

Adapted T'ai Chi Exercises for Complex Regional Pain Syndrome 1

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Case History

In January 2007 a colleague referred a 71-year-old female post-wrist fracture (a mal-union with relative ulna lengthening) and a severe case of Chronic Regional Pain Syndrome 1 (CRPS1). Despite 7 months of 'intensive' (twice weekly) physiotherapy (which included ice, mobilisations, passive, active, functional exercises, passive stretches, contrast baths, soft tissue massage, mirror work and sensory stimulation), a pain clinic referral and trials of analgesics (amitryptilline), 2 guinethidine blocks and lignocaine plasters there was no improvement. The left wrist and fingers remained very painful, stiff, swollen and non-functional and the patient and physiotherapist were ready to accept that there would be no further recovery. However, the orthopaedic surgeon wanted physiotherapy to continue. He planned to surgically correct the mal-union which he felt was contributing to the pain. He could not operate until the CRPS 1 settled and the patient regained some finger mobility. Except for moderate osteoarthritis of the right hip which prevented long walks outside the patient was fit and well.

Assessment

The patient held the left arm protectively into her side with the wrist maintained in flexion and radial deviation as though the hand was still in a cast. The hand exhibited the classic signs of CRPS 1 being markedly swollen, and the skin was a reddened discolouration. The patient reported that the hand and thumb felt numb. Her visual analogue scale (VAS) pain score was 5/10 when wearing the futuro splint and reported verbally as severe with movement. The patient's expectation was to be able to have improved mobility and less pain in her hand. The patient's perception of why the wrist was so painful was that 'the bones were still broken and that they had never healed!'

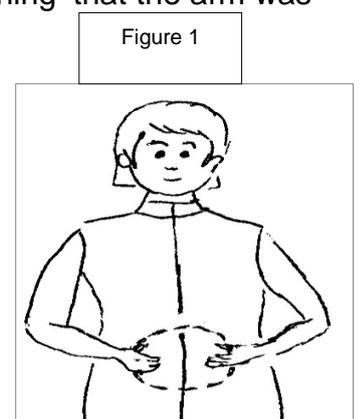
Intervention

Initially, the patient could not see the point of any further therapy as there had been no improvement in her hand so it was explained that a new approach would be tried based on modern pain theory and using exercises adapted from T'ai Chi. Anecdotally, this approach and adapted exercises had been successful in helping patient's with more generalised chronic pain states but had not been tried on such a severe case of CRPS1 before. The first session was used to educate and reassure the patient about mal-union, CRPS 1 and chronic neuropathic pain using the 'Explain Pain' book (Moseley, 2003) and the CRPS & RSD Patient Information Booklet (The Neuroscience Research Group, Royal National Hospital for Rheumatic Diseases). The patient was told that her pain centres were on red alert working all the time and that this had resulted in changes in the nerves which were now sensitised to pain. Treatment was now concentrated on working below pain to calm the pain centres down. She understood the concept of the homunculus and was shown a diagram from the 'Explain Pain' book depicting 'smudging' of the virtual hand thus representing plastic changes that can occur in the somatosensory cortex of the brain following injury and persistent pain. First, a 'feely' bag full of objects such as a pen, golf ball, clothes peg, and even a Wallace and Grommet sheep attached to a bath plug (the latter always makes patient's laugh and laughter is such good therapy!) was used to test stereognosis and sensation. The patient had great difficulty identifying simple objects with the affected hand by touch alone. This illustrated to the patient the impaired sensory system. It is also interesting to note that the patient found these sessions mentally exhausting. The patient was instructed to make her own 'feely bag' and practice identifying objects daily as well as continuing to touch different textures with the affected hand to help re-educate the sensory system. She was also instructed to use the left arm in her daily activities but to avoid anything which caused pain and to continue with the contrast baths.

The second session was arranged the following week and was used to assess the muscle tone in the patient's affected limb and to find out how much movement was possible at each joint before pain was provoked. The affected limb was gently moved revealing an abnormally high

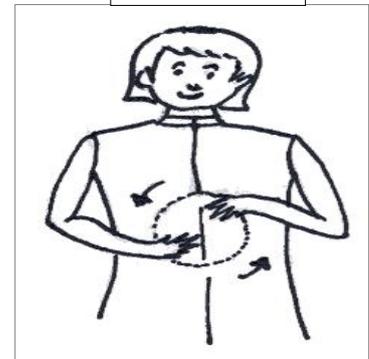
muscle tone. Movement of the left shoulder and elbow as well as the wrist and fingers provoked severe pain. The pain and abnormally high muscle tone resulted in a poor quality of movement and limited movement patterns. The patient began to realise that it wasn't just the mal-union at the wrist which was causing pain but the motor system was also impaired. It was explained to the patient that the severe pain was causing the muscles of the affected arm to go into spasm preventing normal, efficient movement. The next challenge was to teach the patient how to relax. The unaffected arm was supported at the elbow and wrist and the patient was instructed to 'relax and let go', and also imagine that "your arm is a fishing rod and that my hands are the fishing rod stand, relax and let go of your arm into the support of my hands". The patient's upper limb was passively moved in a gentle manner at each joint from distal to proximal assessing whether the patient had relaxed the muscles. The shoulder was left until last as it was the most difficult joint to relax in the upper limb. The patient learnt how to relax the unaffected arm within a few minutes. The therapist repeated the above procedure with the affected arm starting with the elbow then the shoulder but not the wrist which was maintained in neutral as it was so painful. Despite being more difficult, the patient was able to relax the affected arm within 5 minutes. She also felt how easily it moved when the muscle tone was normal and there was no pain.

The next challenge was to teach the patient how to move independently with normal muscle tone and without pain. The T'ai Chi principle of moving in a slow, relaxed, flowing, calm manner, called 'sung' was explained. In order to achieve this relaxed state T'ai Chi involves developing a deep awareness of the internal body sensations (muscle tone, joint proprioception, pressure changes etc) using visualisations and imagined movements. The therapist tried adapted T'ai Chi exercises instructing the patient to lift her affected arm up whilst imagining 'that the arm was floating in the air, moving like the wings of a bird' and 'that the air is a substance like water, feel the air flowing past your fingers' but the patient could not move the affected limb independently without severe pain. The 'Chi ball' exercise (see Figure 1) was also tried. This involves sitting with



the elbows at 90° holding an imaginary ball between the hands in a quarter to three position, the hands are then slowly rotated in a clockwise then anticlockwise direction (see Figure 2). A strong mind awareness and connection is made between the centres of the palms where the 'lao gong' (heart palace) acupuncture point is located. The patient could not do this gentle exercise either without severe pain. The therapist decided to experiment and adapted the chi ball exercise and gave the patient a light sponge football to hold (later a light plastic football worked just as well!). The patient was instructed to perform a small range of movement and very slowly pass the ball

Figure 2



forward to the therapist whilst keeping the affected arm relaxed and not to move into pain. Holding the sponge football isolated the movement of the affected arm to the trunk, shoulder and elbow while the effectively immobilising the wrist and fingers. Surprisingly, the patient was able to do this exercise without provoking pain! This was repeated several times. Then the exercise was progressed to passing the ball slowly to each side, followed by lifting the ball up and down and finally in small circles. Each new movement was repeated several times to help the patient to develop her confidence and learn to move efficiently. Although the patient had a constant baseline level of pain she was encouraged to go home and practice the football exercise 'little and often' and to gradually increase her range of movement. She was asked to perform the exercise in such a manner that it did not increase her baseline pain. It was also explained to her that 'forcing the movement into pain' would be counter productive and produce more pain, swelling and possibly prevent functional adaptive remodelling of the sensory and motor cortex.

Results

Over the next 3 sessions the swelling gradually reduced in the fingers and hand and the patient was able to do a small range of pain free movements. Progress in the early stages was slow because as soon as the wrist improved the patient tried to do her activities of daily living (ADL) such as ironing, cleaning her silver etc and it worsened the wrist pain re-aggravating the

CRPS1. Constant reminders were given to work below pain and referral to Occupational Therapy (OT) for ADL adaptations allowed the patient to regain independent function without pain. The Orthopaedic surgeon also encouraged the patient to wear a futuro splint to reduce the wrist pain requesting physiotherapy concentrate only on the fingers. A compromise was reached with the patient and surgeon and the patient only used the splint for housework taking it off frequently to do exercises. By the middle of April the patient reported feeling 'better in herself', had full range of movement at the thumb, and she was able to flex her fingers 2 ½" from the distal palmar crease. She could hold a wine glass and use an adapted OT fork to eat. She was now able to do active exercise without increasing the pain and progressed to the imaginary Chi ball and adapted T'ai Chi exercises. At the beginning of May she was able to lift a light weight with the affected hand but there was reduced feeling at the finger tips and she still had difficulty picking up and putting objects down. By the end of July she was doing all her normal activities and was able to carry things. In early November, 11 months after referral the patient was able to wear her wedding ring, do buttons up more easily and sew. The patient still complained of the fingers feeling stiff and finger flexion was 1 1/2" from the distal palmar crease. The wrist flexed to 50°, radial deviation was full but extension was limited to 15°, and ulna deviation to 10°, presumably limited by the mal-union. Her pain score on the visual analogue scale was 0/10 at rest but there was an ache (2-3/10) at the ulna styloid at the end of each day. As progress at this point was very slow the patient was happy to continue independently and was discharged. Four months later the orthopaedic surgeon operated to correct the mal-union.

Discussion

This case highlights the importance of – knowing the patient's perception of their condition, and facilitating change towards any unhelpful beliefs, attitudes or misconceptions they have regarding their condition, educating the patient about modern pain physiology, having a positive attitude in order to promote healing, and the value of working in a multi-disciplinary team.

In CRPS 1 the affected limb has increased muscle tone presumably because the muscles go into protective spasm with the severe pain. It is essential to teach the patient how to relax the

muscles so that they can move the affected limb efficiently and improve the quality of the movement. Potentially, even patient's in severe pain with a marked increase in muscle tone could be easily taught how to relax by the method described here. It is hypothesised that by using the 'top down' and 'bottom up' techniques described, these both stimulated a reduction in muscle spasm in the affected limb and influenced sympathetic nervous system regulation of blood and lymphatic circulation thus facilitating healing. This may partly be the reason for the reduction in the swelling noted in the patients affected hand when treatment was started.

One of the main problems in trying to rehabilitate CRPS1 patients is that the affected limb is exquisitely sensitive, and even gentle movements can exacerbate symptoms pain (Moseley, GL 2004). The adapted 'Chi football' active-assisted exercise enabled the patient to begin moving in a way that did not increase her baseline pain, emphasising relaxed, symmetrical, functional movement which the patient enjoyed doing. It put the patient in control and gave her confidence. The slow, repetitive movement described here can be an excellent medium towards helping produce more normal brain inputs/outputs that influence reorganisation in the somato-sensory cortex.

Conclusion

This case report illustrates that exercises adapted from T'ai Chi were beneficial in helping rehabilitate a patient with a 7-month history of CRPS 1 which had previously been resistant to many other commonly used physiotherapy modalities.

Acknowledgements

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