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Integrated management of osteopathy and rehabilitation for complex regional pain syndrome: A case report

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Abstract

Complex regional pain syndrome (CRPS) is a debilitating condition that typically affects one limb, often triggered by acute trauma. Symptoms include persistent pain, skin sensitivity, swelling, and mobility issues. While various therapeutic approaches exist, evidence for the effectiveness of multimodal treatments is limited. A 25-year-old female presented with CRPS following a sciatic nerve injury due to an intramuscular injection. She experienced severe pain, swelling, and limited mobility in her left ankle. Physical therapy assessment revealed significant weakness and limitations in both active and passive range of motion due to pain and swelling. The patient underwent a holistic treatment consisting of osteopathy and rehabilitation exercises over 36 sessions spanning 9 months. Significant improvements were observed after treatment, including reduced pain, increased mobility, and improved nerve conduction. These findings suggest that a multimodal therapeutic approach may be beneficial in managing CRPS and improving patients' quality of life.

Keywords

Complex regional pain syndrome, osteopathy, physical therapy, manual therapy

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Introduction

Complex regional pain syndrome (CRPS) is an uncommon, chronic medical condition that is characterized by persistent episodes of over-amplified neuropathic pain to the stimulus, presenting in one limb, and occurs post-surgery or trauma and can lead to disability.[1] CRPS was estimated to occur at 26.2 per 100,000 people/year in the western population,[1] but the epidemiology of CRPS in Saudi Arabia has not been documented in the literature.[2] There are two types of CRPS, type 1 describes conditions without a nerve injury and type 2 pertains to those with nerve injury.[3] In addition, the accepted diagnostic criteria for the diagnosis of CRPS is the Budapest Criteria (Figure 1), which was issued by the International Association for the Study of Pain.[4] Conservative treatment for CRPS patients includes a wide variety of modalities such as physiotherapy, mirror therapy, pain exposure therapy, and electrotherapy.[5] Current literature supports the implementation of these modalities into the treatment plan of CRPS patients for their high efficiency and low expenses.[6] The reported positive impact of conservative therapy encompasses improved pain levels, gait biomechanics, physical functioning, and quality of life.[5] However, research on the effect of integrated physiotherapeutic modalities, including osteopathy, is limited. This case report addresses the research gap by examining the potential effects of combined physiotherapeutic approaches on a CRPS patient.

Case description

A 25-year-old female was complaining of headache holocephalic, bilateral lower limb spasms followed by sudden dizziness, loss of consciousness, and bilateral lower limb tonic posturing with up-rolling in the eyes lasting for seconds and occurring up to five times per day. The patient reported left lower limb spasms, with painful thigh and limitation of the knee and ankle movement. The patient was initially diagnosed with acute dystonia; however, further examinations revealed that she had a case of CRPS, grade 2 according to the Budapest criteria, from left sciatic nerve injury and neuropathy, following intramuscular injection. The management team

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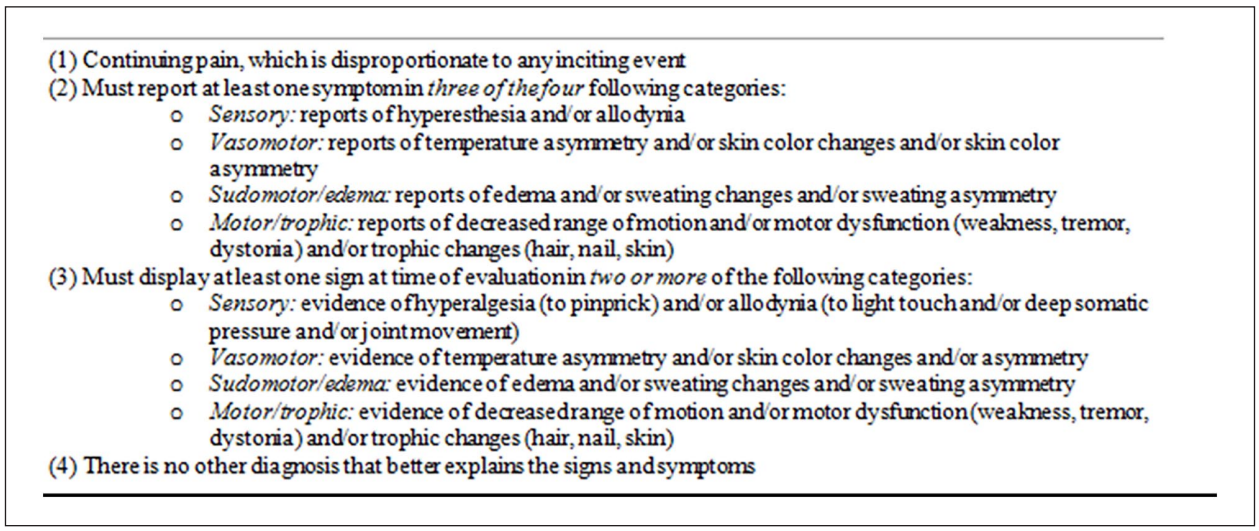
(1) Continuing pain, which is disproportionate to any inciting event
(2) Must report at least one symptom in *three of the four* following categories:
- *Sensory:* reports of hyperesthesia and/or allodynia
- *Vasomotor:* reports of temperature asymmetry and/or skin color changes and/or skin color asymmetry
- *Sudomotor/edema:* reports of edema and/or sweating changes and/or sweating asymmetry
- *Motor/trophic:* reports of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin)

(3) Must display at least one sign at time of evaluation in *two or more* of the following categories:
- *Sensory:* evidence of hyperalgesia (to pinprick) and/or allodynia (to light touch and/or deep somatic pressure and/or joint movement)
- *Vasomotor:* evidence of temperature asymmetry and/or skin color changes and/or asymmetry
- *Sudomotor/edema:* evidence of edema and/or sweating changes and/or sweating asymmetry
- *Motor/trophic:* evidence of decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nail, skin)

(4) There is no other diagnosis that better explains the signs and symptoms

Figure 1. Budapest clinical diagnostic criteria for CRPS.
CRPS, complex regional pain syndrome.

Table 1. Nerve conduction study of anti-sensory summary (pre- and post-therapy).

Site	NR	Onset (ms)	O-P Amp (mV)	Peak (ms)	Full area % (first)	Full area % (prev)	Site 2	Distance (cm)	Velocity (m/s)
Pre-therapy									
Left superficial peroneal nerve anti-sensory (ant lat mall)									
14 cm		2.1	28.8	2.6			Ant lat mall	10.0	48
Left sural anti-sensory (ant lat mall)									
Calf		2.1	12.9	2.7			Lat mall	13.0	62
Right superficial peroneal nerve anti-sensory (ant lat mall)									
14 cm		2.5	30.5	3.3			Ant lat mall	14.0	56
Right sural anti-sensory (lat mall)									
Calf		2.2	53.3	2.9			Lat mall	14.0	64
Post-therapy									
Left superficial peroneal nerve anti-sensory (ant lat mall)									
14 cm		2.7	22.0	3.4			Ant lat mall	12.0	44
Left sural anti-sensory (ant lat mall)									
Calf		2.3	23.7	3.0			Lat mall	12.0	52
Right superficial peroneal nerve anti-sensory (ant lat mall)									
14 cm		2.4	22.9	3.3			Ant lat mall	12.0	50
Right sural anti-sensory (lat mall)									
Calf		2.3	23.7	3.0			Lat mall	13.0	57

NR: no response.
The pre-therapy was taken before 4 weeks of the treatment. The post-therapy result was in the 28 weeks of the treatment.

recommended Ketamine infusion, but the patient refused. Therefore, she was kept on a regular dose of 150 mg of pregabalin with a morning and night dose of 75 mg, respectively. The patient was referred to the physical therapy (PT) outpatient department, 3 months after the injury.

Imaging

Magnetic resonance imaging (MRI) displayed patchy subchondral bone marrow edema of the hind and mid-foot bones, with diffused subcutaneous soft tissue edema around the ankle. Also, proximal plantar fasciitis and mild distal Achilles tendinopathy were found. MRI of the brain, spine, and pelvis was normal. Ultrasound displayed no evidence of deep vein thrombosis in the lower limb. The X-ray revealed no sign of fracture, soft tissue, or acute osseous abnormalities in the left ankle. The nerve conduction results showed electrophysiological evidence of subacute-chronic left axonal sciatic neuropathy. The nerve conduction findings are shown in Tables 1 and 2, respectively.

Table 2. Nerve conduction study of motor summary (pre-and post-therapy).

Site	NR	Onset (ms)	O-P Amp (mV)	Peak (ms)	Full area % (first)	Full area % (prev)	Site 2	Distance (cm)	Velocity (m/s)
Pre-therapy									
Left personal motor (extensor digitorum brevis muscle)									
Ankle	3.1	1.6	100.00	100.00			Extensor digitorum brevis muscle	0.0	
Fibular head	10.2	1.6	77.5	77.5			Ankle	32.0	45
Popliteus	10.5	1.6	105.8	136.5			B fibular head	8.0	45
Left tibial motor (abductor hallucis muscle)									
Ankle	5.2	12.5	100.00	100.00			Abductor hallucis muscle	0.0	
Knee	12.2	10.2	79.6	79.6			Ankle	38.00	54
Right personal motor (extensor digitorum brevis muscle)									
Ankle	3.1	6.1	100.00	100.00			Extensor digitorum brevis muscle	0.0	
B fibular head	9.5	5.6	91.6	91.6			Ankle	32.0	50
Popliteus	10.6	5.2	87.9	95.9			B Fibular head	7.0	64
Right tibial motor (abductor hallucis muscle)									
Ankle	2.8	13.0	100.00	100.00			Abductor hallucis muscle	0.0	
Knee	10.0	11.1	93.5	93.5			Ankle	38.00	53
Post-therapy									
Left peroneal motor (extensor digitorum brevis muscle)									
Ankle	3.4	3.4	100.0	100.0			Extensor digitorum brevis muscle	0.0	
B fibular head	10.8	3.3	90.0	Ankle			32.0	43	
Popliteus	11.9	3.3	89.6	99.6			B fibular head	7.0	64
Left tibial motor (abductor hallucis muscle)									
Ankle	4.1	16.1	100.0	100.0			Abductor hallucis muscle 0.0		
Knee	11.3	13.9	98.9	98.9			Ankle	36.0	50
Right peroneal motor (extensor digitorum brevis muscle)									
Ankle	3.3	4.0	100.0	100.0			Extensor digitorum brevis muscle	0.0	
B fibular head	9.7	3.9	95.8	Ankle			32.0	50	
Popliteus	11.1	2.7	86.8	90.6			B fibular head	7.0	50
Right tibial motor (abductor hallucis muscle)									
Ankle	4.4	29.8	100.0	100.0			Abductor hallucis muscle	0.0	
Knee	11.6	28.1	108.0	108.0			Ankle	38.0	53

NR: no response.
The pre-therapy was taken before 4 weeks of the treatment. The post-therapy result was in the 28 weeks of the treatment.

PT assessment

The patient had swelling and discoloration in the left ankle and she was wearing left ankle–foot orthosis (AFO). The patient's posture was affected due to the pain leading to internal rotation of the hip. The left tibia was shifted anteriorly and the left tarsal bones were immobile. The patient expressed pain and posterior facia tightness during knee flexion, and muscle guarding along the left sciatic nerve pathway, causing discomfort in the long sitting position. Osteopathic assessment was carried out through local listening, general listening, and palpation (Table 3).

A specific pain assessment could not be obtained as the patient was under heavy analgesic medications. The range of motion (ROM) of the lower limb was measured with a goniometer and the muscle strength was measured with a Kinesio Manual Muscle Test (Table 4).

Intervention

The patient received 37 sessions over a 9-month period, each session lasted for 45 min, which involved osteopathic treatment and rehabilitation exercises. During the first 16

Table 3. Osteopathic assessment through local listening, general listening, and palpation.

Osteopathic examination	
Cranium	Coronal and sagittal sutures were immobile, the Jugular foramen was pressed by fascia, the partial bone was immobile, dural tension, and abnormal craniosacral rhythm.
Cervical	Left Atlas (C1) rotated to the right, side bent to the right, and suboccipital muscle tightness.
Thoracic	Thoracic outlet pressed by facial tightness.
Ribs	The first rib was elevated.
Lumbar	L4 and L5 vertebrae were tender during palpation.
Sacrum/Pelvis	Left sacroiliitis. The sacrum was shifted to the left.
Knee	Slight patellar maltracking.
Hip	The left hip internally rotated and shifted anteriorly, left obturator foramen compressed due to muscle tightness and poor biomechanics. Left inguinal ligament tightness. Left femoral artery compressed by inguinal ligament.
Ankle	The left subtalar joint was stuck due to swelling and pain.
Abdomen	Diaphragm ligament tightness. Peritoneum and mesentery tightness. Sigmoid colon hypomobile.

Table 4. MMT and ROM of the left ankle movements pre- and post-therapy.

MMT of the left lower limb	Pre-therapy		Post-therapy	
	MMT	ROM	MMT	ROM
Ankle dorsiflexion	1	Not applicable due to the swelling	4	15
Ankle plantar flexion	1		5	35
Ankle inversion	2		5	30
Ankle eversion	2		5	15

MMT: Manual Muscle Test; ROM: range of motion.

sessions, the main therapy was craniosacral therapy and visceral manipulation techniques, focusing on the occipital cranial base release, cervical vertebrae, cranial tension, parietal bone release, and cranial sutures release. Also, there was a release of the calf muscles, Achilles tendon, fascia of the gluteus, quadratus lumborum, and hamstring fascia. This induced visceral circulation which reduced the muscle guarding in the lower limb muscles indirectly. Later, more focus was applied to enhance mobility and motility of some organs and locations. Then, less tension in the sciatic nerve pathway was noticed, with an improved femoral artery pathway leading to improved circulation, and reduced muscle and facia tightness. Pain and swelling have been reduced with an improvement in ROM, bed mobility, and gait functionality (Table 5).

During the remaining sessions, there was more focus on the iliotibial band and thoracic facia in combination with osteopathic manipulation for the whole leg, trigger point release, dry needling therapy, *Kinesio® Taping* for the Achilles tendon, hip and calcaneus traction. Strengthening exercises for ankle muscles along with gait rehabilitation were implemented. The patient showed improvements in muscle strength, gait mechanics, and walking distance without using AFO or assistive devices.

Clinical outcomes

Following a period of 9 months, improvements in nerve conduction study post-therapy were found (Tables 1 and 2). The pain has been reduced dramatically; hence, the medication dose was reduced to pregabalin 75 mg once a day only. The patient showed significant improvements in the muscle strength and ROM of the left ankle movements (Table 4). In addition, the patient had significantly less tightness and tension over the muscles and facia which has reflected positively on the pain level, swelling, and joint ROM (Figure 2).

After a few PT sessions, the patient was able to walk for a short distance (10–15 m) with a cane while wearing a left foot AFO. After completing treatment, she was able to walk without any assistive devices for 50+ m before taking a 10-min rest. The patient could stand on the left leg without support for 20 s showing no sway which indicates a good level of dynamic standing balance.

Discussion

Osteopathic manipulative treatment (OMT) is a patient-centered healthcare discipline that has an inherent capacity for self-healing, and a holistic approach to health through manual treatment. Osteopathy encompasses a wide variety of techniques,[7] in this case report, soft tissue release techniques, visceral manipulation, and craniosacral therapy have been applied. OMT aims to realign the body and stimulate self-healing by manipulating the fascia, a connective tissue found around muscles, organs, and bones. The techniques work on elongating and correcting the facia to recover movement, improve fluid flow, and regulate the autonomic nervous system.[7] Craniosacral therapy involves releasing the myofascial anatomy and altering the physiological rhythms resulting in significantly improved pain levels and functional abilities.[8] Furthermore, visceral manipulation focuses on improving visceral mobility

Table 5. Progression of clinical symptoms over 9 months.

Month	Sessions	Main therapeutic focus	Clinical symptoms	Notable improvements
Month 1–2	1–8	CST, VM: - OCB release - Parietal bone release - Cranial suture release - Release of calf muscles, Achilles tendon, fascia of gluteus, hamstrings	- Severe pain - Significant swelling - Limited mobility in the ankle - Muscle guarding - Limited ROM	- Initial reduction in muscle guarding and tightness - Slight improvement in lower limb circulation - Slight decrease in pain and swelling
Month 3–4	9–16	Continued CST and VM: - Focus on cervical vertebrae, cranial tension - Release of calf muscles and fascia - Improved visceral circulation	- Persistent pain and swelling - Limited ROM - Mobility issues (bed mobility and gait)	- Significant reduction in pain and swelling - Noticeable improvement in ROM and mobility - Indirect muscle relaxation due to improved circulation
Month 5–6	17–24	Focus on Mobility Enhancement: - Improving mobility and motility of organs - Sciatic nerve and femoral artery improvement	- Reduced tension in the sciatic nerve pathway - Muscle tightness reduction - Improved circulation	- Increased mobility and ROM - Reduction in muscle and fascia tightness - Gait functionality improved slightly
Month 7–9	25–37	Rehabilitation and Strengthening Focus: - Iliotibial band and thoracic fascia manipulation - Osteopathic manipulation for the entire leg - Trigger point release - Dry needling therapy - Kinesio® Taping (Achilles, hip) - Strengthening exercises for ankle muscles, gait rehabilitation	- Muscle weakness - Gait dysfunction - Difficulty walking without assistive devices	- Improved muscle strength - Improved gait mechanics - Increased walking distance without AFO or assistive devices - Better overall functional mobility

AFO: ankle–foot orthosis; CST: craniosacral therapy; OCB: occipital cranial base; ROM: range of motion; VM: visceral manipulation.

which is believed to be affected following a previous inflammation or surgery.[9]

Evidence supports the effectiveness of OMT in alleviating persistent pain, and improving the short- and long-term pain-related psychological outcomes while showing cost efficiency.[10] The literature on the effect of osteopathic treatment with CRPS patients is limited; however, it has demonstrated a reduction in cortisol levels, which can decrease inflammation levels and lead to a reduction in sympathetic tone, positively altering the pain response.[11]

Physiotherapy is an essential intervention for CRPS management as it helps restore function and reduce pain levels and disablement.[3] Physiotherapeutic exercises seek to empower affected individuals to achieve maximum control over their symptoms.[3] Treating CRPS is challenging due to its multifaceted biomedical and psychosocial nature, variable patient presentations, and limited understanding of its epidemiology and natural history, compounded by difficulties in diagnosis and interpretation of research data.[7] This case report shows the positive findings of an integrated treatment for CRPS patients.

Conclusion

This case report emphasized the considerable benefits that physiotherapeutic and osteopathic interventions can offer in addressing CRPS. By employing a holistic approach tailored to each patient, notable enhancements in pain management and functional abilities were evident.

Figure 2. Improvement of swelling and dorsiflexion ROM in the ankle during long sitting and standing. (a, b) The first week of the treatment. (c) The 34th week of the treatment. (d) The first week of the treatment. (e) The 23rd week of the treatment. (f) The 36th week of the treatment.
ROM: range of motion.

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Author contributions

Norah AlKuait: was responsible for identifying and selecting the case for study, as well as overseeing data collection .Hanan AlTaleb: conducted the detailed analysis of the case, including the identification of key themes and patterns. Afrah AlMuwais: contributed to the interpretation of findings and drafting the manuscript. All authors participated in revising the manuscript and have approved the final version.

Data availability statement

Data are available when required.

Declaration of conflicting interests

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Ethics approval

Our institution does not require ethical approval for reporting individual cases or case series.

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