

CASE REPORT

Complex Regional Pain Syndrome (CRPS) Following Distal Radius Fracture and Plaster Immobilization: A Case Report and Review of Literature

Nasreen Bobby¹, Md. Al-Amin Sarkar², Afroza Akter³, Abdul Karim Miah³,
Shamima Akter⁴, AKM Akhtaruzzaman⁵

Received: 22 May 2025

Accepted: 19 June 2025

Abstract

Complex Regional Pain Syndrome (CRPS) is a rare disorder which may arise after injury to extremities or surgery. It is most commonly associated with fracture followed by immobilization by plaster cast. Our case was a 51-year-old woman who developed CRPS after a distal radius fracture treated with plaster immobilization for three weeks. She presented in pain clinic with persistent pain, swelling, abnormally sweaty and restriction of movement in her left wrist and forearm but showed no signs of allodynia and hyperalgesia. After proper clinical examination her signs and symptoms met Budapest criteria and she was diagnosed as a case of CRPS. Treatment started with multidisciplinary approach- including medication, physiotherapy and cognitive behavioral therapy. On follow-up after 3months, pain and swelling appears within normal limits but she was showing signs of carpal tunnel syndrome or compartment syndrome. Ultrasound of left wrist performed and found median nerve swelling. Then intervention ultrasound guided median nerve hydro dissection was done. This case study highlights the importance of prompt diagnosis and timely initiation of treatment of CRPS following fractures to reduce chronic pain and minimize functional disability.

Key word: CRPS, Budapest criteria, Allodynia, Hyperalgesia, Carpal tunnel syndrome.

1. *Anaesthesiologist, Department of Anaesthesia, Pain, Palliative and Intensive Care Medicine, Dhaka Medical College Hospital, Dhaka.*

2. *Junior Consultant, Department of Prosthodontics, Dhaka Dental College and Hospital, Dhaka.*

3. *Assistant Professor, Department of Anaesthesia, Pain, Palliative and Intensive Care Medicine, Dhaka Medical College Hospital, Dhaka.*

4. *Associate Professor, Department of Anaesthesia, Pain, Palliative and Intensive Care Medicine, Dhaka Medical College Hospital, Dhaka.*

5. *Professor, Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangladesh Medical University, Dhaka.*

DOI: <https://doi.org/10.62848/bjpain.v5i1.5050>

Introduction

Complex Regional Pain Syndrome (CRPS) is a chronic debilitating pain disorder most commonly occur after tissue injury like fracture, sprain and surgery of upper and lower limb¹.

Patients usually present with pain that exceeds the expected intensity and duration for the original injury and is often accompanied by unilateral swelling, temperature changes, and movement restriction.

CRPS is a challenging disease associated with poor outcome of the

patient including functional, emotional and psychosocial². The pain is regional not have a specific nerve territory or dermatomal distribution and usually has a distal predominance of abnormal sensory, motor, sudomotor, vasomotor, and/or trophic findings. The syndrome shows variable progression over time³.

CRPS is divided into two types: Type I (Reflex Sympathetic Dystrophy): Evidence of absence of nerve injury and Type II (Causalgia):

Correspondence:

Nasreen Bobby
Email: dr.nasreen.bobby@gmail.com
ORCID: 0009-0001-9642-0178

Citation: Bobby N, Sarkar MAA, Akter A, Miah AK, Akter S, Akhtaruzzaman AKM. Complex Regional Pain Syndrome (CRPS) Following Distal Radius Fracture and Plaster Immobilization: A Case Report and Review of Literature. *Bangladesh J Pain* 2025; 5(1):33-39 doi:10.62848/bjpain.v5i1.5050

Diagnostic Framework: The Budapest Criteria^{3,6}

Criterion	Requirement	Details
1. Continuing Pain	Must be present	Disproportionate inciting event
2. Symptom Report	≥1 symptom in ≥3 of 4 categories	Sensory: Allodynia Vasomotor: Temperature asymmetry skin color asymmetry Sudomotor/Edema: Edema or sweating asymmetry Motor/Trophic: Weakness, tremor, dystonia, nail/hair/skin changes
3. Sign Observation	≥1 sign in ≥2 of 4 categories	Same categories as above, observed during clinical examination
4. Exclusion	Must be fulfilled	No other diagnosis better explains the symptoms

Evidence of confirmed nerve injury^{3,4,5}. To improve diagnostic accuracy, the Budapest Criteria were introduced in 2004 and validated in 2010. These criteria have become the gold standard for diagnosing CRPS.

Epidemiology

The estimated global incidence of CRPS is 26.2 per 100,000 person- years⁷. It more commonly occurs in female than male. Peak age of incidence 40-70 years. The upper extremity was affected more frequently than the lower extremity and a fracture was the most common precipitating event (44%). Among them, approximately 2 in 1000 patients who recover from a distal radius fracture develop CRPS⁸. Postmenopausal woman observed to be at the highest risk for the development of CRPS^{7,9}.

Natural history

Stages of CRPS with sequential clinical signs and symptoms

1. Acute (up to 3 months): Pain, warm and dry, edema.
2. Dystrophic (3–6 months): Persistent pain, sensory dysfunction, skin changes, muscle stiffness.
3. Atrophic (>6 months): Skin atrophy, cold, intractable hyperesthesia, allodynia, contractures, and potential irreversible disability.

However, not all patients follow this stage pattern, and symptoms may fluctuate or overlap⁶.

Prevention

Preventing CRPS, especially following injury or trauma like distal radius fractures (DRFs), focuses on early mobilization, pain control and psychological support.

Evidence-based preventive strategies include:

- Vitamin C supplementation (500 mg/day for 50 days): Shown to reduce CRPS incidence after wrist fractures¹⁰⁻¹³.
- Minimizing immobilization time: Encouraging early active range of motion exercises.
- Self-education of patient about pain behavior.
- Adequate pain management: Suboptimal analgesia may deteriorate CRPS condition
- High-risk group like postmenopausal women closely monitored for development of early symptoms.

Treatment

Treatment of CRPS comprises multidisciplinary, tailored approach which brings best outcome. Option includes:

1. Pharmacological: NSAIDs (especially early stage), corticosteroids in early stage to reduce inflammation, pregabalin and gabapentinoids to treat neuropathic pain¹⁴, bisphosphonates like zoledronic acid or denosumab for bone mineralization, topical agents like lidocaine, capsaicin, infusion of ketamine or combination of ketamine and lidocaine in selected cases unresponsive to usual medication¹⁵

2. Physical and Occupational Therapy: Graded motor imagery as treatment of neuropathic pain¹⁶
3. Psychological Therapy: Cognitive behavioral therapy
4. Interventional Procedures: Sympathetic nerve blocks, spinal cord stimulation, intrathecal drug delivery systems
5. Newer treatments: Neuromodulation, naltrexone (low dose), and biologics are under investigation^{17,18}.

Case report

A 51-year-old female presented with a closed linear fracture in distal radius of left forearm after a fall (radiological feature shown on fig. 1). She visited to orthopedic doctor 8 months ago. Then she was treated conservatively with a plaster cast for immobilization up to three weeks. Post-immobilization, she experienced persistent pain, described as throbbing in nature. The pain was mainly localized to the left wrist and forearm. She also reported to swelling, feeling of warm and abnormal sweating in left forearm (fig. 2). She complained about restricted movement of wrist joint and difficulty to hold or lift heavy object with left hand. She reported about mild weakness but no allodynia or hyperalgesia in left hand.

With those complaints she was referred to our pain center. After obtaining patient detailed history, found her past medical history include hypertension and untreated osteoporosis, as evidenced via a DEXA Bone densitometry scan conducted 6 months after post-injury, revealing left radius T-score of -2.8 suggesting osteoporosis as the likely cause of fracture.

Upon local examination, the affected hand was found swollen warm and abnormally sweaty. Sensory testing revealed no hyperalgesia and allodynia.

Motor examination revealed, the functional capacity of the patient's hand mildly impaired, with active movement limited to slight extension of the wrist joint (20°) due to pain. The passive movements were also constrained. Specifically, flexion of the left wrist joint, radial and ulnar adduction were also affected. Movement of metacarpophalangeal (MCP) joints, proximal interphalangeal (PIP) joints, and distal interphalangeal (DIP) joints were normal.

There was moderate swelling, no muscle atrophy was noted on the palmar and dorsal surfaces of the left hand or the forearm. The remaining joints of the left limb maintained an unaffected range of motion.

The diagnosis of Complex Regional Pain Syndrome (CRPS) was made based on the Budapest clinical criteria. The patient reported persistent, throbbing pain in the left wrist and hand following a distal radius fracture, which was disproportionate to the initial injury. She exhibited three symptoms across all four diagnostic categories including, warmth, swelling and abnormal sweating, and reduced range of motion with mild weakness.

On examination, signs were present in at least two categories: Oedema (sudomotor) and reduced wrist mobility (motor). No other condition better explained the findings. Thus, the criteria were fulfilled, confirming a diagnosis of CRPS, and appropriate treatment was initiated.



Figure 1: X-ray of wrist joint (with plaster)



Figure 2: Swelling of left hand

The patient underwent a conservative management. The administered medications included Paracetamol, Magnesium, a combination of vitamin B1, B6, and B12, Calcium with vit D, Mirogabalin and anti-hypertensive drug. Additionally, intravenous Bisphosphonate was administered for prevention and treatment of osteoporosis. Complementary to pharmacological interventions, the core of the treatment regimen comprised physiotherapy and hand occupational therapy. The patient's affected hand after three weeks of treatment is shown in figure-3.



Figure 3: Left hand after treatment

On follow up after 3 months, patient symptoms were improved but complaints about a tingling sensation and more difficulty to hold any object with left hand. On real time USG examination of her left wrist found median nerve is swollen and compressed (Fig 4). The patient was advised for median nerve hydro dissection. After 1 week, USG guided median nerve hydro dissection was done without any complication. On follow up after 1 month, compression and volume of median nerve reduced (Fig 5). Her symptoms of carpal tunnel syndrome and functional disabilities were improved.

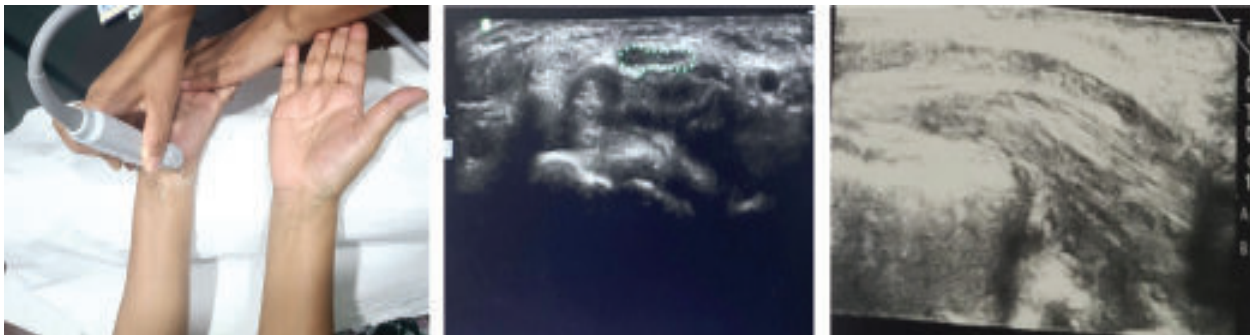


Figure 4: Evaluation of the median nerve by USG



Figure 5: Median nerve after hydrodissection

Discussion

This case study highlights an uncommon presentation of CRPS following a distal radius fracture, where the patient did not present allodynia which is a key feature for the condition. Despite its absence, the combination of pain, swelling, warmth, and limited mobility fulfilled the diagnostic requirements set by the Budapest Criteria.

Complex regional pain syndrome (CRPS) is a poorly understood neuropathic condition that usually causes both peripheral and central sensitization³. The most common cause of CRPS is a fracture of the distal radius (DRF) which is usually treated with plaster cast for immobilization⁴.

In a study by Dilek Kasapođlu et al, describes a case of 57-years old female patient who had been treated by immobilization with a cast for six weeks after a distal radius fracture. This case presented with no allodynia and hyperalgesia but had marked vasomotor sudomotor and motor signs and symptoms which are typical for CRPS¹⁹. This study has concordance with our study.

The Budapest Criteria are gold standard to diagnose CRPS²⁰. They were developed in 2003 and have enhanced the old IASP (International Association for the Study of Pain) criteria^{3,6}. For diagnosis of the CRPS when the patient met at least one symptom in at least three categories or when detects at least one sign in at least two categories (the list of categories of specific signs and symptoms is given in the table above). In addition, the CRPS can be diagnosed if a patient reports continuous pain, which is disproportionate to any inciting event, and in cases

when no other diagnosis can better explain the signs and symptoms²¹. This study fulfills the requirements for fulfilling Budapest criteria.

In other study by Swita et al, describes Budapest criteria to diagnose a case of CRPS after distal radius fracture. In that study, based on the Budapest criteria, the patient exhibited at least one symptom from each category (hyperalgesia, skin temperature and color asymmetry, edema, decreased range of motion), leading to the diagnosis of the complex regional pain syndrome (CRPS)⁶.

In a study for recognizing risk factors of the complex regional pain syndrome (CRPS), 647 patients involving an analysis from the Danish Patient Compensation Association revealed that the female gender, upper limb involvement, and surgical intervention were stated as risk factors²². Notably, in that study age was not identified as a risk factor; but several systematic literature reviews emphasized that the risk increases after menopause, primarily due to osteoporosis^{23,24}. The patient discussed in current case report was a post-menopausal woman who had a distal radius fracture after an accidental fall.

In present study treatment based on a multidisciplinary approach: pharmacotherapy, physiotherapy, psychotherapy and intervention. Analgesics, vitamin and mineral supplementation and bisphosphonate for osteoporosis. The addition of median nerve hydro dissection enhanced both pain control and functional recovery as there was evidenced of carpal tunnel syndrome. These findings align with existing evidence supporting early multidisciplinary management for optimal outcomes.

A variety of medications have been utilized for the management of CRPS; however, many of them fail to respond patient treatments and experience chronic debilitating symptoms²⁵. Now a days, the most interest drugs for study in treatment of CRPS is Bisphosphonates. It is worth to notify that a recent publication about bisphosphonates in treating the CRPS suggests relief of the symptoms, particularly severe and moderate pain, mainly in patients with the CRPS of the upper limb²⁶. Small duration of prednisone may be helpful for patients with CRPS; however, corticosteroids are ineffective in managing

the chronic symptoms of CRPS²⁷. Gabapentinoids and naltrexone are newer agent, but supporting evidence is poor for their effectiveness²⁸. Recent studies have provided no evidence to support the beneficial role of NSAIDs or aspirin²⁸.

A study by F. Del Pinal suggests that some patients with carpal tunnel syndrome (CTS) and a history of CRPS, also known as reflex sympathetic dystrophy or Sudeck's disease, can have significant or complete symptom relief following carpal tunnel release surgery. In that study Fifty-three patients with an average age of 55 years presenting cluster of symptoms of median nerve compression, were underwent carpal tunnel release. All were unilateral cases, had sustained trauma, and were treated conservatively for complex regional pain syndrome before referral for an average of 16 months²⁹.

In current study, Median nerve hydro dissection not only improve her pain but also improve her hand and wrist disabilities. These findings similar with others' experiences, suggesting that even CRPS cases without allodynia can respond well to early aggressive therapy.

Clinicians should be aware that CRPS can present without allodynia, especially in post trauma settings such as distal radius fractures and may be associated with nerve entrapment. A broader awareness of the diverse clinical spectrum can facilitate earlier diagnosis and improved patient outcomes.

Conclusion

This case study shed the light on early diagnosis and prompt initiation of treatment of CRPS. The use of the Budapest Criteria facilitated the timely identification of CRPS, and the multidisciplinary treatment approach significantly contributed to the patient's recovery. Early treatment can prevent the progression to chronic CRPS, which can result in long-term disability. As CRPS remains a challenging condition to diagnose and manage, continuous research into treatment options is essential for improving patient outcomes.

Declaration

Ethics approval: Not applicable

Author contributions

Conception and development of the idea: NB, AKMA

Writing: NB, MAAS

Data analysis: NB, AKM, SA

Data collection: NB, AA

Review and Editing: NB, AKMA

Funding: None

Conflict of interests: None

References

1. Ratti C, Nordio A, Resmini G, Murena L. Post-traumatic complex regional pain syndrome: clinical features and epidemiology. *Clin Cases Miner Bone Metab.* 2015 Jan-Apr;12(Suppl 1):11-6.
2. Shim H, Rose J, Halle S, Shekane P. Complex regional pain syndrome: a narrative review for the practising clinician. *Br J Anaesth* 2019;123(02):e424–e433
3. Harden N.R., Bruehl S., Perez R.S.G.M., Birklein F., Marinus J., Maihofner C., Lubenow T., Buvanendran A., Mackey S., Graciosa J., et al. Validation of proposed diagnostic criteria (the "Budapest Criteria") for Complex Regional Pain Syndrome. *Pain.* 2010;150:268–274.
4. Jo Y.H., Kim K., Lee B.G., Kim J.H., Lee C.H., Lee K.H. Incidence of and Risk Factors for Complex Regional Pain Syndrome Type I after Surgery for Distal Radius Fractures: A Population-based Study. *Sci. Rep.* 2019;9:4871
5. Mangnus T.J.P., Dirckx M., Huygen F.J. Different Types of Pain in Complex Regional Pain Syndrome Require a Personalized Treatment Strategy. *J. Pain Res.* 2023;16:4379–4391.
6. Ęwita M, Szymonek P, Talarek K, Tomczyk-Warunek A, Turzańska K, Posturzyńska A, Winiarska-Mieczan A. Complex Regional Pain Syndrome after Distal Radius Fracture-Case Report and Mini Literature Review. *J Clin Med.* 2024 Feb 16;13(4):1122.
7. de Mos M, de Bruijn AG, Huygen FJ, Dieleman JP, Stricker BH, Sturkenboom MC. The incidence of complex regional pain syndrome: a population-based study. *Pain.* 2007 May;129(1-2):12-20.
8. Crijns, T.J.; van der Gronde, B.A.T.D.; Ring, D.; Leung, N. Complex Regional Pain Syndrome After Distal Radius Fracture Is Uncommon and Is Often Associated With Fibromyalgia. *Clin. Orthop. Relat. Res.* 2018, 476, 744–750.
9. Diepold J, Deininger C, Von Amelunxen BC, Deluca A, Siebert P, Freude T, Wichlas F. Comparison of Epidemiological Data of Complex Regional Pain Syndrome (CRPS) Patients in Relation to Disease Severity-A Retrospective Single-Center Study. *Int J Environ Res Public Health.* 2023 Jan 4;20(2):946.

10. Besse J.L., Gadeyne S., Galand-Desmé S., Lerat J.L., Moyon B. Effect of vitamin C on prevention of complex regional pain syndrome type I in foot and ankle surgery. *Foot Ankle Surg.* 2009;15:179–182.
11. Meena S., Sharma P., Gangary S.K., Chowdhury B. Role of vitamin C in prevention of complex regional pain syndrome after distal radius fractures: A meta-analysis. *Eur. J. Orthop. Surg. Traumatol.* 2015;25:637–641.
12. Zollinger PE, Tuinebreijer WE, Breederveld RS, Kreis RW. Can vitamin C prevent complex regional pain syndrome in patients with wrist fractures? A randomized, controlled, multicenter dose-response study. *Lancet.* 2007;354:2025–28
13. Ebrahimpour A, Biglari F, Sabaghzadeh A, Barazandeh Rad S, Sadighi M, Moradian T et al . Comparing the Effects of Vitamins C and D in Preventing Complex Regional Pain Syndrome After Distal Radius Fracture Treatment. *JROS* 2022; 9 (3) :157-164
14. Ziegler D, Fonseca V, Taheri S, Zwanenburg JJ, Freeman R, Vincent A, et al. Efficacy and safety of gabapentin for the treatment of painful diabetic peripheral neuropathy. *J Pain Symptom Manage.* 2014;47(4):675-82.
15. Birklein F, Dimova V. Complex regional pain syndrome-up-to-date. *Pain Rep.* 2017 Oct 5;2(6):e624.
16. Moseley GL. Graded motor imagery for pathologic pain: a randomized controlled trial. *Neurology.* 2006 Dec 26;67(12):2129-34.
17. Baron R, Binder A, Wasner G. Neuropathic pain: diagnosis, pathophysiological mechanisms, and treatment. *Lancet Neurol.* 2010;9(8):807–19.
18. Ferraro M, O’Connell N, Sommer C, et al. Complex regional pain syndrome: advances in epidemiology, pathophysiology, diagnosis, and treatment. *Lancet Neurol* 2024; 23(5): 522–533.
19. Dilek Kasapođlu, Banu & El, Özlem & Sahin, Ebru & Gulbahar, Selmin & Bircan, Cigdem & Akalın, Elif. (2008). Painless Complex Regional Pain Syndrome: A Case Report. *Türkiye Fiziksel Týp ve Rehabilitasyon Dergisi.* 10.1016/S1090-3801(06)60445-X.
20. Goebel, A.; Barker, C.; Birklein, F.; Brunner, F.; Casale, R.; Eccleston, C.; Eisenberg, E.; McCabe, C.S.; Moseley, G.L.; Perez, R.; et al. Standards for the diagnosis and management of complex regional pain syndrome: Results of a European Pain Federation task force. *Eur. J. Pain* 2019, 23, 641–651.
21. Kessler, A.; Yoo, M.; Calisoff, R. Complex regional pain syndrome: An updated comprehensive review. *NeuroRehabilitation* 2020, 47, 253–264.
22. Petersen, P.B.; Mikkelsen, K.L.; Lauritzen, J.B.; Krosgaard, M.R. Risk Factors for Post-Treatment Complex Regional Pain Syndrome (CRPS): An Analysis of 647 Cases of CRPS from the Danish Patient Compensation Association. *Pain Pract.* 2018, 18, 341–349.
23. Pons, T.; Shipton, E.A.; Williman, J.; Mulder, R.T. Potential risk factors for the onset of complex regional pain syndrome type 1: A systematic literature review. *Anesthesiol. Res. Pract.* 2015, 2015, 956539.
24. Limerick, G.; Christo, D.K.; Tram, J.; Moheimani, R.; Manor, J.; Chakravarthy, K.; Karri, J.; Christo, P.J. Complex Regional Pain Syndrome: Evidence-Based Advances in Concepts and Treatments. *Curr. Pain Headache Rep.* 2023, 27, 269–298.
25. Alebouyeh M, Morsali S F, Zojaji F, Ebrahimi S A, Ahani A, et al. Refractory Complex Regional Pain Syndrome: A Case Report and Review of Literature. *Anesth Pain Med.* 2023;13(4)
26. Breuer, B.; Pappagallo, M.; Ongseng, F.; Chen, C.I.; Goldfarb, R. An open-label pilot trial of ibandronate for complex regional pain syndrome. *Clin. J. Pain* 2008, 24, 685–689.
27. Barbalinardo S, Loer SA, Goebel A, Perez RS. The Treatment of Longstanding Complex Regional Pain Syndrome with Oral Steroids. *Pain Med.* 2016;17(2):337-43.
28. Taylor SS, Noor N, Urits I, Paladini A, Sadhu MS, Gibb C, et al. Complex Regional Pain Syndrome: A Comprehensive Review. *Pain Ther.* 2021;10(2):875-92.
29. Del Piñal F. Outcomes of Carpal Tunnel Release in Complex Regional Pain Syndrome/Reflex Sympathetic Dystrophy/Sudeck Disease Patients. *Plast Reconstr Surg.* 2022 Jul 1;150(1):93-101.