

## CASE REPORT

# The use of acupuncture for the treatment of supraspinatus tendinopathy

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## Abstract

This case study outlines four sessions of acupuncture treatment for a 45-year-old gentleman with five to seven years history of supraspinatus tendinopathy. The clinical assessment and examination findings that lead to the decision to combine acupuncture with the conventional physiotherapy intervention are supported by Cochrane database and research studies. Both the Patient Specific Functional Scale (PSFS) and Visual Analogue Scale (VAS) are reliable and valid instruments for measuring patient's clinical progress. They demonstrate concurrently with the available literature that acupuncture can reduce pain severity and improve quality of life in individuals with supraspinatus tendinopathy. However, since the clinical presentation of supraspinatus tendinopathy can differ greatly from patient to patient, a treatment should be tailor-made to a patient's problems.

*Keywords:* acupuncture, shoulder, subacromial pain syndrome, supraspinatus, tendinopathy

## Introduction

Shoulder problems affect 7% to 26% of the UK population each year (Urwin 1998; Chard *et al.* 1991). It is the third most common musculoskeletal presentation to general practice (McCormick *et al.* 1996). Subacromial pain syndrome (SAPS) is one of the leading causes of shoulder disorders and it is defined as a non-traumatic, unilateral, shoulder pain localized around the acromion during or subsequent to lifting of the arm (Diercks *et al.* 2014). The term has been recently updated from Neer's (1983) original concept of impingement syndrome to better describe the relationship between shoulder anatomical structure, functional load and pain. The different clinical and/or imaging diagnosis such as subacromial/

subdeltoid bursitis, supraspinatus tendinopathy, tear of the rotator cuff, or tendinosis calcarea of the bicep, all fall under the umbrella of SAPS. This case study report will examine the effect of acupuncture as an adjunct to the conventional physiotherapy intervention in treating supraspinatus tendinopathy.

Supraspinatus tendinopathy is an overuse tendon injury most often as a result of repetitive stresses and overloading during sports or occupational activities (Starr & Kang 2001; Sommerich *et al.* 1993). It is a debilitating condition that affects people across different age groups with varying degrees of pain, irritability, decreased exercise tolerance and capacity to function. Pathophysiological changes such as hypovascularity, decrease in oxygen supply and neovascularisation in the structure of supraspinatus tendon and its entheses weaken its capability to sustain repeated tensile load.

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Cook and Purdam's (2009) model describes three stages of continual tendon pathology: reactive tendinopathy, tendon dysrepair (failed healing) and degenerative tendinopathy. Unlike normal tendon adaptation that occurs through tendon stiffening with minimal increase in thickness, reactive tendinopathy induces temporary noninflammatory homogeneous thickening of the tendon to reduce stress by increasing cross-sectional area (Magnusson *et al.* 2008). In the early stage, the tendon has the potential for reversibility if the overload is sufficiently reduced. Tendon dysrepair is the next stage with greater extent of matrix breakdown. There is a marked increase in protein production as a result of the proliferation of myofibroblasts and chondrocytic cells. The proteoglycans separate the collagen leading to disorganisation of the matrix in the tendon. Imaging may also show swelling and increase in vascularity. The tendon still has the potential for some reversibility with load management and exercise (Ohberg *et al.* 2004). However, there is little capacity left for reversibility of pathological changes once tendon has progressed to the last stage. Considerable heterogeneity and breakdown of the matrix due to large areas of cell apoptosis, trauma, acellularity and vascularity are observed in degenerative tendinopathy (Lian *et al.* 2007).

Studies have shown that acupuncture induces blood flow to promote healing to the area (Sandberg *et al.* 2003) and confers an analgesic effect by stimulating the release of endorphin, serotonin and enkephalin at local spinal level (Carlsson 2002) and noradrenaline throughout all levels (White *et al.*, 2008) respectively. Therefore, it is acceptable to reason that acupuncture may provide valuable outcomes when treating patients with supraspinatus tendinopathy. However, there is little evidence to support or refute the use of acupuncture in this patient population.

Cochrane database (2005) has conducted a systemic review on the effect of acupuncture in the intervention of individuals suffering from shoulder disorders including adhesive capsulitis, rotator cuff disease and osteoarthritis. Nine trials of varying methodological quality that

met the inclusion criteria were analysed. In these trials, participants had acupuncture, sham acupuncture, ultrasound, gentle movement or exercises for 20–30 min, two to three times a week for three to six weeks. Although two trials assessed short-term success of acupuncture for rotator cuff disease found no significant difference in short-term improvement when compared to sham acupuncture, due to small sample sizes this may be explained by Type II error. Acupuncture was beneficial over sham acupuncture in improving shoulder function at four weeks. However, by four months, the difference between the acupuncture and sham acupuncture groups, whilst still statistically significant, was no longer likely to be clinically significant. There were some benefits of both traditional and ear acupuncture plus mobilization over mobilization alone. Acupuncture combined with exercise was proven to be more effective than exercise alone for improving pain, range of motion and function for up to five months. Another trial indicated there was no difference in adverse events between acupuncture and sham acupuncture.

One prospective, randomized controlled trial was conducted to compare the efficacy of electro-acupuncture with placebo-acupuncture for the treatment of shoulder pain for patients aged from 25 to 83 years (Hoyos *et al.* 2004). At six month follow-up after treatment the acupuncture group showed a significantly greater improvement in pain intensity compared with the control group and had consistently better results in range of motion (goniometer), functional ability (SPADI), quality of life (COOP-WONCA charts), NSAIDS intake and global satisfaction (10 points analogue scale).

Overall, although little can be concluded due to a small number of clinical and methodologically diverse trials, the available evidence suggests that acupuncture can provide beneficial outcomes in the treatment of supraspinatus tendinopathy. The case study below further supports acupuncture as a useful adjunct when combined with conventional physiotherapy intervention for a patient with supraspinatus tendinopathy.

## Description of the case

This case study outlines the treatment of a 45-year-old gentleman with supraspinatus tendinopathy in his left shoulder.

### Medical screening for acupuncture and consent

Following subjective and objective examinations, I had provided education, discussed his diagnosis with the patient, and the possibility of combining both acupuncture and physiotherapy treatment together. He was informed of the chemical effects of acupuncture on his body and its possible associated risks and side-effects. In date, sterile and single-use acupuncture needles would be administered under a safe working practice and disposed in sharps and clinical waste containers after each use. Anti-bacteria dry hand wash and clinical wipes would also be applied throughout all treatment sessions. The patient did not have any contraindications or

precautions towards receiving acupuncture. His informed consent to the agreed treatment plan, was obtained.

The patient had given verbal and written consent to the clinic's policy and to details highlighted within the information sheet outlining risks and possible side effects for acupuncture. The patient was encouraged to list all physical contributing factors that would aggravate his pain in his activities/daily life and was advised to avoid these movements as much as possible as per NICE guidelines (2017). The importance of maintaining a good posture and performing home exercise program on a daily basis was reinforced. A set of shoulder mobilising exercises and rotator cuff strengthening exercises was included in his home exercise program. The goals of applying acupuncture as an adjunct to the management of patient's condition focussed on pain relief, decreased interference with sleep and improved mood and functions in ADLs.

**Table 1.** Patient Profile

History of present condition	This right-handed 45-year-old gentleman presented to physiotherapy on the 16 <sup>th</sup> of June 2017 with a five to seven years history of left shoulder pain. He reported insidious onset of constant dull ache 6/10 VAS across anterosuperior and lateral aspect of his left shoulder. He had had two corticosteroid injections three years ago with no benefit. He had also attended the physiotherapy department in the Memorial Hospital twice, three to four years ago, and received conventional physiotherapy treatment i.e. soft tissue massage, trigger point release and home exercise program with temporary and minimal effect. He experienced an acute episode of flare-up with 9/10 VAS pain three weeks ago, which had gradually improved after taking one week off work. However, he had another episode again six days ago. He expressed that he had become increasingly frustrated and was considering having surgery but decided to try physiotherapy once more. Aggravating factors were reaching out and lifting his arms especially in sideways direction. Applying ice, taking naproxen and paracetamol as required helped to ease his pain temporarily. He exhibited no particular 24-hour pattern, but his sleep was disturbed every night when he had acute recurrence. Otherwise, he wakes up at night only if he lies on his left.
Investigation	Recent ultrasound shows mild tendinosis and calcification of long head of biceps and supraspinatus muscles.
Past medical condition	No significant medical condition reported. He is generally fit and well.
Drug history	He takes paracetamol and naproxen PRN according to the state of his left shoulder.
Social history	He has been working in a heavy industrial plastic pipe manufacturing factory for the past 23 years. His job involves many manual labour tasks, one of which requires him to lift one end of 6-10 kg pipes and throw them into scrap briquetting machinery. He lives with his family and enjoys spending time with his four-year-old daughter.
Patient expectation and concern	Patient wished to prevent any further episode of recurrence, decrease his shoulder pain and be able to do at least most of the lighter manual tasks at work.
Clinical assessment & examination findings	On initial examination, this gentleman showed slightly elevated BMI with a slouching forward headed position. His active shoulder range of motion was approximately full in all planes with constant 6/10 VAS dull ache throughout range. Whilst his Hawkins-Kennedy test was negative, pain was provoked in both Empty Can and Neer's impingement tests. Manual muscle testing of his external rotators and deltoid were weak 4-/5 and painful. There was point tenderness over the fibres of upper trapezius, levator scapulae, deltoid and supraspinatus muscles. Apley's scarf test and Speed's test were unremarkable and his cervical spine was cleared. His presentation on examination showed that his pain had settled, and his shoulder was no longer irritable since the acute episode six days ago. His total score for patient specific functional scale (PSFS) was 1.3 when there was a flare-up (see Fig. 1).

## The Patient-Specific Functional Scale

This useful questionnaire can be used to quantify activity limitation and measure functional outcome for patients with any orthopaedic condition.

**Clinician to read and fill in below:** Complete at the end of the history and prior to physical examination.

### Initial Assessment:

I am going to ask you to identify up to three important activities that you are unable to do or are having difficulty with as a result of your \_\_\_\_\_ problem. Today, are there any activities that you are unable to do or having difficulty with because of your \_\_\_\_\_ problem? (Clinician: show scale to patient and have the patient rate each activity).

### Follow-up Assessments:

When I assessed you on (state previous assessment date), you told me that you had difficulty with (read all activities from list at a time). Today, do you still have difficulty with: (read and have patient score each item in the list)?

### Patient-specific activity scoring scheme (Point to one number):

0    1    2    3    4    5    6    7    8    9    10

Unable to perform activity

Able to perform activity at the same level as before injury or problem

(Date and Score)

Activity	Initial	10/06/17	29/06/17	07/07/17	14/07/17	
1. Usual work		2/10	6/10	8/10	8/10	
2. Dressing yourself		2/10	8/10	10/10	10/10	
3. Able to sleep at night		0/10	8/10	10/10	10/10	
4.						
5.						
Additional						
Additional						

Total score = sum of the activity scores/number of activities

Minimum detectable change (90%CI) for average score = 2 points

Minimum detectable change (90%CI) for single activity score = 3 points

PSFS developed by: Stratford, P., Gill, C., Westaway, M., & Binkley, J. (1995). Assessing disability and change on individual patients: a report of a patient specific measure. *Physiotherapy Canada*, 47, 258-263.

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Figure 1. Additional questionnaire information



**Table 2.** Consultation and Treatment: Session One

Outcome measure pre-Rx: Constant 6/10 VAS dull ache throughout all shoulder AROM. Positive Empty Can and Neer's impingement tests. PSFS average score 1.3.  
MMT of deltoid and external rotators 4-/5.

Date of treatment	Acupuncture point	Needle size	Angle of needle	Depth of needle	Time	De Qi
16/06/17	(L) LI 14	40 mm×0.25	P	2 cm	10 min	Strong De Qi achieved all points
	(L) LI 15	40 mm×0.25	O	2 cm	no stim	
	(L) LI 16	40 mm×0.25	P	0.5 cm		
	(L) TE 14	40 mm×0.25	O	1.5 cm		
	(L) SI 10	40 mm×0.25	P	1 cm		
	(L) SI 14	40 mm×0.25	O	1 cm		

Rx position: Upright sitting, arm supported by pillow with upper body exposed.

Post treatment: Patient was slightly fearful when the needles were inserted. Reassurance was provided constantly throughout the whole treatment session. Good erythema response was observed. Patient felt mildly fatigued after needles were removed. A cup of cold water was prepared for him while he rested in the reception area until he felt ready to leave.

Considerations for next Rx: If patient experienced a positive response then increased time of treatment and/or depth of needle insertion and/or number of points used and/or stimulation. Consider Gall Bladder (GB) 21 for dermatomal overlap, and Bladder (BL) 17 as an influential point for blood.

Limitation: 30 mm needle was not available in the clinic.

Abbreviations: P = perpendicular, O = oblique, L = Left, R = Right, Stim = stimulation, Rx = treatment

**Table 3.** Consultation and Treatment: Session Two

Patient was pleased and surprised at the same time that his symptoms had significantly improved three days after the first acupuncture treatment. His pain had reduced from 6/10 VAS to 3/10 VAS with all planes of active shoulder movement and he was able to work (PSFS 2/10 to 6/10), dress himself (PSFS 2/10 to 8/10) and sleep at night (PSFS 0/10 to 8/10) a lot better. His Neer's impingement test was now negative. He had not needed to take naproxen or paracetamol since last treatment. He had been compliant with his Home Exercise Programme (HEP) and managed to discuss with his superior at work to allow him to rest from lifting heavy pipes. He reported this was the best he had felt in five years since the onset of shoulder pain. GB 21 and BL 17 were added, depth of needles, treatment time and stimulation were increased.

Date of treatment	Acupuncture point	Needle size	Angle of needle	Depth of needle	Time	De Qi
29/06/17	(L) LI 14	40 mm×0.25	P	3 cm	15 min	Strong De Qi achieved all points
	(L) LI 15	40 mm×0.25	O	3 cm	moderate stim	
	(L) LI 16	40 mm×0.25	P	1 cm		
	(L) TE 14	40 mm×0.25	O	2 cm		
	(L) SI 10	40 mm×0.25	P	2.5 cm		
	(L) SI 14	40 mm×0.25	O	2 cm		
	(L) GB 21	40 mm×0.25	P	2.5 cm		
	(L) BL 17	40 mm×0.25	O	2 cm		

Rx position: Upright sitting, arm supported by pillow with upper body exposed.

Post treatment: No adverse effects, patient felt comfortable.

Considerations for next Rx: If patient experienced a positive response then increased time of treatment and/or number of points used and/or stimulation. Consider HTJ T5 and SI 11 to enhance UL sympathetic outflow and C5/ C6 segmental myotomal effect.

Abbreviations: P = perpendicular, O = oblique, L = Left, Stim = stimulation, Rx = treatment, HEP = ?

Treatment on a weekly basis was ideal, however; changes had to be made according to patient and therapist's availability.

### ***Rationale for acupuncture point selection and treatment dose***

As patient had constant dull ache along the anterosuperior and lateral aspect of his left shoulder, Large Intestine (LI) 14, LI 16 and the

eyes of the shoulder LI 15 and Triple Energizer (TE) 14 were chosen to provide a direct pain relief peripherally at this area. Simultaneously, neuropeptides from sensory nerve endings such as calcitonin gene-related peptide was released at the location of needle insertion causing vasodilation thereby increasing blood flow (Sandberg 2003). This effect could help the patient's body to possibly reabsorb the calcium

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**Table 4.** Consultation and Treatment: Session Three

Patient continued to make good progress. His pain had remained at minimal 3/10 VAS with all planes of active shoulder movement and his ability to work continued to improve (PSFS 6/10 to 8/10). He now had no problem dressing himself (PSFS 10/10 to 10/10) and his sleep was no longer disturbed (PSFS 10/10 to 10/10). His external rotators and deltoid MMT had improved from 4-/5 to 4/5 with minimal pain. His Empty Can test now was negative. HTJ T5 and SI 11 were added, depth of needles and treatment time were increased.

Date of treatment	Acupuncture point	Needle size	Angle of needle	Depth of needle	Time	De Qi
07/07/17	(L) LI 14	40 mm×0.25	P	3 cm	20 min moderate stim	Strong De Qi achieved all points
	(L) LI 15	40 mm×0.25	O	3 cm		
	(L) LI 16	40 mm×0.25	P	1 cm		
	(L) TE 14	40 mm×0.25	O	2 cm		
	(L) SI 10	40 mm×0.25	P	2.5 cm		
	(L) SI 14	40 mm×0.25	O	2 cm		
	(L) GB 21	40 mm×0.25	P	2.5 cm		
	(L) BL 17	40 mm×0.25	O	2 cm		
	(L) HTJ T5	40 mm×0.25	O	1 cm		
	(L) SI 11	40 mm×0.25	P	1 cm		

Rx position: Upright sitting, arm supported by pillow with upper body exposed.

Post treatment: No adverse effects, patient felt comfortable.

Considerations for next Rx: If patient experienced a positive response then increased stimulation. Continued to avoid aggravating factors and focus on strengthening exercises.

Abbreviations: P = perpendicular, O = oblique, L = Left, Stim = stimulation, Rx = treatment

**Table 5.** Consultation and Treatment: Session Four

Patient's pain had further decreased to 2/10 VAS with all planes of shoulder movement. However, he admitted he had been doing more manual work before today's consultation and thus his shoulder was more achy. He felt some tension across his chest and shoulder after work. Having realistic expectations and respecting the healing process were emphasized during our last consultation. His usual exercises were reviewed and deltoid, pectorals and upper trapezius stretches added into his HEP.

Date of treatment	Acupuncture point	Needle size	Angle of needle	Depth of needle	Time	De Qi
14/07/17	(L) LI 14	40 mm×0.25	P	3 cm	20 min strong stim	Strong De Qi achieved all points
	(L) LI 15	40 mm×0.25	O	3 cm		
	(L) LI 16	40 mm×0.25	P	1 cm		
	(L) TE 14	40 mm×0.25	O	2 cm		
	(L) SI 10	40 mm×0.25	P	2.5 cm		
	(L) SI 14	40 mm×0.25	O	2 cm		
	(L) GB 21	40 mm×0.25	P	2.5 cm		
	(L) BL 17	40 mm×0.25	O	2 cm		
	(L) HTJ T5	40 mm×0.25	O	1 cm		
	(L) SI 11	40 mm×0.25	P	1 cm		

Rx position: Upright sitting, arm supported by pillow with upper body exposed.

Post treatment: No adverse effects, patient felt comfortable.

Plan: Patient was happy to be discharged with the given direction and independent HEP.

Abbreviations: P = perpendicular, O = oblique, L = Left, Stim = stimulation, Rx = treatment, HEP = ?

deposit in the long head of bicep and supraspinatus tendons shown on the ultrasound results. By using points LI 14, LI 15 and LI 16 along the same meridian i.e. large intestine meridian in this case would help to correct patient's flow of chi, our body energy. According to traditional Chinese medicine, a balanced flow of chi along all major meridians is vital in reducing tension and improving a person's health and general wellbeing (NCCIH 2013). Small Intestine (SI)

10 was added as it is inserted into infraspinatus which shares the same C5 and C6 myotomes as supraspinatus muscle. They are both innervated by the suprascapular nerve. The two rotator cuff muscles work in synergy to externally rotate the humerus and stabilise the shoulder joint. Furthermore, as the deltoid muscle is also innervated by the anterior rami of C5 and C6, this point could improve the strength of the muscle. The location of SI 14 exploits the

“layering technique” by overlapping the sensory tissues supplied by C5 nerve root, which is effective in treating chronic nociceptive pain (Bradnam 2003). No stimulation was applied and reassurance was constantly given to address patient’s fear towards receiving acupuncture for the first time. In order to avoid risk of exacerbation, the treatment duration was limited to 10 min, which is also the timeline dose to increase vascular permeability (Pearce 2006).

At second consultation, the patient’s shoulder pain and function had significantly improved. GB 21 was added as it further enhanced the C6 dermatomal segmental analgesia. This was achieved through the axon reflex of fast myelinated A $\delta$  fibers, which inhibits nociceptive input produced in substantia gelatinosa stimulated by slower unmyelinated C fibers in the upper segment of spinal cord (White 2008). As there would likely appear to be a certain degree of hypovascularity and neovascularisation due to the chronic nature of his tendinopathy, the influential point for Blood Bladder (BL) 17 was also added. Depth of needle insertion, treatment time and stimulation were increased since patient had responded reassuringly to the initial acupuncture treatment.

At the third and last consultations, HTJ T5 and SI 11 were added as the patient continued to show functional progress in his activities/daily life. The spinal HTJ T5 point is considered to influence patient’s upper limb sympathetic outflow and activate descending inhibitory systems from the hypothalamus (Bradnam 2003). SI 11 further enhances the C5/C6 segmental myotomal effect removing pain inhibition and thus improving infraspinatus, supraspinatus and deltoid muscles activation. Strong De Qi sensation was achieved throughout all treatment sessions to stimulate type II and III fibers in the muscle layer (Pomeranz 1997).

## Discussion

As the patient already received two corticosteroid injections into his shoulder along with the conventional physiotherapy treatment with minimal and temporary effect, the available evidence suggests that acupuncture can be an effective alternative analgesia option for pain

control and progressive rehabilitation. The PSFS and VAS were completed at the beginning of each treatment session as outcome measures for the patient’s clinical progress. The PSFS is shown in Fig. 1 while VAS was recorded in tables 2 to 5. Studies have shown that the PSFS is a reliable, valid and responsive instrument for determining treatment goals and evaluating treatment in patients with a primary shoulder complaint (Koehorst *et al.* 2014). VAS assesses variation in patient’s intensity of pain and has been established as a valid and reliable method in a range of clinical and research applications (McCormack 2009). In this case study, both the PSFS and VAS demonstrate that acupuncture can reduce pain severity and improve quality of life in individuals with supraspinatus tendinopathy. However, lack of long-term follow-up of the patient’s progress and the unlikelihood of acupuncture to remain clinically significant by four months suggested by research, are the limitations present in this case study.

Segmental, extrasegmental and homonculus points away from head of humerus and acromion region could be used instead of the local points if the patient was in acute pain upon his presentation (Bradnam 2003). This would stimulate both segmental pain relief and supraspinal analgesic mechanism without exacerbating his acute symptoms. While crucial patient education and advice in regards to avoidance of aggravating activities were given as per NICE guidelines (2017), the importance of allowing sufficient time between loadings to assist tendon recovery and improve strength could also be mentioned. As tendons can respond to load both anabolically and catabolically, an imbalance between repetitive energy storage and release and excessive compressive force appear to be key factors in the onset of tendinopathy (Andres & Murrell 2008).

As the patient also presented with latent myofascial trigger point pains (MTPs) in upper trapezius, levator scapulae and deltoid muscles, dry needling could have been used as an alternative treatment method to using acupuncture meridian points. When the MTPs are pressed, they may elicit referred pain characteristic of that muscle (Simons 2008). This is explained by

the increased amount of local noxious chemicals such as bradykinin, substance P and calcitonin gene-related peptide stimulating the surrounding nociceptors. There is severe hypoxia in the area of an MTP that would result from the ischemia and increased energy demand from the sarcomere shortening of taut bands causing a local energy crisis (Simons 2008). Unlike active MTPs, which elicit pain pattern that the patient recognises as familiar when pressed, latent MTPs are tender but cause no clinical pain complaint. Latent MTPs can significantly disturb normal motor function not only in the same muscle but also in functionally related muscles. Dry needling into MTPs attempts to elicit a local twitch response to restore the energy deficit.

In conclusion, this case study concurs with the available literature to suggest that acupuncture can provide beneficial outcomes in the treatment of supraspinatus tendinopathy. It also further supports the findings that acupuncture combined with exercise is more effective than exercise alone for improving pain, range of motion and function for up to five months. However, more long-term future studies will need to be conducted in order to consolidate these theories. It is worth noting that individuals with supraspinatus tendinopathy will present with varying degrees of pain, irritability and functional capacity. Therefore, treatment should aim to tailor to each patients' needs as opposed to using a generic 'one size fits all' approach.

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