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## Acupuncture as a Treatment Modality for Low Back Pain

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### Brief Report

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## INTRODUCTION

Low-back pain is a common disabling disorder associated with great economic burden due to absence from work and medical expenses worldwide [1]. Most cases of acute low back pain resolve within weeks with conservative treatment [2], but recurrences of pain are common, seen nearly on 70% of patients [3,4] and up to 7% of patients develop pain that lasts more than 6 weeks [5].

The role of non-steroidal anti-inflammatory drugs (NSAIDs) in the early management of acute low back pain is well established, providing sufficient short-term symptomatic relief [6,7]. However, in several randomized controlled trials acupuncture has been found to be significantly more effective for the treatment of low back pain when compared to conventional therapy for up to 6 months [8-11].

Acupuncture, one of the most ancient therapeutic techniques used on the planet, utilizes special needles that are placed in superficial or deep body tissues or in specially selected sensitive or painful skin areas, in order to treat functional, reversible disorders, syndromes or symptoms. Acupuncture has been extensively used to treat low back pain and it is estimated that 2% of adults in the UK use it each year for a variety of conditions including back pain [12].

## MECHANISMS OF ACTION

Acupuncture has grown in popularity among alternative therapies over the last decades. Its effectiveness has motivated many researchers into investigating possible mechanisms of action. Various hypotheses based on animal and human studies can explain the analgesic effects of acupuncture. These effects are complex and depend on the interaction of neurochemical, physiologic and psychologic factors [13]. Positron emission tomography (PET) studies have shown that binding of  $\mu$  opioids to brain receptors is increased after several days of acupuncture [14] and functional magnetic resonance imaging (fMRI) demonstrates activation of the basal anterior brain, limbic system and other areas of the brain responsible for somatosensory functions [15]. Recently, studies all around the world, based on modern Neurophysiology, have shown that acupuncture can cause inhibition of pain by at least three mechanisms:

### Gate control theory

Pain is a sensory stimulus and hence transmitted from the periphery to the central nervous system through three successive neurons (first-, second- and third-order sensory neurons). According to the gate control theory each neuron in the synapses acts like a station, a passage gate through which the stimulus can either pass or not, if several factors impede its transmission [16]. Acupuncture can be one of these factors. Acupuncture points are rich in A $\beta$  nerve fibers (thick myelinated and fast) which are responsible for transmitting touch and pressure sensation. At the same time they are poor in A $\delta$  and C nerve fibers (thinner, slower

and A $\delta$ : myelinated, C: unmyelinated) which are responsible for transmitting pain sensation. Specifically, A $\delta$  fibers are responsible for the acute localized pain, while C fibers transmit diffuse, blunt pain. When a needle is inserted at an acupuncture point, it stimulates all free nerve endings. But, since A $\beta$  nerve fibers of pressure and touch are faster, they conduct the stimulus to the first-order sensory neuron 20-50 times faster. So, when the pain stimulus, conducted through the slower A $\delta$  and C fibers, reaches the same sensory neuron with some slight delay, it finds the synapse "occupied". In other words, it finds the gate closed and thus, the transmission of the stimulus to the postsynaptic fibers, and hence to the thalamus and cortex, is suspended and pain sensation cannot be perceived by the brain [16].

### **Hormonal theory**

Specific receptors of both exogenous and endogenous (produced naturally inside the body) analgesic substances are located over the entire nervous system [17]. These substances are polypeptides, endorphins ( $\alpha$ ,  $\beta$ ,  $\gamma$ ), methionine-enkephalin, leucine-enkephalin and dynorphins [13]. Acupuncture causes a quantitative change in these substances but also in neurotransmitters: dopamine, serotonin, ACTH etc. The analgesic effect of these endogenous substances is several fold more potent than morphine's and, particularly 200 times regarding endorphins and more than 400 times stronger regarding dynorphins [13].

### **Reflex arc theory**

The basis of this theory is the "axial reflex arc ": periphery-CNS-periphery [18,19]. Pain signals are transmitted from the periphery through the dorsal sensory nerve fibers to the posterior horns of the spinal cord. There, they may follow two routes: a) reach the thalamus and sensory cortex through afferent nerve fibers or b) be transmitted from the dorsal to the ventral horn of the spinal cord and then, through the centrifugal ventral motor roots, to various organs, muscles, skin, blood vessels, glands, etc., which are innervated by the same or adjacent neurotomes [18,19].

## **DISCUSSION**

The World Health Organization (WHO) and the American National Institutes of Health (NIH), based on a series of clinical trials designed with strict methodological criteria, have included low back pain in the list of indications of acupuncture, which has also been accepted by IASP (International Association for the Study of Pain)[20,21].

Acupuncture is particularly effective for the treatment of low back pain (among other painful disorders) either combined with medication or not [22]. It is usually effective even in cases that medication cannot bring the desired analgesic results and also helps in reducing medication dosage, since it has a long duration of action (months or even years). Acupuncture is a safe, painless and cost-effective treatment modality for low back pain that can be applied to all ages with an extremely low probability of adverse events. Thus, it should be a part of the armamentarium of each physician treating patients with low back pain.

## **CONFLICT OF INTERESTS**

None

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