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Case Report Open Access

Complex Regional Pain Syndrome Limiting to One Finger Treated with Nicardipine Hydrochloride and Lidocaine under Intravenous Region Block

Chia-Ming Chang, Wei-Zen Sun and Yi-Jer Hsieh*

Changhua Christian Hospital, Changhua, Taiwan

Introduction

Complex regional pain syndrome (CRPS) is known as a post-traumatic event that results in neuropathic pain and tenderness that is exaggerated in one or more limbs. The involved limb usually has swelling, skin color change, temperature change and limitation of motion [1].

CRPS type 1, caused by previous injury without apparent nerve damage, commonly involves one whole limb, particularly in the upper extremities. Partial-form CRPS involving only the fingers was first reported in 1972 by Dammann [2], and was termed "fingers isolated Sudeck's syndrome". The early diagnosis and treatment of partial-form CRPS remains challenging.

We do not completely understand the pathophysiology of CRPS. However, it is postulated that the pain, tenderness and swelling may be mediated through the sympathetic nervous system and neuro-inflammatory reaction. The treatment varies -- oral analgesic medication, transdermal nitroglycerin patches and nerve blocks all play roles in partial CRPS [3-5]. We herein report a case of partial-form CRPS limited to one finger that was treated effectively with intravenous regional block (IVRB).

Case Report

A 49-year-old right-handed carpenter in otherwise good health was referred to our pain clinic because of persistent right middle finger burning pain. Approximately 3 months ago, he suffered from a minor trauma on his right middle finger due to occupational injury. He reported only moderate pain in the finger without hypersensitivity of the skin, nor impaired mobility, within the first 3 days of injury. The pain relieved gradually without medication in one month. However, he became aware of a sudden burning pain and tenderness in the finger in a morning 8 weeks after injury. Red, swollen and limitation of interphalangeal joint movement of the finger were also noted. He visited an orthopedic clinic, where a radiograph was taken of his right hand that revealed no fractures but right middle finger periarticular bone erosion (Figure 1). The right middle finger remained visibly red and edematous with persistent burning pain. Antibiotics were prescribed under the impression of infection, and tramadol was given for pain management. However, the patient reported a deteriorated painful condition in the following 4 weeks. The burning pain, allodynia, swelling and impaired movement in his finger persisted, so he was referred to our pain clinic. Upon arrival at our pain clinic, the patient rated his pain at 5/10 on the Numerical Rating Scale (NRS) [NRS; zero=no pain, 10=worst pain imagined], and the middle finger of his right hand was bluish and shiny with a decreased crease but hair growth. The skin temperature of the middle finger of his right hand was lower than that of the other fingers. The distal, middle, proximal phalanx and metacarpal region was obviously swollen (Figure 2). The active and passive movement of the distal interphalangeal (DIP) joint, proximal interphalangeal (PIP) joint and metacarpophalangeal (MCP) joint were limited due to finger edema and tenderness. Flexion in the DIP joint, PIP joint and MCP joint was no more than 30 degrees (Figure 3). However, the other 4 fingers moved freely. The burning pain intensified after rubbing with an alcohol pad.

Three-phase bone scintigraphy (TPBS) was arranged and revealed an increased blood flow and blood pool involving the PIP joint and the MCP joint in the right middle finger (Figure 4). In the delayed bone phase, there was increased uptake involving the right middle finger, especially in the articular regions (Figure 5).

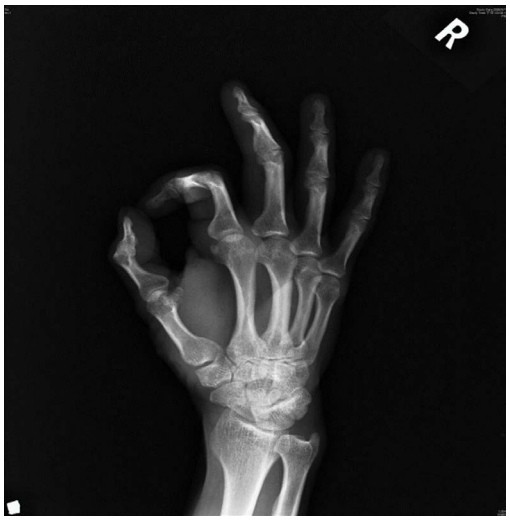

Figure 1: Radiograph of the right hand. Demineralization of the right middle finger with para-articular bone erosion could be seen.

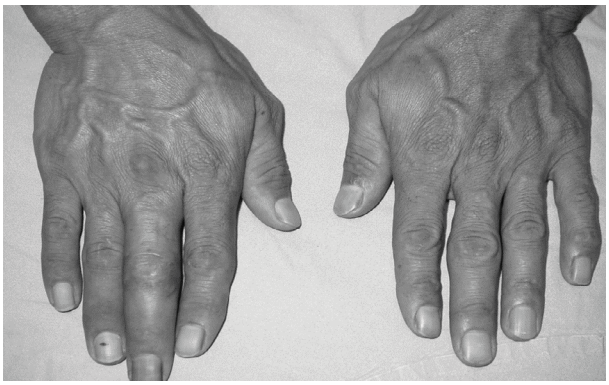

Figure 2: Before treatment. The right middle finger was bluish and shiny with a decreased crease and hair growth, compared with the left middle finger.

***Corresponding author:** Yi-Jer Hsieh, Changhua Christian Hospital, Changhua, Taiwan; Tel: 886-926435363; E-mail: 67259@cch.org.tw

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After primary multidisciplinary team (MDT) case discussion, we planned a diagnostic stellate ganglion block (SGB) [6]. Amitriptyline 25 mg, tramadol 50 mg and clonidine 75 ug were prescribed concurrently. An SGB was administered smoothly without complication with a mixture of 0.5% bupivacaine 3 ml and 1% lidocaine 3 ml. The first SGB achieved efficient pain relief, and the patient's NRS dropped from 5/10 to 2/10 (Figure 6). The movement of the DIP joint and PIP joint improved to 40 degrees with subsiding of the minimal edema.

Partial-form CRPS type I was suspected based on the observed clinical symptoms and signs, physical examination, bone scan findings and positive findings of a diagnostic block.

We performed SGB once a week for the following 4 weeks. The patient's burning pain had obviously improved and his pain scale dropped to 1/10. The active mobility of the DIP joint, PIP joint and MCP joint reached 60 degrees in flexion after the fourth block. His right hand grip strength was now similar to that of his left hand, and he could tolerate alcohol pad rubbing on the finger. However, the distal and middle phalanx still had swelling and allodynia, and the skin temperature was still lower than that of the other fingers. Following a MDT review and discussion, IVRB was proposed as a substitute for SGB [7]. IVRB with a mixture of nicardipine hydrochloride 2 mg and 2% lidocaine 10 ml diluted in normal saline to a total volume of 50 ml was then administered, combined with concurrent oral medication. On the day after the first IVRB, the patient reported the edema and allodynia in his finger had decreased greatly. His pain dropped from 1/10 to 0/10 on the NRS scale, and analgesic medication was no longer needed during daytime. However, tenderness persisted while resting at night. In terms of active mobility, the DIP joint, PIP joint and MCP joint were able to reach 90 degrees in flexion. The second IVRB achieved further significant reductions in finger edema, increased skin temperature and improved skin color, and full interphalangeal joint movement. After the 3rd and 4th IVRB, the patient showed almost complete improvement with normal skin color, subsided swelling, no pain, and full range of finger movement (Figure 7). He was then discharged and returned to work.

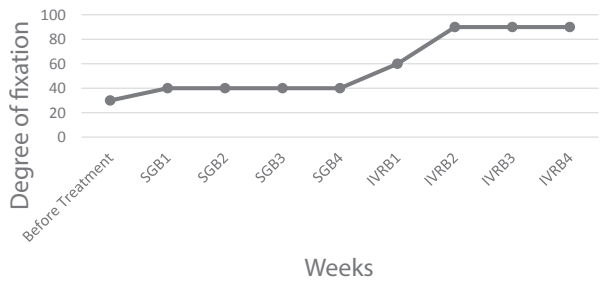

Figure 3: Degrees of flexion of the right middle finger during treatment. Flexion in the DIP joint, PIP joint and MCP joint was no more than 30 degrees before treatment. Flexion increased to 40 degrees after the first SGB at the first week, and improved to 60 degrees after the first IVRB at the fifth week. Flexion reached 90 degrees after the second IVRB at the sixth week. DIP: Distal Interphalangeal Joint, PIP: Proximal Interphalangeal Joint, MCP: Metacarpophalangeal Joint, SGB: Stellate Ganglion Block, IVRB: Intravenous Region Block.

Figure 4: Results of TPBS. An increased blood flow and blood pool involving the PIP joint and MCP joint in the right middle finger were seen. TPBS: Three-phase Bone Scintigraphy, PIP: Proximal Interphalangeal Joint, MCP: Metacarpophalangeal Joint.

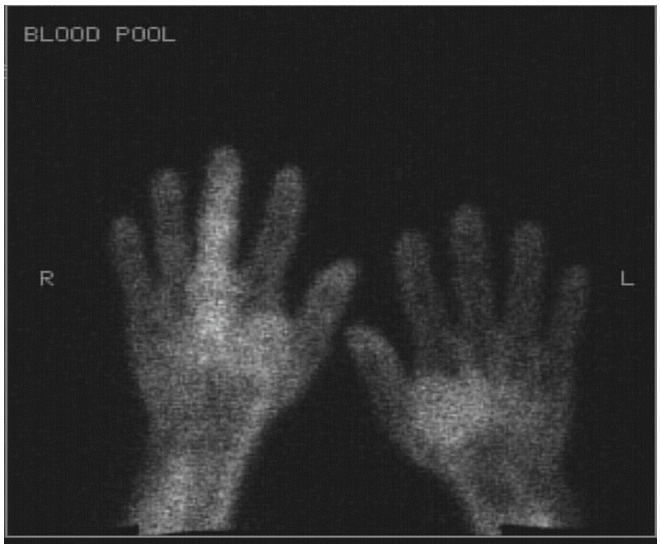

Figure 5: Delayed bone phase results of TPBS. There was an increased uptake involving the right 3rd finger, especially in the articular regions. TPBS: Three-Phase Bone Scintigraphy.

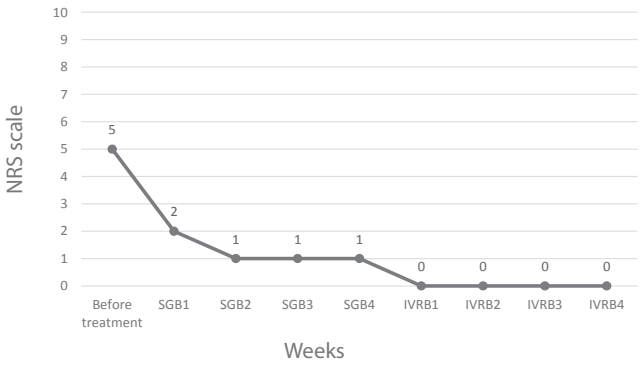

Figure 6: Pain scales measurement during treatment. The patient's pain was rated at 5/10 on the NRS before treatment, and decreased to 2/10 after the first SGB at the first week. The NRS was 1/10 after the second SGB at the second week, and decreased to zero after the first IVRB at the fifth week. NRS: Numerical Rating Scale [NRS; Zero=no pain, 10=worst pain imagined], SGB: Stellate Ganglion Block, IVRB: Intravenous Region Block.

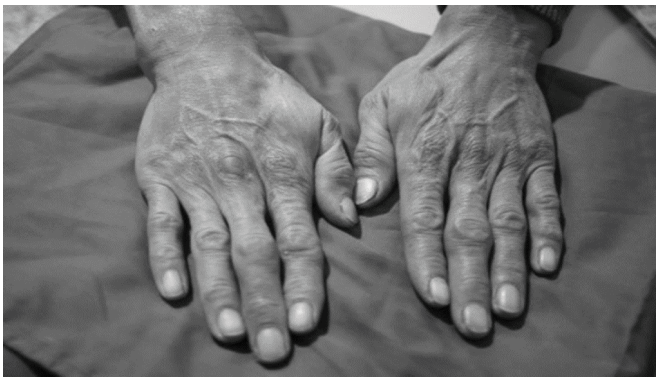

Figure 7: After treatment. The skin color of the right middle finger was normal, there was no swelling or pain, and the finger had full range of motion compared with the left one.

Discussion

CRPS type 1 most commonly involves the hand and the shoulder, and manifests as stiffness, pain and osteoporosis [8]. Partial-form CRPS type I, formerly known as' Segmental Reflex Sympathetic Dystrophy,' is an atypical manifestation that contrasts with the usual CRPS findings [2]. Various case reports involving one to 3 fingers have been published [3-5]. The pathogenesis of partial-form CRPS is unclear and multiple mechanisms may play roles. The diagnostic criteria of CRPS were developed by IASP, and CRPS was further subdivided into two groups, types I and II. Harden et al. proposed modified clinical diagnostic criteria in 2003 [9,10], the Budapest criteria, to improve the specificity in the original CRSP diagnostic criteria. Depending on the particular form of CRPS in the patient, TPBS could assist in the clinical diagnosis process for this atypical entity. A recent retrospective study of CRPS type1 of the hand revealed TPBS was a helpful tool when it was performed in the first 6 months [11]. SGB is useful in patients with severe pain that does not respond to pharmacologic therapy [6]. We chose SGB as a diagnostic block and also the following treatment modality since it helped relieve the patient's pain and aided his finger joints movement. However, the unresolved symptoms, such as finger edema, allodynia and low skin temperature, made us try an alternative treatment. IVRB consisting of local anesthetics, guanethidine, or reserpine has been used since 1974 [12]. The aim was to reduce the sympathetic activity of the injured limb by depleting noradrenaline at the terminals of the sympathetic efferent. Guanethidine is often considered the mainstay for IVRB [13] and is widely used in the clinical setting. However, guanethidine and reserpine are not available nowadays in our country. Nicardipine was chosen as a substitute in our case based on the encouraging report by Katsuji Tomi in 1988 [14]. He described intravenous regional injection with nicardipine in 5 patients with reflex sympathetic dystrophy. Marked pain relief was observed, and the analgesic effect lasted for 2 days. He also found an apparent improvement in mobility of the affected limbs. Our patient received IVRB with nicardipine 2 mg and 2% lidocaine 10 ml diluted in normal saline to a total volume of 50 ml. The burning pain subsided completely, with recovery of full range of motion of the injured finger. Edema and allodynia diminished after 4 courses of IVRB. The skin color was similar to that of the other fingers with similar skin temperature. Although guanethidine, reserpine and nicardipine all are vasodilators, their mechanism in IVRB remains unclear. Guanethidine has an immediate action on the sympathetic nerves during the block by reducing the release of catecholamines, then decreasing the sympathetic activity. Nicardipine, a calcium-channel blocking agent, serves as a direct vasodilator through blocking the contraction of vascular smooth muscle, but does not suppress the sympathetic activity. The effect of IVRB in treating CRPS may come from the lidocaine, but not the vasodilators.

Takashi Mashimo et al. [15] studied the effects of nicardipine on primary afferent nociceptors by measuring the thermal pain threshold. Nicardipine (0.2 mg/mL) 0.5 mL was intradermally injected at 3 sites each on both forearms in a healthy volunteer. The pain threshold increased with nicardipine. Whether this effect helped pain relief in IVRB with nicardipine requires further study. The favorable response to IVRB with nicardipine and lidocaine has indicated to us that this modality could be an alternative treatment for CRPS.

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