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Medical Acupuncture: the History, Theory, Mechanism, and Its Role in Headache Treatment

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History of Acupuncture

2,000-1,500 BC 1,800 BC 18th Century 19-20th Century 1899 1950s

Xia Dynasty, China First recorded in "Yellow" Emperor's Classic of Medicine" Europe **United States** Sir William Osler's Medical Textbook (lumbago treatment) China reported the use of electroacupuncture in surgical analgesia

Property of Chongha Ollett GA., et al. South Med J. 1998; Helms JM. Acupuncture energetics. 1995; Osler W. The principles and Practice of Medicine. 1899.

Acupuncture in United States (1)

- 1971 James Reston reported his experience of symptomatic relief from acupuncture for gas pains after an appendectomy
- 1972 NIH gave the first grant to study acupuncture
- 1996 FDA promoted the acupuncture needles from Class III to IIClass III: 1) as a investigational and experimental device performed only in the proved research settings (e.g. hospital labs)
 - 2) banned for specific medical or therapeutic claims
 - Class II: 1) medical devices which are safe and effective
 - 2) regulation required

Property of Chen J. Acupuncture. 1972; Jenerick H. Proceedings NIH Acupuncture Research Conference. 1973; Eskinazi DP & Jobst KA. JAltern Complement Med. 1996.

Acupuncture in United States (2)

1997 NIH Consensus Development Panel concluded acupuncture shows efficacy or may be useful in treating 13 kinds of disorders

Effective	Useful as an adjunct treatment
Adult postoperative and	Addiction Stroke rehabilitation
and vomiting	Asthma
Postoperative dental pain	Headache
	Menstrual cramps
	Tennis elbow
	Fibromyalgia
	Niyolascial pain Octoorthritic
	Low back pain
	Carpal tunnel syndrome

Property of Chonghao ZhaniH Consensus Development Panel on Acupuncture. JAMA. 1998.

Acupuncture in United States (3)

- 10,000 acupuncturists practice in the United States
 - MD acupuncturist: < 3,000
 - Others are non-MD acupuncturists
- Training Requirement
 - MD (Board certified by American Academy of Medical Acupuncture):
 - 200 hours of formal training (didactic and clinical)
 - Passing of the board examination
 - > 500 medical acupuncture treatment
 - Non-MD (for license purpose):
 - Usually 2 to 4 year curriculum required
 - Passing of the state license examination
 - Dentist?

Property of Chong American Academy of Medical Acupuncture. Board Certification Information. 2001. Ulett GA & Han S. South Med J. 1998.

Theory of Acupuncture: Qi and Pain

- Definition:
 - The vital energy or life force of human being.
- Function:
 - Qi circulates inside the meridians and supports every life process and every organic function.
- Pain:
 - The result of stasis or blockage of the meridian Qi flow.
- Pain treatment:
 - Needle stimulation aims to re-open the related meridian by giving an external force to the energy/Qi. After the elimination of a severe blockage of Qi flow, pain will go away.

Property of Chonghao Zyao Y. Concise Traditional Chinese Medicine. 1993; Sun P. The treatment of Pain with Chinese Herbs and Acupuncture. 2002.

Jin-Luo (Meridian) System (1)

Jin-Luo (Meridian) Network:

- Jin (major meridians) and Luo (minor meridians) are distributed throughout the body, inside which the body energy (Qi) flows continuously.
- This network connects the internal organs to the acupuncture points (acupoints) in the body surface.

Property of Chorzhang EQ. Chinese Acupuncture and Moxibustion. 1988; Hecker HU, et al. Color Atlas of Acupuncture: Body Points, Ear Points, Trigger Points. 001.

Jin-Luo (Meridian) System (2)

- 14 major meridians: 12 "regular" and 2 " curious" meridians in the body.
- Named according to their distributed organs, using the International Nomenclature endorsed by the World Health Organization (WHO)
 - Regular: Pericardium (PC); Heart (HT); Large Intestine (LI); Triple Energizer (TE); Small Intestine (SI); Stomach (ST); Gallbladder (GB); Bladder (BL); Spleen (SP); Liver (LR); Kidney (KI).
 - Curious: Ren Mo (Conception Vessel, CV); Du Mo (DU, or Governor Vessel, GV).

Zhang EQ. Chinese Acupuncture and Moxibustion. 1988; Hecker HU, et al. Color Atlas of Acupuncture: Body Points, Ear Points, Trigger Points. 001.

Demonstration of Major Meridians



Acupoint (1)

- Acupoints of 14 regular meridians:
 - Major components of the acupoint system.
- The extraordinary points:
 - locate in parts of the meridian network other than the 14 regular meridians.
 - important complement to the regular acupoint system and contribute to pain management.
- Ashi points
 - also called tender points.
 - do not have specific names and defined locations,
 - highly important in the diagnosis and treatment of headache and pain

Acupoint (2)

Anatomical Characteristics of Acupoint:

- Body:
 - In the vicinity of the small or large peripheral nerves and their bifurcations, neuromuscular attachments, blood vessels, ligaments and suture lines of the skull.
- Head and Face:

Along terminal or cutaneous branches of the trigeminal nerve and between muscular branches of the facial nerve.
 Property of Chonghao Zhao, MD, Pomeranz B. in Basics of Acupuncture. 1998 Dung HC. Am J Chin Med. 1984.

Acupoint (3)

Physical Characteristics of Acupoint:

- A double-blind, placebo-controlled randomized study compared true acupoints vs non-acupoints
 - True acupoint has higher local temperature
 - True acupoint has lower electrical resistance

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Johansson V et al. Adv Pain Res Ther. 1976.

Winding Phenomenon

- Winding phenomenon (De Qi): winding around the needle
 - manually rotating the needle will generate a local resistance around the needle that can be easily felt
 - grasp force that prevents the needle from being pulled out
 - predicting an effective needling treatment to this acupoint
- Using the computer-controlled needling instrument, a quantitative study found that the pull-out force in the acupoints is 18% significantly greater than at nonacupoints 2 cm away
- The winding phenomenon between the needle rotation and tissue whorl may lead to development of sensory signals via mechanotransduction

Property of Choop Langevin HM & Yandow JA. Anat Rec. 2002; Langevin HM, et al. FASEB J. 2002; Langevin HM, et al. J Appl Physiol. 2001; Langevin HM, et al. FASEB J. 2001

Analgesic Mechanism of Acupuncture: Concept in Chinese Medicine

- Analgesic Mechanism:
 - Strengthening the Qi
 - Repairing the damaged meridians
 - Reopening the constricted meridians
- Pain free or relief:
 - Restoration of the Qi flow
 - Yin-Yang balance of internal organs

Property of Chonghao Yao Y. Concise Traditional Chinese Medicine. 1993; Sun P. The treatment of Pain with Chinese Herbs and Acupuncture. 2002.

Analgesic Mechanism of Acupuncture in Headache



Suppressive Effect of Acupuncture on the Trigeminal Nucleus Caudalis

- Suppressed the increased c-fos protein expression in the TNC evoked by the tooth pulp stimulation (TPS)
- Suppressed the jaw opening reflex response to tooth pulp stimulation or direct stimulation of the TNC
- Inhibited the evoked potential and substance P release in TNC following tooth pulp stimulation

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Sheng LL et al. Neurosci Res 2000. Takagi J. et al. Jpn J Pharmacol 1996. Toda K. Am J Chin Med 1981.

Acupuncture Stimulation on Structures with Central Inhibitory Effect on TNC

- Stimulated the C-fos protein expression in dorsal raphe nucleus, the locus ceruleus, the hypothalamus, the thalamus, the rostral ventromedical medulla, the periaqueductal gray area
- Increased of the firing rate of the excitatory raphespinal (R-S) neurons in the nucleus raphe magnus
- The inhibitory effect of acupuncture on the TNC was reduced by the functional inactivation of the secondary somatosensory cortex

Property of Chongh Zhou Z. et al. Zhen Ci Yan Jiu 1993. Liu X. et al. Pain 1986. Reshetniak VK. et al. Biull Eksp Biol Med 1985. Sheng LL et al. Neurosci Res 2000.

Modulation of Acupuncture on Headache Through the Analgesic System

• Spinal dorsal horn (DH)

- The increased c-fos expression in the spinal DH induced by noxious stimulation was inhibited by the EA
- Presynaptically inhibits the afferent pain transmission in the DH
- Descending inhibitory system
 - Increasing mu binding sites in PAG NRM, hypothalamus, and amygdala
 - Stimulating the release of beta-endorphine from the hypothalamus into the CSF and plasma

Property of Choose JH, Beitz AJ. Brain Res. 1992. Gao M. et al. Acupunct Electrother Res. 1997. Raj PP. in Practical Management of of Pain. 1986. Pomeranz B, Paley D. Exp Neurol. 1979. Chen E. Cross-sectional Anatomy of Acupoints. 1999.

Inhibitory Effect of Acupuncture on the Pain Processing in Headache Patients

- Increase in plasma opioid levels in the chronic post-traumatic headache patients after acupuncture stimulation
- Increased release of beta-endorphin in the plasma in the pediatric migraine patients after the acupuncture, coupled with clinical improvement
- Low CSF met-enkephalin levels in cluster headache were elevated by acupuncture
- Serum magnesium levels were increased with acupuncture treatment of migraine, coupled with the clinical improvement

Property of Chonghao Z Nappi G, et al. Headache. 1982; Pintov S, et al. Pediatr Neurol. 1997; Hardebo JE, et al. Headache. 1989; Chen B. J Trad Chin Med. 2000.

Acupuncture for Migraine Prophylaxis

TRUE ACUPUNCTURE vs. Different Control Parameters



Property of Chonghao Zhao, MDLinde K. et al. Cochrane Database of Syst Rev. 2009.

ACUPUNCTURE TREATMENT : MIGRAINE

TRUE ACUPUNCTURE vs. SHAM ACUPUNCTURE



Property of Chonghao Zhao, Melchart D. The Cochrane Database of Syst Rev. 2001.

Acupuncture for Tension-Type Headache

TRUE ACUPUNCTURE vs. Different Control Parameters



Acupuncture vs. physiotherapy or relaxation or massage/relaxation

Acupuncture is slightly better

Acupuncture vs. routine care or treatment of acute headache only

Acupuncture is better

Property of Chonghao Zhao, Linde K, et al. Cochrane Database of Syst Rev. 2009.

Acupuncture for Cluster Headache

- Extremely little information
- Scanty of case reports suggested relief by acupuncture
- Acupuncture significantly raised CSF metenkephalin level, but only improved symptoms in 2 out of 7 patients

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Gwan KH. Am J Chin Med. 1977. Dana G. Med Acupunct. 2003. Hardebo JE, et al. Headache. 1989.

Acupuncture Needles

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Acupuncture Needle Insertion



Acupuncture Treatment: Classification Based on Modality (1)

- Electroacupuncture (EA): connected to a electrical stimulator (4-channel outlet model)
 - Low frequency: 2-4 Hz, stimulates endorphin release
 - High frequency: 100-300 Hz, stimulates serotonin release

Property of Chonghao Zhao, MD, PAung S. Medical Acupuncture. 2001. Pomeranz B. In Basics of Acupuncture. 1998. **Acupuncture Treatment: Classification Based on Modality (2)**

- Traditional acupuncture: manually twisting the needle, using the Yin-Yang principle
 - Clockwise: supplementing the deficiency of energy
 - Counterclockwise: draining the excessive energy
 - "De Qi" Phenomenon (winding the needle)

Acupuncture Treatment: Classification Based on Modality (3)

- Meridian acupuncture: stimulation based on the meridian diagnosis
- Anatomical acupuncture: Stimulation based on the anatomy of the nervous system

Acupuncture Treatment: Classification Based on Body Part

- Hand acupuncture
- Foot acupuncture
- Scalp acupuncture
- Ear acupuncture
- Body acupuncture



Acupoints for Headache Treatment



Head & Neck Acupoint and the Nearby Nerves



Property of Chonghao Zhao, Netter FH. Atlas of Human Anatomy. New Jersey. 2003.

Acupuncture Treatment

• Frequency: 2x /week for 4 weeks, followed by weekly x 8 weeks

– Takes 3-5 treatment to see the benefit.

Adverse Effect of Acupuncture

A prospective study of 32,000 consultations (White's study)

- 2178 reported AE in 31,888 acupuncture treatments
 - incidence: 684/10,000
 - Commonest: bleeding, needling pain, aggravation of • symptoms, aggravation followed by resolution of symptoms

A retrospective report of 403 AE by 1,332 acupuncture practitioners (Norheim's survey)

- Minor AE in order of frequency
 - Fainting (142/403) > increased pain (56/403) > nausea/vomiting (25/403)
- Severe AE in order of frequency
 - Local skin infection (68/403) > pneumothorax (33/403) > perichondritis (16/403)

Property of Chonghao Zhao, Norheim AJ and Fonnebo V. Complement Ther Med. 1996.

White A et al. Acupunct Med. 2001.

Contraindications of Acupuncture

- Cardiac pacemakers
 - Contraindicated in the use of electroacupuncture
- Skin and soft tissue infections
- Bleeding disorders or on anticoagulants
 - A small series of case report (Non-EA, N=4) did not find prolonged bleeding or bleeding-related problems with coexisting use of Coumadin (INR 2.2- 4.9)
- Infants

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Ernst E. Int J. Risk & Safe in Med. 1995 Lundegerg T. Cephalalgia. 1999 Sciammarella J. Medical Acupuncture. 2002

Acupuncture and Pregnancy

- Treating nausea and vomiting in the early pregnancy
 Safe
- Treating headache in the pregnant women
 Unknown safety
- Two points are contraindicated for pregnant women
 LI 4 and SP 6
 - Preparation of 1st trimester abortion
 - Increase cervical dilation
 - Induction of labor at term
 - Supporting cervical ripening

Property of Chonghao Zhao, Wabl M et al. Wien Klin Wochenschr (abstract). 2001 Ying YK et al. J Reprod Med. 1985

Summary

- Acupuncture needle was revised from Class III experimental device to Class II non-experimental but regulated medical device in 1996
- Acupuncture demonstrated suppressive effect on the Trigeminal Nucleus Caudalis in the animal model
- The NIH Consensus Development Panel concluded in 1997, that acupuncture could be used as an adjunct treatment, for variety of disorders including headache
- Whether true acupuncture is superior to sham acupuncture for headache is still controversial.
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