Physiologic Basis of Acupuncture

by D.E. Kendall, OMD, PhD

A rational and consistent approach to the clinical application of needling therapy is better achieved if one has an understanding of the physiological basis of the underlying Chinese medical theory.

It was the genius of ancient Chinese physicians that organized the human body in terms of longitudinal systems involving the distribution of blood vessels, muscles, and related nerves, as well as their somato-visceral relationships. They described these anatomical body areas in terms of yin and yang much like the Western physicians did using adjectives such as medial, lateral, external, and internal.

The circulation of blood in the body via the cardiovascular system to the superficial regions and internal organs, like a ring without end, is perhaps the most fundamental physiological discovery of the Chinese. Even more impressive is their discovery that collaterals (luomai) of the longitudinal distribution vessels (jingmai) formed dense concentrations of fine vessels (sunmai) in the superficial regions which they called nodes, or critical junctures.

The ancients figured out that these nodes (called acupoints in the west) could be stimulated by various means, including needling, to bring about restorative reactions. These almost miraculous responses could be directed to influence the internal organs, muscular distributions, immune system, vitality and endocrine glands, and physiological balance (homeostasis) to treat pain and every disease and disorder affecting the human population. In describing their understanding of these nodal relationships of the body, the Chinese unknowingly discovered how the brain, spinal cord, and neural processes were organized. By the 17th century (CE), the Chinese had created machines to demonstrate how blood continuously circulates throughout the body along with the fact that nerves were involved (1).

Vascular and Neural Participation

Present research into the role of the spinal afferent processing and propriospinal neural systems in needle-stimulated reactions and somatovisceral relationships now provides a physiological explanation of how superficial needling brings about beneficial and restorative processes. Initiating and sustaining these reactions require participation of both vascular and neural components at the site of needle insertion (2,3). These needling sites are best described as neurovascular nodes since needling responses cannot be produced and sustained without participation of both vessels and nerves that supply these locations. Furthermore, many indications for nodal sites display somatotopically organized somatovisceral relationships. In other words, indications for most nodal sites are mostly related to the spinal level where their local afferent fibers distribute and integrate with visceral afferents at the same spinal cord segment.

Response to Needling

The critical feature of neurovascular nodes is the synergistic way the vascular and neural components interact (2,3). Needle insertion micro trauma causes production of bradykinin via blood coagulation tissue reactions. These reactions stimulate the substance P-containing afferent A\(\delta\) nociceptive fibers which activate local, spinal, and brainstem restorative processes. The initial needling response is sustained by an axon reflex of the A\(\delta\) fibers releasing substance P directly on the capillary bed associated with the tissue affected by the inserted needle. The tissue reaction also produces immune complement C3 which activates the immune complement system alternative pathway, causing degranulation of mast cells in the local tissue and their basophil plasma counterparts. The basophils are attracted to the site affected by the needle micro trauma.

The kinin protease produced in these reactions serves to stimulate the tissue response to preferentially produce more bradykinin, which further sustains the initial activation of the A\(\delta\) fibers. The local vascular structures also participate in the needling reaction processes by enhancing outflow of immune cells that participate in the initial reaction as well as in the restorative processes. If the A\(\delta\) nociceptive fibers are inhibited, the needling reaction cannot be sustained. The somatic A\(\delta\) afferent fibers converge with visceral afferents in the spinal dorsal horn to form somatovisceral connections and also stimulate the spinal afferent processing system. This results in descending control signals from the brainstem back down to the same spinal cord level that initiated the afferent signals.

Needling also activates the proprioceptive group II static load muscle spindle fibers that bring the propriospinal system into play. When threshold conditions permit, the patient may feel a propagation sensation (PS) of an electrical-type nature along the nodal pathway represented by an organ-related distribution vessel (jingmai). This PS travels from node to node and seems to follow along the line resulting from connecting the nodal locations along any one distribution vessel (jingmai). Most individuals can feel the PS over one or two nodes, while the rare sensitive responders can feel the signal traverse along the entire nodal pathway and many collateral branches. The propriospinal system is activated by needling even when the subject does not subjectively feel the PS.

Directing Descending Control

The primary purpose of the PS signal is to activate many reflex responses, which can be remote to the needling site, mainly involving the muscular system. The other role of PS is to direct the descending control signals, from the brainstem via the dorsolateral funiculus of the cord, to the correct spinal segmental levels to provide restorative effect. Descending control signals to the spinal cord results in: inhibition of nociceptive fibers (pain signals), restoration of blood flow and vascular tone in the periphery and in the viscera, relaxation of residual muscular tension (antispasmodic feature), restoration of visceral homeostasis, and control features of tissues responses to needling that enhances immune responses and promotes tissue healing.
Clinical Applications

A fundamental understanding of the needle mechanisms allows the practitioner to better understand subtle aspects of needling therapy such as needle retention time, methods of needle stimulation, and selection of nodes to achieve the best clinical outcomes. This physiological information provides a rational and justifiable basis for selecting local and adjacent, distal, and proximal nodes in formulating a treatment protocol for any condition that may present in the clinical setting. This approach helps the practitioner to direct restorative descending control to a specific area of the body, as well as promote the needed overall response, to best treat the patient.


D.E. Kendall, OMD, PhD, LAc, has devoted extensive time to understanding the mechanisms of needling and has developed the effective use of electroacupuncture for treating a wide range of problems. Deke, the author of The Dao of Chinese Medicine, provides a clear scientific explanation of Chinese medical theory. Deke will be presenting “Physiologic Basis of Acupuncture” at the CSOMA Expo North on Friday, September 17, from 9:00 to 12:30.

Look and Readability

This book wins on all accounts in readability, organization, and layout. The authors chose simpler TCM terminology style—using gao lin or cloudy dysuria, for example—over the cumbersome style (“unctuous strangury”) used by Wiseman & Feng adherents. Hats off to co-author Laraine Crampton’s contribution for making the text so readable.

My only criticism is with graphic choices that make CMHP look more like a consumer-targeted pamphlet, such as the cliché papyrus type-face that is so common in TCM literature. If the Chens want to speak to students and practitioners of both TCM and Western sciences, they should emulate the graphic choices of books that aim higher in terms of the educational standards of their readership.

After using Chinese Medical Herbology and Pharmacology for a few months while preparing this review, I find that I’m still consulting it as a daily reference. For this reason alone, I believe that CMHP will become an important brick on the bridge between east and west.

For a more complete review on CHMP, please see the book review forum at www.gancao.net.

Chinese Medical Herbology and Pharmacology (1327 pages) can be purchased for $89.95 through Art of Medicine Press, Inc. at www.aompress.com or www.redwingbooks.com.