

Japanese Acupuncture - Current Research

Efficacy of Acupuncture Treatment for Headache

Satoru Yamaguchi
Department of Oriental Medicine,
Saitama Medical School

1. Introduction

Headache is a symptom frequently encountered in daily practice, but many questions regarding the mechanisms of its onset, diagnostics, and therapy still remain unanswered. The classification,¹⁾ first published by the International Headache Society in 1988, has been adopted by many clinicians and researchers. However, in 2003, based on recent progress in headache research this classification has been revised by the above mentioned academic society and published as the International Classification of Headache Disorders 2nd Edition (Table 1)²⁾.

IHS ICHD-II code	WHO ICD-10NA code	Diagnosis
Part one		The primary headache
1	[G43]	Migraine
2	[G44.2]	Tension-type headache (TTH)
3	[G44.0]	Cluster headache and other trigeminal autonomic cephalalgias
4	[G44.80]	Other primary headaches
Part two		The secondary headache
5.	[G44.88]	Headache attributed to head and/or neck trauma
6.	[G44.81]	Headache attributed to cranial or cervical vascular disorder
7.	[G44.82]	Headache attributed to non-vascular intracranial disorder
8.	[G44.4 or G44.83]	Headache attributed to a substance (2) or its withdrawal
9.		Headache attributed to infection
10.	[G44.882]	Headache attributed to disorder of homeostasis
11.	[G44.84]	Headache or facial pain attributed to disorder of cranium, neck, eyes, ears, nose, sinuses, teeth, mouth or other facial or cranial structures
12	[R51]	Headache attributed to psychiatric disorder
Part three		Cranial neuralgias, central and primary facial pain and other headaches
13	[G44.847, G44.848 or G44.85]	Cranial neuralgias and central causes of facial pain
14	[R51]	Other headache, cranial neuralgia, central or primary facial pain

Table 1: International Classification of Headache Disorders 2nd Edition (ICHD-II)

When complaining about headache in Japan, the most frequent form is tension headache, as described in the classification. This can be treated with acupuncture as a characteristic form of oriental therapy, with considerable success. Conversely, the same therapeutic modality is more useful for prevention than treatment of actual migraine or cluster headache (functional) attacks. In this study, we introduce the mechanisms of the onset of tension headache as a form of transient headache and describe the effects of acupuncture therapy and its modes of action. We also describe acupuncture treatment for migraine and cluster headache.

2. Tension headache

a. Acupuncture therapy

The author used plethysmography, EMGs and thermography for an investigation of the mechanism of onset and the modes of action of the acupuncture therapy. The results of the study showed that for the mechanism of onset of headache, excessive tension of the posterior muscle, groups of the head, the posterior neck muscles as well as the suprascapular and interscapular muscle groups are more important than the muscles of the head³⁾. Acupuncture therapy is performed in order to facilitate the relaxation of the excessive tension of these muscle groups and normalize the hemodynamics in these muscles.

In the posterior neck region points in the trapezius and semispinalis capitis muscles, Tenchu (BL10), Fuchi (GB20), Kankotsu (GB12) by the mastoid process (insertion of the splenius capitis muscle) the suprascapular region Kensei (GB21) within the upper fibers of the trapezius muscle; Koko (BL43) where various muscle cross each other in the interscapular region; or points in the lateral region of the neck in the splenius muscle or the levator scapulae muscle; or also in the region of the angulus superior scapulae (insertion of the levator scapulae muscle) are selected as treatment sites.

Actual acupuncture stimulation is adjusted to the patient's physical strength, general condition and severity of the symptoms. Basically, electro-acupuncture (1 Hz, 10-20 min) is performed in the regions of the various hypertonic muscles.

In refractory cases, facet joint needling is sometimes performed in the C2-3 intervertebral space (medial branches of the dorsal rami of the spinal nerves).

b. Modes of action of acupuncture therapy³⁻⁵⁾

The study also included application of the above mentioned non-invasive EMG examination that provided for repeated examinations and open loop video pupillography. This allowed for quantitative measurement of autonomic nerve function to examine the modes of action of acupuncture. These examinations provided the following results.

(1) Acupuncture therapy causes relaxation of the excessive tension of the muscles groups in the posterior neck, suprascapular and interscapular regions. It also facilitated normalization of the hemodynamics and thereby contributed to an alleviation of the headache (Figure 1).

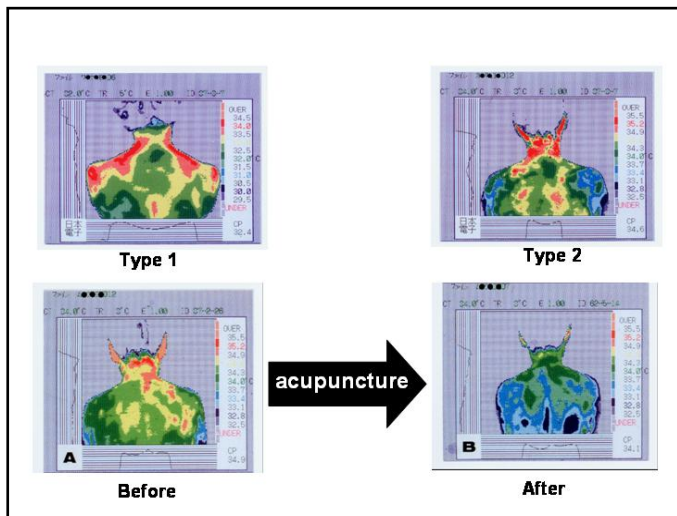


Figure 1: Thermograms of patients with tension headache before and after acupuncture treatment

Upper row: Type 1 covers the posterior area of the neck to the suprascapular region, Type 2 covers the posterior area of the neck to the suprascapular region and refers to areas of elevated temperature; thermograms of patients with tension headache can be grossly divided into two patterns.

Lower row: Improvement of symptoms due to acupuncture treatment is associated with a decrease in skin temperature in the areas of increased temperature, thus approaching the temperature of the surrounding areas.

(2) The modes of action of acupuncture partially differ from that of central acting muscle relaxants.

(3) Acupuncture treatment of the muscle groups in the posterior neck, suprascapular and interscapular regions in patients with tension headache, did not only elicit local reflexes (axon reflexes), but the evidence also indicated the possibility of an influence on higher centers.

(4) The reaction of patients with tension headache to acupuncture treatment (autonomic nervous system) differed from that obtained in healthy persons, suggesting that the acupuncture therapy apparently contributes to an improvement in the homeostasis of the body. (Figure 2a, b)

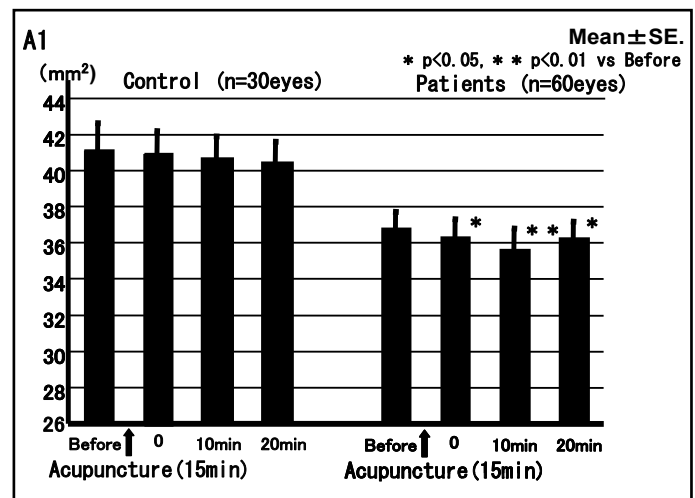
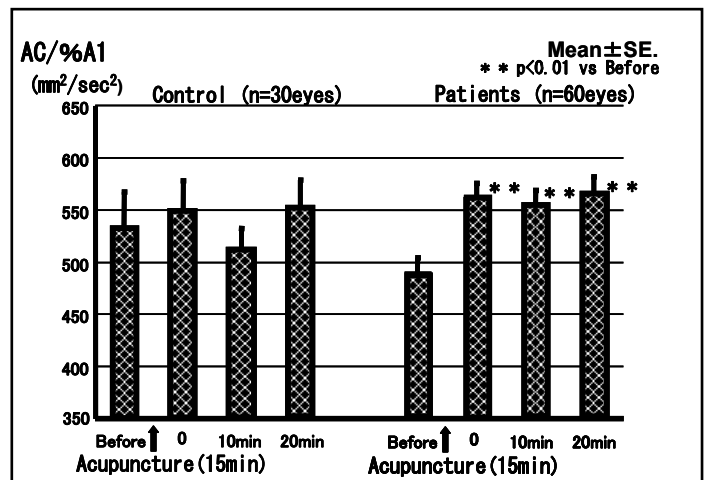


Figure 2: Variations in pupillary reactions in patients with tension headache before and after acupuncture treatment

a) Pupillary area prior to light stimulation (A1)

a: The pupillary area after light stimulation in patients with tension headache decreased immediately, 10 and then 20 minutes after the acupuncture treatment. In healthy persons no significant variations between the conditions before and after the acupuncture treatment were observed.



b) Maximal pupillary contraction velocity (AC)

b: Maximal pupillary contraction velocity following acupuncture treatment of patients with tension headache led to an immediate increase, 10 and then 20 minutes after the acupuncture treatment. In healthy persons no significant variations between the conditions before and after the acupuncture treatment were observed.

c. Effects of acupuncture treatment

Patients with tension headache were referred from departments of neurology etc. to our department for an investigation of the therapeutic effects of acupuncture. The study included 86 patients, 22 men and 64 women with an average age of 53.6 ± 14.9 years. A visual analogue scale (VAS) and pain score (PS) were used as evaluation tools for the therapeutic effects on the patients' subjective symptoms. The improvement of symptoms was calculated in conjunction with the objective findings: improvement of more than 80% more than 60% as effective, more than 40% as slightly effective, less than 40% ineffective and an increase in symptoms as aggravation.

The results showed that in the patient group, 29.1% of the patients also had diseases of the cervical vertebra and related conditions, while 72.1% complained of neck and/or shoulder stiffness. In 17 (19.8%) of these patients acupuncture treatment was markedly effective, in 39 (45.3%) effective, and in 14 (16.3%) slightly effective; so that the overall efficacy was 81.4% (Figure 3). Acupuncture treatment and the improvement in shoulder stiffness showed an extremely high positive correlation ($r=0.912$; Figure 4) that resulted in some patients requiring a reduction of muscle relaxants or anti-inflammatory drugs.

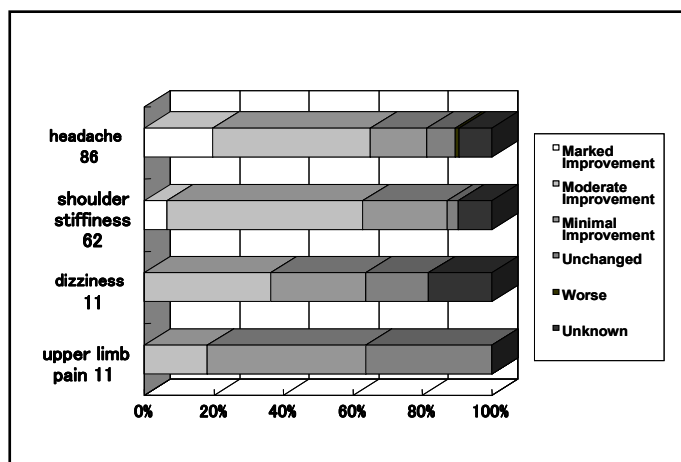


Figure 3: Results of acupuncture treatment of tension headache and associated symptoms

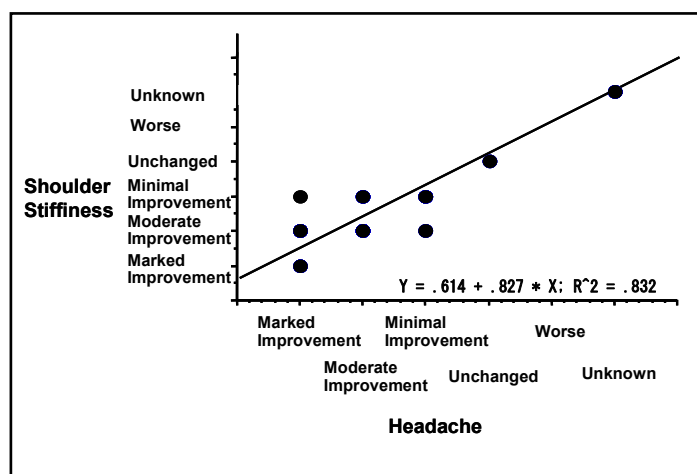


Figure 4: Therapeutic results for tension headache and shoulder stiffness

3. Migraine and cluster headache

Acupuncture treatment for migraine is performed primarily for preventive purposes mainly during remission rather than during actual attacks. During an attack, a combination therapy with triptan medications is desirable. Since the mechanism of the onset of cluster headaches differs from that of migraine, this condition is treated in the classification of the International Headache Society as an independent item; but the acupuncture treatment is, except for the attacks, approximately the same as that for migraine.

a. Acupuncture treatment

For the region in which headache occurs most frequently, namely in the vicinity of the acupoints Ganen, Kenryo, Kenri (GB 4-6) and Zui (St8); as well as for migraine, the vascular mechanism of onset of trigeminal neuralgia is considered to be likely. Therefore, points in the course of that nerve, like the supraorbital incisure or the point Gekan (St7), are selected. Moreover, for the purpose of regulating autonomic nerve functions of the circulatory system, Jingei (needling of the carotid sinus) has been added to the list of needled regions. Application of distant needling described in the classics (use of the brighter yang stomach channel of the leg, greater yang bladder and lesser yang gall bladder channels), choosing points on the legs like Taikei (KI3), Shoyo (LI1), Ichu (BL40), Konron (BL60), Yoryosen (GB34), Kyukyo (GB40), Rinkyu (GB41), and similar points are also very

important. The courses of these channels on the legs closely resemble that of the sciatic nerve, so that stimulation of distant regions presumably acts via the nervous system. Taking stimulation of the temples as the local site of the pain into account during consideration of the mechanisms of onset, suggests that a light stimulation (manual thrusting and lifting (Jakutaku) manipulation of the needles, rotation and electric stimulation of the needles at 30 to 100 Hz) inhibits triggering of attacks and aggravation. Alleviation of complicating complaints or fatigue and improvement of the general condition is also important.

4. Discussion

Recent epidemiologic studies⁶⁾ of patients with headache in Japan indicate that 8.4% of the patients suffer from migraine and 22.3% from tension headache, indicating a significantly higher incidence for the latter condition. This high incidence of tension headache makes it a good indication for acupuncture treatment and the condition may be expected to correspond well to this treatment modality.

The author used plethysmography, EMGs and thermography for an investigation of the mechanism of onset and the modes of action of the acupuncture therapy and reported that the muscle groups of the posterior neck region, as well as suprascapular and interscapular muscles, play an important role in the development of headache. These results closely resemble the findings observed during daily clinical practice and indurations or tenderness in the posterior neck and suprascapular muscles. These are frequently encountered. In the *International Classification of Headache Disorders* 2nd Edition as revised in 2004, tender spots are considered of pivotal importance. The effect of acupuncture treatment for these patients showed that wave amplitude and the electric discharge from the muscles approached those of healthy persons, indicating that the acupuncture treatment led to a relaxation of the excessive muscle tension and improvement in hemodynamics. Thermographic examinations in the same patients revealed a skin temperature distribution showing higher

temperatures in the posterior region of the neck, as well as the supra and interscapular regions. The acupuncture treatment led to a decrease in temperature, observing an approximation to the surrounding skin temperature (Figure 1) and thus suggests a partially different mode of action from that of central acting muscle relaxants.

For the assessment of the influence of acupuncture treatment on the autonomic nerve function in patients with tension headache, an open loop video pupillography was employed, which permitted non-invasive, repetitive and quantitative measurements of the autonomic nerve function. The results showed that prior to light stimulation the pupillary area was decreased in size and the primary indicators of the parasympathetic nervous function, maximal pupillary contraction velocity, and maximal pupillary contraction acceleration were increased (Figure 2a, b). Yet, no significant changes were observed for the indicator of sympathetic nerve function maximal pupillary dilatation. In healthy people, significant changes were not observed for sympathetic and parasympathetic nerve function. Regarding pupillary innervation, pupillary dilatation is controlled by sympathetic nerves with their centers located in the spinal cord (C8-TH1). Pupillary contraction on the other hand, is controlled by parasympathetic nerves having their center in the Edinger-Westphal nucleus and the surrounding central grey matter. Deduction from these acupuncture treatment induced changes in pupillary reaction in patients with tension headache, suggests an increase in parasympathetic nervous function. These results indicate that acupuncture treatment does not only act on the muscle groups in the posterior region of the neck, supra and interscapular regions (via axon reflexes), but probably also has an influence on higher centers. This influence on higher centers suggests a close relationship to the mechanism of action of acupuncture analgesia.

The results of the investigation by the authors of the influence of acupuncture treatment on cerebral blood flow in patients with cerebrovascular disorders reportedly revealed that the acupuncture therapy led

in a group of patients with markedly decreased cerebral blood flow, to an improvement of the cerebral circulation⁷⁾. Among these results, the above described acupuncture induced variations in pupillary reaction in patients with tension headache. Healthy persons, on the other hand, indicate that acupuncture treatment elicits different reactions depending on the presence or absence of symptoms and their severity. This clearly shows that the treatment contributes to an improvement in homoeostatic regulation.

5. Future prospects

Content of the new *International Classification of Headache Disorders* 2nd Edition published in September 2003 by the International Headache Society, also contained cephalalgia²⁾. Tension headache is classified into the following 4 types: occasional recurrent, frequently recurrent, chronic, plus a suspect form. For further subdivisions relevant diagnostic criteria have been established. Adopting these criteria for further investigations into the effects of acupuncture based on EBM principles is required. Regarding the mechanisms of onset progress in biochemical investigations of the influences on higher centers, will help to illuminate the pathophysiology and clarify the modes of action of the acupuncture treatment.

Reference

- 1) Headache Classification Committee of the International Headache Society. Cephalalgia 8 (Suppl 7): 1-96, 1988.
- 2) Headache Classification Subcommittee of the International Headache Society. *The International Classification of Headache Disorders*, 2nd ed. Cephalalgia 24 (Suppl 1): 1-160, 2004.
- 3) Yamaguchi S, Matsuo H, Omata H, et al.: *Thermography in Patients Receiving Oriental Medical Care*: Biomedical Thermology 8 (1): 185-187, 1988
- 4) Yamaguchi S: *Influence of Acupuncture Treatment on Pupillary Responses*. Journal of the Japanese Association of Physical Medicine, Balneology and Climatology 58 (4): 232-240, 1995
- 5) Yamaguchi S, Omata H, Arai C, et al.: *Oriental Medical Therapy for Tension Headache*, (6th Report), Japanese Journal of Headache 26 (1) 45-47, 1997
- 6) Igarashi H: Journal of The Japanese Society of Internal Medicine 90 (4): 567-573, 2001
- 7) Maruki Y, Shimazu K, Okubo T, et al.: *Effect of acupuncture on cerebral blood flow in patients with CVD (abstr)*. Journal of Cerebral Blood Flow and Metabolism 9 (suppl.1): 695 1989, Raven Press, New York