

Research on the Application of Acupoint Embedding Thread in Comprehensive Tumor Treatment

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Abstract: Acupoint embedding therapy is a traditional Chinese external treatment method that, under the guidance of the theory of meridians and acupuncture in traditional Chinese medicine, implants absorbable thread bodies into specific acupoints and exerts therapeutic effects through continuous, gentle, long-lasting stimulation. In recent years, as the comprehensive treatment model for tumors has shifted from simply “prolonging survival” to “improving quality of life”, acupoint embedding, as an important part of integrated traditional Chinese and Western medicine treatment, has shown unique advantages in alleviating cancer pain, reducing adverse reactions of radiotherapy and chemotherapy, improving gastrointestinal function and regulating immune function. Based on relevant studies at home and abroad, this article reviews the mechanism of action, clinical application status and existing problems of acupoint embedding in adjuvant treatment of tumors, with the aim of providing references for clinical practice and in-depth research.

Keywords: Acupoint embedding; Tumor; Cancer pain; Chemoradiotherapy adverse reactions; Immune regulation

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1. Introduction

Malignant tumors have become a serious threat to human health. According to global cancer statistics, the incidence and mortality rates of malignant tumors continue to rise year by year. The current clinical treatment mainly consists of surgery, radiotherapy, chemotherapy, targeted therapy and immunotherapy. Although these treatment methods significantly prolong the survival period of patients, adverse reactions such as pain, nausea and vomiting, bone marrow suppression, fatigue, gastrointestinal dysfunction and psychological disorders are often accompanied during the treatment process, seriously affecting the treatment compliance and quality of life of patients.

With the transformation of the tumor treatment model from simply “prolonging survival” to “improving

quality of life”, the combination of traditional Chinese and Western medicine has gradually gained attention. The unique advantages of traditional Chinese medicine in “strengthening the body and enhancing the root” and “reducing toxicity and increasing efficacy” make it an indispensable part of comprehensive tumor treatment. Acupoint embedding thread therapy, as an extension and development of acupuncture therapy, involves embedding absorbable thread bodies into acupoints to continuously stimulate meridians in the body. It has the characteristics of long stimulation time, low treatment frequency and good compliance. In recent years, the therapy has been widely used in the field of chronic disease and tumor support treatment, and has made certain progress in improving the symptoms of tumor patients. This article provides a systematic review of the mechanism of action, clinical application and existing problems of acupoint embedding in comprehensive tumor treatment, with the aim of providing a reference for the clinical promotion and in-depth study of this therapy.

2. Overview of acupoint embedding therapy

2.1. Basic principles

Acupoint embedding therapy, under the guidance of acupuncture theory, involves implanting absorbable protein threads (such as sheep intestine thread, polyglycolic acid thread, etc.) into relevant acupoints. Through the degradation and absorption process of the thread body, a continuous stimulating effect is produced to achieve the purpose of regulating qi and blood, unblocking meridians, and strengthening the body and eliminating pathogenic factors^[1].

From the perspective of modern medicine, the mechanism of action can be summarized into three levels: At the physical level, the continuous mechanical stimulation of the thread on the acupoints and nerve endings produces a long-lasting needle sensation similar to “retention”, and the stimulation effect lasts for several hours to several days, much longer than the immediate effect of ordinary acupuncture; At the neuro-humoral level, acupoint stimulation is transmitted through afferent nerves to the central nervous system, which regulates the neuro-endocrine-immune network, promotes the release of endogenous opioid peptides to exert central analgesic effects, and regulates the expression of inflammatory factors to improve the systemic inflammatory state; At the local tissue level, the filament degradation process induces immune cell infiltration and cytokine release in the local microenvironment, improves microcirculation and tissue metabolism, and promotes the repair of damaged tissues. The thread usually takes 7 to 30 days to fully degrade and absorb in the body. During this period, it continuously provides gentle and effective stimulation to the acupoint, and this “long-lasting needle sensation” feature is the core difference between acupoint embedding thread and ordinary acupuncture.

2.2. Characteristics of action

The core advantage of acupoint embedding over traditional acupuncture lies in its “long-lasting stimulation, low-frequency treatment” feature. The thread body is slowly degraded in the body, and a single treatment can maintain a continuous stimulating effect for 7 to 30 days. The treatment frequency is usually once every 1 to 2 weeks, significantly lower than the daily or alternate treatment of ordinary acupuncture^[2]. This feature offers a triple advantage: first, it reduces the frequency of patient visits, lowering time and economic costs; Second, it improves treatment compliance, especially for cancer patients who have difficulty moving or live in remote areas; Third, continuous acupoint stimulation is more conducive to the long-term management

of chronic symptoms and is highly consistent with the need for long-term rehabilitation support for cancer patients ^[3].

3. The mechanism of acupoint embedding thread in the comprehensive treatment of tumors

3.1. Immunomodulatory effects

Tumorigenesis and development are closely associated with immune dysfunction. The body's anti-tumor immunity mainly depends on the functional integrity of immune effector cells such as T lymphocytes and natural killer cells (NK cells). Studies have shown that acupuncture and acupoint stimulation can regulate the proportion of T lymphocyte subsets, increase NK cell activity, and enhance the body's immune surveillance function.

By continuously stimulating tonifying acupoints such as Zusanli, Guanyuan and Qihai, acupoint embedding can improve the immunosuppressive state of cancer patients and enhance the body's disease resistance. A randomized controlled study by Zhang et al. ^[2] on 140 patients with spleen and lung qi deficiency syndrome of non-small cell lung cancer after chemotherapy showed that after treatment with acupoint thread and Jianpi Qingfei Decoction, the CD4⁺/CD8⁺ ratio and interferon- γ (IFN- γ) levels in the study group were significantly higher than those in the control group, while the interleukin-10 (IL-10) level was lower than that in the control group. It was suggested that acupoint embedding could effectively improve the immune function of patients after chemotherapy. Another study observed the effect of acupoint embedding on T lymphocyte subsets in the peripheral blood of colorectal cancer patients and found that it could maintain the normal distribution of T lymphocyte subsets in the peripheral blood of patients during chemotherapy, thereby better maintaining the immune status of patients ^[4]. Animal experiments further revealed the mechanism by embedding sheep intestinal thread into the Zusanli point in rats, which induced an increase in the levels of macrophage CD68, tumor necrosis factor- α (TNF- α), and interleukin-1 β (IL-1 β) in the local microenvironment ^[5]. The findings suggest that acupoint embedding may activate immune cells by inducing local aseptic inflammatory responses at the acupoint, thereby initiating systemic immunomodulatory effects.

3.2. Analgesic effects

Cancer pain is one of the most common and unbearable symptoms for cancer patients. According to the World Health Organization, about 60% to 90% of patients with advanced cancer suffer from cancer pain to varying degrees. The analgesic mechanisms of acupoint embedding mainly include: activating the endogenous analgesic system and promoting the release of endogenous opioid peptides such as β -endorphin and enkephalin; Inhibiting the expression of pain mediators such as prostaglandins, substance P, etc. Regulate pain conduction in the central nervous system and raise the pain threshold; Relieve pain indirectly by regulating inflammatory factors. Relevant studies have shown that back-shu acupoint embedding can relieve cancer pain, improve the quality of life of patients, and at the same time improve anxiety and depression, demonstrating the comprehensive regulatory advantage of acupoint embedding in pain relief ^[6].

3.3. Improve gastrointestinal function

Patients with tumors, especially those with digestive system tumors, often experience a series of gastrointestinal dysfunction symptoms such as nausea, vomiting, loss of appetite, abdominal distension,

constipation, etc. These symptoms not only affect the patient's nutritional intake, but also seriously reduce the quality of life. Acupoint embedding can promote the recovery of gastrointestinal motility and improve digestive function by stimulating acupoints related to the stomach meridian, spleen meridian and Ren meridian such as Zusanli, Zhongwan and Tianshu. Studies have found that it has a good sustained effect in improving abdominal pain and quality of life. Studies on patients after colorectal cancer surgery have shown that acupoint embedding therapy can significantly accelerate intestinal function recovery and shorten the time to first flatulence and defecation after surgery^[7]. Acupoint embedding also shows certain application value in the prevention and treatment of delayed-type diarrhea caused by irinotecan^[8].

3.4. Regulating the neuroendocrine system

Long-term dual stress of disease and treatment in cancer patients can lead to neuroendocrine dysfunction, mainly manifested as dysfunction of the hypothalamic-pituitary-adrenal axis (HPA axis), abnormal increase in sympathetic nerve tension, etc.^[9] Acupoint embedding can improve the overall condition of patients by regulating the function of the HPA axis, alleviating anxiety, depression and cancer-related fatigue. Clinical studies of Wuzangshu acupoint embedding for the treatment of cancer-related fatigue in breast cancer patients have shown that the therapy can effectively relieve fatigue symptoms, improve quality of life and immune function^[10]. For the "chemotherapy brain" (chemotherapy-related cognitive impairment) that occurs in breast cancer patients after chemotherapy, the study suggests that acupoint thread therapy can restore neurological function, regulate neural reflexes, and inhibit the release of inflammatory factors^[11].

4. Clinical application of acupoint embedding in comprehensive treatment of tumors

4.1. Cancer pain treatment

Cancer pain has a significant impact on the quality of life of patients and is one of the core elements of palliative care for tumors. Although the three-step analgesic principle is the standard regimen, long-term use of opioids is prone to problems such as nausea, vomiting, constipation, drug resistance and addiction risk, so adjuvant analgesic treatment has received extensive attention.

A number of randomized controlled studies have shown that acupoint embedding is one of the effective adjunctive methods for controlling cancer pain. Studies have found that acupoint embedding combined with three-step pain relief treatment can significantly increase the efficiency of pain relief and improve the quality of life of patients. Gou Jiao et al. conducted a randomized controlled study on 80 patients with moderate to severe bone metastatic cancer pain and found that acupoint embedding combined with paracetamol and oxycodone tablets could significantly relieve pain, reduce the dosage of painkillers, lower the incidence of drug-related adverse reactions, and significantly improve the quality of life of patients^[12]. A study on patients with lung cancer pain also confirmed the analgesic effect of acupoint embedding. Common acupoints include Ashi, Shenshu, Pishu, Weishu, Zusanli, Sanyinjiao, Yanglingquan, etc. The principle is to select acupoints based on syndrome differentiation combined with local location.

4.2. Reduce adverse reactions of radiotherapy and chemotherapy

4.2.1. Nausea and vomiting

Chemotherapy-related nausea and vomiting are among the most common and feared adverse reactions for

patients. In clinical practice, acupoints such as Neiguan, Zusanli, Zhongwan and Gongsun are often selected for thread embedding treatment. Continuous stimulation can improve gastrointestinal nerve function, relieve nausea and vomiting, and increase patients' food intake and treatment compliance. A randomized controlled study of patients with non-small cell lung cancer undergoing chemotherapy showed that moxibustion combined with acupoint embedding could significantly improve chemotherapy-related nausea and vomiting and improve the quality of life of patients ^[13]. Another study observed the intervention effect of acupoint thread on chemotherapy-induced nausea and vomiting in patients with malignant hematological diseases and found that it could improve gastrointestinal motility hormone indicators and quality of life in patients ^[14].

4.2.2. Myelosuppression

Myelosuppression manifestations such as leukopenia, thrombocytopenia and anemia often occur after chemotherapy, which not only increase the risk of infection and bleeding, but also often lead to delayed or reduced chemotherapy dosage. Some clinical studies have found that stimulating acupoints such as Zusanli, Guanyuan, and Pishu can promote the production of qi and blood and improve the state of bone marrow suppression. A clinical study involving 72 patients with advanced non-small cell lung cancer found that acupoint embedding combined with GP chemotherapy could lower the grade of adverse reactions and reduce the degree of bone marrow suppression ^[15].

4.2.3. Cancer-related fatigue

Cancer-related fatigue is an important long-term symptom in patients with cancer, characterized by persistent, subjective fatigue that is closely related to the tumor itself and treatment and is difficult to relieve with rest. Acupoint embedding can improve fatigue and enhance activity and quality of life by strengthening the body and tonifying the spleen and kidneys. The clinical study of Wuzangshu acupoint embedding for the treatment of cancer-related fatigue in breast cancer patients has achieved positive results, providing clinical evidence for the application of acupoint embedding in this field ^[16].

4.3. Postoperative rehabilitation of tumors

Patients who have undergone tumor surgery are prone to problems such as gastrointestinal dysfunction, delayed flatulence and defecation, loss of appetite, and slow recovery of physical strength, which seriously affect the postoperative recovery process. Acupuncture for the recovery of gastrointestinal function has been widely studied in recent years. A randomized controlled study involving 80 patients after laparoscopic rectal cancer surgery showed that warming the kidney, strengthening the spleen and benefiting qi combined with embedding thread at Zusanli point could effectively promote the recovery of gastrointestinal function and improve immune function in patients ^[16]. In patients after colorectal cancer surgery, acupoint embedding therapy also showed the effect of accelerating intestinal function recovery ^[18]. Common acupoints include Tianshu, Zusanli, Shangjuxu, Zhongwan, Dachangshu, etc., based on the principle of regulating the gastrointestinal tract and strengthening the body.

4.4. Improve the quality of life of cancer patients

With the obvious trend of cancer becoming chronic, improving quality of life has become one of the important goals of cancer treatment. Studies have shown that acupoint embedding can improve the quality of life of cancer patients in multiple ways: relieve pain, improve sleep, increase appetite, relieve anxiety and

depression, and improve physical condition. Some studies have found that patients' Karnofsky Performance Status Score (KPS) and Quality of Life Core Scale score (QLQ-C30) improved significantly after thread embedding treatment. Acupoint embedding, through the comprehensive regulation of multiple symptoms such as pain, digestive tract symptoms, fatigue and mood, demonstrates the advantages of the holistic concept and syndrome differentiation and treatment of traditional Chinese medicine.

5. Common acupoints and their selection patterns

According to current literature reports, thread embedding treatment for cancer patients often follows the principle of combining syndrome differentiation with disease differentiation, and the selection of acupoints shows certain regularity.

The main acupoints for strengthening the body are Zusanli, Guanyuan, Qihai, Pishu and Shenshu, which are mainly used to enhance immunity, improve physical condition and relieve fatigue. Among them, Zusanli is the most frequently used acupoint, embodying the classic theory of “retaining the three Li points in the abdomen” in the “Four General Acupoint Songs”.

- (1) Pain-relieving acupoints: mainly ashi, Yanglingquan, Sanyinjiao, Hegu, Taichong, mainly used for the treatment of cancer pain and bone metastasis pain, embodying the therapeutic concept of “if there is no flow, there is pain; if there is no flow, there is no pain”.
- (2) Acupoints for regulating the spleen and stomach: Zhongwan, Tianshu, Neiguan, Gongsun, Shangjuxu are the main acupoints for improving digestive tract symptoms such as nausea, vomiting, constipation and abdominal distension.
- (3) Emotional regulation acupoints: Mainly Shenmen, Baihui, Yintang, Taichong, mainly used for regulating emotional problems such as anxiety, depression, and sleep disorders.

Overall, the selection of acupoint embedding in tumor supportive treatment centers on Zusanli, taking into account both syndrome differentiation and local selection of acupoints, embodying the therapeutic principle of “strengthening the body and eliminating pathogenic factors, treating both symptoms and root causes”.

6. Conclusion

To sum up, acupoint embedding, as a safe and convenient traditional Chinese medicine external treatment method, has shown unique auxiliary value in the field of tumor supportive treatment. Existing clinical evidence supports its application in alleviating cancer pain, reducing nausea, vomiting and bone marrow suppression caused by radiotherapy and chemotherapy, promoting postoperative gastrointestinal function recovery, improving cancer-related fatigue, etc., and shows comprehensive advantages of multi-dimensional regulation in improving the quality of life of patients. The mechanism of action involves the overall regulation of the neuro-endocrine-immune network, and the hypothesis that linear degradation products induce local aseptic inflammatory responses and activate Toll-like receptor signaling pathways provides a new direction for subsequent studies.

However, there are still many deficiencies in this field at present. First, studies are mostly single-center, small-sample, with most trials having a sample size of 60 to 150 cases, limited statistical power, and the particularity of acupoint embedding operations makes it difficult to perform complete blinding for both

the operator and the patient, which may introduce implementation bias and measurement bias. Secondly, different studies used different efficacy evaluation indicators (such as VAS, NRS, KPS, QLQ-C30, etc.), and there was a lack of unified standards for operation elements such as thread materials (sheep intestine thread, PGA thread, etc.), acupoint combinations, treatment frequencies, and course Settings, resulting in poor comparability and repeatability between studies and limiting the conduct of high-quality meta-analyses. At the same time, existing mechanism studies mostly remain at the level of clinical efficacy observation, and there is a lack of systematic exploration of the molecular mechanisms by which acupoint embedding regulates the neuro-immune-endocrine network and reshapes the tumor microenvironment. At the same time, the vast majority of studies did not use “false thread embedding” (only the skin was pricked without thread embedding) as a placebo control, making it difficult to eliminate the interference of psychological comfort effect on the assessment of subjective symptoms (fatigue, pain); There was also a lack of long-term systematic follow-up for rare adverse events such as thread migration, deep infection, and allergic reactions.

In response to these limitations, future research should focus on the following directions: conducting multicenter, large-sample, high-quality randomized controlled studies and promoting the inclusion of acupoint embedding in tumor supportive treatment guidelines; Establish standardized operation norms covering thread materials, acupoint combinations, treatment frequency and course of treatment to enhance comparability and repeatability among studies; Explore in depth the molecular mechanisms by which acupoint embedding regulates the tumor immune microenvironment, especially the hypothesis that “thread degradation products act as adjuvants to activate the TLR pathway” deserves particular attention; Actively promote the combined application research of acupoint embedding with modern anti-tumor approaches such as immunotherapy and targeted therapy. Animal experiments have preliminarily confirmed that acupoint embedding can enhance the anti-tumor efficacy of anti-PD-1 inhibitors^[19] and has significant potential for clinical translation. Based on the above research, an expert consensus on acupoint embedding for tumor support therapy was ultimately formed to provide standardized guidance for clinical promotion.

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