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CASE REPORT

The physiotherapeutic management of distal biceps tendinopathy: Is there a role for acupuncture?

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Abstract

The cause and management of distal biceps tendon (DBT) injuries and in particular tendinopathies remains unclear in the current literature. It is believed that acupuncture may be able to play a role in the often multi-dimensional treatment plans for this clinical presentation. This case study presents evidence to suggest that, in combination with eccentric exercise, acupuncture can have significant treatment effects on the pain and limb dysfunction associated with a DBT tendinopathy; post-treatment alterations in patient reported pain via a visual analogue scale (VAS) and QuickDASH scores. However due to treatment protocol limitations the results of this case study need to be viewed with restraint, and it is recommended that further research be completed, e.g. multi-centred or randomised control trials, to substantiate the findings of this paper.

Keywords: acupuncture, distal biceps, management, tendinopathy.

Introduction

Injuries to the distal biceps tendon (DBT) are believed to exist upon a spectrum of conditions, ranging from chronic tears to bicipitoradial bursitis (Alentorn-Geli *et al.,* 2016). In a current concepts review the epidemiology of DBT injuries in the extreme case of tendon ruptures was reported as being 'relatively rare' (Miyamoto *et al,* 2010). However, correlations between gender, limb affected and lifestyle were reported as key demographic variables (Safran & Graham 2002). The aetiology of DBT injuries remains unclear, however the two main theories prevalent in the literature relate to either hypo-vascularisation or mechanical mechanisms, or both, such as impingement of the tendon (Miyamoto *et al.* 2010*)*.

The understanding of pain originating from tendons has evolved over the last 30 years from a tendinitis model where inflammation was believed to be responsible for changes in tendon pathology, to a degenerative model where inflammation is absent and there has been a 'failed healing response' (Rees *et al.* 2013*)*. Management strategies have also evolved to correlate with these changes in theory, with current treatment approaches centred upon physical therapy (e.g. eccentric exercise), the injection of blood or blood products into or around the tendon (e.g. platelet rich plasma) and strategies to interrupt the pain stimuli (e.g. extracorporeal shock wave therapy) (Rees *et al.* 2013; Maffulli *et al.* 2010). However, despite these evolutions tendinopathy remains 'an extremely common condition . . . with few truly effective treatments' (Rees *et al.* 2013), with 'best practice for the management of tendinopathy currently unclear' (Neal & Longbottom 2012).

Acupuncture in the management of tendinopathy has been proposed as an alternative

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method of treatment, with suggested effects including the facilitation of blood flow, encouragement of fibroblastic activity, as well as increases in synthesis and reorganisation of collagen fibres (Neal & Longbottom 2012; de Almeida *et al.* 2014). Acupuncture as a treatment for managing musculoskeletal pain is well documented and supported by an ever growing research base (Han & Ho 2011). Its use as an adjunct to other physiotherapeutic treatments is included in several of the clinical guidelines produced by the National Institute for Clinical Excellence (NICE 2016).

When considering the current treatment approaches used in the management of tendinopathy it has been argued in the literature that acupuncture can replicate similar outcomes. For example, in the case of injection therapy, is it the product being injected or more rudimentarily the insertion of the needle through the skin that elicits a therapeutic response (Neal & Longbottom 2012). Furthermore, by applying acupuncture needles to an area where the patient has indicated they feel their symptoms, increased blood flow and vasodilation of blood vessels is believed to occur locally (Sandberg *et al.* 2003). With these changes and the acute trauma caused by inserting the needles, peripheral opioid analgesia is believed to occur resulting in a pain relieving effect (Stein *et al.* 2001), both of which support the targeting of symptoms of tendinopathy i.e. pain. This could address one of the contributing factors to tendon injury, i.e. hypo-vascularisation.

It was the intention of this case study to examine the use of acupuncture as a therapeutic adjunct to the more traditional management strategy of eccentric exercise in the management of a chronic DBT tendinopathy.

Case report

History and clinical presentation

A 53-year-old white male was referred to the author via their GP, they were seen in an outpatient clinic weekly for a 6-week period. The gentleman reported deep anterior pain and reduced power in his left elbow (P1); visual analogue score for pain was (VAS) 5–8/10. He worked full time as a secondary school caretaker. He was left hand dominant.

There was no reported history of trauma, with the onset of symptoms described as gradual over the last 8 months. Symptoms were reported as initially an intermittent twinge but this had since progressed to a more constant dull ache. There was no sleep disturbance reported. Morning symptoms were predominantly stiffness, with P1 activity dependent and worse at the end of the day. Holding a set of keys / 1kg weight in his left hand with elbow flexed to 90°, and holding weight with a closed grip and supinating the left hand, aggravated his symptoms. No easing factors were reported, and pain was managed via oral and topical analgesia. A plain elbow x-ray and ultra-sound imaging of the left DBT revealed no osteogenic or arthrogenic issues, and was reported as being consistent with a chronic tendinopathy. No past medical history of note was reported. All screening and special questions to exclude sinister origins of the pain were answered satisfactorily. No neurological symptoms were reported.

Objective assessment

The patient was a medium build gentleman with good muscle definition of his upper limbs and some mild atrophy of the bicep muscle bulk was observable on comparison with the right side. The left DBT was tender on palpation, with P1 reported located over the bulk of the tendon; VAS 7/10. Range of motion (ROM) of the cervical spine and shoulder were full, elbow active ROM was full with P1 reported on end range extension and supination. Over pressure of these ends of range resulted in increased P1; VAS 8/10. Passive ROM of the left elbow was full and equal to that of the right. Isometric power of the elbow muscles was weak and uncomfortable into flexion and supination; manual muscle testing (MMT) = 3+/5, VAS = 5–7/10. Ligamentous testing was negative for pain or instability. The integrity of the DBT was sound and confirmed via a negative Hook Test (O'Driscoll *et al.* 2007).

Treatment protocol

The aims of the treatment protocol were to relieve the patient's anterior elbow pain, increase pain free muscle strength, and improve function. The treatment protocol and the patient's progression over the 6-week treatment period is presented in Table 1.

As healthcare professionals physiotherapists 'encourage development and facilitate recovery' and at the centre of this 'is the patient's involvement in their own care, through education, awareness, empowerment and participation in their treatment' (CSP 2013). To ensure informed consent was achieved and compliance with the treatment protocol was accomplished the patient was educated on all aspects of their presentation, as well as the intended outcome of any treatments. A home exercise plan (HEP) was created for the patient to facilitate a sense of involvement in their treatment. Eccentric loading of the left DBT was used as current literature still substantiates this type of exercise as an effective treatment approach in the management of tendinopathies (Rees *et al.* 2013; Maffulli *et al.* 2010; Lorenz & Reiman 2011).

Acupuncture was chosen as an adjunct to the HEP because of its reported ability to influence structures locally and elicit a therapeutic response more centrally (Sandberg *et al.* 2003; Stein *et al.* 2001; Han & Terenius 1982; Han 2011). Furthermore, there is research to suggest that acupuncture can have an influence upon the affective component of pain, causing changes in the limbic system (Hui *et al.* 2010), and that a patient's expectations and beliefs can influence the outcome of treatment (Pariente *et al.* 2005). Prior to any acupuncture the patient completed an acupuncture pre-treatment checklist. They indicated that they had no past medical history that could be seen as a contraindication or precaution to treatment. The patient was also asked to read a patient information and consent form, and sign at the bottom to ensure informed consent was obtained.

As the patient reported symptoms predominantly along the C6 dermatome, consistent with the C5/6 spinal level innervation of the biceps brachii, acupuncture points were selected which were recognised to elicit a segmental effect in this region. It is believed that segmental needling can result in altered local biochemical balances, which in turn can disrupt signals being received at the dorsal horn of the spinal cord and cause a segmental effect on the patient's pain (Sandberg *et al.* 2003; Stein *et al.* 2001). Due to the anterior location of the patient's reported symptoms an amalgamation of meridian points was used; Large Intestine (LI) 11 and Lung (LU) 5 antero-laterally in combination with Heart (HT) 3 and Pericardium (PC) 3 anteromedially. These points were all selected as they most closely reflected the patient's indicated region of pain, and as local or proximal points were anticipated to promote local soft tissue changes via the changes in vascularity and biochemistry already mentioned. Distal points were then added as extra-segmental points designed to illicit a response from the autonomic nervous system, Large Intestine (LI) 4 and Liver (LV) 3 were selected to illicit a response via the creation of a strong stimulus as the hand is well represented upon the sensory homunculus (Haker *et al.* 2000). Additionally, these two points are recognised in traditional Chinese medicine (TCM) as being part of the Four Gates and are traditionally used to stimulate the higher centres of the brain to achieve a pain relieving response (Kaptchuk 2002). The length and gauge of each acupuncture needle was selected to achieve the optimal depth of application and maximise the stimulus created, however at all times safe practice standards and an awareness of local anatomical structures was maintained. A 'layering technique' was used as a clinical reasoning model and to focus point selection towards the desired treatment effects; local, segmental and extra-segmental (Bradnam 2007). Additionally, guidance from the current literature was sought as to dosage, with the general consensus agreeing that 'acupuncture is adequate if it consisted of at least 6 sessions, at least 1 per week, with at least 4 points needled . . . for at least 20 minutes' (Vas & White 2007).

'To measure is to know' (Verheyden & Meyer 2016) and so to establish quantitative evidence for the effectiveness of the treatment protocol

Table 1. Acupuncture treatment (VAS) visual analogue scale; (LI) Large Intestine; (LU) Lung; (HT) Heart; (PC) Pericardium

Treatment Date	Acup Points*	Needle Size (mm)	Needling Depth*	Treatment Time	Treatment Response
01/11/16	LI 4 & 11 LU 5 HT 3 PC 3	0.25 × 25 (LI 4, LU 5, PC 3) 0.25 × 40 (LI 11, HT 3)	1.0cm (LI 4, LU 5, PC 3) 2.0cm (LI 11, HT 3)	20 mins treatment time (total) Re-stim × 3 at 5 min intervals	Quick to achieve de qi at LI 4, LI 11 and LU 5, however HT 3 and PC 3 only on some additional rotation of needle once inserted. Patient had mild erythema at LI 4, 11 and LU 5 post treatment. No adverse effects reported or noted.
08/11/16	LI 4 LI 11 LU 5 HT 3 PC 3	0.25 × 25 (LI 4, LU 5, PC 3) 0.25 × 40 (LI 11, HT 3)	1.0cm (LI 4, LU 5, PC 3) 2.0cm (LI 11, HT 3)	20 min treatment time (total) Re-stim × 3 at 5 min intervals	Patient reported that arm was 'achy' for about a day post treatment, however has noticed that over last week arm 'a little less stiff' in the morning, VAS 6–7/10, 10% better; patient happy to continue with treatment. Treatment as above, patient achieved de qi quicker and had moderate erythema response to LI 11, and mild again at LI 4, LU 5 and on this occasion PC 3 post treatment. No adverse effects reported or noted.
15/11/16	LI 4 LI 11 LU 5 HT 3 PC 3	0.25 × 25 (LI 4, LU 5, PC 3) 0.25 × 40 (LI 11, HT 3)	1.0cm (LI 4, LU 5, PC 3) 2.0cm (LI 11, HT 3)	20 min treatment time (total) Re-stim × 3 at 5 min intervals	Patient reported same ache post treatment as previously however treatment effects lasted longer ~48 h. Patient reported arm feeling more relaxed and that could do exercises easier with less discomfort on loading, VAS 5/10, 40% better; patient happy to continue with treatment.
22/11/16	LI 4 LI 11 LU 5 HT 3 PC 3	0.25 × 25 (LI 4, LU 5, PC 3) 0.25 × 40 (LI 11, HT 3)	1.0cm (LI 4, LU 5, PC 3) 2.0cm (LI 11, HT 3)	20 min treatment time (total) Re-stim × 3 at 5 min intervals	22–11-16; Patient reported same ache post treatment as previously and treatment effects lasted ~48 h. Patient reported arm feeling more relaxed and less uncomfortable, VAS 4/10, 60% better; patient happy to continue with treatment. Treatment as above, no adverse effects reported or noted.
29/11/16	LI 4 LI 11 LU 5 HT 3 PC 3	0.25 × 25 (LI 4, LU 5, PC 3) 0.25 × 40 (LI 11, HT 3)	1.0cm (LI 4, LU 5, PC 3) 2.0cm (LI 11, HT 3)	20 min treatment time (total) Re-stim × 3 at 5 min intervals	Patient reported busy day at work with parents' evening and no flare up of P1 as on previous occasions. Patient reported arm was a lot less uncomfortable and felt stronger, VAS 3–4/10, 70% better; patient happy to continue with treatment. Treatment as above, no adverse effects reported or noted.
06/12/16	LI 4 LI 11 LU 5 HT 3 PC 3	0.25 × 25 (LI 4, LU 5, PC 3) 0.25 × 40 (LI 11, HT 3)	1.0cm (LI 4, LU 5, PC 3) 2.0cm (LI 11, HT 3)	20 min treatment time (total) Re-stim × 3 at 5 min intervals	Patient reported able to achieve all previously aggravating tasks, with pain reduced to on average occasional 2/10. Pt reported feeling confident to continue with rehabilitation for arm strength, and was happy to be discharged after this session. Treatment as above, no adverse effects reported or noted. Patient discharged with progressed strengthening programme.

Treatment Outcome:
Prior to treatment VAS was 8/10, and the starting QuickDASH score was 50.0.
On final assessment VAS was 2/10 and the QuickDASH was scored as 9.1.

*Only points in the left arm were used. *All needles were applied at perpendicular angle.

two outcome measures were used. The patient's aggravating task and associated VAS were used as one, and the Disabilities of the Arm, Shoulder and Hand questionnaire (DASH) was used as the other. The DASH 'is a self-administered region-specific outcome instrument developed as a measure of self-rated upper extremity disability and symptoms' and which can 'detect and differentiate small and large changes of disability over time' (Gummesson *et al.* 2003). The DASH is a widely recognised and respected patient reported outcome measure (PROM) in the literature (Kennedy & Beaton 2016). It is available in a short and long (original) format, and in this instance the short version or QuickDASH was used as research has shown both to be similarly precise (Gummesson *et al.* 2006).

Discussion

Treatment outcome

Following the sixth session of treatment the patient reported the following outcomes, and he was discharged to continue with his rehabilitation independently; VAS 2/10 at worst and QuickDASH 9.1. The outcomes of this course of treatment would appear to suggest that the combination of acupuncture and eccentric exercises can have a significant effect on reducing the pain and dysfunction associated with DBT tendinopathy. The reduction of the VAS of 6 levels was important as it is understood that patients who start treatment with a high VAS 'require a greater change in the score to achieve clinically significant pain relief' (Bird & Dickson 2001). Additionally, a score of < 10.1 on the QuickDASH is considered to be of an appropriate level for discharge, with a change of score of > 8 a sign of significant clinical change (Hunsaker *et al.* 2002; Mintken *et al.* 2009). Prior to commencing the treatment protocol the patient was asked to refrain from taking their analgesics so the treatment effect on pain wasn't influenced, and they were advised to avoid the previously identified aggravating tasks at the elbow as their long term prognosis was likely to be influenced by altering P1's causative factors (Kesson & Atkins 2005).

Case study limitations

Regrettably, the evidence available to support or refute the use of acupuncture in the management of tendinopathies is in general single-centred and involves a single participant (as in this case study); hence they have low level value when considered against the hierarchy of evidence (Harbour & Miller 2001). Additionally, those which focused upon the proposed physiological and biochemical effects of acupuncture were predominantly animal studies, which further limits the transferability of any results found. A further limitation includes the reality that it is unlikely ethical approval would be readily available for the more invasive research to be performed with a human study population. Also the majority of research into acupuncture is plagued by study design incongruences e.g. what is meant by 'sham' acupuncture (Lund & Lundeberg 2006), and how can the 'placebo effect' be mitigated (Hopton & MacPherson 2010)?

The treatment protocol followed within this case study was also limited, for example no consideration to the changing tendon structure was given. Within the recognised tendon changes associated with tendinopathy are adhesion formation through disorganised collagen synthesis and consequently reduced flexibility of the tendon (de Almeida *et al.* 2014). To maintain any changes to this via the acupuncture and/or eccentric exercises static stretches could have been prescribed, and may have resulted in quicker restoration of pain free ROM (Witvrouw *et al.* 2007). Considering more specifically the acupuncture techniques incorporated into the treatment protocol the use of the right limb and completion of the Four Gates may have been considered. Furthermore, the Wei Ci technique, also known as *surrounding the dragon,* another type of needling technique which has been found to have good treatment effects on pain could have been included (Fang 2014). However, as the patient was making clear progress with the points selected, with no ill effects reported, these techniques were not integrated into the treatment plan.

Another limitation was an uncontrollable external factor, due to the policies of the clinic

where the treatment was completed (an NHS acute hospital) there was a cap on the number of acupuncture sessions each patient could receive (N = 6). Treatment time was limited as follow-up appointments were restricted to 30 mins. Overall this limited the needles in treatment time as patient admin had to be completed within the appointment time, and resulted in a sense of increased pressure to accelerate the patient's progress. This could have easily influenced effectiveness of the needling technique and resulted potentially in a poorer outcome for the patient. Finally, due to the nature of the clinical setting the patient treated in this case study was unable to access the long term effects of the treatment protocol, in particular the longevity of the pain relief once the acupuncture element of the protocol was complete.

Conclusion

It would seem that acupuncture in combination with eccentric exercises can have a significant effect as a management strategy for DBT tendinopathy. However multi-centred or randomised control trials, with long term follow-ups, are required to fully determine the effectiveness of this treatment approach.

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