

Acupuncture for Phantom Limb Pain: A Case Study

Abstract

Introduction: Current research suggests that more than 80 per cent of amputees suffer from phantom pain and phantom sensations post-amputation. Whilst the evidence for the use of acupuncture in this condition is limited, the results have been positive to date. This study was undertaken to investigate the use of acupuncture following upper limb amputation in a male patient suffering from debilitating phantom pain and other phantom phenomena, including the feeling that his phantom hand was clenched shut.

Method: Three sessions of acupuncture at a specialised amputee therapy centre utilised points on the contralateral limb, combined with acupressure around the shoulder girdle of the amputated limb. Points utilised were on multiple channels, including the Lung, Large Intestine, Liver, Small Intestine, Heart, Pericardium and San Jiao (Triple Burner). Outcomes were measured using a visual analogue scale (VAS) and subjective reports from the patient.

Results: Initially the VAS was nine out of ten for pain. During the second session the patient reported that his phantom hand felt as if it had partially opened, and it remained open over the next few weeks. During the third session he reported that the hand had opened fully and was now completely flat. The VAS score was now four out of ten.

Conclusions: Although there is limited scientific evidence to support the use of acupuncture in the treatment of phantom phenomena, this case study clearly highlights its potential benefits. Further work is needed to establish a larger body of evidence for this intervention to ensure that the management of this complex condition is optimised for the future.

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Acupuncture, phantom limb pain, phantom limb phenomena, amputation.

Introduction

Amputation can lead to chronic pain and it is thought that more than 80 per cent of amputees experience significant chronic pain (Rauck et al., 2014). Following amputation, two types of sensation are common: phantom limb pain (PLP) and phantom limb sensation (PLS). The origins of PLP and PLS remain unclear and currently a multifactorial genesis is suggested, including peripheral factors, neuroma, increased excitability of peripheral axons, myofascial trigger points and central nervous system changes (Kern et al., 2012). The pain can be extremely debilitating, significantly decreasing quality of life, increasing the risk of depression and negatively impacting on personal relationships and the ability to work. Current medications are often unsatisfactory in controlling post-amputation pain and have the potential for unwanted side-effects, addiction and misuse (Rauck et al., 2014).

Nikolajsen & Jensen (2001) state that 'a large number of different treatments have been suggested but the vast majority of studies concerning the treatment of phantom pain are based on small groups with no controls.' They also state that 'a clear and rational treatment regime is difficult to establish as long as the underlying pathology is not fully known.'

Sherman and Sherman (1983) documented that

although 61 per cent of amputees with phantom pain discussed the problem with their doctor, only 17 per cent were offered treatment and a large proportion were told they were mentally disturbed. This highlights the lack of understanding of this condition and goes some way to demonstrate the difficulties patients may experience when trying to seek advice and support.

The evidence to support acupuncture as an alternative to medication in this patient group is limited, with only a small number of patient case studies. However, the conclusions so far are positive, with Bradbrook (2004) stating that 'PLP and PLS have been shown to be successfully treated with acupuncture in two out of three cases'. Nikolajsen & Jensen (2001) also describe the use of alternative treatments including acupuncture, and reported that despite the widespread use of these interventions, clear evidence of effect is generally positive but limited.

In a recent review of the current treatment options for PLP, Kern et al. (2012) stated that when studying transcutaneous electrical nerve stimulation (TENS) 'out of 289 patients, 36% used TENS, and 42% of them indicated a "satisfactory" alleviation of pain.' They went on to say that TENS was commonly used due to its availability and lack of side effects, and that the

same argument could hold true for acupuncture.

Western medical acupuncture teaches that the insertion of needles into the skin reduces pain through the activation of complex interwoven neurological and chemical pathways. At a segmental or spinal level, it stimulates cells in the dorsal horn to produce a substance called enkephalin which directly blocks the transmission of pain (White et al., 2008). It also has an extrasegmental effect on the brain, stimulating the release of β -endorphin. This neuromodulator works throughout the body to dampen the response to pain and stays active long after the needles are removed (White et al., 2008).

Due to the lack of an affected limb to needle, acupuncture in amputees utilises the principle of 'cross education'. The contralateral, or remaining limb is needled to produce therapeutic effects on the amputated side. There have been multiple studies undertaken to try and understand this phenomenon, with most research concentrating on improvements in muscle strength rather than the resolution of pain. For example, Huang et al. (2007) studied the effect of electro-acupuncture on contralateral dorsiflexion strength and found a 'significant increase in strength in both legs' of the healthy subjects. It is thought that cross education works at the level of both the brain and the spinal cord (Hortobagyi, 2005), indicating that stimulation of neural pathways in the contralateral limb, whether for muscle excitation or pain relief (as per the mechanisms mentioned above), should have an effect on the phantom side.

This case study is based on a single upper limb amputee who reported severe phantom pain and other phantom sensations. The treatment method adopted used predominantly Western medical acupuncture informed by a basic understanding of traditional Chinese medicine (TCM).

Case description

The patient was a 35 year-old male who underwent a left shoulder disarticulation in October 2013. Since the amputation he had suffered from significant phantom limb pain and sensations in the left phantom hand. He specifically described a painful sensation in the left hand as though his fingers were curled into a claw and he was unable to straighten them. He also described continuous pins and needles throughout his phantom left hand and forearm. No pain was reported further up the arm or around the shoulder.

He had the sensation of his whole left arm being present hanging at his side although he was unable to move it in any way. It seemed to be of normal size compared to the other arm but often felt cold, regardless of the rest of his body temperature.

He was right-hand dominant and his initial score for pain on the visual analogue scale (VAS) was nine out of ten. The amputation was carried out due to recurrent synovial

sarcoma and he had had previous pulmonary metastasis removed in 2004. He was diagnosed with secondary right lung metastasis following the upper limb amputation. He was not currently undergoing chemotherapy but was still experiencing side effects of nausea and hot flushes from previous treatments. He had no other significant previous medical history. His drug history consisted of oxycodone, pregabalin, gabapentin, duloxetine, MST (morphine sulphate tablets) and oramorph. He lived with his partner and child in a house with stairs. He was mobile unaided and able to complete all personal care independently. He needed assistance with cooking and cleaning due to his amputation and had previously worked as high rise window cleaner. He was unable to work since the operation but was keen to regain an occupation, although he was unsure what he could do.

Clinical assessment and findings

The patient presented with a left shoulder disarticulation with a fully healed scar line across the left axilla. The left clavicle remained fully intact, with a prominent acromion visible under the skin. The left shoulder rested in an elevated position and the left scapula was fully present but elevated and protracted compare to the right. The patient was able to depress this shoulder when prompted, but it returned to its elevated position when he relaxed.

It was unclear if any ribs had been removed during the operation giving unrestricted access to the thorax and it was thought to be inadvisable to needle around the surgical site due to a high risk of pneumothorax.

The patient's right upper limb was unremarkable. Range of movement and strength were both full and he had adapted well to his amputation. The right shoulder was relaxed and the scapula positioned normally. He held his head in the midline and had full range of movement in the cervical spine.

No pain, pins and needles or numbness were experienced around the left scar line and the patient did not report any symptoms on the right. Although anxiety regarding body image and feelings of depression were not voiced, the patient was also seeing an amputee counsellor to assist him with coming to terms with the amputation. He had previously undergone hypnotherapy and mirror-box treatment to assist with pain and body image difficulties, although sadly these had been ineffective.

Treatment

Informed consent was gained before the commencement of treatment and again when additional points were added. Details of treatment are recorded in Table 1.

Rationale for treatment dose

Needles were inserted to the recommended depth for each point as suggested by Jarmey & Bouratinos (2008) and did not exceed the maximum depth recommended. At points

Date	Points used (needle length in parentheses)	Dose	Outcome
15/07/14	Hegu L.I.-4 (30mm), Shousanli L.I.-10 (30mm), Shaohai HE-3 (30mm), Waiguan SJ-5 (30mm).	Needles inserted to depth (see Jarney & Bouratinos, 2008). Deqi achieved at all points. Stimulated with rotation at 2 minutes and removed after 5 minutes.	No adverse effects noted. Deqi achieved most strongly at Hegu L.I.-4 and Shousanli L.I.-10. VAS was at 9/10 pre- and post-treatment. Patient keen to continue sessions.
22/07/14	Hegu L.I.-4 (30mm), Shousanli L.I.-10 (40mm), Taichong LIV-3 (30mm), Shenmen HE-7 (30mm), acupressure at Quyuan SI-13 and Jianwaishu SI-14.	Needles inserted to depth (see Jarney & Bouratinos, 2008). Deqi achieved initially at all points and felt most strongly at Hegu L.I.-4 and Shousanli L.I.-10. Stimulated with rotation at 5 and 10 minutes and removed after 15 minutes. Acupressure points stimulated with sustained pressure until local discomfort resolved completely.	Left phantom hand partially opened during session. Patient reported increased comfort from hand position. VAS score for phantom pain was 6/10 post-treatment. No adverse events noted.
12/08/14	Hegu L.I.-4 (30mm), Shousanli L.I.-10 (40mm), Jianyu L.I.-15 (40mm), Neiguan P-6 (30mm), Waiguan SJ-5 (30mm), Shenmen HE-7 (30mm), Luozhen M-UE-24 (30mm), Jianqian M-UE-48 (30mm), acupressure at Quyuan SI-13 and Jianwaishu SI-14.	Needles inserted to depth recommended by Jarney and Bouratinos (2008). Deqi obtained at all points initially with strongest response at Shousanli L.I.-10. Stimulated at 5, 10 and 15 minutes to obtain deqi and removed at 20 minutes. Acupressure points stimulated with sustained pressure until local discomfort resolved completely.	During treatment session patient's phantom hand fully opened. VAS score decreased from 6/10 to 4/10. Pain remained localised to heel of left phantom hand. No adverse effects to treatment noted. Phantom pins and needles previously felt in left fingertips resolved completely post treatment.

Table 1: Treatment method and outcomes

where deqi was obtained more superficially, needles were not inserted further. Treatment time was increased gradually as recommended by White et al. (2011) to ensure the patient did not respond adversely to treatment. Stimulation of each needle was achieved with rotations of small amplitude. This was used for patient comfort and prevent over-stimulation of a potentially sensitive area.

Rationale for points

- **Hegu L.I.-4** – The most widely-used point in the body due to its pronounced ability to alleviate pain and calm the mind. It is known as the ‘analgesic point’ and is often combined with Taichong LIV-3 to relax and alleviate pain of any kind and location. It is extensively used in acute and chronic pain and is indicated as a local point

for the upper limb. It is also used as a psycho-emotional point for the treatment of anxiety, physical or emotional stress (Jarney & Bouratinos, 2008).

- **Taichong LIV-3** - Forms the ‘four gates’ when bilaterally combined with Hegu L.I.-4 and is an extremely powerful point to alleviate pain. This point is also indicated for the treatment of neurological disorders and has a powerful calming and soothing effect on the mind (Jarney & Bouratinos, 2008).
- **Shousanli L.I.-10** - Considered an important point to treat pain, stiffness, motor impairment and paralysis of the upper limb (Jarney & Bouratinos, 2008).

- **Jianyu LI-15** - Useful local point for the treatment of upper limb symptoms including pain, paralysis and atrophy (Jarmey & Bouratinos, 2008). Chosen as a proximal channel point along the patient's phantom pain pathway.
- **Neiguan P-6** - A strong point for calming the mind and alleviating depressive feelings. Known to have a strong analgesic effect and treat nausea (Jarmey & Bouratinos, 2008).
- **Shenmen HE-7** - Regularly used for the treatment of insomnia and for general calming of the mind. Local point for wrist pain and indicated for the location of the patient's symptoms (Jarmey & Bouratinos, 2008).
- **Waiguan SJ-5** - Known as the 'point of a thousand pains' and is the cardinal point for the hand (Hopwood, 2014). It is a Luo-connecting point forming a connection with the Pericardium meridian through its close anatomical relationship to Neiguan P-6, working to treat the internally-externally related channels (Prodoehl, 2016). It assists in the reduction of pain and has a steadying effect throughout the body (Clogstoun-Willmott, 2015). It is also used as a distal/local point for elbow/hand pain.
- **Quyuan SI-13** - Considered to be a local point for shoulder and scapula pain and stiffness. It is indicated in the treatment of chronic shoulder problems.
- **Jianwaishu SI-14** - A local point for shoulder and scapular region pain, this point is also considered a trigger point for the levator scapulae muscle (Jarmey & Bouratinos, 2008).
- **Shaohai HE-3** - Widely used point for the soothing effects on the Heart and mind including in the treatment of insomnia, mental agitation and depression (Jarmey & Bouratinos, 2008). This point was also used as a local point for the treatment of upper limb pain.
- **Luozhen M-UE-24** - Used as a local point for the alleviation of pain and stiffness in the hand and arm (Jarmey & Bouratinos, 2008).
- **Jianqian M-UE-48** - Used as a local point for the treatment of shoulder pain and stiffness (Jarmey & Bouratinos, 2008) and to promote the relaxation of the contralateral shoulder girdle.

Discussion

This case study illustrates the partial success of acupuncture for the treatment of PLP and PLS. PLS was most successfully treated, with the complete and lasting resolution of the clawing of the phantom hand. PLP

improved over the sessions but yet to be completely resolved. The patient was happy with the results and keen to continue with the therapy. Unfortunately he became increasingly unwell and was unable to attend any further sessions. The VAS outcome measure used also shows the success of the treatment with the decrease in score from nine to four over the course of the study. Although the results were positive, there were further areas to explore and treat in this case. Further acupressure points around the left shoulder girdle might have assisted in the ongoing reduction of pain and the use of alternative channels might have meant a complete resolution of this patient's symptoms. It would have been interesting to explore any link there between the physical and psychological benefits of symptom relief, but the short time frame and incomplete treatment regime in this case did not allow for such comparisons.

As highlighted previously, the use of acupuncture for PLP and PLS is not widely known and has little evidence to support it. Single case studies and small trials have shown positive outcomes (Davies, 2014) but there are no large cohort trials available to date. The lack of available evidence to underpin the background understanding and treatment of this condition is a significant limitation to this case study. Nikolajsen and Jensen (2001) state that 'clear evidence-based guidelines for the treatment of phantom pain cannot be given, as most studies suffer from major methodological errors.' Having little evidence on which to base point location choices or assist with understanding the mechanism of the pain proved challenging in this case. The decisions for treatment were based on the suggested point uses in standard available texts, but with no specific evidence for their use in PLP or PLS.

The lack of research on how 'cross-education' affects pain made explaining the technique to the patient challenging. It is a complex phenomenon that is not yet fully understood and few studies have investigated its role in pain rather than muscle strength. Hortobagyi (2005) states that 'cutaneous stimulation appears to exert strong excitatory effects on contralateral motor neurons' and that 'an understanding of interhemispheric interactions in the human motor cortex may shed light on the mechanisms of motor learning ... and improve methods of therapeutic rehabilitation'.

Time was another limiting factor to this study. Over a six-week period the patient was only able to attend three sessions with a more-than-ideal break between each one. It was therefore difficult to ascertain the exact benefits of treatment and the subtle changes felt to the PLP and PLS.

Treatment sessions for were carried out at a regional amputee centre rather than in an acute hospital setting. For this reason, there was no access to his original documentation of the operation. It was therefore impossible to know exactly what structures remained following amputation and due to the high risk of pneumothorax if

needling around the surgical site, acupressure only was used on the left side.

This study was conducted using a Western medical approach, with point selection mainly based on this, with some TCM influence. The text by Jarmey & Bouratinos (2008) had a significant influence over the treatment plan and helped to guide the point progression. On reflection, although point selection was appropriate for the complaint, a better understanding of the points according to TCM theory may have guided treatment more effectively. Influence from other texts and background reading could have also assisted the treatment planning and given the patient a better outcome in a shorter period of time.

Whilst continuing to treat this patient and future similar cases, it would be wise to gain a better understanding of the psychological factors influencing phantom phenomena. A more in-depth knowledge and appreciation of the role TCM can play in such treatment regimes would also help to influence point selection and may provide a more holistic approach to care. Similarly, the patient responded well to the use of acupressure and attributed the alleviation of the majority of his PLS to this technique. Further study on appropriate points and techniques for acupressure could also aid treatment planning and symptom control.

Conclusion

It is suggested that more than 80 per cent of amputees experience PLP and PLS at some point following amputation (Tseng et al., 2014). To date there is little evidence to support particular treatment options, resulting in patients often left to rely on a considerable amount of medication and still being in pain. Hsu & Cohen (2013) state that 'the treatment of post amputation pain is very challenging because the underlying mechanisms are multifactorial in nature.' They go on to say that identifying a single causative mechanism can be almost impossible, resulting in the poor pain control often experienced by patients. The lack of available evidence highlights the considerable need for future research into the use of acupuncture in PLP and PLS. Large cohort studies are required to investigate the true effect this treatment can offer, and provide solid evidence to support clinical practice in the future.

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