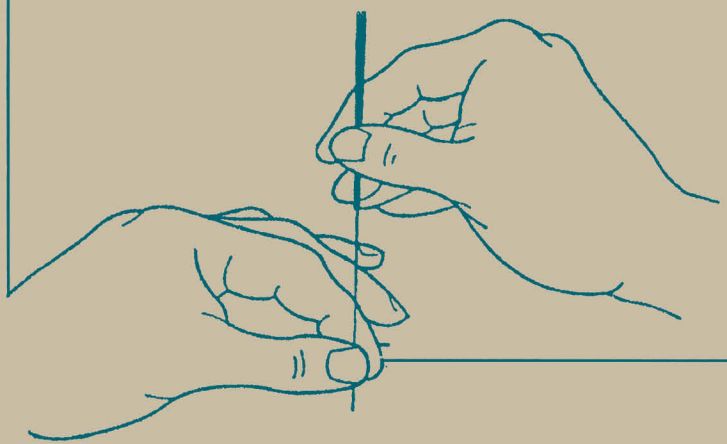
Acupuncture Treatment for Musculoskeletal Pain

A Textbook for Orthopaedics, Anesthesia, and Rehabilitation

Harris Gellman, MD



CRC Press
Taylor & Francis Group

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CRC Press
Taylor & Francis Group
Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business

CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

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I thank my wife for her support and patience without which I could not have completed this book; To my children, I thank them for their unconditional love; To my mentors and teachers, I thank them for their friendship and the stimulation to seek knowledge; and to the contributors, I thank them for the willingness to share their knowledge and give of their time to make this an outstanding work.

CONTENTS

PREFACE

In today's changing medical environment, physicians are being called upon to provide more comprehensive care—by patients as well as their insurance carriers. Patients expect more from us as physicians in our ability to manage both acute and chronic pain. Many of our patients are becoming aware of such treatment alternatives as acupuncture, homeopathy, and Chinese herbal medicine, and expect that we, as physicians, should also have an understanding of these techniques. Until recently, many physicians have ignored the techniques used in China for thousands of years to treat pain and other maladies, however, many United States medical schools now include courses in acupuncture and alternative medicine in their curricula.

I personally have been interested for many years in the use of alternative methods to treat patients who have been treatment failures, in an attempt to achieve at least some measure of improvement. Many of these patients have valid complaints of pain. The inability to cure or even improve these complaints has led to a search for a way to help. We, as western trained physicians, tend to focus on specific complaints that we can rapidly identify and treat, ignoring the ones we feel are unrelated. Eastern philosophy is much different. The relationships between the organ systems are well recognized, allowing seemingly unrelated sets of complaints to be identified as a weakness or overactivity of energy within a single organ system or group of organ systems.

Western physicians are traditionally taught that the body's physiologic functions are mediated by hormones, polypeptides, and neurotransmitters that are released and transported through the blood. The Chinese, or eastern, philosophy of medicine and healing is based on the body's energy or *Chi*. This system or paradigm of medicine is different than ours, but in many ways, just as valid. To understand and use acupuncture for the treatment of disease and pain, one must accept some of the basic philosophies of Chinese medicine.

Traditionally, western trained physicians initially have trouble understanding the concept of chi or energy flow. Interestingly, these same physicians have no trouble understanding the ability to measure the electrical energy of the heart using EKG monitoring, or the brain with an EEG. The use of electricity to augment fracture healing when a non-union or delayed-union is present has become an accepted technique. A natural extension of this is the understanding that all of the body's organs are surrounded by an electric field, which we are capable of measuring, should we so choose. Extending these concepts to include the concept of chi, we realize that, not only is there an electric field that surrounds the body, but also one that flows within the body. These energy fields flowing within the

body move through meridians or channels. This is a very basic explanation of the concept of chi. The energy within and around each organ system can affect other organs and organ systems. The organ systems are related to each other by radiant energy fields very similar to the harmonics of radio waves.

Blockage of energy flow results in disease and pain. Unblocking the flow of energy helps to cure disease and alleviate pain. This is one area where the western and eastern medical systems differ. We have been taught that to cure disease and alleviate pain medications with measurable pharmacological levels must be used. Although we are not yet able to fully measure the effect of acupuncture in stimulating the neuro-endocrine system the effect is readily apparent in the patient's response. Studies have shown that neurotransmitters and endorphins are released during electrical stimulation of acupuncture needles.

While practicing hand surgery in Southern California, I have had the opportunity to observe and interact with many practitioners of acupuncture and Chinese medicine. During this time I saw dramatic improvement in some of my patients with refractory pain after receiving acupuncture treatments. This improvement renewed my interest in other methods available to use when treating these patients. This book is written in an attempt to impart some of this information, in the hope that it will be useful in patient care. The purpose of this text is not to draw anyone away from their present treatment regimens, but to add to the armamentarium of available techniques for patient care. As you read this text, you will progress on a journey through healing in a way which will serve as a useful adjunct to the procedures and medications currently in use.

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PART I

BASICS OF ACUPUNCTURE

1

INTRODUCTION TO ACUPUNCTURE AND CHINESE MEDICINE

Harris Gellman, M.D.

The Chinese system of medicine uses a different paradigm than that of western medicine. Although eastern and western systems of medicine may seem diametrically opposed, they *can* be used together to complement each other and provide a more complete treatment program for the patient.

Traditional Chinese medicine recognizes that the body is divided by a series of meridians or channels into an orderly network. These lines form a longitudinal course around the body. This complex system of channels and their connecting vessels act as the distribution system that carries *Chi* (energy), blood, and the body fluids around the body. One must not be tempted to think of the meridians or channels in the same way in which we think of blood vessels because conventional anatomy and physiology would not be able to identify these pathways in the same physical sense.

The origins of acupuncture are impossible to define because they lie in periods before recorded history. The acupuncture channels and their corresponding points were described as early as 200 BC in the classic ancient work on acupuncture, the *Huang Di Nei Jing*. The channels (meridians) were compared to the great rivers in China, extending to all parts of the country, keeping it alive by providing the essential water and nutrients.

According to traditional concepts, Chi is the dynamic vital energy present in all living things which flows through these channels, regulating the body's functions. These channels connect the interior of the body with the exterior. This interlacing network of meridians is the essence of traditional acupuncture. A basic principle of acupuncture is that by stimulating points on the surface of the body, an effect occurs that is transmitted through the meridians and ultimately into the interior of the body. Therefore, by utilizing the external or surface acupuncture points, it is possible to exert a direct therapeutic effect on the channels and organs, and thus the body's internal functions. Chi has five major functions in the body. Movement, including involuntary movements and activities like thinking and dreaming; protection of the body from pathological

and environmental agents; transformation of food into blood and urine; governing retention of the body's substance by holding organs in their proper place; and lastly, warming the body.

Chinese medicine sees all illness as a process of energetic disharmony. Modern western medicine tends to be divisive, looking at individual body parts and functions without always considering their relation to the body as a whole. Chinese medicine works in a circular way, believing that there are many factors that create a pattern of imbalance, disharmony or disease. The heart of Chinese medicine lies in recognizing these patterns of disease. Acupuncture tries to reestablish this harmony, stimulating the body's own natural healing ability.

THE ORGANS

The concept of organs in Chinese medicine is quite different from that of traditional western medicine. Understanding this difference is very important because the pathophysiology and pathology of the organs is fundamental to the understanding and treatment of disease. The salient characteristic of the Chinese concept of the organs is the lack of emphasis on the physical structure. Although many of the terms for the organs are similar to their western counterparts, they do not refer to the specific tissue, but to concepts which are complexes of closely interrelated groups of functions. These functions, which are described in traditional texts, are not based on surgical correlates, but on clinical observation of patients over many hundreds of years.

There are 11 organs: six hollow or *Fu* organs that are considered *yang*. These include the large intestine, small intestine, gallbladder, stomach, urinary bladder and Sanjiao. The remaining five *Zang* organs are solid and considered to be *yin*. These include the lung, heart, pericardium, spleen, kidney, and liver. Although heart and pericardium are considered as part of a single functional system, they lie on separate channels. One yin and one yang organ form a single functional unit. The functional units run parallel to each other in the limbs.

The treatment itself consists of stimulating acupuncture points with needles (acupuncture), pressure (acupressure), electricity (electroacupuncture) or heat (moxibustion).[1] The acupuncture points are regions containing a rich supply of nerve endings.[2] Dung[3–6] pointed out that about one third of the points coincide with the motor end points of the underlying muscle. Bossy[7] described the anatomical features of acupoints, while Rosenblatt[8]showed lower electrodermal resistance at acupuncture points, which is the basis of all acupoint locating devices. Zhu[9],in 1984, showed that during electrical excitement of one distant acupuncture point, the entire connected channel demonstrated low impedance. In 1984, DeVernejoul et al.[10] demonstrated that radioactive tracers would migrate along the meridians after being injected into an acupuncture point. This work was challenged however, by Lazorthes et al.[11] Darras et al.[12] produced further evidence of the tracer migration along the meridians in 1992. Heine[13] described anatomical features of the two central meridians, the Ren Mai and the Du Mai, claiming his findings could explain the control and coordination function of these two meridians as described in TCM (traditional Chinese medicine) (Table 1.1).

Table 1.1. Basic Meridian Theory

The Twelve Principle Meridians			
Principle Meridian	Yin/Yang	Location	Coupled Pair
LUNG	YIN	ARM	Tai Yin
LARGE INTESTINE	YANG	ARM	Yang Ming
STOMACH	YANG	LEG	Yang Ming
SPLEEN	YIN	LEG	Tai Yin
HEART	YIN	ARM	Shao Yin
SMALL INTESTINE	YANG	ARM	Tai Yang
URINARY BLADDER	YANG	LEG	Tai Yang
KIDNEY	YIN	LEG	Shao Yin
PERICARDIUM	YIN	ARM	Jue Yin
SANJIAO	YANG	ARM	Shao Yang
GALLBLADDER	YANG	LEG	Shao Yang
LIVER	YIN	LEG	Jue yin

Lung

The lungs are yin organs. Their main meridian is the lung meridian of the hand (Tai Yin).

Large Intestine

The large intestine is yang meridian. Its main meridian is the large intestine meridian of the hand (Yang Ming).

Stomach

The stomach is a yang organ. Its main meridian is the stomach meridian of the foot (Yang Ming).

Spleen

The spleen is a yin organ. Its main meridian is the spleen meridian of the foot (Tai Yin).

Heart

The heart is a yin organ. Its main meridian is the heart meridian of the hand (Shao Yin).

Small Intestine

The small intestine is a yang organ. Its main meridian is the small intestine meridian of the hand (Tai Yang).

Urinary Bladder

The bladder is a yang organ. Its main meridian is the bladder meridian of the foot (Tai Yang).

Kidney

The kidney is a yin organ. The main meridian is the kidney meridian of the foot (Shao Yin).

Pericardium

While the pericardium is not considered an organ in the true sense, it is classified as yin in character. Its main meridian is the pericardium meridian of the hand (Jue Yin).

Sanjiao (Triple Heater)

The triple heater meridian is considered a yang meridian. Its main meridian is the triple heater meridian of the hand (Shao Yang).

Gallbladder

The gallbladder is a yang organ. Its main meridian is the gallbladder meridian of the foot (Shao Yang).

Liver

The liver is a yin organ. Its main meridian is the liver meridian of the foot (Jue yin).

There are eight additional meridians known as the *extraordinary* meridians. Two of these are of particular importance: The first is the **"Du-Mai"** also known as the **"Governor Vessel"** (see Fig. 4.16), runs along the midline of the back. The du channel is not linked to any particular organ, but it has a controlling or "governing" influence on all the other yang channels and is closely related to the central nervous system. The Du Mai has significant influences on the functions of the central nervous system. Du in Chinese means "the governor".

The second is the **"Ren-Mai"** also known by the names **"Jenn Mo"** or **"Conception Vessel"** (see Fig. 4.17). It which runs along the midline on the ventral surface or front of the body. The ren channel is not linked to any definite internal organ. It has however a controlling influence over all the yin channels and the anteriorly situated alarm points of certain internal organs. The Ren Mai influences the genital organs, hence the name Conception Vessel.

Modern practice is to classify these two channels with the 12 paired channels to make up fourteen channels. These 12 coupled "main" meridians and the two "extraordinary" meridians (Ren Mai and Du Mai) make up the system of 14 meridians on which the 361 classical acupuncture points are located.

Extra Points

These are additional points, found after the categorization of the 361 classic acupuncture points, which are not on the principle or extra meridians, but are of importance because of their specific actions.

MUSCULOSKELETAL PATHOLOGY AS RELATED TO MERIDIANS AND THE ORGAN SYSTEMS

Tendons

Liver yang energy sends liver blood to nourish and support **tendons and muscle functions**. The liver is on the Jue Yin meridian. Strong healthy muscles, which are supple in movement, are an indication of good liver (and spleen) blood and Qi (energy). **Muscular spasm, tremor or numbness of the limbs**, and other signs of tendon malnutrition point to insufficient liver blood and an imbalance of liver yang energy.

Nails: The ancient philosophers considered the nails to be extensions of the tendons. When the **liver blood** is healthy, the nails are strong and pink; a decrease in blood and energy is reflected in soft pale nails. Brittle nails are often a reflection of liver disease.

Muscles

Spleen energy and muscle health are closely related. Deficient spleen energy reduces muscle tone and results in **weakness and muscle wasting** of the extremities. The spleen is on the Tai Yin meridian.

Lumbar Back Pain

This is due to a deficiency of **kidney** energy, while **heel pain, leg pain, and knee pain** are due to a deficiency of **kidney** yin. The kidney is on the Shao Yin meridian.

Hair

Good growth and richness of color are indications of strong **kidney** energy. As kidney energy weakens, the hair falls out.

Growth and Development

Kidney energy is responsible for controlling growth, development and reproduction. Kidney energy nurtures the **growth and development of the bones** and marrow, and when necessary, aids in their repair.

2

THE NEUROPHYSIOLOGIC BASIS OF ACUPUNCTURE

May C. M. Pian-Smith, MD, Lang Ha T. Pham, MD and Francis W. K. Smith, Jr., DVM

In many Western cultures, any positive effects of acupuncture therapy were often attributed to the placebo effect or hypnosis, despite the fact that a placebo effect could not account for the successful use of acupuncture for veterinary medicine for over a thousand years in China. In traditional Chinese medicine, acupuncture therapy is thought to cure diseases by balancing energy within the meridians through stimulation of specific acupuncture points, but "Scientific" interest in acupuncture began in the 1950s, under the Chairman Mao's direction. After 1972, in the setting of improved diplomatic relations between China and the Western world, reports from China indicated that acupuncture could produce a surgical plane of analgesia. Since then, a great deal of research has been performed on both hemispheres to elucidate the mechanisms of acupuncture analgesia. This chapter reviews the research, which has focused on the relationship between the acupuncture point and the neuroendocrine system and its role in pain control. Also describes culture studies that have explored acupuncture points and meridians as vessels for transport of bioelectric energy.

THE PAIN PATHWAY

To understand many of the theories of acupuncture requires an understanding of the central nervous system (CNS), especially as it relates to the transmission, perception and inhibition of pain. Pain results from a noxious stimulus applied to pain receptors in the skin or in musculoskeletal or visceral structures. Pain receptors are free nerve endings that transmit information regarding mechanical, chemical or thermal stimuli.

The neurons that transmit pain impulses are components of the sensory nervous system and are referred to as A-delta and C-fibers. A-delta fibers are thin and poorly myelinated. C-fibers are one-tenth the diameter of A-delta fibers, are unmyelinated, and transmit impulses ten times more slowly than A-delta fibers.[14]

C-fibers have a higher threshold for stimulation and transmit a more unpleasant pain sensation.[14]

A-alpha sensory neurons located in the muscles and joints are important for proprioception. A-beta sensory neurons are mechanoreceptors involved in perceptions of light touch and the bending of hairs. A-alpha and beta sensory neurons transmit sensory information much faster than A-delta or C-fibers. They are not involved in pain transmission but may play a role in some mechanisms of acupuncture.

Stimulation of A-delta and C-fibers results in propagation of a nerve impulse along the peripheral nerve corresponding to the spinal cord (Fig. 2.1).[15] Somatic and visceral sensory neurons enter the dorsolateral funiculus and Lissauer's tract, from which impulses can be transmitted to several spinal segments cranial and caudal to the point of entry.[16] Sensory neurons then synapse on projection neurons and inhibitory and excitatory interneurons in the substantia gelatinosa of the dorsal horn gray matter. Excitatory interneurons probably release glutamate or substance P, whereas inhibitory interneurons contain endorphins.[14]

In primates, the projection neuron travels in the contralateral spinothalamic tract in the ventrolateral funiculus. The location of the spinothalamic tract and the degree of

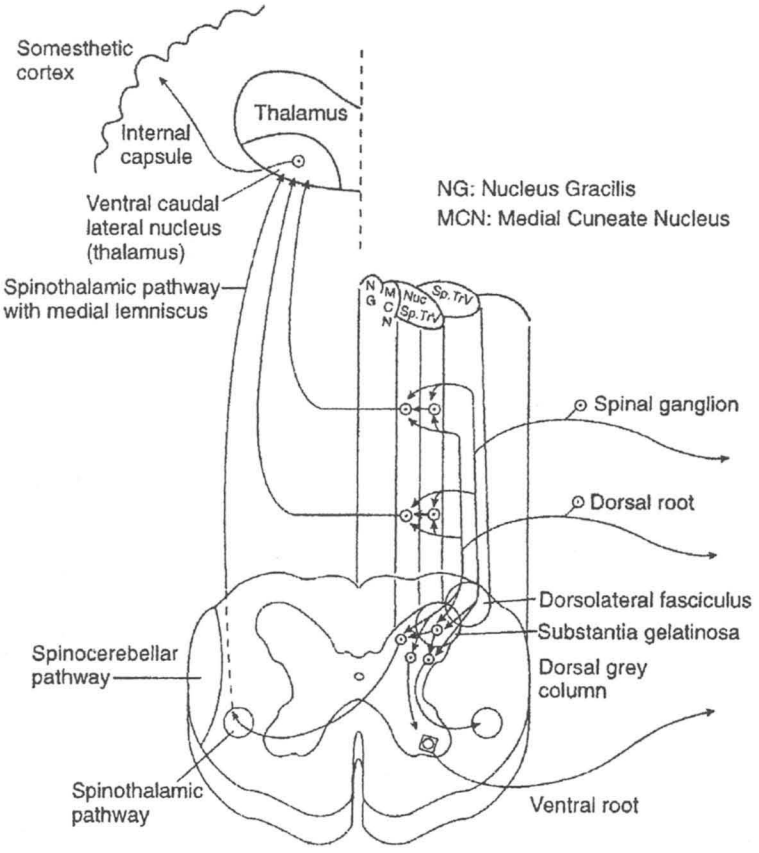

Figure 2.1 Ascending pain pathway[15] (Courtesy of W. B. Saunders.)

crossing vary among species.[15] Unlike primates, most other animals have a diffuse, bilateral, and multisynaptic pathway for conduction of pain impulses to the brain.[15] These interspecies variations in anatomy could account for some of the conflicting results of studies that use spinal cord lesions to study acupuncture analgesia.

The spinothalamic tract consists of several tracts that project to different higher brain centers (reticular formation, periaqueductal gray matter, thalamus, limbic system, somatosensory cortex).[14] Pain perception is believed to occur at the thalamic and cortical levels.[17]

Endorphins

Transmission of information within the nervous system is modulated by neurotransmitters. Though many neurotransmitters (endorphins, serotonin, norepinephrine, acetylcholine) are involved in pain transmission and inhibition, endorphins inhibit pain and have been implicated as a cause of the analgesia and some of the systemic effects induced by acupuncture.

There are at least eighteen endogenous peptides with opiate-like activity, commonly referred to as endorphins.[14] They are derived from three precursor molecules. Proopiomelanocortin is the precursor for *B*-endorphin and adrenocorticotrophic hormone (ACTH). Proenkephalin is the precursor for met-enkephalin and leu-enkephalin. Prodynorphin is the precursor for dynorphin and related peptides.[14]

B-endorphin and the enkephalins differ in many respects. *B*-endorphin is a larger polypeptide containing thirty amino acids, as compared with enkephalins, which contain only five.[18] *B*-endorphin is 10–100 times more potent than morphine, while the enkephalins have less than 1% of the potency of morphine.[18] The rate of degradation also differs significantly. *B*-endorphin circulates for several hours, whereas the enkephalins are degraded in seconds to minutes.[19]

B-endorphin is found in the pituitary gland and brain.[18] In the pituitary gland, highest concentrations occur in the pars intermedia, lower concentrations occur in the adenohypophysis, and none is present in the neurohypophysis.[20] In the brain, *B*-endorphin is found in the arcuate nucleus of the hypothalamus, from which long nerve tracts innervate the midbrain and limbic structures.[7]

Enkephalins

Enkephalins are not found in the pituitary gland. In the brain, they have a multifocal distribution among local cells with short nerve tracts emanating from them.[18] Enkephalins are found in highest concentrations along pain pathways. The areas include the periaqueductal gray matter, periventricular gray matter, nucleus raphe magnum, nucleus reticularis gigantocellularis, nucleus caudalis, and substantia gelatinosa in the spine.[19] Dynorphin is found in interneurons in the spinal cord.[21]

Neurotransmitter Receptors

There are several types of endorphins, and there are several types of endorphin receptors.[22] The endorphins vary in their afffinity for the different receptors. The effects of naloxone (a morphine antagonist) also vary with the receptor type involved. For example, it takes 10 times more naloxone to reverse the effects of