurology and anesthesia, the complex nature of this neurological condition requires physicians in multiple specialties, including dermatology, to work together and cotreat these individuals. The dermatologic manifestations of this syndrome results in patients being referred to dermatology clinics for a neurological disorder. This warrants dermatologists to appreciate CRPS and take comprehensive medical histories and perform physical examinations to minimize diagnostic error and ensure the highest quality of patient care.

ARTICLE INFORMATION

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