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# Acupuncture for whiplash associated disorder following a road traffic collision: a physiotherapy service evaluation

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## **Abstract**

Whiplash associated disorder (WAD) is a common musculoskeletal condition that often occurs following a road traffic collision. Physiotherapy is often prescribed to help with the symptoms and injuries. Research evidence has demonstrated that acupuncture may be beneficial, but no studies have examined the routine clinical use of acupuncture by physiotherapists for treatment of WAD. Therefore, a physiotherapy service evaluation was conducted to examine the effects of acupuncture on WAD following a road traffic collision.

This study involved 87 patients who attended a private physiotherapy practice following a road traffic collision after referral by their solicitor as part of a personal injury claim. Patients were included if they had been diagnosed with WAD (Grade I-III) and received acupuncture as part of their treatment.

An average of 3 sessions of acupuncture were given, which primarily involved acupoints of the neck, upper and lower back. Pain significantly reduced ( $p<.001$ ). Musculoskeletal outcomes measures significantly improved; neck disability index ( $p<.001$ ), Oswestry low back pain scale ( $p<.001$ ) and Quick DASH ( $p<.001$ ). Adverse events were minor. The majority of the patients ( $n=66$ ) were able to return to full work duties following treatment.

In conclusion, acupuncture appears to be an effective clinical treatment for WAD following a road traffic collision, which should be considered by physiotherapists working with such patient groups.

**Keywords:** acupuncture, trauma management, physiotherapy, musculoskeletal, rehabilitation medicine

## INTRODUCTION

Whiplash associated disorder (WAD) is a common musculoskeletal condition that results from a sudden acceleration-deceleration of energy [1]. It primarily affects the soft tissue of the neck and upper back [2], but can also impact other regions (i.e. low back or upper/lower limbs) [3]. WAD commonly occurs as a result of road traffic collisions [4], but can also be acquired through other mechanisms such as contact sports [5, 6] or falls [7]. The prevalence of WAD varies depending on the country, with greater rates within developing countries [4]. In recent years the prevalence of WAD may have increased due to greater public awareness of the mechanism of injury and symptoms [8]. WAD is a complex condition that presents with varied motor and non-motor symptoms, such as psychosocial distress, sub-occipital headaches, balance disturbance, neck pain (constant or movement induced) and reduced range of movement [9].

Physiotherapy is often prescribed for WAD injuries to help with the motor and non-motor symptoms that arise [10, 11]. Acute WAD injuries are treated with education regarding early physical activity and mobilization, with specific exercises to help with movement and strength in injured regions [12-14]. Similarly, other complementary or alternative treatments are also commonly used by physiotherapists within regular clinical practice to treat WAD [15], such as acupuncture (primarily Western medical acupuncture) [16-22]. Indeed the current National Institute for Health and Care Excellence (NICE) guidelines recommended acupuncture treatment for non-specific neck pain (within 4-12 weeks of injury) [23]. Acupuncture is defined as the insertion of needles into the skin and underlying tissues for therapeutic purposes [24], and has evolved from traditional Chinese acupuncture [25].

Research studies have demonstrated the potential of acupuncture for the treatment of WAD [16-22], however such studies involve only participants who meet strict inclusion criteria and often those with issues such as co-morbidities are excluded. Research recommendations therefore must be cautiously applied to clinical practice, as it is rare for physiotherapists to see patients in clinical settings that would meet the strict criteria applied to medical research [26-28]. Therefore, there is still a need to evaluate the use of acupuncture for road traffic-related WAD injuries within clinical practice by physiotherapists, as this will help to establish the effects of this treatment and inform future therapist training or education.

The aim of this clinical audit was to evaluate the use of acupuncture for WAD-related injuries following road traffic collisions within a private physiotherapy clinic in the north east of England.

## **METHODS**

A review of anonymized physiotherapy records was conducted, which assessed clinical implementation and outcomes collected from patients who attended a private physiotherapy clinic between January 2013 and June 2016. The authors retrospectively examined anonymous physiotherapy records that were kept confidentially on an electronic notes system (Pro-claim). The methods described below were carried out to evaluate the service being offered to patients as part of their routine clinical care, hence no attempts were made to control for variables and there was no control group involved. This is an ongoing evaluation that takes place with every patient within the clinic in order to monitor efficacy.

### **Setting**

On Medical Limited, a private physiotherapy clinic in Newcastle upon Tyne, UK. All treatment sessions took place within an outpatient physiotherapy clinic.

### **Patient selection**

Patients who received (Western medical) acupuncture treatment were screened by a physiotherapist for suitability to receive acupuncture prior to treatment implementation within each session. All patients were seeking compensation for a road traffic collision and were attending physiotherapy as part of their legal claim. Patient demographics (age, gender and number of days from road traffic collision to initial physiotherapy assessment) were evaluated for each patient. All participants were receiving standard physiotherapy treatment alongside their acupuncture, which included advice, exercises, manual therapy and massage. Only patients diagnosed with WAD (grade I-III) who fully completed their physiotherapy rehabilitation were included in the study. All included patients had neck/upper back pain, with some additionally having pain in other regions (i.e. low back, upper or lower limbs).

### **Acupuncture treatment**

There is no official or accredited acupuncture education for physiotherapists in the UK. However, the Health and Care Professions Council (HCPC) and Chartered Society of Physiotherapy (CSP) have established a minimum standard of completion of a 'foundation course in acupuncture' to practice and be insured. All physiotherapists practicing acupuncture employed by On Medical Ltd. had completed this requirement.

### ***Needling location***

The physiotherapists inserted needles at traditional acupuncture points and/or myofascial trigger points within each session. All points were listed in the physiotherapist records for each treatment session and upon review all points needed by the therapist were listed.

#### *Type and duration of treatment*

The achievement of *de qi*, manual and/or electrical stimulation and duration of the treatment sessions (in minutes) were also obtained. The number of times that stimulation was applied was also recorded.

#### *Number of sessions and acupuncture treatments*

The number of treatments was evaluated for each patient, including both the total number of physiotherapy sessions and number of acupuncture sessions.

### **Outcome measures**

Specific outcome measures were recorded by patients receiving treatment with physiotherapist assistance at the initial assessment and upon completion of their course of treatment. The outcomes were self-reported to minimize bias within the results. Outcomes were as follows.

#### *Assessment of pain using a visual analogue scale*

A visual analogue scale (VAS), validated for measurement of pain in clinical practice [29] was used; zero indicated no pain and 10 indicated the worst pain imaginable. The assessment of pain was made before and after each treatment.

#### *Self-reported questionnaires*

- Neck disability index (NDI) [30]: consists of a series of questions related to the impact of neck pain on daily activities and quality of life. A higher score equates to worse disability or symptoms, with each score rated on a 5-point Likert scale. The score can be reported as a total summed score or a percentage.
- Oswestry low back pain scale (OLBPS) [31]: consists of a series of questions related to the impact of low back pain on daily activities and quality of life. A higher score equates to worse disability or symptoms, with each score rated on a 5-point Likert scale. The score can be reported as a total summed score or a percentage.
- Quick disabilities of the arm, shoulder and hand scale (Quick-DASH) [32]: consists of 11 questions related to the impact of upper limb pain on daily

activities and quality of life. There are also two optional sections related to work and sports activities, which add a further 8 questions. A higher score equates to worse disability or symptoms, with each score rated on a 5-point Likert scale. The score can be reported as a total summed score or a percentage.

- Lower extremity functional scale (LEFS) [33]: consists of a series of questions related to the impact of lower limb pain on daily activities and quality of life. Each question is scored on a 0-4 Likert scale, with lower scores relating to worse disability or symptoms.

### ***Side effects/adverse events***

Details of any acupuncture side effects that were reported to the physiotherapist were recorded within clinic notes and evaluated.

### **Ethical approval**

This study was reviewed and given ethical approval by a Newcastle University research ethics committee. The practice of complementary therapies, such as acupuncture, is part of routine physiotherapy clinical practice at On Medical Ltd.

### **Statistical analysis**

Data were analysed using PSPP (version 3, available at: <https://www.gnu.org/software/pspp/>), which is a freely available program for statistical analysis of sampled data. Due to the large sample size ( $n=87$ ) Kolmogorov-Smirnov tests were used to confirm normal data distribution, parametric statistical analysis was used throughout to analyse the data, consistent with the central limits theory of statistical analysis where  $n>30$  is sufficient to hold normal distribution [34-37]. Descriptive data were reported using means and standard deviation for patient data. The summed scores from the Likert-scale questionnaires were analysed as a percentage and treated as continuous data, an approach supported by published literature [38-41]. Differences in outcome measures (including questionnaires) from initial assessment to discharge were analysed with parametric paired sample t-tests. The significance level was set to  $p=0.05$ .

# RESULTS

## Demographics, injured area, work status and outcomes

A total of 87 patients who received acupuncture treatment between January 2013 and June 2016 were included in this audit. Table 1 shows that the average patient age was 39 years old and the most common sites of musculoskeletal injury were the neck/upper back and lower back. Table 1 shows that only 27 of 87 patients were on full duties at work at the time of their initial assessment but, when discharged from physiotherapy, 66 of the patients were able to perform full work duties. Pain levels and the majority of outcome measures significantly improved from initial assessment to discharge from physiotherapy ( $p<0.001$ ). However, lower limb symptoms (measured in 10 subjects) did not significantly improve ( $p=0.169$ ).

## Treatment and needling location

Table 1 provides details of the treatment given to the patients. The majority of the patients ( $n=77$ ) experienced *de qi* sensation or erythema during their acupuncture treatment. Treatments ranged from 10 to 30 minutes, with primarily manual stimulation applied to the needles up to 4 times per treatment by the physiotherapists.

Table 2 details all of the traditional acupuncture points at which needling was administered by the physiotherapists to treat the various injury sites related to the patients' WAD injuries. The most frequently used traditional acupuncture points were BL11 ( $n=66$ ), LI4 ( $n=78$ ), GB21 ( $n=63$ ), GB20 ( $n=20$ ), BL10 ( $n=37$ ), BL23 ( $n=38$ ) and BL24 ( $n=34$ ).

## Adverse events

There were very few adverse events as a result of acupuncture treatment (Table 1). The only reported events related to patients believing that treatment was ineffective ( $n=6$ ), worsening of symptoms ( $n=4$ ), pain with needle stimulation ( $n=1$ ), feeling unwell ( $n=2$ ) or just dislike of having acupuncture ( $n=3$ ).

# DISCUSSION

To our knowledge, this is the first study to evaluate the use of acupuncture for the treatment of WAD following a road traffic collision within a private physiotherapy clinical service. The results demonstrate that acupuncture may significantly improve pain and musculoskeletal injury outcome measures, which may be accompanied by a return to full work duties. There were very few adverse events and those that did occur were



not serious. The clinical use of acupuncture appears beneficial for the various injuries and symptoms that occur with WAD following a road traffic collision.

Previous controlled research studies have shown that acupuncture is a useful and effective treatment for WAD and other musculoskeletal injuries [16, 19, 21, 22]. This study involved a relatively large number of patients (n=87) who had been diagnosed with WAD (grade I-III) following a road traffic collision. Patients primarily presented neck and upper back injuries; however, similar to our previous research findings [3], many patients also had simultaneous injuries to their low back, or upper and lower limbs. This clinical service evaluation furthers the findings of prior research studies, but, importantly, presents evidence that directly applies to clinical practice. Our findings suggest that acupuncture used within clinical practice by physiotherapists significantly reduces pain levels and improves self-reported outcome measures related to neck, low back and upper limb symptoms or pain. Lower limb symptoms or pain may also significantly improve with acupuncture, but as our audit only contained ten subjects with lower limb symptoms/pain, a larger sample size is likely to be required to show statistically significant differences. Acupuncture was part of physiotherapy treatment that included other interventions (e.g. exercises, stretches etc.), which may also have influenced these outcomes. Regardless, the positive outcomes and minimal adverse events show that acupuncture may be a useful tool for physiotherapists to apply within clinical practice when dealing with WAD following a road traffic collision.

Acupuncture treatments within the clinic were conducted in line with individual patient clinical need. Specifically, all of the practitioners involved were trained in Western medical acupuncture and were qualified physiotherapists, therefore patient treatment sessions and management was planned to include their specific diagnosis (i.e. WAD and other simultaneous disorders) and individual presentation of symptoms following their road traffic collision. The most commonly needled sites over the neck, upper and lower back regions included traditional acupuncture points BL11, LI4, GB21, GB20, BL10, BL2 and BL24. This highlights that, due to the individual nature of musculoskeletal disorder presentation following a road traffic collision [3], practitioners often use a variety of acupuncture needling locations and practice on an individual basis, which differs from more strictly controlled research studies, which may use a protocolled approach to treatment.

The average number of acupuncture treatment sessions was 3.3 ( $\pm 2.2$ ), which is less than the recommended six sessions for certain musculoskeletal symptoms and injuries [42]. This may have been due to the fact that an average of 4 ( $\pm 2.5$ ) sessions of physiotherapy were given prior to the use of acupuncture, which could indicate that acupuncture was being used by the physiotherapists as a secondary tool following

traditional physiotherapeutic treatments (e.g. exercises, stretches). The clinicians primarily applied acupuncture after several sessions of physiotherapy, therefore less acupuncture treatment may have been required for an effect on symptoms due to the patients already having received some initial treatment. This evidence implies that physiotherapists may view acupuncture as an invasive treatment that they apply following non-invasive management but that, once applied, only a few sessions may be required to alleviate WAD symptoms.

## **Recommendations**

Uncontrolled evidence from this service evaluation suggested that acupuncture could alleviate the symptoms of WAD following a road traffic collision within regular physiotherapy clinical practice. We recommend that further evaluation be carried out within several clinical settings (both private and National Health Service (NHS)) to establish the clinical effectiveness of acupuncture for WAD. We also recommend the following;

- Physiotherapists primarily dealing with WAD or musculoskeletal injuries or symptoms following a road traffic collision should be trained in acupuncture, so they have the opportunity to use this treatment method.
- Acupuncture may be less effective for lower limb injuries as a result of road traffic collision, but future work is needed to establish this finding in a larger cohort.
- Development of standardised practice for acupuncture treatment of different regional injuries following a road traffic collision and WAD (neck/upper back, lower back, upper limb, lower limb) should be examined in future work.

## **Limitations**

This article describes the results of a retrospective observational physiotherapy service evaluation (clinical audit) of acupuncture for the treatment of WAD-related injuries following a road traffic collision. This was conducted within a private clinical practice setting as part of routine care and so there are no control subjects or variables. Therefore, the described results must be interpreted with caution as other factors such as the placebo effect or simultaneous exercises and physiotherapy management may have led to injury or symptom recovery.

Future research or service evaluation is required to elicit whether the improvements found within this study are solely due to acupuncture treatment. This should ideally be done within numerous clinical settings, both private and NHS, in order to truly assess clinical effectiveness.

## Conclusions

This physiotherapy service evaluation (clinical audit) has provided some valuable evidence that suggests acupuncture may have a positive impact on the management of injuries and symptoms of WAD following road traffic collision. Although the specific mechanisms underlying the efficacy of acupuncture within physiotherapy clinical practice is unknown, there is emerging evidence for its use in musculoskeletal disorders and for other clinical applications.

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## Competing Interest

None declared.

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**Table 1 – Demographics, injured area, treatment details and adverse events**

<b>Demographics (n = 87)</b>	<b>Mean</b>	<b>SD</b>	
Age (yrs)	39.2	12.2	
Gender (male/female)	33M / 54F		
Days to initial assessment following referral	7.1	4.9	
Days to initial assessment following road traffic collision	15.0	14.6	
Average number of physiotherapy sessions in total	10.0	3.5	
Average number acupuncture sessions	3.3	2.2	
Average number of physiotherapy sessions until acupuncture began	4.0	2.5	
<b>Injured area</b>			
	<b>n</b>		
Neck/upper back	84		
Lower back	54		
Upper limb	28		
Lower limb	10		
<b>Treatment details</b>			
De qi or erythema achieved (n)	77 Yes / 10 No		
Time (range)	10 to 30 min		
Stimulation type (n)	79 Manual / 0 Electrical / 8 None		
Stimulation number (range)	0 to 4		
<b>Adverse events</b>			
	<b>n</b>		
None	71		
Patient believed not effective	6		
Symptoms worsened	4		
Pain with needle stimulation	1		
Felt unwell/dizziness	2		
Disliked acupuncture	3		
<b>Work Status</b>			
	<b>Initial assessment</b>	<b>Discharge</b>	
	<b>n</b>	<b>n</b>	
Full duties	27	66	
Light duties	24	1	
Off work	24	5	
Unemployed	10	10	
Retired	2	2	
<b>Outcomes</b>			
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>p</b>
Pain score (visual analogue scale)	7 (2)	3 (2)	<0.001 *
Neck disability index	49 (17)	18 (18)	<0.001 *
Oswestry low back pain scale	56 (18)	26 (22)	<0.001 *
Quick-DASH scale	56 (20)	22 (23)	<0.001 *
Lower extremity functional scale	40 (8)	35 (5)	0.169

Quick-DASH = Quick disabilities of the arm, shoulder and hand ; SD = standard deviation

**Table 2 – Point selection for acupuncture treatment**

<b>Needling location</b>	<b><i>n</i></b>
LI4	78
BL11	66
GB21	63
GB20	53
BL23	38
BL10	37
BL24	34
BL25	21
BL12	19
BL22	18
BL26	18
ST8	10
GV3	7
Myofascial trigger points	6
SI9	6
SI10	6
SI11	6
GV4	5
GV14	5
KI3	4
BL13	3
BL31	2
BL36	2
BL60	2
LI11	2
LI14	2
TE14	2
ST38	2
BL14	1
BL15	1
BL16	1
BL32	1
KI7	1
LI9	1
LI10	1
LI15	1
GB23	1
GB24	1
ST36	1
LU5	1
KI3	1