

Research and Application Progress of Special Acupuncture Combined with Three-Step Analgesia Method in the Treatment of Cancer Pain

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Abstract: *Cancer pain is one of the most common symptoms experienced by cancer patients, significantly impacting their quality of life. Currently, Western medicine employs the three-step ladder approach as the primary treatment for cancer pain. However, the accompanying adverse reactions such as nausea and vomiting limit its clinical application to some extent and affect the ultimate efficacy of cancer pain management. Specialized acupuncture techniques, developed through innovation based on traditional acupuncture, offer advantages such as rapid onset and high efficacy in cancer pain management. In recent years, they have demonstrated an increasingly significant role in the comprehensive management of cancer pain. This review aims to systematically summarize the research progress and current applications of specialized acupuncture combined with the three-step analgesic approach in cancer pain treatment, with the goal of providing reference for clinical application and cancer pain management.*

Keywords: Specialized acupuncture, Cancer pain, Stepwise analgesia approach, Adverse reactions, Quality of life, Research progress.

1. Introduction

Cancer pain refers to pain caused by the cancer itself, its complications, or anticancer treatments. Studies indicate that 59% of patients receiving anticancer therapy and 64% of patients with advanced-stage cancer experience varying degrees of pain [1]. Unlike ordinary pathological pain, cancer pain that fails to improve effectively over time may progress to chronic pain. This chronic progression can induce neural plasticity changes, leading to pain hypersensitivity and a state of “pain center sensitization” [2-3], thereby rendering cancer pain refractory and triggering negative emotions such as anxiety and depression, which significantly impair patients’ quality of life [4]. Additionally, cancer pain can accelerate disease progression by altering the tumor microenvironment [5].

For the treatment of cancer pain, the clinical approach follows the WHO-recommended “three-step analgesic ladder” principle, with opioids being the primary pharmacological choice [6]. This therapy, characterized by “stepwise and timed administration,” can alleviate 80%–90% of cancer pain cases but is often associated with adverse effects such as nausea, vomiting, and constipation [7,8]. Acupuncture, as a classical traditional Chinese medicine (TCM) therapy, offers a novel option for cancer pain management due to its unique clinical efficacy and favorable safety profile [9,10]. In cancer pain management, beyond conventional therapies such as needling, electroacupuncture, and standard moxibustion using moxa cones or sticks, recent years have seen widespread adoption of specialized acupuncture techniques including fire needle therapy, press needle therapy, suppurative moxibustion, and thunderfire moxibustion. To distinguish these from conventional acupuncture and moxibustion, we refer to all non-traditional acupuncture methods as special acupuncture therapies. Literature has demonstrated that combining special acupuncture therapies with the three-step analgesic ladder not only enhances the analgesic effect of opioids [11] but also mitigates their adverse effects [12,13], achieving synergistic

benefits. This article therefore reviews the clinical applications and research advancements of special acupuncture therapies combined with the three-step analgesic ladder for cancer pain management, providing a comprehensive basis and reference for clinical practice.

2. Special Needle Techniques Combined with a Three-step Analgesic Protocol

Special acupuncture techniques refer to a form of acupuncture therapy developed from specialized needle instruments beyond conventional acupuncture and electroacupuncture, characterized by distinct features in target stimulation sites and manipulation methods. These techniques not only inherit the theoretical foundations of Traditional Chinese Medicine but also demonstrate unique advantages in clinical practice. Currently, various approaches such as fire needle therapy, wrist/ankle acupuncture, and press needle therapy are employed clinically for cancer pain management. Preliminary studies indicate that special acupuncture techniques can not only complement the three-step analgesic ladder but also mitigate adverse drug reactions associated with analgesics, providing a synergistic therapeutic approach for cancer pain management.

2.1 Fire Needle Combined with the Three-step Analgesic Method

Fire needle therapy involves rapidly inserting a specially heated needle into acupoints with analgesic effects or pain-related Ashi points, leveraging the warming properties of heat to promote meridian circulation, resolve stasis, and dissipate nodules, thereby achieving the goal of “relieving pain through heat” [14]. Patients with cancer pain often exhibit qi deficiency accompanied by cold stagnation or blood stasis due to tumor progression and its complications [15]. The high temperature and strong stimulatory effect of fire needles can warm cold stagnation and activate blood

circulation, providing a theoretical basis for pain relief based on the principle that “yang transforms qi, and blood circulation alleviates pain.” In a randomized controlled trial conducted by Mi Jianping et al. [16], the combined fire needle therapy and three-step analgesia regimen achieved a total effective rate of 90.6% in pain control, significantly higher than the control group receiving only the three-step analgesia regimen, with a markedly lower incidence of adverse reactions in the treatment group, confirming the efficacy, safety, and feasibility of this approach in clinical practice. Zhang Yutian et al. [17] employed fire needle therapy combined with OxyContin for patients with bone metastatic cancer pain, demonstrating superior pain relief in the experimental group compared to the control group, along with fewer adverse reactions. Zhang Zhipeng et al. [18] enrolled 70 cancer pain patients, administering fire needle therapy combined with OxyContin to the treatment group versus OxyContin alone to the control group. Results showed a total effective rate of 90.32% in the treatment group, significantly higher than the 61.29% in the control group; moreover, the Karnofsky Performance Status (KPS) scores in the treatment group were not only higher than pre-treatment levels but also exceeded those of the control group post-treatment. These studies collectively demonstrate that fire needle therapy combined with the three-step analgesic approach can synergistically reduce cancer pain severity and improve patients’ quality of life, gradually establishing its importance in cancer pain management.

2.2 Fire Needle Combined with the Three-step Analgesic Method

Haohuo needle therapy is an improved version of traditional fire needle therapy, utilizing specially designed fine needles instead of coarse ones. It retains the therapeutic principle of fire needles—“using heat to induce further heat and eliminate pathogens”—while incorporating the precise stimulation advantages of fine needles. Through rapid needling, it forces pathogens out, thereby alleviating pain. Additionally, Haohuo needle therapy offers distinct clinical benefits such as ease of operation, minimal invasiveness, and significant efficacy, demonstrating excellent outcomes in relieving acute and chronic pain and improving quality of life [19]. Researchers including Wang Jing [20] randomly divided 80 cancer pain patients into a control group and an experimental group. The control group received only the three-step analgesic regimen, while the experimental group received the same regimen combined with haohuo needle therapy. Results showed that the experimental group exhibited superior quality of life scores (Quality of Life Scale, QOL) and numerical pain ratings (Numerical Rating Scale, NRS) compared to the control group, with significantly reduced incidence of breakthrough pain and adverse drug reactions. These findings indicate that haohuo needle therapy combined with the three-step analgesic regimen outperforms the regimen alone in enhancing quality of life, reducing pain, and minimizing adverse drug reactions. Further studies by Bai Weijie et al. [21] further confirmed the positive effects of haohuo needle therapy in alleviating pain, improving quality of life, and modulating immune function. These findings support the clinical value of haohuo needle therapy combined with the three-step analgesic regimen in cancer pain management.

2.3 Wrist-ankle Acupuncture Combined with a Three-step Analgesic Protocol

Wrist-ankle acupuncture therapy is a specialized needling technique characterized by “holistic micro-needling with superficial puncture of skin areas.” It involves superficial stimulation of acupoints on the wrist and ankle to activate meridian qi, regulate meridian pathways and visceral functions, thereby achieving therapeutic effects [22]. Its key advantages include simplicity of operation, safety, reliability, objective efficacy, and ease of widespread application, making it a convenient and effective treatment option for patients with cancer pain [23-25]. Dong Fangfang et al. [26] randomly assigned 120 enrolled patients in a 1:1 ratio to either an experimental group receiving wrist-ankle acupuncture combined with a three-step analgesic regimen or a control group receiving only the three-step analgesic regimen. Results showed that immune markers such as CD³⁺ and CD⁴⁺ levels were significantly elevated in the experimental group, while the NRS score, sleep quality index, and quality of life score were all superior to those in the control group. Zhang Yingzun et al. [27] conducted a randomized controlled trial evaluating the clinical efficacy of wrist-ankle acupuncture combined with opioid therapy for cancer pain. Data demonstrated that the overall analgesic efficacy rate of wrist-ankle acupuncture combined with opioids (96%) was significantly higher than that of opioid therapy alone (86%). Additionally, pain scores decreased in both groups post-treatment, with more pronounced reductions observed in the combined group. Ding Wenlong et al. [28] treated 100 advanced tumor patients with refractory cancer pain; the control group received only opioid therapy, while the observation group received wrist-ankle acupuncture therapy in addition. Results indicated that the VAS (Visual Analogue Scale) score in the observation group was significantly lower than both pre-treatment levels and post-treatment levels in the control group, with an overall efficacy rate of 98% significantly higher than 76% in the control group. Zhao Zhuang [29] and colleagues optimized the treatment regimen of hydrocodone hydrochloride sustained-release tablets for cancer pain by combining it with wrist-ankle acupuncture. The results demonstrated that, compared to the control group receiving only hydrocodone sustained-release tablets, the observation group exhibited significantly better pain control, reduced medication dosage, lower incidence of adverse reactions, and improved quality of life. These findings support the clinical efficacy of combining wrist-ankle acupuncture therapy with hydrocodone sustained-release tablets for cancer pain management and warrant widespread adoption.

2.4 Acupoint Injection Combined with the Three-step Analgesic Approach

Umbilical acupuncture therapy, as an innovative branch of traditional acupuncture, achieves the goal of regulating systemic or localized conditions by stimulating specific acupoints around the umbilicus, offering advantages such as minimal invasiveness and low infection risk. From the perspective of Traditional Chinese Medicine (TCM), the umbilicus (specifically the “Shenque point”) is regarded as the body’s “primary pain center,” and stimulation of these acupoints can effectively alleviate pain [30]. Researchers

including Li Shuyi [31] conducted a study involving 60 patients with lung cancer-related pain. The control group received hydroxychloroquine sustained-release tablets, while the treatment group received the same medication combined with umbilical acupuncture therapy. Results demonstrated that the pain scores in the treatment group were significantly lower than those in both the control group and the pre-treatment baseline group; the frequency of acute pain episodes was reduced in the treatment group, and the incidence of adverse reactions was also lower. Additionally, post-treatment improvements in Quality of Life (QOL) scores and Carthage score were statistically significant ($P < 0.05$). These findings indicate that umbilical acupuncture combined with the three-step analgesic regimen effectively alleviates pain, reduces the incidence of adverse reactions associated with this treatment approach, and enhances patients' quality of life. Further research by Zhao Yunjie et al. [32] revealed that the overall analgesic efficacy rate in the treatment group was 83.3%, significantly higher than the 60.0% observed in the control group. Moreover, the combination of the three-step analgesic protocol with umbilical acupuncture improved the onset time and duration of analgesic effects, thereby reducing the required dosage of analgesics and lowering adverse reaction rates. This confirms that such combined therapy not only enhances the efficacy of the three-step analgesic regimen but also does not increase the incidence of adverse reactions, demonstrating excellent safety profiles.

2.5 Pressing Needle Combined with the Three-step Analgesic Method

Press needle therapy, also known as "buried needle technique," is a form of intradermal needle treatment in which specialized micro-needles are implanted subcutaneously to exert prolonged and sustained effects on acupoints for therapeutic purposes [33]. In recent years, the clinical application of press needle therapy has gradually increased, with multiple studies demonstrating its definitive efficacy and promising prospects in managing cancer pain. Chen Yuanyuan et al. [34] conducted a randomized controlled trial, randomly assigning 62 cancer pain patients to either a control group receiving only acetaminophen and oxycodone or an observation group receiving press needle therapy in addition to these medications. The results showed that the total effective rate in the observation group was 96.77%, significantly higher than the control group's 77.42%; the quality of life (QOL) score in the observation group was also superior, and the Brief Pain Inventory (BPI) scores were lower compared to those of the control group. Long Canhai et al. [35] investigated the efficacy and safety of press needle therapy combined with a three-step analgesic regimen for cancer pain, finding that the incidence of adverse opioid reactions and NRS scores were significantly lower in the experimental group than in the control group. Wang Jingxia et al. [36] employed a three-step analgesic regimen combined with press needle therapy for cancer pain, revealing significant reductions in NRS scores and markedly decreased levels of serum prostaglandin E2 (PGE2) and calcitonin gene-related peptide (CGRP) in the treatment group. These studies collectively demonstrate that press needle therapy combined with a three-step analgesic regimen is highly effective for cancer pain management, reduces the incidence of adverse opioid reactions, and

improves patients' quality of life.

2.6 Acupoint Pressure with Beans Combined with a Three-step Analgesic Method

Ear acupoint seed pressure therapy is a traditional external treatment modality in Chinese medicine that involves applying seeds of *Semen Semen Semen Herba* (Wangbuliuxing) to specific reactive areas of the auricle and applying sustained pressure stimulation to regulate internal organs and alleviate pain [37]. Its primary advantages include being non-invasive, which significantly surpasses previous methods, as well as simple operation and high safety profile. Huang Zhen et al. [38] randomly divided 68 patients with cancer-related pain into a control group and an experimental group; the control group received opioid therapy alone, while the experimental group received combined ear acupoint seed pressure therapy. Results showed that the NRS scores in both groups were lower on days 7 and 14 in the experimental group, with further reduction observed by day 14 compared to day 7. Additionally, the experimental group exhibited fewer episodes of acute pain, lower incidence of adverse reactions, and reduced opioid dosage during treatment, demonstrating the efficacy of ear acupoint seed pressure therapy combined with a three-step analgesic regimen in alleviating cancer pain, improving pain severity, and reducing opioid usage and adverse effects. Jiang Yiming et al. [39] investigated the clinical efficacy of ear acupoint seed pressure therapy for cancer pain by randomly assigning 180 patients to three groups (ear acupoint seed pressure group, electroacupuncture group, and oxycodone hydrochloride group, each comprising 60 cases). The results indicated that the pain relief rate in the ear acupoint seed pressure group reached 81.3%, significantly higher than those in the electroacupuncture group (67.5%) and the oxycodone group (59.2%). Chen Run [40] et al. investigated the effect of auricular acupressure combined with hydroxycodone hydrochloride sustained-release tablets on the frequency of episodic pain in cancer patients. The results demonstrated that the present pain intensity score (PPI) in the treatment group improved significantly more than that in the control group, and its KPS score was higher. Additionally, the frequency of episodic pain was markedly reduced, along with a significant decrease in nausea and vomiting rates. In conclusion, auricular acupressure, as a non-invasive external therapy, can substantially enhance the efficacy of the three-step analgesic ladder, reduce opioid dosage and adverse effects, and is characterized by simplicity, safety, and controllability, making it one of the most promising traditional Chinese medicine therapies for adjuvant cancer pain management.

2.7 Acupoint Injection Combined with a Three-step Analgesic Regimen

Acupoint injection therapy is a distinctive traditional Chinese medicine treatment that involves administering low-dose medications at acupoints or Ashi points to alleviate pain [41]. It offers advantages such as simple operation and high safety, making it widely used in clinical practice [42]. Numerous studies in recent years have demonstrated the clinical efficacy of acupoint injection in cancer pain management from various perspectives. Song Wenjing et al. [43] conducted a meta-analysis on the effectiveness of seven acupuncture

therapies combined with a three-step analgesic regimen for cancer pain, revealing that acupoint injection combined with the three-step approach achieved the highest efficacy rate (87.3%) and the lowest incidence of adverse reactions, indicating its balance between safety and efficacy. Luo Jiahua et al. [44] designed a randomized controlled trial involving 128 patients, who were randomly assigned in a 1:1 ratio to either a morphine-injected Zusanli point group or a conventional intramuscular morphine injection control group. The results showed that the morphine-treated group exhibited significantly higher analgesic efficacy than the control group, with markedly reduced NRS scores and adverse reaction rates. Bai Tao et al. [45] investigated the clinical efficacy of auricular acupoint injection in cancer pain patients, enrolling 97 cases. The control group (48 cases) received hydroxycodone sustained-release tablets, while the observation group (49 cases) received combined auricular acupoint injection therapy. After one treatment course (12 days), the results demonstrated significantly lower BPI scores and higher quality-of-life scores in the observation group compared to the control group. Scholars including Chen Jianlin [46] randomly divided 96 patients with bone metastatic cancer pain into a treatment group and a control group. The treatment group received morphine injections at acupoints, while the control group received intramuscular morphine injections. Results showed that the treatment group exhibited significantly better NRS scores and VRS ratings compared to the control group; additionally, the frequency of acute pain episodes was reduced, and the duration of pharmacological analgesia was prolonged. These findings confirm that acupoint morphine injection is more effective, acts faster, and provides longer-lasting relief than intramuscular morphine administration for cancer pain management.

3. Special Moxibustion Techniques Combined with Three-Step Analgesia Therapy

Special moxibustion refers to a therapeutic approach developed from traditional moxibustion techniques, distinct from conventional methods using mugwort cones or sticks. It enhances efficacy or tailors to specific conditions through improvements in both moxibustion materials and stimulation methods. As a dual innovation in both materials and techniques, special moxibustion provides a safe and effective non-pharmacological treatment for cancer pain [47]. When combined with the three-step analgesic ladder, it not only demonstrates the advantages of multimodal pain management but also highlights the unique value of external therapies in Traditional Chinese Medicine for patients with advanced tumors accompanied by cancer pain.

3.1 Pyrogenic Moxibustion Combined with the Three-step Analgesic Approach

Suppurative moxibustion involves placing ignited moxa wool directly on the skin, where the heat generated from combustion precisely targets specific acupoints and meridian sites, inducing sterile inflammation in local tissues and forming moxibustion lesions to provide sustained stimulation of acupoints. This process activates the body's immune regulatory functions, achieving the objectives of warming meridians, promoting qi circulation and blood flow,

harmonizing yin and yang, and reinforcing healthy qi while eliminating pathogenic factors [48]. In recent years, the efficacy of suppurative moxibustion in cancer pain management has made it a focal point of research. Zhou Ruyi et al. [49] employed suppurative moxibustion at the Zusanli acupoint combined with a three-step analgesic regimen for cancer pain treatment. Data demonstrated that post-treatment, the experimental group exhibited significantly fewer episodes of acute pain and lower NRS pain scores compared to the control group, along with reduced analgesic consumption. Additionally, significant improvements were observed in quality-of-life indicators such as emotional well-being, gastrointestinal reactions, pain intensity, and appetite. These findings indicate that the combination of suppurative moxibustion and the three-step analgesic approach outperforms the latter alone in alleviating cancer pain severity, reducing acute pain episodes, and decreasing analgesic dosage, demonstrating a synergistic effect of "analgesia, toxicity reduction, and enhanced efficacy." However, current studies on this combination remain limited, often plagued by small sample sizes and non-standardized designs, resulting in low evidence quality. Therefore, large-scale, multicenter randomized controlled trials are urgently needed to validate its true efficacy and risk-benefit ratio.

3.2 Thermosensitive Moxibustion Combined with a Three-step Analgesic Approach

Thermosensitive moxibustion is a targeted moxibustion technique applied to thermosensitive points (acupoints with heightened responsiveness to moxa heat stimulation), achieving therapeutic effects by inducing specific moxibustive sensation transmission. In cancer pain management, thermosensitive moxibustion penetrates through the skin and mucous membranes to directly target pathological sites, alleviating pain while offering advantages such as minimal invasiveness, simplicity of operation, high safety profile, and high patient acceptance, making it widely adopted in clinical practice [50]. Researchers including Liu Huawei [51] conducted analgesic treatment for 40 patients with moderate-to-severe cancer pain: the control group received only hydroxychloroquine acetate sustained-release tablets, while the experimental group received the same medication combined with thermosensitive moxibustion therapy. Results demonstrated that the total efficacy rate in the experimental group (90%) significantly exceeded that of the control group (85%), indicating that thermosensitive moxibustion combined with a three-step analgesic regimen markedly alleviates pain. Liu Bing [52] randomized 60 colorectal cancer patients into a control group receiving only morphine sustained-release tablets and an observation group receiving additional thermosensitive moxibustion. The results showed that the observation group exhibited significantly higher overall efficacy rates, shorter duration of pain episodes, and fewer acute pain occurrences compared to the control group. Furthermore, due to significant pain control, patients in the observation group experienced prolonged sleep duration, reduced anxiety levels, and improved quality of life. Liu Lixia [53] enrolled 60 patients with moderate hepatocellular carcinoma pain and randomized them into a control group receiving tramadol sustained-release tablets alone and an observation group receiving combined therapy with thermosensitive moxibustion. Data revealed that

post-treatment NRS scores were significantly lower in the observation group, along with improvements in serum levels of TNF- α and IL-2. All the aforementioned studies indicate that the combined use of thermosensitive moxibustion and the three-step analgesic protocol can not only alleviate patients' pain intensity and reduce inflammatory cytokine levels but also provide a novel, safe, and feasible option for cancer pain management.

3.3 Fire and Lightning Moxibustion Combined with the Three-Step Analgesic Protocol

Thunderfire moxibustion therapy involves applying moxa sticks containing specific traditional Chinese medicine formulations to the painful area of patients through suspended moxibustion. The high temperature penetrates the tissue, delivering therapeutic effects that warm meridians, promote circulation, resolve blood stasis, and alleviate pain, demonstrating unique advantages in managing cancer pain caused by cold stagnation or blood stasis [54]. Xu Ping et al. [55] investigated the combination of thunderfire moxibustion with opioid medications for cancer pain management, revealing that compared to the control group receiving opioids alone, the treatment group exhibited faster onset of analgesic effects, longer duration of pain relief, lower incidence of adverse reactions, and improved quality of life. Lü Liqiong and Zhu Xiaoxiao [56] further validated this via a randomized controlled trial, demonstrating that thunderfire moxibustion combined with oxycodone sustained-release tablets provided more effective pain control, shorter analgesic onset time, and prolonged pain relief duration compared to monotherapy. Lu Fengzhi et al. [57] employed thunderfire moxibustion combined with morphine hydrochloride sustained-release tablets for moderate-to-severe cancer pain; the observation group received additional thunderfire moxibustion therapy alongside morphine hydrochloride sustained-release tablets, showing higher rates of complete remission (CR) and partial remission (PR) than the control group. In conclusion, thunderfire moxibustion combined with the three-step analgesic regimen demonstrates significant clinical efficacy in cancer pain management and serves as an effective adjunctive treatment option.

3.4 Warm Needle Acupuncture Combined with the Three-step Analgesia Method

Warm needle acupuncture therapy is a specialized acupuncture technique in which an ignited moxa stick is inserted into the handle of a fine needle that has already been inserted into the acupoint, with the thermal energy from the burning moxa stimulating the acupoint via the needle [58]. This method regulates qi and blood circulation, promotes meridian flow, and alleviates pain through the dual mechanisms of needle insertion and thermal conduction. Lai Hongkang et al. [59] conducted a randomized controlled trial, randomly assigning 105 patients with cancer-related pain to three groups: a warm needle group receiving only warm needle acupuncture, a Western medicine group treated with a three-step analgesic regimen, and a combined group receiving both warm needle acupuncture and the three-step analgesic protocol. The results demonstrated that the combined group exhibited significantly superior analgesic efficacy compared to the other two groups, confirming the effectiveness of this

combined approach for cancer pain relief, which surpasses both Western medication and traditional acupuncture therapy. Hu Xuxuan et al. [60] performed another randomized controlled trial to evaluate the analgesic effects of combining warm needle acupuncture with OxyContin in cancer pain management. The findings showed that compared to OxyContin monotherapy, the combined treatment not only shortened the onset time of analgesia and reduced the frequency of acute pain episodes but also decreased the required dosage of OxyContin and the incidence of related adverse reactions. Wei Ke [61] et al. further validated the efficacy of warm needle acupuncture combined with the three-step analgesic ladder in cancer pain management through their study. The results demonstrated that adding warm needle acupuncture to the conventional three-step analgesic ladder approach increased the overall analgesic efficacy rate to 90.00%, significantly reduced opioid dosage and adverse reaction rates, while also markedly lowering anxiety and depression scores in the treatment group compared to the control group. These findings indicate that this combination not only reduces opioid use while maintaining analgesic efficacy but also alleviates patients' anxiety and depressive symptoms, achieving dual benefits in both pain relief and emotional regulation.

4. Problems and Prospects

Cancer pain has become the most common complication of cancer, significantly impacting patients' quality of life. Although the three-step analgesic ladder recommended by the WHO can alleviate most cases of cancer pain, alternative safe and effective adjunctive therapies are urgently needed when opioid medications fail to achieve desired analgesic efficacy or when patients experience intolerable adverse effects. Extensive domestic and international studies have confirmed the efficacy of acupuncture in managing cancer pain [62], particularly specific acupuncture techniques characterized by "minimal invasiveness and high therapeutic efficacy." When combined with the three-step analgesic ladder, these techniques not only enhance analgesic outcomes but also reduce opioid dosage and lower the incidence of adverse reactions, demonstrating unique advantages such as synergistic effects and reduced toxicity. This approach provides a novel "acupuncture-pharmacotherapy synergy" strategy for comprehensive cancer pain management.

However, the application of specialized acupuncture combined with the three-step analgesic approach in cancer pain management still faces numerous challenges: Firstly, existing literature predominantly focuses on clinical efficacy observations, with limited research on the mechanisms underlying acupuncture's therapeutic effects for cancer pain. Moreover, the molecular targets involved in acupuncture's pain-relieving mechanisms remain unclear and require further investigation. Secondly, most current studies integrate specialized acupuncture with the three-step analgesic protocol, while research employing acupuncture alone for cancer pain management is scarce, hindering the assessment of its independent analgesic efficacy. Future studies should conduct standardized controlled trials focusing solely on specialized acupuncture therapies [63]. Additionally, insufficient sample sizes and non-compliance with rigorous study design protocols compromise the reliability and objectivity of

findings, resulting in a lack of high-quality evidence [64]. It is recommended to establish robust research protocols aligned with the CONSORT guidelines and STRICTA standards, utilizing multicenter, large-sample, double-blind randomized controlled trials to provide stronger evidence-based support for acupuncture's efficacy in cancer pain management [65]. Finally, given the diversity of cancer types, dedicated disease-specific treatment frameworks should be developed for each type of cancer-associated pain, with optimal acupuncture regimens selected to enhance therapeutic reliability.

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