A review of mechanisms governing the analgesic effects of hypnoacupuncture

Jennifer Chou’, HuaDe Chen

International Education College, Zhejiang Chinese Medical University, Zhejiang Province, China

Review

Abstract: As there are many causes to pain, mechanisms in governing the analgesic effects for pain relief are varied. The study of analgesic effects is thus becoming complicated and difficult as it is not easy to have a universal standard especially when the feeling of pain is subjective. This review paper aims to summarize studies across neurophysiological analgesia, acupuncture (hegu) analgesia (i.e., acupuncture treatment by using the hegu acupuncture point), and hypnotic analgesia, serving as a reference point for combining hegu analgesia and hypnotic analgesia to prolong analgesic effects. The overlapping brain mechanisms between hegu analgesia and hypnotic analgesia are 1) the somatosensory system, for identifying pain characteristics (primary somatosensory cortex and secondary somatosensory cortex areas); 2) anterior cingulate cortex, for processing the emotional experience of pain; 3) insular cortex, for processing visceral and kinesthetic senses, emotional responses, and memory functions on pain; 4) prefrontal cortex, for recognizing and assessing pain; and 5) 5-hydroxytryptamine neurotransmitter, which influences analgesic effects. Papers on acupuncture analgesia and hypnotic analgesia from the five cerebral mechanisms were reviewed to identify the role of hypnoacupuncture analgesia in pain relief.

Key words: Medical hypnosis; acupuncture analgesia; analgesic mechanism; neuroalgology; psychological hypnosis; hypnotherapy.

Correspondence to: Jenniferchou2002@hotmail.com (J. Chou); docchd@sina.com (H. Chen)

Received: November 19 2016; Accepted: December 27 2017; Published: December 31 2017

doi: http://dx.doi.org/10.18088/ejbmr.3.3.2017.pp1-5

Introduction

According to the American Psychological Association, hypnosis is a medical technique applied to change the feelings, thoughts, and behaviors of an individual through guidance. In 1996, the National Institute of Health (NIH) announced that hypnotherapy can be used to relieve chronic pain such as those associated with cancer (1). When hypnosis is applied in medical treatment, its most notable effect is the control of pain which has a clear cause. Hypnotherapy has been approved by the American Medical Association, American Psychiatric Association, and American Psychological Association (2). Recent advance in psychology has used Cognitive-Behavioral Therapy (CBT) as the first line of therapeutic interventions for chronic pain (3). When applied in medical treatment, hypnosis is referred as medical hypnosis. Numerous discourses on the psychology of traditional Chinese medicine are recorded in Huangdi Neijing, an ancient Chinese medical text that is also known as “The Emperor’s Inner Canon” (4).

In 1979, the World Health Organization (WHO) lists a variety of medical conditions, including many for acute and chronic pain, which may benefit from the use of acupuncture or moxibustion (5). In addition, an NIH consensus panel of scientists, researchers, and practitioners was convened in November 1997 to provide health care providers, patients, and the general public with a responsible assessment of the use and effectiveness of acupuncture for a variety of conditions (6). As a result, more studies on acupuncture were encouraged on its physiology and clinical value due to the sufficient evidence of its potential value to conventional medicine. Acupuncture has been demonstrated to enhance endogenous opiates, such as dynorphin, endorphin, encephalin, and release corticosteroids, relieving pain and enhancing the healing process. Conceptually, it is believed to stimulate the body’s meridians, or energy-carrying channels, from the proximity of acupoints with nerves through intracellular calcium ions, in an attempt to correct imbalances and to restore health (7).

Little attention has been given to the clinical implementation of hypnosis for physical, psychological, and spiritual (physiological and aspirational) integration in traditional Chinese medicine. For a long time, there exist many misunderstandings in western medicine concerning the effects of medical hypnosis and acupuncture analgesia; as such, it was deemed as pseudo effects and thus classified as placebo effects. Following the advance in medical technology in the past decade, more and more scientific evidence has emerged in the studies of hypnotherapies used in Chinese and western medicine. In this paper, related papers were collected, analyzed, and summarized to obtain scientific evidence for the analgesic effect of medical hypnosis combined with hegu acupuncture point in order to encourage their clinical application for physical, psychological, and spiritual integration in traditional Chinese medicine.

Literature Review

This review paper focused on hypnoacupuncture analgesia. Papers on hegu acupuncture and hypnotic analgesia were collected and classified based on neurophysiological mechanisms. Studies on the mechanisms of neural, hegu acupuncture, and hypnotic analgesia and the theory of hypnoacupuncture were organized. The remainder of this paper describes the focal points of these
studies.

Pain is transmitted through various pathways according to its type, neurotransmitters, sources, characteristics, and projection areas, as illustrated in a network diagram of the pain matrix in (8).

The form of each acupuncture point profoundly influences its function. As shown in Fig. 2 in (9), the primary afferent nerve fiber of a hegu point is currently known to end at the fifth–eighth segments of the cervical vertebra. According to the theory of near-segment acupuncture, acupuncture and surgical points belong to the same or neighboring spinal innervations. Therefore, traditional Chinese medicine scholars have claimed that craniofacial hegu acupuncture is consistent with modern physiological anatomy. On the basis of hegu morphology, the stimulation signals of hegu acupuncture points can be transmitted to solitary nuclei and reticular formations in addition to the dorsal horns of the cervical spinal cord.

In an experiment conducted by Zhao et al. (10), de qi sensations (e.g., sourness, numbness, swelling, and heaviness) and the experimental environment in which acupuncture was performed induced emotional change in the participants. Notable signal changes were observed in the precuneus and prefrontal lobes, which are associated with emotion processing and awareness. When acupuncture is applied to different points, it causes tissue changes in different cerebral areas, and the compatibility of medicines applied to two different points leads to the redistribution of brain activation areas (5). According to the World Health Organization, acupuncture is an appropriate therapy for more than forty conditions, particularly those involving pain. Currently, scientific studies on hegu acupuncture analgesia have provided more details. The effects of acupunctural analgesia are primarily defined by acupuncture points, point combination, techniques, time, and depth. However, studies on acupunctural analgesia remain for further clarification.

Regarding neurophysiological studies on acupunctural analgesia, more than 600 cases of psychotherapy, which detail the specific methods of the unique traditional psychological treatment, are recorded in ancient manuscripts of traditional Chinese medicine. These descriptions bear numerous similarities with cognitive activity detailed in the modern psychology. Numerous studies have investigated hypnotic analgesia (11-12). In particular, hypnotic analgesia has been noted as a type of psychotherapeutic approach to pain management.

The key to hypnotic analgesia is to apply the appropriate hypnotic approach relevant to the type of pain. On acute pain, the main techniques of hypnosis are to reduce psychological anxiety and pain awareness in patients; on chronic pain, the main techniques of hypnosis are to provide patients with an accurate physiological and psychological understanding of pain occurrences (13). Accordingly, appropriate hypnotic approaches are selected on the basis of the pain type (acute versus chronic) to attain the expected analgesic effects. In addition, attention has to be paid to select specific hypnotic methods for treatment effects. To date, medical hypnosis has become prevalent in the United States. In addition to medical research, hypnosis has been applied in clinical practices, leading to the development of various hypnosis techniques. On the other hand, the placebo myth has been discussed in studies on acupuncture and hypnotic analgesia. However, recent studies have verified that the placebo effect induces analgesic effects in human brains.

From the perspective of western medicine, pain management is a branch of the interdisciplinary medical approaches that involve mitigating pain through administering medication and improving quality of life for patients in easing the pain (14). Culture-based belief and behavior enable patients in chronic pain to redefine their pain awareness, and this has a direct influence on their health-related quality of life. The American Board of Medical Specialties is an organization for the professional certification of practices, including a subspecialty certification for pain medicine, which primarily involve mitigating pain through the use of medicine. As shown in the functional magnetic resonance imaging (fMRI) scans of human brains depicted Fig. 3 (15), the effect of physiological pain mitigation substantially differs from that of hypnotic pain mitigation. During hypnosis, the intensity and processing areas of pain in the human brain also vary.

In addition, Dr. Khils from, of the University of California, Berkeley, empirically confirmed the difference between the placebo effect and hypnotic analgesia. This difference was identified in 1969, but only began to garner attention nearly fifty years later (16-17).

Experiments have demonstrated hypnosis as an effective means for pain relief. Jamieson et al showed a qualitatively distinct state, following a hypnotic induction, for high hypnotically susceptible participants (18). The findings of the study conducted by Lang et al demonstrated the analgesia effect gained through non-pharmacological behaviors such as structured attention and self-hypnotic relaxation during invasive medical procedures, specially, hypnosis had more pronounced effects on pain and anxiety reduction (19). As such, psychological analgesic techniques differ from one another in their effects.

Materials and Methods

This study analyzed the treatises from major academic databases in China, the United States, and Taiwan. A total of 193 research papers were collected from the Wanfang Standards Database (http://www.wanfangdata.com.cn), U.S. National Library of Medicine (https://www.ncbi.nlm.nih.gov/pubmed/), and National Taiwan Library (http://www.ntl.edu.tw).

Results

As revealed through the collection, analysis, and generalization of the physiological research data, numerous studies worldwide have investigated hegu acupuncture point and hypnotic analgesia in the past 15 years with remarkable results. The five brain mechanisms generalized from the data are listed as follows: 1) the somatosensory system (SS), for identifying the characteristics of pain (primary somatosensory cortex [SI] and secondary somatosensory cortex [SII] areas); 2) the anterior cingulate cortex (ACC), for processing the emotional experience of pain; 3) the insular cortex (IC), for processing the visceral and kinesthetic senses, emotional responses, and memory functions on pain; 4) the prefrontal cortex (PFC), for recognizing and assessing pain; and 5) the 5-hydroxytryptamine (5-HT) neurotransmitter, which influences analgesic effects.
The functional connectivity changes in the SII involved the integration of external information perceived by the brain. After acupuncture, changes occurred in the cingulate cortices, temporal lobe, precuneus, and frontal lobe. As a part of the medial pain system, the cingulate cortices play a vital role in pain perception. The temporal lobe, precuneus, and frontal lobe are related to spirituality, emotions, and awareness. Acupuncture was speculated to change the signals in the emotional and pain areas of the SII. In other words, hegu acupuncture might have led to neural analgesia through integrating the functional connectivity in the aforementioned four areas by the SII (10).

---

Xu et al. (5) indicated that peripheral nociceptive stimuli activate the neurons of the sensory cortex, and that acupunctural information reaches the cerebral cortex. Exciting the SII area inhibits the nociceptive reactions of the central medial nucleus and parafascicular neurons (21).

---

The cingulate cortices, precuneus, and frontal lobe exhibit a high temporal correlation after acupuncture. The precuneus functions are divided into four types: visual–spatial imagery, episodic memory retrieval, self-treatment, and awareness. The prefrontal lobe exhibits abundant neural connectivity with the amygdaloid nucleus and hypothalamus and enables emotion processing and episodic memory retrieval. De qi sensations and the experimental acupuncture environment caused emotional changes and significant signal changes in the precuneus and prefrontal areas, which are related to emotion processing and awareness (10).

---

Hypnosis can activate the ACC and reduce pain. The pain mitigation mechanism is related to activation of the ACC by the specific hypnosis techniques (11).

---

Hypnosis activates key areas for pain mitigation, namely the thalamus, insula, ACC, and prefrontal cortices (22).

---

The hypnotic effect occurs in the anterior cingulate gyrus, which receives and responds to errors and perceives emotional outcomes. The hypnotic effect also occurs in the upper-left prefrontal cortex, which involves higher-level cognitive processing and behavioral phenomena (23).

---

Rainville (20) applied hypnosis and verified that the sensations and emotions of pain can be behaviorally separated. This is related to the ACC and emotional dimension of pain. The SI area is related to the sensory dimension of pain. Under hypnosis, only the emotional dimension is affected, whereas the sensory dimension is unaffected (11).
IC activity might be a specific result of acupuncture, and the gray matter surrounding the ACC, dorsolateral prefrontal cortex, and cerebral aqueduct might have been generated because of expectancy (24). Acupuncture information is transmitted to the medicine.

The present review provides the first systematic analysis of experimental studies on hegu acupuncture point and hypnotic analgesia, from the five overlapping categories of brain neural mechanisms for pain. According to the study (11), pain is a multi-dimensional advanced mechanism with the integration of sensations, emotions, and cognition. It covers brain areas in SI, SII, PPC, IC, RF, HYP, SMA, AMGY, ACC, PFC, etc. This review paper identifies the five overlapping brain mechanisms between hegu analgesia and hypnotic analgesia as a reference point for combining hegu analgesia and hypnotic analgesia to prolong analgesic effects in naturopathy. Furthermore, it encourages the clinical application of physical, psychological, and spiritual integration in traditional Chinese medicine.

**Discussion**

Faymonville (25) examined the effect of hypnotic analgesia on the neural pathways, indicating that hypnotic analgesia increases the functional connectivity in the midcingulate cortex and related pain sensation structures, namely the insula, right frontal lobe, brain stem, thalamus, and basal ganglia (25). In particular, the midcingulate cortex can connect with the central brain structure, which adjusts sensations, emotions, cognition, and behaviors related to pain, all of which are magnified by cortex activity (26).

Hang et al. (27) reported that 5-HT Type 3 receptors can modulate hypnotic and analgesic effects induced by emulsified sevoflurane. Zhao et al. (28) used L-type calcium channel blockers to enhance the hypnotic effect induced by barbiturates. The result revealed that diltiazem increases the pentobarbital and slow-wave sleep but reduces rapid eye movement sleep, similar to the hypnotic effect induced by 5-HTP and its precursor. This type of hypnotic effect reduces the pain response and pain threshold (27-28).

Using fMRI scans of brain tissues, Xu et al. (5) investigated the effect of applying acupuncture at different points, revealing that hegu acupuncture increased the blood flow and blood volume in frontal and occipital lobe tissue, but taichong acupuncture increased the blood flow and blow volume only in temporal lobe tissue; applying acupuncture at both hegu and taichong increased the blood flow and blood volume in frontal and temporal lobe tissue (5).

**References**


