ACTA SCIENTIFIC ORTHOPAEDICS (2581-8635)

Volume 4 Issue 8 August 2021

Case Series

Pincer Grasp Pain- A New Sign in CRPS-1: A Case Series

Prakash Deshmukh[1]*, Helee Khetan[2], Manjiri Ranade[3] and Kailash Kothari[4]

[1]D. Anaesthesiology, Spine and Pain Management Centre, Kalyan West, Pain Clinic of India, Kalyan, Mumbai, Maharashtra, India

[2]Fellow, Pain Clinic of India, Chembur, Mumbai, Maharashtra, India

[3]D. Anaesthesiology, Pain Clinic of India, Thane, Mumbai, Maharashtra, India

[4]Director, Pain Clinic of India, Chembur, Mumbai, Maharashtra, India

***Corresponding Author:** Prakash Deshmukh, D. Anaesthesiology, Spine and Pain Management Centre, Kalyan West, Pain Clinic of India, Kalyan, Mumbai, Maharashtra, India.

Received: July 03, 2021

Published: July 12, 2021

Abstract

Background and Aims: Chronic regional pain syndrome (CRPS) has always been a diagnosis of exclusion. As there are no specific tests to confirm the diagnosis of CRPS, other causes of chronic pain such as nerve root compression, discopathy, muscular causes have to be definitively ruled out. This can cause a significant delay in the treatment of such patients who then have to suffer through the pain for a longer duration of time. During our practice, we have encountered several patients with confirmed CRPS of the upper limb who have all shown a common 'sign' which resolves upon treating the CRPS. This case series aims to describe the findings of these patients and also to provide a hypothesis for the mechanism behind the sign.

Methods: 4 patients who were diagnosed with CRPS of the upper limb were asked to perform the clinical test. The test involved pinching a piece of paper between their forefinger and thumb (pincer grasp, or OK sign) of the affected limb, and the end point was pain around the shoulder joint of the same limb. The test was repeated on the normal side with no elicitation of pain. The patients underwent T2-T3 sympathetic block with immediate relief of symptoms. They were asked to repeat the test on the affected limb after the procedure.

Result: All patients reported an immediate relief in their symptoms after the procedure. On repeating the pincer-grasp on the affected limb, there was no pain around the shoulder.

Conclusion: The pincer-grasp pain reflex looks to be a promising sign that may help in diagnosing CRPS, which may in turn reduce the time to treatment in these patients. Although more data has to be collected, preferably pooled, to document this sign in more patients, using this in clinical practice will be beneficial to patients. There need to be more studies to define it further.

Keywords: Complex Regional Pain Syndrome (CRPS); Pincer Grasp Pain

Introduction

Complex regional pain syndrome (CRPS) is the name given to a constellation of symptoms and signs that are otherwise unexplained by other diagnoses. It has been described historically as early as 1812, when a surgeon reported a case of persistent and burning pain in a soldier who had experienced a bullet injury to his upper arm, injuring the radial nerve [1]. Over the next few decades, other doctors also reported similar cases of burning pain

distal to the site of injury in soldiers, adding other findings such as skin changes and muscular atrophy. In 1872, Silas Weir Mitchell coined the term "causalgia" for these findings [1]. By the 1900s, the condition was being studied further and the term "Sudeck's atrophy" was introduced by Nonne, a student of Paul Sudeck, who also defined the forms of the disease [1,2].

Between 1946-47, James Evans described 57 patients with a history of symptoms and signs he called "Reflex Sympathetic Dystrophy" [1,2]. He hypothesised that an activation of the sympathetic neurons was linked to the condition, and sympathetic blocks relieved the symptoms. It was John Bonica who proposed to rename the disease as "Complex Regional Pain Syndrome" (CRPS) and classified it in the 1950's, and in 1993, the criteria for the diagnosis of CRPS were established as the Orlando criteria [1,2].

Over the years, the Orlando criteria were added to and revised and a conference of the International association for the study of Pain (IASP) in Budapest led to the development of the currently followed Budapest criteria for the diagnosis of CRPS (Figure 1). The Budapest criteria showed a sensitivity of 0.85 and specificity of 0.69, which was better than the previous Orlando criteria [1].

Figure 1: IASP clinical budapest criteria for the diagnosis of CRPS.

Through all these years, it has been widely established that CRPS is a diagnosis of exclusion. There are no specific tests to positively diagnose CRPS, while one may test for the absence of the differentials to ensure a diagnosis of exclusion [2].

While following the criteria leads to a definitive diagnosis of CRPS, there is often a delay as other organic causes need to be ruled out. A lot of times, patients under report symptoms and are unable to relay an accurate history. In such cases where we must rely on clinical signs, a non-invasive clinical test that can be easily performed may prove to be of great help to establish a diagnosis of CRPS.

We are presenting a case series of 4 patients in whom we have observed a common sign, which may aid the diagnosis of CRPS.

Description of the sign

The clinical test involves holding a piece of paper between the index and thumb of the affected upper limb (OK grasp, or pincer grasp). The paper is pulled by the examiner and the patient is asked to resist this movement by pinching the paper tightly.

A positive sign involves the elicitation of pain around the shoulder, part of the chest and/or axilla in the affected limb when the paper is grasped tightly. The pain may be of sharp, burning or aching nature. On loosening the hold, the pain should disappear.

The test is repeated on the normal or unaffected limb, and the absence of pain in the above-mentioned areas is considered to be a negative sign.

Case Presentation

Between 2019 and 2020, we encountered four cases of CRPS-1 in the upper limb. All patients were female, between the ages of 14 and 45. All patients underwent a definitive intervention for the pain.

Case 1

A 14-year-old female had injured her ring finger while playing tennis. 2 months after the injury, she had persistent pain in her finger despite no apparent physical deformity. She started facing difficulty in holding a pen and writing and her pain increased in the second month following her injury. The severity of her pain caused her to avoid going to her school.

On examination, she had severe supraspinal tenderness without allodynia. She had features consistent with CRPS-1 and was diagnosed with CRPS-1 in her right upper limb.

Her MRI was unremarkable and other investigations were normal.

Intervention: On performing the pincer grasp test, she had pain in her shoulder on the affected side. The sign was absent on the left side (normal, unaffected limb).

Treatment and outcome: A diagnostic sympathetic block under fluoroscopic guidance was performed in which we injected a 4:1 mixture of local anesthetic (Ropivacaine 0.75%) and steroid (triamcinolone 40 mg/ml) at the T2 and T3 paravertebral ganglionic sites (3 ml at each site). Following which she had complete, immediate pain relief. She also developed an ipsilateral Horner's syndrome, which indicated an effective block. On performing the pincer grasp, no pain was elicited and the sign was negative.

She was advised to undergo pulsed radiofrequency ablation (RFA) at T2 and T3 paraspinal ganglionic level under fluoroscopic guidance, but as she was pain-free at her one-month follow-up appointment, she opted not to undergo the RFA.

Case 2

A 45-year-old female complained of severe occipital headache (more on right) followed by giddiness since the past 4 to 5 years. She was taking various medications but had no relief in her symptoms. Apart from these symptoms, she also experienced difficulty in writing.

Based on her symptoms, she was given a diagnostic Third Occipital Nerve (TON) block with 1 ml of 0.5% Bupivacaine at three sites, on the right side. She had relief from her headache immediately after the procedure, until the effect of the anaesthetic agent persisted. She was scheduled for RFA of TON on the right in the next visit.

However, on her follow-up visit, it was noticed that right upper symptoms had not improved, and she was still experiencing a difficulty in using it. She was diagnosed as having CRPS-1 in accordance with the Budapest criteria.

Intervention: On performing the pincer grasp test on the right, it was found to be positive. The test yielded a negative result in the left upper limb.

Treatment and outcome: The patient received a T2-T3 sympathetic block as mentioned in the previous case, under fluoroscopic guidance. This provided immediate relief of pain in her right upper limb, along with development of an ipsilateral Horner's syndrome. She also remarked that her right upper limb felt lighter than before. Her pincer grasp became negative on the affected side after the procedure.

As her headache persisted after this block, she was given the planned continuous RFA of the TON. She was pain free at the time of her 2-month follow-up appointment and required no other intervention for her CRPS.

Case 3

A 35-year-old female presented with a history of headache since many years, the intensity of which had increased in the past year. She also complained that she was unable to do household work due to pain in her left upper limb and felt as if it was "not there". She had consulted many doctors including a neurologist and an orthopaedic surgeon but was not able to obtain any relief. She was also diagnosed with depression during this time.

On examination, she had upper cervical tenderness, and fulfilled the Budapest criteria for diagnosis of CRPS.

Her investigations were normal.

Intervention: She was asked to perform the pincer grasp test. She experienced a sharp pain in her left shoulder region on grasping the paper which disappeared on loosening the hold (positive sign), while it was negative on the right.

Treatment and outcome: She was given Inj. Diclofenac at her initial visit as she had complained of severe pain, which provided little relief. Following her diagnosis, she was given a T2-T3 sympathetic block (as mentioned in case 1). Following the procedure, she had complete relief from pain in her left upper limb. She also said that it felt lighter than before. Her left pincer grasp reflex became negative after the procedure.

As her headache persisted, we performed a diagnostic TON block on the left following which she had complete relief from her headache for 24 hours (duration of anaesthetic). A continuous RF ablation of TON and pulsed RF ablation at T2-T3 level were done on her next visit. She had complete pain relief following the procedures and pincer grasp was painless in her affected limb.

Case 4

A 40-year-old female who worked with computers presented with severe pain in her right hand following an injury to her right shoulder and arm in 2015. She was unable to perform day-to-day activities and household chores were painful. Her pain was associated with stiffness in the early morning and episodes of light-headedness during the day. She consulted several doctors in the following two years and was treated with multivitamins and mineral supplements for a suspected Vitamin D deficiency. She developed hypersensitivity to touch and allodynia in 2018. As she has a family history of rheumatoid arthritis, she consulted a rheumatologist and was diagnosed with rheumatoid arthritis with positive ANA titres. The treatment helped with her morning stiffness but not with the pain. Her dizziness became frequent and she was also treated for vertigo by an ENT surgeon. She had an episode of blurred vision and severe headache and was treated for severe hypertension at that time. She was diagnosed with depression and put on antidepressants in 2018 and told that her pain was due to depression. Through these years, all her reports, including various MRIs were unremarkable.

She presented to the clinic in 2019. By this time, she was not able to work on computers and use the mouse without severe pain in her right upper limb.

On examination, she had allodynia in her right upper limb. Motor power was 5/5 but painful, and reflexes were normal but also associated with pain. She was diagnosed with CRPS-1 based on the Budapest criteria.

Intervention: She was asked to perform the pincer grasp test. She experienced immediate pain in her shoulder and axillary region and in the front of her chest on the right side upon performing the test. The test was negative on the left.

Treatment and outcome: She was posted for a stellate ganglion block with 7 ml of a 4:1 local anesthetic-steroid mixture (as mentioned in previous cases) on the right. She experienced complete pain relief following the block which persisted for several months. Her pincer grasp turned painless following the procedure. She was also able to return to normal activities.

She returned after 6 months due to a return of pain following a mild re-injury to the right shoulder. The characteristics were similar as before, and her pincer grasp was painful on the affected side. A diagnostic T2-T3 sympathetic block (as mentioned above) was performed which gave her immediate and total relief from pain that lasted for a few hours, and the pincer grasp became painless. Following this, pulsed RF ablation was done at T2-T3 ganglionic level on the right. She has been pain-free since then till her most recent follow-up and has a persistent, absent pain response to pincer grasp.

Discussion

CRPS is the name given to a constellation of symptoms and findings, with new findings being added over time. Previously known as algodystrophy, CRPS was recognised under many different names such as causalgia, Sudeck's atrophy and Reflex Sympathetic Dystro-

phy. All these conditions described a similar combination of findings that include chronic, burning pain associated with changes in the skin, vessels and musculature.

It was in the 1950's that John Bonica proposed a staging for RSD that included three stages. In 1973, the International Association for the Study of Pain (IASP) was founded, which worked on standardizing the nomenclature and definitions for different pain conditions. In 1993, the criteria for diagnosing CRPS were established at the conference in Orlando, Florida, USA. These criteria had a high sensitivity (90%) but a low specificity (less than 50%), which led to a false diagnosis of CRPS in many cases. As these criteria included only symptoms reported by the patient, they were prone to false diagnosing of CRPS [1]. In 1999, Norman Harden and Stephen Bruehl published studies that evaluated the criteria and proposed the addition of clinical findings to the list [1,3]. During the Budapest conference in 2003, the "Budapest Criteria" for CRPS diagnosis were established and in 2010, they were compared to the existing IASP criteria and published [1,3,4] and were found to be superior in diagnosing CRPS accurately compared to the previous criteria.

The Budapest criteria outlines several features, a combination of which is must for the diagnosis of CRPS. The inclusion of clinical signs has further reduced false positive diagnoses, improving the treatment offered and better outcomes for the patient [4]. However, as CRPS comprises several presenting features that can be marked over a wide range, a term "CRPS not otherwise specified" was coined for an additional subtype of CRPS [1,3]. The Budapest criteria does have its own issues pertaining to application in other clinical settings, for example diabetic patients and orthopaedic patients. It also does not include any imaging studies and a major point is that IASP recognises the flexibility of the criteria and its usefulness in helping to diagnose the differentials, rather than CRPS [1].

Despite attempts at developing specific tests or diagnostic tools for CRPS, there are very few studies that outline diagnostic tests or predictors for CRPS [2,5]. Autonomic tests such measuring skin temperature using infrared thermography, sweat output measurement, laser-Doppler flowmetry for measuring vasomotor constriction reflex, etc. have been described and can help in diagnosing CRPS [5]. As these tests require specialized equipment which are found in only select clinics, and the use of these tests in routine practice becomes difficult. In 2017, Elsharydah., *et al*. published a study regarding the predictors for CRPS-1 [6]. They found significant associations between "female gender, Caucasian race, higher median household income, depression, headache and drug abuse" and CRPS-1. A study published by Vadapalli R., *et al*. in 2021 concluded that by using a multi-modal imaging approach, the phases of CRPS could be accurately diagnosed and their underlying pathological change could be detected [7].

However, till date, there is no specific clinical test to aid in the diagnosis of CRPS. That CRPS is frequently misdiagnosed by clinicians who fail to refer the patient early to a pain specialist is well known. Even in the setting of a pain clinic, there is usually a delay in diagnosing CRPS due to there being no clinical or laboratory test to aid in the diagnosis. This leads to a delay in offering treatment. CRPS needs to be treated as early as possible [5] to avoid a condition refractory to standard treatment, which is why early intervention with sympathectomy had been advocated [8,9].

FC Schasfoort., *et al*. published 2 papers in which they measured the impact of upper limb CRPS-1 on everyday life and found that CRPS has a clear impact on the activity of the upper limb with relation to the intensity, percentage and proportion of activity especially while sitting, and even more so if the dominant side was involved [10]. Patients spared or protected their affected side during day-to-day activities [11].

The clinical sign described in this paper was developed by the author (PD) over several years of practice and it was implemented on the patients described here. The sign demonstrates a pain characteristic in patients with CRPS, which is not explained by any other organic causes.

Thoracic sympathetic ganglia which provide sympathetic innervation to the upper limb project fibres via the stellate ganglion, or even directly to the brachial plexus [12,13]. The presence of the nerve of Kuntz (variable intrathoracic ramus between the 2nd intercostal nerve and ventral ramus of the 1st thoracic nerve) has been noted in several studies and it has been demonstrated to have a sympathetic connection to the second thoracic ganglion. It affords an alternative pathway to the brachial plexus that bypasses the stellate ganglion [13].

The anterior interosseous nerve (branch of the median nerve) is responsible for flexion of the thumb and forefinger, which performs the OK grasp, and receives fibres from the C8 T1 level via the bra-

chial plexus. Fibres from the C8 T1 roots are also responsible for the innervation of the medial brachial cutaneous nerve (sensory supply to skin of the medial side of the arm), medial antebrachial cutaneous nerve (skin supply to axilla, medial side of the forearm), and the medial pectoral nerve (supplies the pectoralis minor muscle, and a few branches to pectoralis major muscle). Apart from the motor innervation, C8 T1 also gives sensory innervation to the same digits. In CRPS, there is misfiring of neurons that results in abnormal pain perception and stimulus gathering, especially involving the sympathetic nervous system. There may be an abnormal sympathetic reflex following motor firing while performing the OK grasp. An abnormal polysynaptic reflex that causes sympathetic mediated pain in the shoulder region may be an explanation for this phenomenon.

In this case series, patients underwent procedures at the T2-T3 ganglia. One patient was previously treated with the stellate ganglion block, which had also given a good result, but it was later followed by a T2-T3 intervention. The author chose T2-T3 sympathetic block and neurolysis procedures due to the evidence in recent literature that indicates that thoracic sympathectomy provides a better and more long lasting result in upper limb CRPS when compared to Stellate ganglion blocks [12,13]. It has been shown in recent literature that pulsed RF to the thoracic sympathetic ganglia is superior to stellate ganglion pulsed RF for the treatment of upper limb CRPS-1 [14-16].

All the patients in this series experienced immediate pain relief and relief from other symptoms following interventions to the thoracic sympathetic ganglia. The clinical sign (pincer grasp pain) that had been demonstrated on them to be positive before the procedure was negative immediately following the procedure. This indicates that the sign was due to CRPS, and its underlying mechanism is connected to the pathophysiology of CRPS, as mentioned previously. The patients were followed up in the Pain clinic for up to 6 months following the interventions and all demonstrated a negative pincer grasp sign. All the patients had an improved quality of life on subjective questioning and were happy with the results.

Conclusion

The diagnosis of CRPS for the upper limb can be aided by the pincer grasp reflex test. Further prospective studies in a wider population can be undertaken to validate the test for use in the diagnosis of CRPS.

Conflict of Interest

None.

Financial Support

None.

Ethical Permission

Consent sought from patients for sharing relevant parts of their history.

Bibliography

1. Iolascon G., *et al*. "Complex regional pain syndrome (CRPS) type I: historical perspective and critical issues". *Clinical Cases in Mineral and Bone Metabolism* 12.1 (2015): 4-10.

2. Cutts S., *et al*. "Complex regional pain syndrome: an evolving perspective". *Postgraduate Medical Journal* 97.1146 (2021): 250-255.

3. Littlejohn G and Dutton K. "Terminology, criteria, and definitions in complex regional pain syndrome: Challenges and solutions". *Journal of Pain Research* 8 (2015): 871.

4. Harden RN., *et al*. "Validation of proposed diagnostic criteria (the "Budapest Criteria") for Complex Regional Pain Syndrome". *Pain* 150.2 (2010): 268-274.

5. Mazzola TJ., *et al*. "Complex Regional Pain Syndrome I in the Upper Extremity". *Current Sports Medicine Reports - LWW Journals* 3.5 (2004): 261-266.

6. Elsharydah A., *et al*. "Complex regional pain syndrome type 1 predictors — Epidemiological perspective from a national database analysis". *Journal of Clinical Anesthesia* 39 (2017): 34-37.

7. Vadapalli R. "Multimodality Predictive Diagnostic Characterization of Chronic Regional Pain Syndrome an Observational Study with Clinical and Imaging Correlation". *The Annals of Medical and Health Science Research* 11.3 (2021): 7.

8. Pather N., *et al*. "The anatomical rationale for an upper limb sympathetic blockade: preliminary report". *Surgical and Radiologic Anatomy* 26.3 (2004): 178-181.

9. Gungor S., *et al*. "Sympathetic blocks for the treatment of complex regional pain syndrome". *Medicine* 97.19 (2018).

10. Schasfoort FC., *et al*. "Impact of upper limb complex regional pain syndrome type 1 on everyday life measured with a novel upper limb-activity monitor". *Pain* 1 (2003): 79-88.

11. Schasfoort FC., *et al*. "Impairments and activity limitations in subjects with chronic upper-limb complex regional pain syndrome type I11No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit upon the author(s) or upon any organization with which the author(s) is/are associated". *Archives of Physical Medicine and Rehabilitation* 85.4 (2004): 557-566.

12. De Oliveira Rocha R., *et al*. "Thoracic sympathetic block for the treatment of complex regional pain syndrome type I: A double-blind randomized controlled study". *PAIN*® 155.11 (2014): 2274-2281.

13. Ramsaroop L., *et al*. "Thoracic origin of a sympathetic supply to the upper limb: the 'nerve of Kuntz' revisited". *Journal of Anatomy* 199.6 (2001): 675-682.

14. Park J., *et al*. "Clinical effects of pulsed radiofrequency to the thoracic sympathetic ganglion versus the cervical sympathetic chain in patients with upper-extremity complex regional pain syndrome". *Medicine* 98.5 (2019).

15. Kim ED. "A Prospective, Randomized Cross-Over Trial ofT2 Paravertebral Block as a Sympathetic Block in Complex Regional Pain Syndrome". *Pain Physician* 5.22-5 (2019): E417-424.

16. Chen CK., *et al*. "Percutaneous T2 and T3 Radiofrequency Sympathectomy for Complex Regional Pain Syndrome Secondary to Brachial Plexus Injury: A Case Series". *The Korean Journal of Pain* 26.4 (2013): 401-405.

Volume 4 Issue 8 August 2021