Case Report

The Acupuncture Vol. 34 No. 1 February 2017 : 81-87
pISSN 1229-1137 eISSN 2287-7797
http://dx.doi.org/10.13045/acupunct.2017077

Acupuncture for chronic post-thoracotomy pain in a patient with major chest trauma: A case report※

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[Abstract]

Objectives : Chronic post-thoracotomy pain is a refractory condition that responds poorly to existing pain treatments. The aim of this report is to describe favorable symptom changes in a patient with chronic post-thoracotomy pain after major chest trauma who received a series of manual acupuncture treatments over 3 months.
Methods : Twelve sessions of manual acupuncture were provided to the patient, once or twice a week.
Results : The manual acupuncture sessions were well tolerated. Minor adverse events, including temporary minor bleeding at the needled sites, were intermittently observed. The patient's symptoms, including pain, sleep disturbance, and anxiety gradually resolved and had almost completely disappeared after 12 sessions of acupuncture treatment.
Conclusion : This single case report cannot confirm whether the observed positive changes in the patient's symptoms and dysfunctions are associated with the acupuncture treatments. Randomized controlled trials are necessary to explore the role of acupuncture in chronic post-thoracotomy pain in patients with major chest trauma.

Key words :
Acupuncture;
Post-thoracotomy pain;
Korean medicine;
Chest Trauma;
Multiple injuries

Received : 2017. 02. 01.
Revised : 2017. 02. 05.
Accepted : 2017. 02. 06.
On-line : 2017. 02. 20.

※ This work was supported by a 2-Year Research Grant of Pusan National University. The authors are thankful to Ji Min Bae for her assistance in the manuscript editing and submission process.
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I. Introduction

Chronic post-thoracotomy pain is defined by the International Association for the Study of Pain (IASP)[1] as "pain that recurs or persists along a thoracotomy incision at least two months following the surgical procedure." Poor, if not incomplete, response to existing analgesic treatments, impaired physical function due to disturbing pain and reduced quality of life are common[2]. Previous studies suggest that chronic post-thoracotomy pain is a prevalent condition after the surgery. A group of patients who underwent elective thoracotomy were followed up to observe the changes in pain over time; the study showed that a substantial number of patients had pain at 3 months (80%; 67/84), 6 months (75%; 56/79), and one year after surgery (61%; 38/62)[3]. Another survey of 255 patients who underwent thoracotomy at least six months before the survey in specialist care settings showed that 52% of respondents (78/149) reported mild to severe post-thoracotomy pain[4]. In the Chinese population, the point-prevalence of chronic pain after thoracic surgery was 24.9% (320/1284 patients)[5]. Although there is a variation in reported prevalence between studies, possibly due to differing definitions of cases and research settings, post-thoracotomy pain is known to be the most common complication of thoracotomy[1].

Various analgesic therapies, including oral analgesics, paravertebral nerve block, and thoracic epidural block have been recommended, although evidence for each of these remains insufficient[6-8]. Acupuncture is widely practiced for pain management, and recent high-quality systematic reviews have reported the favorable effects of acupuncture for chronic pain[9-11]. The role of acupuncture in the management of chronic post-thoracotomy pain, however, is largely unknown.

In this case report, we describe favorable changes in a patient with chronic post-thoracotomy pain after a series of regular acupuncture sessions. We also provide a brief review of the relevant literature.

II. Case presentation

1. Ethics

Written informed consent for the case report and a photograph was obtained from the patient. Approval from the local ethic committee was not sought as this is a single-case report.

2. Patient history

A 47-year-old man was referred by a thoracic surgeon to the Korean medicine outpatient clinic. The chief complaint was intermittent pain at the left posterolateral chest wall. This occurred after a traumatic multiple rib fracture and subsequent surgery two months before the initial visit to the clinic. There was local tenderness at the incision site. A spontaneous tingling sensation and local pain was also present and was aggravated when the patient laterally rotated the torso or abducted the ipsilateral shoulder. There was no allodynia around the incision site.

Gabapentin (Neurontin 300 mg, three times a day; total 900 mg daily), opioids (Targin [oxycodone and naloxone] 10 mg, two times a day; total 20 mg daily) and analgesics (Ultracet [acetaminophen and tramadol] 650/75 mg, two times a day; total 150 mg daily) were prescribed to manage the patient's symptoms. However, the patient's response was incomplete. Sleep quality was disturbed due to pain at night, and he could not sleep without the prescribed pain medication. There were no opioid dependence symptoms, such as constipation.

3. Acupuncture treatments

Dermatome longitudinal, back-shu points were needled at the approximate level of T4 to T10 to cover multiple adjacent dermatomes around the surgery incision site and the relevant pain area. After the first session using electroacupuncture, the patient's symptoms were aggravated. Thus, the dose and the type of stimulation was adjusted (gentle manual stimulation, clockwise and anti-clockwise rotation). In total, 12 sessions were provided. The treatment was completed based on the patient's recovery (nearly full recovery from pain and no requirement of pain management). Details of the acupuncture treatments are provided in Table 1.

4. Changes in symptom manifestation after the acupuncture sessions

Pain at the posterolateral chest wall, which was the most significant discomfort at the time of initial presentation, gradually reduced during the treatment course. Pain at night, related sleep disturbance and anxiety were also satisfactorily resolved. Pain related discomfort during shoulder and torso movements was also reduced, and there was no functional limitation at the end of the provided sessions. The patient reported that prescribed analgesics were no longer needed due to decreased pain from the treatment (from the fifth acupuncture session onward) (see Table 2).

5. Adverse events

Minor, temporary adverse events such as local bleeding at the needled points were occasionally observed, although the patient did not report discomfort. Except for the temporary symptom aggravation after the first session of electroacupuncture, which resolved spontaneously, there were no other adverse events. No serious adverse events related to needling of the thoracic region, such as organ-penetration injury (e.g., pneumothorax or local tissue infection), occurred during the treatment period.

III. Discussion

In this case presentation, the patient, who did not respond well to a paravertebral nerve block and oral analgesics, showed favorable improvement in pain after acupuncture treatment. No serious adverse events related to the needling of the thoracic region occurred. The treatment course of acupuncture seemed acceptable to the patient. We cannot conclude that the observed improvement was attributable to the acupuncture because this is an uncontrolled, single-case report. Various factors, including the patient's expectation of the effects of acupuncture treatment, natural remission of the post-thoracotomy pain, and other non-specific effects of being enrolled in a different treatment course may have contributed to the overall clinical changes. Given the patient's symptoms as being refractory to conventional treatment and significant symptom severity before the treatment, however, it can be hypothesized that acupuncture may play a role in managing chronic post-thoracotomy pain; this should be further tested through well-controlled randomized trials.

The mechanism of post-thoracotomy pain itself is incompletely understood, and no consensus regarding its causal pathway is available[1]. Suggested associated factors of post-thoracotomy pain include crushing of the intercostal nerve after chest wall trauma and rib resection, inevitable muscle incisions during the surgery, disarticulation of costochondral and costovertebral junctions due to extensive rib retraction, and personal anxiety traits[1]. The proposed mechanism of the analgesic effects

Table 1. The revised Standards for Reporting Interventions in Clinical Trials of Acupuncture (STRICTA) table for the acupuncture treatments

Item	Detail	Details
1. Acupuncture rationale	1a) Style of acupuncture	Acupuncture treatments were based on Korean medicine theory and neurophysiology (for segmental analgesia)
	1b) Reasoning for treatment provided	Textbook of Acupuncture and Moxibustion Medicine
	1c) Extent to which treatment was varied	Treatment was almost the same except for slight modification on the dose or additional point selection based on the patient's response during the treatment course.
2. Details of needling	2a) Number of needles inserted	25 to 40 needles per session
	2b) Names of points used	– ipsilateral LI4, LI11, and SI11 – bilateral back-shu points on the level of T4 to T10 – ipsilateral local parallel needling on the nearby posterolateral area that shares the same dermatome as the incision pain area – GV20, bilateral LI20, and Yintang points
	2c) Depth of insertion	– 1.0 to 1.5 cm perpendicular insertion on LI4, LI11, and SI11 – 2.0 to 2.5 cm perpendicular insertion on the back-shu points – 1.0 to 1.5 cm parallel insertion on the posterolateral area – 0.2 to 0.5 cm oblique or superficial needling on GV20, bilateral LI20 and Yintang points
	2d) Response sought	– Needle sensation including de-qi was not vigorously sought to enable the patient to tolerate the acupuncture treatments.
	2e) Needle stimulation	– Gentle manual stimulation by clockwise to anti-clockwise rotation technique for most points – For the parallel needles on the posterolateral area, needles were slightly stimulated (2 or 3 times of rotation stimulation technique) to prevent needle-related injury on the chest wall. – For the 1st session only, electrical stimulator (ES-160, Ito, Tokyo, Japan) was connected to the T4-T7 and the corresponding parallel needles on the ipsilateral chest wall area with an alternating frequency of 2-100 Hz, a biphasic square wave, and at a tolerable intensity by the patient.
	2f) Needle retention time	20 to 30 minutes
	2g) Needle type	– back-shu points, posterolateral chest wall, LI4, LI11, and SI11: 0.25 × 40 mm – GV20, LI20, and Yintang points: 0.20 × 30 mm – A sterilized disposable stainless acupuncture needle (Dongbang Inc.)
3. Treatment regimen	3a) Number of sessions	12 sessions
	3b) Frequency/duration	Once or twice a week over 12 weeks (session frequency was determined based on the patient's availability.)
4. Other components of treatment	4a) Details of other interventions	Infrared irradiation on the local area of pain was provided during the needle retention. The patient was advised to apply gentle heat stimulation at home, avoid painful shoulder/torso movement, and maintain the acceptable level of physical activity to prevent acute aggravation of symptoms.
	4b) Setting and context of treatment	An outpatient department of Korean medicine in a tertiary care university hospital. The patient was referred by a thoracic surgery specialist. Regular information and explanation of ordinary acupuncture treatments (possible benefits, risks, uncertainties of treatment results) were provided to the patient.
5. Practitioner background	5) Description of participating acupuncturists	An academic faculty (Korean Medicine Doctor) of the university hospital with over 10 years of clinical experience

Table 2. Changes of pain and related symptoms after treatment

Outcomes	Before treatment: 2 weeks after surgery	After treatment: 5 months after surgery
Response to the previous treatments	Refractory	–
Pain	Spontaneous, intermittent aggravation: moderate to severe degree	Almost completely resolved
Sleep disturbance	Pain at night	No disturbance
Anxiety	High level of anxiety	No anxiety
Discomfort at shoulder movement	Limited shoulder/torso movement due to aggravation of pain at the chest wall	No discomfort
Patient satisfaction	–	Very satisfied
Use of medication	Opioids, non-steroidal anti-inflammatory drugs, and anti-neuropathic pain agents (i.e., gabapentin)	No medications

of acupuncture includes inhibition of the nociceptive afferent pathway at approximately the same spinal level in the dorsal horn (i.e., segmental analgesia), neuromodulation related to the release of endogenous opioid peptides in the brain and spinal cord, as well as involvement of non-opioid neurotransmitters (e.g., serotonin and oxytocin)[12]. The cholinergic anti-inflammatory pathway by acupuncture stimulation may alter chronic inflammatory status after incision into tissues, which is potentially related to the centralization of pain[13]. These mechanistic insights may contribute to the design of further experimental studies and clinical trials for chronic post-thoracotomy pain.

Patients' symptom trajectory and responses to acupuncture treatment after major chest trauma are largely unknown. Most previous studies of acupuncture have dealt with post-thoracotomy pain in patients who underwent elective thoracic surgery due to non-traumatic etiology, such as lung cancer or other non-cancer diseases; these studies reported inconsistent findings. Son et al. randomized 20 non-trauma patients who were supposed to undergo elective thoracotomy into an acupuncture group (n=10) and a control group (n=10) and provided embedding acupuncture at LI4 and TE6 until discharge (up to seven days after surgery)[14]. Patients allocated to the acupuncture group consumed less analgesics compared to patients in the control group, although there was no between-group difference in pain or upper-limb dysfunction. The major drawbacks of this study include poor quality of reporting on the randomization method, concealment of allocation, lack of safety assessments and small sample sizes, all of which increase the unreliability of the observed results. In an uncontrolled feasibility trial by Vickers et al. of lung cancer patients who underwent elective thoracotomy[15], in addition to the routine postoperative pain management, intradermal needles on BL12 to BL19, ST36, and auricular "Shenmen" points, a total of eighteen points, were embedded over four weeks after surgery. In the 36 patients treated with acupuncture, 29 patients (81%) provided data. The procedure was well tolerated without any serious adverse events. However, a subsequent randomized trial by the same researchers showed no difference between an intradermal embedded acupuncture group and a sham intervention (i.e., placement of non-penetrating studs on the near acupuncture points) up to three months after surgery[16]. A small pilot trial for post-thoracotomy pain in patients with non-small cell lung carcinoma undergoing elective thoracotomy randomized 27 patients into electroacupuncture and sham electroacupuncture (non-penetrative blunt stimulation and mock electrical stimulation) on the ipsilateral LI4, GB34, TE8, and GB36 for the

Fig. 1. Segmental acupuncture needling on the posterolateral back area

first seven postoperative days (twice a day, for a total of 14 sessions)[17]. There was no between-group difference in respiratory function (i.e., peak flow rate), pain intensity, or total amount of intravenous patient-controlled analgesia. Since the small sample size of the pilot trial does not allow definitive conclusions, the authors proposed further large-scale randomized trials, although no information on subsequent trials was available. Outcomes two or three months after surgery, a common cut-off period for chronic pain, were also largely unknown. In all these studies, patients undergoing elective thoracic surgery due to non-traumatic diseases were enrolled. Overall, current evidence on the role of acupuncture in chronic post-thoracotomy pain in patients with major chest trauma, such as in this case, is scarce.

The patient showed significant recovery after acupuncture treatment. This single-case report cannot confirm whether the observed positive changes in the patient's symptoms and dysfunctions are associated with the acupuncture treatments. Randomized controlled trials are necessary to explore the role of acupuncture in chronic post-thoracotomy pain treatment for patients with major chest trauma.

V. References

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