

The 7th Conference on Health Care of the Chinese in North America



A Scientific Explanation of Acupuncture Mechanisms of Action

Alfred T.C. Peng, MD, Chairman of Anesthesiology, St. Peter's Hospital, New Brunswick, NJ

Abstract

Summary

Several neurophysiological explanations of mechanisms of acupuncture effects - ranging from basic research to clinical investigation - are presented. While much remains to be elucidated, it is most exciting to be on the threshold of a scientific explanation of the mechanism of action of acupuncture and acupuncture medicine.

It has now been several decades since open minded researchers in medicine and dentistry began seeking the mechanism by which pain relief can be achieved with acupuncture needling. Several theories have been advanced (1,2,3) to explain the mechanism of action of acupuncture, but none of these has been met with total acceptance by the scientific community.

Han(4) introduced significant new findings related to the mechanism of acupuncture analgesia, and revealed several important new implications of the mechanism. In applying electrical stimulation to acupuncture needles, different kinds of neuropeptides can be released in the central nervous system (CNS), simply by changing the frequency of electrical stimulation. without moving the position of the needle. While low frequency (2 Hz) electroacupuncture (EA) activated the release of B-endorphine and metenkephalin in the CNS, high frequency EA (100 Hz in the rat and 15 Hz in the rabbit) accelerated the release of dynorphine in the spinal cord.

At the very least, these studies demonstrated conclusively that EA is mediated through neurotransmitters and is not related to the influence of hypnosis. This was further confirmed by a clinical double-blind study conducted by Peng (5) and also commented upon by Frost (6).

Sato and Takeshige's animal experiments(7) also indicated that pain relief due to acupuncture needling might be produced by improved circulation in the affected muscle. Spasm is continuous muscle contraction that may be induced in various ways, including enhanced reflex activity caused by a pathological source, as well as increased neuronal activity originating from a higher or a peripheral source.

It has been shown that reduction of temperature in the affected painful muscle in humans can be restored to normal by means of acupuncture needling applied to this muscle (8). On the other hand, parallel needle insertion into the muscle fibers was seen to be less effective

in reducing muscle twitch (9). Parallel needle insertion is much less injurious to the muscle. Since injury can cause the release of histamine, which would tend to stimulate the nerve endings, the effect of acupuncture may continue until the injury is cured. This could explain the immediate and long-lasting effect of acupuncture often seen following a single application of needling. It is possible that the nerve terminal mechanism associated with acupuncture needling may involve axon reflex. Vasodilation accompanied by muscle contraction was studied by Hilton and was described as "post contraction hyperemia" which was induced by the non-atropine-sensitive axon reflex (10,11,12). Needle insertion stimulates nerve endings of the calcitonin-gene-related peptide (CGRP)-containing primarily afferent nerves (13). Its axon collaterals innervate the cholinergic nerve ending in the sympathetic nerves innervating the blood vessels, and are excited. The release of acetylcholine is facilitated by needle insertion, which produces dilation of the blood vessels in the spastic ischemic muscle. A schematic illustration of the mechanism is outlined in figure 1.

Figure 1. Schematic illustration of the pain relief mechanism produced by needle insertion into the painful muscle (after Takeshige)

The agent responsible for depletion of substance P and CGRP from the nerve ending, capsaicin, abolished the acupuncture needling effect. It has been reported that capsaicin destroys the medium and small size neurons that contain both substance P and CGRP. It has also been reported that both substance P and CGRP are vasodilators (14,15).

Becker (16) has postulated that electrical current can trigger tissue regeneration of an underlying lesion in mammals. The electrical stimulus causes cells to "differentiate" and leads to the formation of masses of blastocytes. These cells then become redifferentiated into the missing part. A blastema must be formed before regenerative growth can occur. An important key to the process is the specific characteristic of the electrical current, since the optimal current is 3 to 6 nano-amperes for tissue regeneration (16). We speculate that acupuncture needling may produce a current of injury that is equivalent to the optimal current.

Acupuncture for substance abuse

The use of acupuncture in the treatment of opiate addiction was initiated in 1972 by Wen (17). Since that time, acupuncture has been used to treat drug addiction and substance abuse in many parts of the world, including the United States (18,19,20).

In drug addiction, the drug gradually takes the place of natural endorphines at the receptor sites in the central nervous system, such as the amygdala, periaqueductal grey, hypothalamus, medial thalamus and caudate nucleus (21). The endorphines are displaced and possibly are inhibited by the addictive drugs and substances. Recently, it was shown that acupuncture can increase the endorphine level in the brain through electrical stimulation of the acupuncture needle inserted at a peripheral nerve (22).

If the studies cited above provide information sufficient to explain the mechanism of acupuncture effects on treatment of substance abuse, clearly more clinical studies are needed in order to verify the merit of this approach. Peng et al. (23) reported preliminary

findings of a study on smoking cessation with the use of acupuncture. In this study, 13 of 20 patients (65%) completely stopped smoking after one or two treatments. Mean carboxyhemoglobin (CO Hg) levels among the smokers was 4.78%, which decreased to 1.22% three months later after smoking cessation. Mean CO Hg level of non-smoking volunteers was 1%. These results were unique and reproducible. The clinical significance of CO Hg level was also described in this article.

With regard to selection of acupuncture points, Li et al. (24) reported that there were no obvious differences between valid ear acupoints and non-valid ear acupoints ($p < 0.05$). Accordingly, Peng et al. chose random points near the conchae of the ears, instead of the traditionally designated auricular points.

Additional studies of this type should be encouraged and conducted by teams of trained personnel under institutional support. The use of retention technique devices, e.g., ear staples, retention needles, and beans should be avoided, since several incidents of auricular chondritis have been reported.

In summary, the use of acupuncture for the treatment of substance abuse as well as for smoking cessation has opened new horizons for acupuncture. However, to clarify the safety and effectiveness of these procedures, more controlled scientific studies are necessary.