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# Application and Effect of Acupuncture and Moxibustion for Analgesia in Perioperative Period of Total Knee Arthroplasty

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## 1. Introduction

As patients going to take total knee arthroplasty(TKA) lying in bed for a long time, eating less, bowel movements Slowing down, then influencing defecation.And they will come up with tension and fearness.At the same time, their lifestyle is changing. Epidemiological survey of constipation displaying: tension, anxiety and depression are the dangerous factors of constipation. Eating less, Diet low in fiber content are easily leading to constipation. In addition, lots of patients aren't used to defecate in bed for a long time, which will also making the defecation difficult. While constipation may cause whole body and partial illness, we should pay more attention to it.

Total knee replacement surgery has become the ultimate effective treatment for the disease. However, this surgical method is associated with severe postoperative pain, including severe pain 60%, 30% moderate pain, not only to patients with pain, but also to varying degrees, affect the circulatory, respiratory, digestive, endocrine, immune and other function of each system that may lead to various postoperative complications, serious impact on early postoperative functional rehabilitation and treatment. Postoperative pain not due to early exercise, active physical therapy, so prone to deep vein thrombosis, pulmonary embolism, infection and other complications. Patients within the environment can also lead to disorder, anxiety is not conducive to sleep and rest, short-term deterioration in the quality of life of patients. Severe pain due to joint dysfunction caused by anxiety, depression, most patients need a year of health care in order to get the final improveing. Almost all patients are expected to be their smallest incision, postoperative pain and satisfaction with the lightest of functional recovery. Therefore, adequate postoperative analgesia, especially for sports is not just pain relief, but also to help patients get out of bed early, active physical therapy, as much as possible to restore knee activity and the prevention of deep vein thrombosis formation and other complications. In addition, effective postoperative analgesia reduces stress response, so that patients in a stable environment, and reduce patient anxiety, sleep and rest help to improve the quality of life in patients with short-term..

Early postoperative pain caused by stress response, significantly increased the secretion of stress-quality alcohol, so that myocardial contractility, heart rate, cardiac output increased, liver and kidney blood vessels and gastrointestinal vasoconstriction, myocardial oxygen consumption significantly increase induced myocardial oxygen supply/oxygen ratio

disorders, but also make the body insulin sensitivity, glucose uptake and utilization of energy for the oxidation of reduced capacity. These will affect the perioperative and postoperative quality of life of patients recovered as soon as possible. Therefore, postoperative pain and reduce the body's stress response, the promotion of early postoperative recovery has a positive effect.

## **2. Mechanism of acupuncture analgesia in the perioperative period of total knee arthroplasty**

The current total knee arthroplasty analgesia strategies, mainly compound of preemptive analgesia and multimodal analgesia. Postoperative analgesia with epidural administration, intravenous, intra-articular administration, local continuous joint cryotherapy, oral drug therapy. Today, we discuss mainly the total knee replacement surgery perioperative analgesic mechanism of acupuncture, as follows:

### **2.1 Nerve**

#### **2.1.1 Central mechanism**

Signal is acupuncture acupuncture analgesia and pain signals in the central nervous system interactions, processing and integration of the results. Studies have shown that the central nervous system from spinal cord to the cerebral cortex at all levels are involved in this interaction. Acupuncture analgesia is a multi-channel, multi-level synthesis process. Spinal cord of the central segment of the downstream modulation and high modulation is the main mechanism of acupuncture analgesia.

**2.1.1.1** Spinal cord injury is acupuncture signal and primary signal integration hub. Acupuncture both hyperalgesia induced by dorsal horn neurons produce inhibitory postsynaptic potentials (IPSP), but also caused depolarization of the spinal cord and peripheral transmission occurs presynaptic inhibition. Therefore, the level of acupuncture in the spinal cord can produce analgesia, the mechanism involves both presynaptic inhibition, postsynaptic inhibition is also involved.

**2.1.1.2** The structure of the spinal cord above the mechanism of acupuncture analgesia in the spinal cord above the central thalamic structures including nuclear-forebrain loop-the loop parafascicular nucleus, the brain-the edge of pain loop, descending inhibitory system under the central nucleus and thalamus-ventrolateral orbital cortex-in the periaqueductal gray pathway. ① central thalamus in the nucleus-forebrain loop-the loop parafascicular nucleus: acupuncture causes the central nuclear signals resulting from the impulse may be excited by forebrain circuits (caudate nucleus, pillow core, cortex and thalamic reticular nucleus) to reach the parafascicular nucleus, activity of pain-sensitive neurons produce inhibitory modulation. ② in the brain-the edge of pain loop: the limbic system in the midbrain periaqueductal gray (PAG), nucleus accumbens, amygdala and habenula, these neural pathways between nuclei with each other to form a circular path. The loop to 5-HT and enkephalin as neurotransmitters. Acupuncture to the releasing of brain 5-HT and enkephalin, promote analgesic effects loop rotation. ③ descending inhibitory system: Acupuncture information can be passed from brain PAG nucleus raphe magnus (NRM) to reach the spinal cord or trigeminal plexus, the information produced inhibition of pain modulation. (Liu Xiang, 1996) The following line suppression system, the main initiation site, the medullary NRM neurons, and one of the seam - spinal neurons as an indicator of unit discharge was observed acupoint electric stimulation PAG, nucleus accumbens and

caudate nucleus can activate NRM neurons inhibition of spontaneous discharge and damage response; and electrolysis damage to these brain areas are able to block the analgesic effect of EA. Prompt the activation of descending inhibitory systems in play a major role in acupuncture analgesia. ④under the central thalamic nucleus - ventral lateral orbital cortex - in the periaqueductal gray matter: Teachers (Tang, Jing-shi & Yuanbing, 2002) research group studies have shown that the hypothalamus under the central nucleus (Sm)-ventrolateral orbital cortex (VLO)-PAG is not only a central feeling pain, but also constitute an important in pain modulation negative feedback loop, through the activation of the brainstem descending inhibitory system, the level of modulation in the spinal cord and trigeminal nociceptive transmission. The fine fiber loop in the excitement generated by acupuncture analgesia play an important role. Sm neurons they observed the response to acupuncture, as well as damage to Sm or VLO, or Sm injection of local anesthetic effect of acupuncture. The results show that acupuncture can activate neurons in rat Sm activity, these neurons respond to noxious mechanical stimulation was not found on non-noxious stimulation of neurons. Further studies have shown, bilateral electrolytic damage can be significantly reduced Sm or VLO strong electro-acupuncture (5.0 mA) on rat tail flick reflex inhibition, while the weak-pin (0.5mA) of the inhibitory effect no significant effect. Tip strong electro-acupuncture analgesia produced fine fibers excited by activation of Sm-VLO-PAG pathway. Sm microinjection in the local anesthetic lidocaine can significantly weaken the strong EA (5-6 mA) of the rat spinal dorsal horn nociceptive neurons in response to the inhibitory effect, while the weak-pin (1mA) had no effect on the effects of. The results for the Sm-VLO-PAG pathway involved in the fine fibers provides further proof of the analgesic.

### 2.1.2 Peripheral mechanisms

Peripheral nerve needle nerve signal transmission, the types of acupuncture by or to the types of fiber conduction problems, had long been in dispute. After a large number of experiments, now that: electric acupuncture(EA) of varying intensity, a different transmission fibers can be excited. Low-intensity electro-acupuncture (2 V) major excitatory I, II class and some III (A $\delta$ ) class crude fiber transmission through the integration of the role of pain in spinal cord segments to achieve analgesia, but also on the mechanism involved in the spinal cord, the analgesic effect showed limited of the specificity; and high-intensity electric acupuncture(EA) 18 V (over C fiber threshold, equivalent to noxious stimulation) is mainly excited III (A $\delta$ ), especially IV (C) class small transmission fibers, the spinal cord through the activation of negative feedback on the NRM pain adjustment mechanism to play a wide range of effects long after the analgesic effect of this analgesic effect without showing broad specificity. These facts prove that acupuncture is a noxious stimulus, transmission of C fibers in acupuncture analgesia play an important role. Capsaicin (Cap) effective selective damage to a descendant of C fibers, in recent years to use it in a sense of electric acupuncture(EA)-human transmission have done a lot of research. (Fangzong Ren, et al 1992 & Liu Xiang, et al, 1997) observed that after peripheral nerve with capsaicin treatment, significantly reduced the analgesic effect of EA, clear that the peripheral nerve C fibers are the main ingredients involved in acupuncture analgesia.( Xu Rong et al, 1993) will be a direct effect of capsaicin in the rat sciatic nerve, its pain threshold was significantly higher; electric acupuncture(EA) capsaicin treatment side of the "ring dance" of the analgesic effect, significantly lower than prior to treatment and control side effects Tip a capsaicin-sensitive C fiber transmission of information not only involved in pain transmission, but also involved in acupuncture analgesia an essential component of information transmission.

### 2.1.3 Neurotransmitters

Acupuncture analgesia by the brain to complete a number of neurotransmitters in the joint, and neurotransmitters in acupuncture analgesia mechanisms of acupuncture analgesia is the most extensive and deep areas.

**2.1.3.1** Endogenous opioid peptides (EOP) acupuncture is mainly dominated by activating the endogenous opioid peptides in pain modulation system and analgesic effects, so the EOP is an important material basis for acupuncture analgesia.

(Wang Hongbei et al, 1998) at different frequencies of electroacupuncture on acute adjuvant arthritis (AA) in rats with pain and tissue reaction of  $\beta$ -endorphin ( $\beta$ -EP) Content of the study, observed two 5 Hz and 100 Hz frequencies for the AA rats were significantly power analgesic effect, but also significantly increased the hypothalamic content of  $\beta$ -EP, the two frequency electroacupuncture analgesia are related to hypothalamic  $\beta$ -EP levels were significantly elevated positive correlation, but both the frequency and electro-acupuncture analgesia between elevated  $\beta$ -EP levels in the hypothalamus no significant difference in the role. (Chen et al, 2004) further found that acupuncture can promote  $\beta$ -EP precursor POMC original (POMC) mRNA expression increased to further enhance the  $\beta$ -EP levels to analgesic effect. This not only immediate effect of acupuncture analgesia, there are more significant after-effects,. (Wang Sheng Xu et al, 1999) studies have shown that acupuncture can Jiaji AA levels in rat spinal cord dorsal horn of the original before dynorphin (PPD) mRNA expression was significantly increased, suggesting that EA may activate the dynorphin system resistant to injury, the level of inflammation in the spinal cord and hyperalgesia is modulated. (Huang Yong, 2004)A method of acupuncture in the study satisfied leucine enkephalin on the AA effects in rabbits, and found that satisfied a method and routine acupuncture can significantly improve the AA rabbit serum in the hypothalamus and brain leucine enkephalin (LEK) level of analgesic effect. LEK for the regulation of serum, Na A is better than routine acupuncture

Acupuncture can not only promote the release of central EOP can also make local EOP inflammation increases the synthesis and release, to achieve peripheral analgesia. (Zhao chang huan & Zhou jun, 2002)positions AA rats in the study of electricity for local opioid peptide gene expression observed when the EA in the AA rats increased the pain threshold, but also promote inflammation in local immune cells POMC and preproenkephalin (PENK) mRNA expression increased, to achieve peripheral pain modulation. Inflammation in AA rats while local injection of  $\beta$ -EP and LEK antisera may antagonize the analgesic effect of electro-acupuncture, in which  $\beta$ -EP antiserum stronger effect, suggesting that  $\beta$ -EP and LEK are involved in EA's peripheral towns pain in the process (Yangjie Bin et al, 1999), different acupuncture on peripheral analgesic mechanism of AA rats in the study, using electro-acupuncture, moxibustion, Bloodletting and four methods of acupoint-injection can increase the pain threshold of AA rats to electro-acupuncture, point injection is excellent, its peripheral analgesic mechanism may promote inflammation in local analgesic substances by  $\beta$ -EP and LEK increased, causing physical pain prostaglandin E2 (PGE2), histamine, 5 - hydroxytryptamine (5-HT), norepinephrine (NE) reduction achieved.

**2.1.3.2** Monoamine neurotransmitter monoamine neurotransmitters are important bioactive substances in vivo, the relationship with acupuncture analgesia, the study is more 5-HT, NE and dopamine (DA). (Wang Sheng Xu et al, 1999) were observed in the EA Jiaji of AA in peripheral blood and the spinal cord content of monoamine neurotransmitters, studies show that: EA AA rats after the platelet 5-HT, and plasma 5-- HIAA (5-HIAA, 5-HT, the end product of catabolism) were significantly increased, indicating that acupuncture in the



promotion of platelet 5-HT increased absorption, but also the blood of free accelerated catabolism of 5-HT involved in analgesia, electro-acupuncture to peripheral NE and DA were significantly decreased, which may be respectively enhanced sympathetic activity and inhibition of autonomic nervous activity. In the spinal cord, EA Jiaji AA rats significantly increased spinal 5-HT and 5-HIAA levels, while 5-HIAA increased significantly more than the 5-HT, indicating that electro-acupuncture analgesia Jiaji mechanism downstream activation of 5-HT, 5-HT on pain control system synthesis, release and use also increased, but synthesis faster than the speed of the release and use, so 5-HT content increased, indicating that 5-HT, is involved in spinal pain modulation important neurotransmitter; EA Jiaji spinal cord NE and DA content were significantly decreased, indicating that the NA and DA are involved in the mechanism of electroacupuncture analgesia in the spinal cord. These results suggest that peripheral and spinal cord monoamine neurotransmitters are involved in inflammatory pain modulation in rats during electroacupuncture analgesia. (Liang fan long et al 2001)prosperity AA rats in the study of electricity for local inflammation in 5-HT, NE, DA content in, they get the same results, and show some of the after-effects.

**2.1.3.3 Substance P(SP)**, (Wang Sheng Xu et al, 2000), electro-acupuncture in the study of AA Jiaji effect of substance P in rat spinal cord found that EA can make the AA rat spinal cord lumbar enlargement of SP-positive cells in the immune response to a further increase in Tip EA Jiaji inhibit adjuvant-induced spinal cord dorsal horn release of SP, the SP storage increases, the mechanism through the spinal cord and spinal analgesic effect.

**2.1.3.4 Nitrogen monoxidum(NO)** is a neurotransmitter of new neurons found at different levels play an important role in pain modulation. (Tian Jin Hua et al, 1996) confirmed that NO can not only promote the formation of the spinal cord level and development of hyperalgesia, and pain in the brain caused by the role. (Pan Huijuan et al, 2002) also experiment found that acupuncture can significantly increase the pain threshold of AA rats, and has obvious after-effects; AA rats while significantly reducing the NO content in brain tissue, resulting in analgesia.

## **2.2 Psychology**

**2.2.1 Release of endorphins** within the brown skin is a neuromodulator class of chemicals that can alter or adjust the postsynaptic neuron function, sexual and emotional pain control has an important role. Because of its role in pleasure and pain regulation and control, known as the "key to enter heaven." Researchers have checked out the course of acupuncture in reducing pain, endorphins at least part of the role (Fields & Levine, 1984; Murray, 1995; Watkins & Mayer, 1982), which is similar to opium and coffee, with the same receptors in the brain

**2.2.2 Distracting mental process** of the importance of the pain experience can be used to illustrate two extreme examples: First, do not feel physical pain stimulus, and second, when stimulated by a strong pain did not feel pain. Feelings of pain that occur will be pain response scenarios and habits of the impact of acquisition, so by distracting, resulting in appropriate information to enhance the contrast stimuli ability to overcome pain. Mel Zach (Ronald Melzack, 1973, 1980) proposed gated background theory that describes the psychological impact of pain perception, the theory that the cells in the spinal cord, as cut off as the door and prevent some of the pain signals into the brain, while allowing other signals into the brain and spinal cord to receptors in the skin send information to open or

closed, the information provided from the brain of pain experienced by the background scene. Acupuncture treatment by applying an external stimulus, distracted the attention of patients, pain in the affected area so that it no longer focus on the scene. Psychology from the Chinese point of view, this should be easy to therapy empathy through the spirit of the transfer, change the patient's point of Love within the guilty to distraction emotions, changes in aspirations, in order to treat pain caused by emotional factors.

**2.2.3** Since the perceived control of pain experience and decided on the physiological and psychological factors, to successfully deal with the pain factor is the establishment of another major source of stress, perceived control, that can change the event or experience for the process or result of faith. If you believe you can influence some of the symptoms of discomfort or pain of the daily process, you may better adapt to the symptoms of these disorders. Good results of acupuncture analgesia trust the doctor before administering treatment to give patients confidence so that patients have to reduce or cure the pain beliefs, and thus affect the perceived control of pain through the process. Therefore, the confidence of patients and doctors who stress indoctrination is extremely important. Chinese psychology to love wins love with this therapy or a fit of the Department.

**2.2.4** Social and environmental support to provide social support is a resource for others to tell someone he is loved, cared for and respected, he lives in contact with each other and help each other a social network (Cohen & Syme, 1985). Acupuncture analgesia in the treatment of this social support mainly from doctors and family members, doctors information support, such as on the cause of the disease, information, recommendations on the effects of uncertainty, as well as doctors and their families emotional support, etc. Many researchers have pointed out that social support's role in mitigating damage when given to patients can rely on a sense, they are better able to cope with stress, pain and suffering, it can promote the individual has been diagnosed with the disease from rehabilitation. For pain patients, acupuncturists and differentiation before administering treatment information and emotional support in the treatment of the point of the eye. At the same time when the clinic environment, differentiation, treatment of mental quiet position also helps patients self-control and regulation. Enlighten the language of psychology, medicine therapies, including delight joyful way, way clear up doubts, and doubts therapy is also suggested that social support. But rather God Seishi therapy is a supportive environment, through meditation or repose, to achieve "without thinking of the suffering inside and outside workers are not shaped at all" to a read on behalf of the Wan study results.

**2.2.5** Catharsis chronic pain damage to human health, its immune function, neurotransmitter, autonomic nervous system, mental and psychological adverse effects will be, it allows patients with physical pain, mental distress, reduce outdoor activities and social interaction, and gradually form a "sleep a fatigue, insomnia and a pain in a troubled one, "the vicious circle of pain in patients with enlarged and somatization. Therefore, so that patients get the emotional drain should have a good health benefits. Doctor to listen to on the one hand, and the course of treatment by acupuncture to relieve tension and calm the mind the body can have a relaxation response, which is an effective response to combat stress, muscle tension, cortical excitability, heart rate and blood pressure have decreased, the pain eased. This was reflected in the Chinese psychology along the intelligence from For therapy, the patient's compliance ideas, emotions, mind and body to meet the needs of patients, but the patient's psychological interpretation of the cause

In summary, the psychological mechanism of acupuncture analgesia can not be questioned. And the role of acupuncture analgesia in acupuncture, in place of a body from the outside and thoughtful hub at all levels, involving the nervous, endocrine and immune interactions of multiple factors, including anti-pain and pain caused by two aspects of the unity of opposites complex dynamic integration process. In this process, the nervous system and neurotransmitters as well as between various neurotransmitters, nerve, endocrine and immune systems are not isolated individual, but rather complement each other, interact, participate in the modulation of acupuncture on pain role. Although the mechanism of acupuncture analgesia in recent years made great progress in the study, but the mechanism of acupuncture analgesia has still not clear, need from multi-disciplinary, multi-level, multi-angle in-depth study in order to promote the town of acupuncture mechanism of pain and to promote the wider use of acupuncture in clinical.

### 3. Preoperative eletroacupuncture for postoperative pain

The clinical practice of acupuncture is growing in popularity world-wide. In parallel, interest in the scientific basis of acupuncture has been increasing, as reflected by a dramatic rise in the number of scientific publications on acupuncture and related techniques (ART) in the recent decade. After 40 years of extensive studies, compelling evidence has been obtained to support acupuncture as a useful tool for treating a spectrum of diseases. In fact, more than 40 disorders have been endorsed by the World Health Organization (WHO) as conditions that can benefit from acupuncture treatment. Pain is particularly sensitive to acupuncture. Postoperative pain management remains a significant challenge for healthcare providers. Many patients experience pain after surgery, with about 86% reporting moderate, severe, or extreme pain. Opioids remain the mainstay for postoperative pain control. However, opioid analgesics are associated with undesirable side-effects, including nausea, vomiting, pruritus, sedation, dizziness, and decreased gut motility which can lead to delayed post-operative recovery. The use of adjunct analgesics that provide opioid-sparing effects and decrease the incidence of opioid-related side-effects is therefore useful. Acupuncture, a component of traditional Chinese medicine, is a well-known and widely used treatment for pain and other conditions that has been employed in China for more than 3000 yr. There have been increasing numbers of clinical trials evaluating the efficacy of acupuncture and related techniques as an adjuvant method for postoperative analgesia. Paul F, et al. designed a randomized, double-blind, sham-controlled study, which was used to compare three prophylactic acustimulation treatment schedules: preoperative—an active device was applied for 30 min before and a sham device for 72h after surgery; postoperative—a sham device was applied for 30 min before and an active device for 72h after surgery; and peri-operative—an active device was applied for 30 min before and 72 h after surgery (n 35 per group). All patients received a standardized general anesthetic, and ondansetron 4mg IV was administered at the end of surgery. The incidence of vomiting/retching and the need for rescue antiemetics were determined at specific time intervals for up to 72 h after surgery. Nausea scores were recorded with an 11-point verbal rating scale. Other outcomes assessed included discharge times (for outpatients), resumption of normal activities of daily living, complete antiemetic response rate, and patient satisfaction with

Antiemetic therapy and quality of recovery. Perioperative use of the Relief Band significantly increased complete responses (68%) compared with use of the device before surgery



only(43%).Median postoperative nausea scores were significantly reduced in the peri- and post-operative (versus preoperative) treatment groups.Finally, patient satisfaction with the quality of recovery ( $83 \pm 16$  and  $85 \pm 13$  vs  $72 \pm 18$ ) and antiemetic management ( $96 \pm 9$  and  $94 \pm 10$  vs  $86 \pm 13$ ) on an arbitrary scale from 0 worst to 100 best was significantly higher in the groups receiving peri- or postoperative (versus preoperative) acustimulation therapy. For patients discharged on the day of surgery, the time to home readiness was significantly reduced ( $114 \pm 41$  min versus  $164 \pm 50$  min;  $P < 0.05$ ) when acustimulation was administered perioperatively (versus preoperatively). In conclusion, acustimulation with the Relief Band was most effective in reducing postoperative nausea and vomiting and improving patients' satisfaction with their antiemetic therapy when it was administered after surgery. Sun et al.conducted a systematic review to quantitatively evaluate the efficacy of acupuncture and related techniques as adjunct analgesics for acute postoperative pain management. The authors concluded that perioperative acupuncture might be a useful adjunct for acute postoperative pain management.there are few Literatures about preoperative eletroacupuncture for postoperative pain after total knee arthroplasty, in our hospital, patients who takes the operation of total knee arthroplasty will be received preoperative eletroacupuncture at bilateral points (LI4-LI11, LR3-ST36, PC6-TE5) for 30 min with alternating frequencies of 3 and 15 Hz., postoperative range of motion(ROM)Of knee joint and Hospital for Special Surgery(HSS)score were recorded. two weeks after operation the initiative ROM and the HSS score were improved, so Applying preoperative eletroacupuncture in perioperative period Of knee joint replacement is favorable for alleviating postoperative pain, decreasing narcotic consumption, and promoting early rehabilitation.

Many studies have supported the effectiveness of acupuncture for postoperative pain relief. However, the mechanism of acupuncture analgesia remains unclear. Acupuncture theory is based on two conditions: "yin", which is considered feminine, passive, dark, and cold, and "yang", which is masculine, aggressive, bright, and hot, as well as "qi," which is considered the vital energy that flows and cycles throughout the body. The acupuncture theory is to harmonize any imbalance in yin-yang and qi in a human body to restore the body to a healthy condition. Acupuncture is thought to unblock any obstruction to the flow of qi and, thereby, relieves pain. The acupuncture technique that has been most often studied scientifically involves penetrating the skin with thin, solid, metallic needles that are manipulated by the hands or electrical stimulation. Although in the past scepticism has been voiced over the effects claimed for acupuncture, in recent years the effect of acupuncture on different conditions (pain and diseases) has been studied from a Western scientific perspective, and the results have demonstrated that acupuncture has both physiological and psychological impacts. Needle insertion into the skin and deeper tissues, in addition to subsequent stimulation of the needles, results in a particular pattern of afferent activity in peripheral nerves, mainly the A-delta and possibly also the C fibres. Acupuncture stimulation has been demonstrated to activate inhibitory systems in the spinal cord, which results in segmental inhibition of the sympathetic outflow and pain pathways, as predicted by the gate control theory. EA releases endogenous opioids and oxytocin, which seem to be essential in the induction of functional changes in different organ systems. In this respect, particular interest has been dedicated to  $\beta$ -endorphin-an endogenous opioid with a high affinity for the  $m$  receptor. Indeed, evidence suggests that this hypothalamic  $\beta$ -endorphin system plays a central role in mediating the pain-relieving effect of acupuncture.

Furthermore, it has been shown that intense stimulation results in the activation of supraspinal pain inhibitory centres, and this mechanism is denoted diffuse noxious inhibitory controls (DNIC) or counterirritation.

In conclusion, the preoperative eletroacupuncture may be a useful adjunct for postoperative analgesia. Further large, well-designed studies are required to confirm those findings and to answer questions regarding the most efficacious type of acupuncture and optimal timing of administration.and the mechanism of acupuncture analgesia

#### **4. Pain relief by acupuncture**

Normal knee is freedom in flexion and extextension, which is limited now, just because of pain due to obstruction of Qi and blood in meridians, even there'stagnation. Where meridians pass, there is available to be treated. Accordingly, we should take local or remote acupoints in meridians where the disease is. Prescription: Yinlingquan (SP9), Yanglingquan (GB34), Neixiyan (EX-LE4), Taichong (LR3), Dachangshu (BL25), Quchi (LI11), Fengchi (GB20), both bilateral acupoints. If the course is long, we can add Zusanli (ST36), Sanyinjiao (SP6). Select 5 to 6 points each, after the arrival Of Qi, we take reinforcing and reducing movement, needle retention 15min.2 to 3 times per week, 2 weeks as a course of treatment. Acupuncture treatment can be adjusted locally by tendon thinning the blood, promoting blood circulation, eliminating wind, removing obstruction from the meridians and relieving pain. Effective stimulation of acupuncture points receptors, so that pain signals are inhibited, anti-pain, enhance its ability to achieve the balance restored both inside and outside the state of the local meridian, and promote early recovery after surgery.

#### **5. Application and effect of auricular acupoint pressing for analgesia in perioperative period of total knee arthroplasty**

The role of Total knee arthroplasty has been widely recognized in the reconstruction of knee joint function and the remission the patient's pain. Effective postoperative analgesia is not just to alleviate the pain of patients, but also to help to do early ambulation, to do active physical therapy, to restore the knee's Range of motion as possible, to prevent deep vein thrombosis or other complications, to shorter hospital stay Time. In addition, effective postoperative analgesia reduces stress response, so that patients with stable internal environment, and can reduce patient anxiety and help patients sleep and rest, to improve the quality of life in patients with short-term.

Acupuncture has been used for more than 2, 000 years in traditional Chinese medicine to treat pain and other ailments. This technique was traditionally thought to work by channeling energy or Qi through body 'meridians' with acupuncture needles.And modern medicine has been trying to figure out the mechanism of acupuncture analgesia. And now various hypotheses about the mechanism of acupuncture analgesia are currently being discussed, e.g., the endogenous opioid system, gate-control mechanism, longterm depression, and diffuse noxious inhibitory controls (DNIC), as well as involvement of different neurotransmitters such as serotonin and norepinephrine, But none of them can explain it completely. Hence, acupuncture-induced analgesia seems to be a complex, multimodal interaction of neuronal and humoral pathways. On the other hand, large randomized controlled trials have proven a clinically relevant effect of acupuncture on pain conditions in the past years.

Auricular acupuncture is defined as 'a form of acupuncture in which needles are placed in various positions of the ear to affect the person. It postulates body correlates on the ear, so a treatment performed upon the ear will have effects reflected on the body part'. The Silk Book, China's earliest medical treatise written approximately 500 B.C, and Nei Jing, the Classic of Medicine, written around 200 B.C, both documented the theory Auricular acupuncture for analgesia. In Traditional Chinese Medical, it was concluded that all meridians converge at the ear, and the relationships of the Auricle, the Meridians, and the Zangfu Organs were very closely. Auricular acupuncture was first introduced into clinical western medicine by Nogier (1972) (Nogier PFM, 1972), who empirically identified Auricular acupuncture points. The generally accepted view on auricular acupuncture is based on the conjecture that the human body is represented on the auricle in the form of an inverted fetus. It is claimed that this representation is constant, and can be detected by measuring the electrical resistance of the auricular skin and used for diagnostic purposes and/or treatment. Although the morphological structures connecting the specific auricular zones (acupuncture points) with corresponding parts of the body have not yet been identified, the effects of various stimulations applied to these regions have been verified in experimental and clinical studies.

Although no anatomical pathways exist to directly connect inner organs with the ear, a lot of nerve fiber distribution in the ear. The innervation of the central part of auricle (triangular fossa and concha) comes from trigeminal, geniculate and superior vagal ganglions, whereas the peripheral regions receive their innervation mainly by spinal nerves. The central parts of the neurons constituting the auricular branch of the vagal nerve are situated in the superior ganglion of the vagal nerve and nucleus tractus solitarii. Functionally, the stimulation of the inferior concha induced a significant increase in parasympathetic activity. In another study, the stimulation of the sympathetic AA point significantly decreased the stimulus-evoked electrodermal response compared with an AA stimulation to a non-specific point of the helix.. This resembles the design of studies performed by (Usichenko et al, 2005, 2007) where stimulation of the points in the central regions of the auricle was better than sham acupuncture at the non-specific points of the helix for reduction of postoperative analgesic requirement.

Early studies of Auricular acupuncture have demonstrated beneficial effects on both pain and anxiety including pain associated with cancer, knee arthroscopy, and hip fracture and hip arthroplasty. Several recent small studies have suggested that auricular acupuncture alone can relieve pain and anxiety in the prehospital transport phase of hip fracture and reduce acute pain due to a variety of causes in the emergency department setting.. Auricular acupuncture may be effective for the treatment of a variety of types of pain, especially postoperative pain

Auricular acupoint pressing (AAP), Vaccaria seeds be used to press in auricular acupoint, is the most commonly clinically Auricular acupuncture. In our hospital we observe the effect of AAP for analgesia during perioperative period of total knee joint replacement, Methods: Sixty patients with osteoarthritis of ASA grade I to III scheduled to receive unilateral total knee joint replacement were equally randomized into the AAP group and the control group, 30 in each group. The general anesthesia on all patients was implemented by physicians of an identical group through endotracheal intubation. To the patients in the AAP group, AAP with Vaccaria seed was applied before operation, and the local analgesia on affected limb with acupoint pasting was used after operation. Besides, administration of celecoxib 400 mg on the day before operation, and celecoxib 200 mg twice daily postoperation was given to all patients. When the visual analogue scales (VAS) reached more than 7 points, 0.1 g of bucinazine hydrochloride was given for supplement. Meantime same post-operative

training methods were adopted in both groups. The resting VAS pain scores, contentment of sedation, incidence of adverse event, postoperative range of motion (ROM) Of knee joint and Hospital for Special Surgery(HSS) score were recorded Results: The resting VAS pain scores at 6 h and 24 h after operation was  $5.99 \pm 0.67$  scores and  $4.26 \pm 0.59$  scores in the AAP group respectively, which was significantly lower than that in the control group at the corresponding time ( $7.02 \pm 0.85$  scores and  $4.92 \pm 0.43$  scores,  $P < 0.01$ ), Through clinical observation we found that the resting VAS pain scores at 6 h and 24 h after operation reach its peak; but it showed insignificant difference between the two groups at 1 h and 48 h after operation ( $P > 0.05$ ), which regard as the effect of Narcotic for analgesia at 1 h after operation is not eliminate Thoroughly, and Patients has tolerated the pain gradually at 48 h after operation so threshold of pain tolerance Increased, The result is the acute pain of the knee after surgery relieve gradually, After 48 hours after operation, patient's Acute pain was replaced by Chronic Pain that can be relieved by drugs for inflammation and pain, so the intergroup difference of the resting VAS pain scores at 1 h and 48 h after operation was statistically insignificant; sedation contentment in the two groups was similar: incidence of adverse event in the AAP groups seemed lower (4 cases VS. 11 cases), but the intergroup difference was statistically insignificant ( $P > 0.05$ ). The application of postoperative narcotic analgesics and analgesic effects related to the occurrence of adverse reactions is the use of narcotic analgesics was positively correlated ROM before surgery were  $75.630 \pm 5.74$  and  $75.43 \pm 5.63$  in the two groups respectively, showing no significant difference ( $P > 0.05$ ), two weeks after operation, the initiative ROM raised to  $96.500 \pm 3.790$  and  $93.500 \pm 3.50$  and the passive ROM reached  $107.80 \pm 3.370$  and  $105.27 \pm 3.250$  in the two groups respectively, with statistical significance between them ( $P < 0.05$ ) HSS score was similar between groups before operation ( $60.23 \pm 3.44$  scores VS.  $61.70 \pm 2.83$  scores,  $p > 0.05$ ); while it became  $86.97 \pm 2.33$  scores and  $85.37 \pm 2.30$  scores after operation. showing significant difference between groups ( $P < 0.05$ ) so we draw the conclusion that Applying auricular acupoint pressing in perioperative period Of knee joint replacement is favorable for alleviating postoperative pain, decreasing narcotic consumption, and promoting early rehabilitation, and it has the advantages of low cost, less complication, simple manipulation and high safety.

After analysis the resting VAS pain scores at each time point, we must consider long enough analgesia for patient and additional analgesia aimed to the Peak pain point when we Select analgesic method. the satisfaction with analgesia in two groups of patients is about 50%, This shows that we must improved our Analgesia in the future, So in the next task we can combined many methods for better Analgesia in Perioperative Period of total knee arthroplasty, such as Auricular Acupoint Pressing, nerve block, intra-articular infusion reserved and so on, as far as Auricular Acupoint Pressing was considered, we prepare to Increase the intensity of the stimulus for better Analgesia through needle-embedding therapy and electric acupuncture in Auricle.

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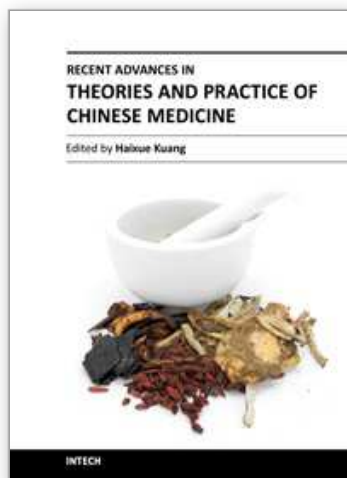


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During the recent years, traditional Chinese medicine (TCM) has attracted the attention of researchers all over the world. It is looked upon not only as a bright pearl, but also a treasure house of ancient Chinese culture. Nowadays, TCM has become a subject area with high potential and the possibility for original innovation. This book titled Recent Advances in Theories and Practice of Chinese Medicine provides an authoritative and cutting-edge insight into TCM research, including its basic theories, diagnostic approach, current clinical applications, latest advances, and more. It discusses many often neglected important issues, such as the theory of TCM property, and how to carry out TCM research in the direction of TCM property theory using modern scientific technology. The authors of this book comprise an international group of recognized researchers who possess abundant clinical knowledge and research background due to their years of practicing TCM. Hopefully, this book will help our readers gain a deeper understanding of the unique characteristics of Chinese medicine.

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