

## NARRATIVE REVIEW

# Acupuncture treatment of headaches

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## Abstract

Headache occurs in up to 40% of adults in the UK and may be divided into primary and secondary types, with primary types being reviewed. Headaches may be caused through irritation of the dura mater and cranial blood vessels, or mechanical changes in the sub-occipital tissues. Treatment of primary headache includes lifestyle changes, medication and physiotherapy. Acupuncture and dry needling have been shown to be effective adjuncts to these methods, and evidence supporting needling intervention is overviewed. Prior to needling, full patient examination is required to identify potential red flags, and clinician guidance using the SNOOP mnemonic is presented. Both acupuncture and dry needling methods give equal results, and choice of point location is normally based on symptom modification. Local and distal points are typically selected to engage descending pain reduction effects. Acupuncture and dry needling points for the treatment of headaches are described and their target muscles highlighted, using a clinical reasoning approach.

**Keywords:** acupuncture, clinical reasoning, dry needling, headaches, pain, red flags.

## Introduction

Headache is defined as pain behind the eyes and ears, or in the upper part of the neck (BMJ Best Practice 2016). It occurs in 40% of people in the UK, with migraine seen in 15% of adults. However, up to 80% of individuals state that tension-type headaches are a normal occurrence for them at some time in their lives (BASH 2010).

## Headache types

Headaches may be broadly categorized as primary (not associated with an underlying condition) or secondary (occurring as a result of an underlying local or systemic pathology). Main headache classifications are shown in

Table 1. The brain itself has no sensory receptors, and the pain of headache is likely the result of irritation to the dura mater and cranial blood vessels. Additionally, cervicogenic (sub-occipital) headaches may occur due to changes in the local musculature and/or alteration to the trigeminal cervical nucleus (the convergence of the sensory fibres from the trigeminal nerve in the brain stem with those of the upper cervical nerves roots C1-C3).

**Table 1.** Main headache classifications

Primary	Secondary
Not associated with underlying pathology:	Result of underlying local or systemic pathology:
<ul style="list-style-type: none"><li>• migraine</li><li>• tension</li><li>• cluster headache</li></ul>	<ul style="list-style-type: none"><li>• trauma to the head or neck</li><li>• intracerebral infection</li><li>• vascular disorder</li><li>• medication</li><li>• neoplasm</li></ul>

Source: NICE 2019

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Migraine is a primary headache which may present with or without aura (transient neurological symptoms). This type of headache is typically unilateral and throbbing in nature and may last 4–72 h. The condition is more common in women (two to three times) and can reduce during pregnancy. Triggers such as stress, dehydration, food changes or disturbed sleep may be identified, and avoiding these together with lifestyle changes form part of the condition management (NICE 2019). Migraine itself has been described as due to vasodilatation of extracranial vessels, while the aura is thought to be due to vasoconstriction (Grant 2016). Over the counter (OTC) analgesia, antiemetics, and preventive medication such as beta-blockers (propranolol) and antiepileptics (topiramate) are typically used depending on the severity of symptoms.

Cluster headaches are less common, occurring in about 0.05% of the population with 70% of patients under 30 years of age. Males are affected more than females (6:1 ratio). The nature may be episodic (85% of cases) or chronic. Generally, attacks are briefer than migraine (<3 h) and focused over the eye or temporal region. Cluster headache has been described as a trigeminal autonomic cephalalgia (Benoliel 2012), in that it is associated with autonomic features on the same side as the pain such as changes in lacrimation, nasal congestion, eyelid oedema, ptosis and rhinorrhoea. Medication may typically include triptans, which stimulate production of the neurotransmitter serotonin aiming to constrict blood vessels and reduce inflammation.

Tension-type headaches may be sub-categorized as frequent (10 episodes within 14 days), infrequent (<1 day of headache per month) or chronic (15 or more days of headache per month). They typically present

as generalized pressure or tightness around the head spreading into, or from, the neck. Intensity tends to be milder than migraine or cluster-type and the condition is normally managed using analgesia and anti-inflammatories. Sometimes a mild antidepressant such as amitriptyline may be used preventively.

## Patient examination

It is vital to screen patients for headache red flags, as headache may be a symptom of serious pathology. The mnemonic SNOOP (Table 2) is useful to guide clinicians. Signs of systemic disease such as weight loss, fever or fatigue require further investigation, as do abnormal neurological signs which may suggest a focal neurological lesion (Smith 2018). Secondary headache may be associated with additional symptoms in older patients especially where there is a sudden non-traumatic onset. Progression of a headache from time of onset is important, as musculoskeletal-oriented headaches are often self-limiting. Headaches which are progressive or show cranial nerve signs, positional precipitation or a link to exertion or straining (Valsalva) may indicate a structural pathology and warrant further investigation.

## Effectiveness of acupuncture in the treatment of headaches

The use of acupuncture in the management of headaches has been investigated by large German healthcare trials, and two Cochrane systematic reviews have been produced. Several trials looked at the effectiveness of acupuncture for chronic conditions. The ART (Acupuncture Randomized Trials), ARC (Acupuncture in Routine Care), COMP (comparative trial) and GERAC (German Acupuncture Trial) compared

**Table 2.** SNOOP screening mnemonic

	Clinical features	Exclude
S	Systemic signs and disorders (fever or weight loss)	Infection, metastasis, HIV
N	Neurological symptoms +/- abnormal signs	Stroke, mass lesion, encephalitis
O	Older (new or changed) in patient > 50 years old	Temporal arteritis, glaucoma
O	Onset in thunderclap presentation	Bleed
P	Papilledema, pulsatile tinnitus, postural/positional provocation, precipitated by exercise, progressive pattern	Altered intracranial pressure, secondary cause, cervicogenic

Data from BASH 2010; BMJ 2016; Smith 2018

acupuncture, sham acupuncture, medication and standard care (Cummings 2009), and the results were published in several papers.

Comparing acupuncture and sham acupuncture (dry needling) with a waiting list control in patients with tension-type headache (270 patients, 12 sessions over 8 weeks), the number of days with headache decreased by an average of 7.2 (acupuncture) and 6.6 (dry needling), compared to 1.5 for the waiting list patients (Melchart *et al.* 2005), showing that needling is effective but acupuncture using traditional points is not superior to superficial dry needling of local non-acupuncture points. Using a similar protocol (302 patients, 12 sessions per patient over 8 weeks) both acupuncture and dry needling were more effective (2.2 days reduction) than waiting list control (0.8 days reduction) after 12 weeks (Linde *et al.* 2005). Use of acupuncture and dry needling was also investigated in tension-type headache in a larger study (Diener *et al.* 2006). Looking at 409 patients (10 sessions of 30 min duration over a period of 6 weeks), response was set as greater than 50% reduction in headache days per month over a 6-month period. Both groups achieved the response rate (acupuncture group 33%, dry needling 27%).

Acupuncture has been shown to be similarly effective to the beta-blocker metoprolol for migraine prophylaxis (number of migraine days reduced = 2.5 acupuncture, 2.2 metoprolol) but with fewer adverse effects reported by both examining physicians and patients (Streng *et al.* 2006). Looking at 960 patients using acupuncture, dry needling or continuous drug prophylaxis for migraine, Diener *et al.* (2006) set a response rate of a 50% reduction in migraine days 26 weeks after randomization. This was achieved by acupuncture (47%), dry needling (39%) and standard drug treatment (40%), showing no difference in outcomes. Analyzing 15 056 primary headache patients treated with routine care or routine care plus acupuncture (up to 15 sessions over 3 months), Jena *et al.* (2008) showed a reduction of headache days from 8.4 to 4.7 for the routine care plus acupuncture group, and from 8.1 to 7.5 in the control group receiving no acupuncture,

demonstrating a “marked clinical improvement” according to the authors.

Two Cochrane reviews were published summarizing the evidence for acupuncture treatment of migraine and tension-type headaches. For migraine (Linde *et al.* 2016b), the authors reviewed 22 trials including 4985 participants and found adding acupuncture to treatment reduced headache frequency, and that true acupuncture gave a small but greater effect over dry needling. The trials showed acupuncture to be similarly effective to prophylactic drugs, leading the authors to conclude that acupuncture can be considered a viable treatment option for this condition. For tension-type headache (Linde *et al.* 2016a), the authors reviewed 12 trials with a total of 2349 participants and concluded that acupuncture is effective for treating both episodic and chronic tension-type headaches.

The NICE guidance pathway for the management of headaches (NICE 2012) recommends practitioners consider a course of up to 10 sessions of acupuncture over 5–8 weeks for the prophylactic treatment of chronic tension-type headache and chronic migraine.

## Acupuncture and dry needling technique

Acupuncture has effects at several structural levels (Table 3), and these effects may be preferentially stimulated by varying needling strength (manual or electrical stimulation) and point selection.

**Table 3.** Acupuncture effects at different structural levels

Site	Effect
Local	Local mediators of inflammation and pain Local neurotransmitter activity Increased local blood flow Myofascial trigger point (MTTrP) changes
Spinal	Altered dorsal horn activity Changes to pain referral area Bidirectional stimulatory effect Reduced substance P concentration at dorsal horn Autonomic changes
Brainstem	Thalamus Descending inhibition
Cortex	Changes to sensorimotor processing Changes to limbic system Alteration in default mode network (DMN)

Data from White *et al.* 2018; Fernández-de-Las-Peñas & Nils 2019

Acupuncture points may be selected using a Western medical acupuncture (WMA) or traditional Chinese acupuncture (TCA) approach. The difference is mainly the method of patient assessment and the anatomical location of points. In WMA, it is common for practitioners to palpate a point at a precise anatomical location, but to vary the needling site according to palpation findings. In TCA, classical points are described at set locations, with Ah Shi points varying according to palpation findings. Both acupuncture and dry needling have been shown to be effective for the treatment of headaches, with needling by physiotherapists typically used together with other techniques such as manual therapy, exercise therapy and lifestyle advice. Needling has also been used with drug prophylaxis or analgesia as an alternative to drug therapy where patients show adverse effects or due to patient choice.

Local acupuncture points within the posterior neck and shoulders, or dry needling targets in these tissues, are usually augmented with distal points in the hands and feet to produce pain reduction through descending inhibition via diffuse noxious inhibitory control (DNIC). Typically, Gall Bladder (GB) 20 is used to target semispinus capitis at the skull base or splenius capitis caudally, and GB 21 to target the upper trapezius. Tightness and ischaemia in these muscles is typical in a head forward posture where the upper (sub-occipital) cervical spine is forced into extension and held in this position throughout large portions of the working day. In addition, a shrugged shoulder posture associated with physical or psychological stress may give local muscle pain and palpable trigger points. Trapezius myalgia (TM), associated with tightness and stiffness in the upper trapezius, may be targeted with trigger points to the local region. However, no change in muscle morphology is found between patients with TM and healthy controls (De Meulemeester *et al.* 2017), suggesting that effects of dry needling into this region are mainly through a pain reduction response.

When needling Bladder (BL) 10 level with the C1 spinous process, the needle targets obliquus capitis inferior, one of the suboccipital group with a rich proprioceptive nerve supply, active

in accurate head positioning tasks. As such, the suboccipitals in general are often associated with mechanical headaches and whiplash associated disorder (WAD) and targeted in sensorimotor rehabilitation programmes for the head and neck (Jull *et al.* 2008). BL 11 may be used to target the middle trapezius and cervical erector spinae lying over the rhomboid minor, and Governor Vessel (GV) points (14, 15, 16) or central dry needling to target the interspinous ligament. Where pain extends over the eyes, GB 14 or yintang may be used to target the frontalis muscle. If pain refers to the scalp, GV 20 at the skull vertex may be used, to affect occipitofrontalis. This is traditionally a powerful point in TCA as it is a meeting point of several acupuncture meridians (GV, BL, GB, Triple Energizer (TE) & Liver (LR)). When temporal pain is present, Stomach (ST) 8 may be used as a local point to target the epicranial tissues.

Distal points in the hands and feet such as Large Intestine (LI) 4 and LR 3 typically give powerful effects to augment the local points. Known as the “Four Gates” in TCA, these points have parallel anatomical locations, both targeting the first dorsal interosseous muscles (hand and foot respectively) and lying close to major vessels. LI 4 lies distal to the radial artery, LR 3 distal to the dorsalis pedis artery. Both arteries lie at the apices of their respective first web spaces. ST 36 is often used as a major point for sustained central effects. This point has been shown to increase functional connectivity of the default mode network (DMN) to other brain regions when compared to control points located both in the same and different dermatomes (Long *et al.* 2016), and to enhance immunity measured as cytokine and T-cell levels compared to controls (Chen *et al.* 2017).

TCA approaches to headache management typically begin by identifying patterns based on internal organ function according to traditional Chinese beliefs, the presence of environmental pathogens and the position of the acupuncture meridian. Headache with pain to the sides of the head tends to represent the GB meridian, while the occiput represents the BL meridian. Facial symptoms may be ST or GB meridians and points would be selected locally or distally



along these channels. Local meridians travelling over the head may be invaded by Wind pathogen, indicated by symptoms which get worse in windy or cold conditions, and symptoms which often change in nature. Where patients feel that their head is hot, the pattern may be one relating to the liver organ in Chinese medicine, and distal liver or gall bladder points such as LR 3 or GB 43 may be used in addition to local head points. Finally, where the headache is related to low energy (deficiency), major points such as ST 36 may be used to enhance energy.

Although the diagnosis in TCA may differ from that of WMA, points selected are often similar, and many treatment protocols used and researched in the West have often taken their point selection from TCA approaches originally.

## Conclusion

Both acupuncture using classical Chinese points, and dry needling using local tissue responses, have demonstrated effectiveness in the management of headaches, but one is not superior to the other. Local and systemic responses are likely due to both psychological and physiological effects, fitting in with the biopsychosocial (BPS) model of healthcare currently used within physiotherapy. It is recommended that healthcare practitioners consider acupuncture and dry needling as part of any potential care package for the management of headache after full patient examination and within a clinical reasoning framework. It is likely that needling of this type will be adjunctive to, but not replace, other forms of management.

## Appendix

### Point locations and needling methods

Point (code)	Location (surface anatomy and cun measurement)	Needling method (traditional)	Relevant anatomy (muscle and myotome)
ST 36	Below the knee, 3 cun* inferior to the lateral infrapatellar sulcus (ST 35) and 1 finger width lateral to the anterior crest of the tibia	Perpendicular insertion 1–1.5 cun	Tibialis anterior muscle (L4/5)
LI 4	On the dorsum of the hand, between the first and second metacarpal bones. Level with the midpoint of the second metacarpal bone	Perpendicular insertion 0.5–1 cun	First dorsal interosseous muscle and adductor pollicis (T1)
LR 3	On the dorsum of the foot, in the depression distal to the junction of the first and second metatarsal bones	Perpendicular insertion 0.5–0.8 cun	First dorsal interosseous muscle (S2/3)
GB 20	Below the occiput, approximately midway between the mastoid process and the external occipital protuberance	Oblique insertion directed towards the tip of the nose, 0.8–1.2 cun	Semispinalis capitis (C1/2)
GB 21	At the level of the midpoint between C7 and the tip of the acromion, at the highest point of the trapezius muscle	0.5–0.8 cun oblique anteriorly or posteriorly	Upper trapezius (C3/4)
GV 14	At the base of the neck in the depression below the spinous process of C7	Oblique cranial insertion 0.5–1 cun	Interspinous ligament (C8)
GV 20	At the vertex of the head, midway between a line drawn between the two auricular apices	Transverse insertion 0.5 cun	Occipitofrontalis (facial nerve)
Yintang	On the midline of the forehead, between the eyebrows	0.3–0.5 cun subcutaneous	Periosteum (facial nerve)
GB 14	On the forehead directly above the pupil, 1 cun superior to the middle of the eyebrow	0.3–0.5 cun transverse	Frontalis (facial nerve)
BL 10	On the lateral aspect of the trapezius muscle, 1.3 cun lateral to the 1 <sup>st</sup> cervical vertebral (C1)	Perpendicular insertion 0.5 cun	Obliquus inferior (C1–5)
BL 11	1.5 lateral to the lower border of the T1 spinous process approximately level with the superior angle of the scapula	Oblique insertion medially towards the spine, 0.5 cun	Rhomboid minor (C4/5)
ST 8	At the temple 4.5 cun lateral to the midline and 0.5 cun within the anterior hairline	Transverse subcutaneous insertion 0.5 cun	Epicranial tissues (facial nerve)

\* 1 cun is the width of the patient's thumb at the distal interphalangeal joint

ST = Stomach; LI = Large Intestine; LR = Liver; GB = Gall Bladder; GV = Governor Vessel; BL = Bladder.

Data from Norris 2011; White *et al.* 2018

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