Acupressure for Postoperative Pain and Analgesic Use Reduction

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Abstract
Postoperative pain remains a significant clinical concern following surgical procedures, often affecting recovery, mobility, sleep quality, and overall patient satisfaction. Although pharmacological analgesics such as opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), and regional anesthesia techniques are widely used, they may be associated with adverse effects including nausea, constipation, respiratory depression, sedation, and risk of dependence. These limitations have prompted increasing interest in complementary approaches that can enhance pain control while reducing reliance on medications. Acupressure is a non-invasive technique that involves applying manual pressure to specific acupoints to stimulate neuromodulatory and physiological responses. This study examines the effectiveness of acupressure in reducing postoperative pain intensity and decreasing analgesic consumption. Commonly targeted acupoints include LI4 (Hegu), PC6 (Neiguan), and ST36 (Zusanli), which are associated with pain modulation and systemic regulation.
Keywords: Postoperative Pain; Acupressure; Analgesic Use Reduction; Opioid Sparing

Introduction
Postoperative pain is an expected consequence of surgical intervention, yet inadequate pain control remains a common clinical challenge. Moderate to severe pain following surgery can delay mobilization, impair respiratory function, prolong hospital stay, and negatively affect patient satisfaction. Effective postoperative pain management is therefore essential not only for comfort but also for optimal recovery and prevention of complications.Conventional management relies primarily on pharmacological analgesics, including opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and regional anesthesia techniques. While these approaches can provide significant relief, they are often associated with adverse effects. Opioids, in particular, may cause nausea, vomiting, constipation, sedation, respiratory depression, and risk of dependency. NSAIDs may contribute to gastrointestinal irritation or renal complications. These concerns have led to increased emphasis on multimodal analgesia strategies that combine pharmacological and non-pharmacological methods to minimize drug-related side effects. In recent years, complementary therapies have gained attention as adjunctive approaches in postoperative care. Among these, acupressure is a non-invasive technique derived from traditional East Asian medicine that involves applying manual pressure to specific acupoints associated with pain modulation and physiological regulation. From a biomedical perspective, acupressure is thought to stimulate endogenous opioid release, modulate autonomic nervous system activity, improve local circulation, and influence central pain-processing pathways. Common acupoints used in postoperative pain management include LI4 (Hegu), PC6 (Neiguan), and ST36 (Zusanli), each associated with analgesic and regulatory effects. Because acupressure does not require needles or specialized equipment, it is considered safe, cost-effective, and relatively easy to implement in clinical settings. Given the global

concerns regarding opioid overuse and the need for enhanced recovery protocols, evaluating the effectiveness of acupressure in reducing postoperative pain and decreasing analgesic consumption is clinically relevant. current evidence regarding the analgesic benefits of acupressure and its potential role as part of a comprehensive, patient-centered postoperative pain management strategy.

Pathophysiology of Postoperative Pain

Postoperative pain arises as a direct consequence of surgical tissue injury. Incision, retraction, and manipulation of tissues activate inflammatory and neural pathways that generate and amplify pain signals. Although acute postoperative pain is a protective physiological response, excessive or poorly controlled pain can delay recovery and increase the risk of chronic pain development.

1. Tissue Injury and Inflammatory Response

Surgical trauma disrupts skin, muscle, fascia, and sometimes internal organs, triggering the release of inflammatory mediators such as prostaglandins, bradykinin, histamine, and cytokines. These substances sensitize peripheral nociceptors, specialized sensory nerve endings that detect harmful stimuli.

Inflammation increases local blood flow and vascular permeability, contributing to swelling and tenderness around the surgical site. This peripheral sensitization lowers the threshold for pain perception, making normally mild stimuli more painful.

2. Nociceptive Transmission Pathways

Activated nociceptors transmit electrical signals through peripheral nerves to the dorsal horn of the spinal cord. From there, pain impulses ascend via the spinothalamic tract to higher brain centers, including the thalamus and cerebral cortex, where pain is consciously perceived.

This process involves multiple neurotransmitters such as glutamate and substance P, which facilitate signal transmission within the spinal cord.

3. Central Sensitization

Persistent or intense nociceptive input following surgery can lead to central sensitization. In this state, neurons within the spinal cord and brain become hyperresponsive, amplifying pain signals. Central sensitization may result in hyperalgesia (increased sensitivity to painful stimuli) and allodynia (pain from normally non-painful stimuli).

If not adequately managed, central sensitization can contribute to prolonged postoperative pain and potentially transition into chronic postsurgical pain.

4. Neuropathic Components

In some surgical procedures, direct nerve injury may occur. Damage to peripheral nerves can generate neuropathic pain characterized by burning, tingling, or shooting sensations. Neuropathic mechanisms may coexist with inflammatory pain, complicating postoperative pain management.

5. Psychological and Neuroendocrine Factors

Pain perception is influenced by emotional and psychological factors such as anxiety, fear, and prior pain experiences. Surgical stress activates the hypothalamic–pituitary–adrenal axis and sympathetic nervous system, which may enhance pain sensitivity. Elevated stress hormones can further influence inflammatory processes and pain modulation pathways.

postoperative pain results from a combination of inflammatory responses, peripheral nociceptor activation, central sensitization, and psychological influences. Understanding these mechanisms supports the rationale for multimodal pain management approaches, including complementary interventions such as acupressure that may modulate both peripheral and central pain pathways.

Multimodal Analgesia and Enhanced Recovery Protocols

Effective postoperative pain control has evolved from reliance on single-drug opioid therapy to a broader, integrated approach known as multimodal analgesia. This strategy combines different classes of analgesics and non-pharmacological techniques that target multiple pain pathways simultaneously. The goal is to improve pain relief, reduce opioid consumption, and enhance overall recovery.

1. Principles of Multimodal Analgesia

Multimodal analgesia is based on the understanding that postoperative pain arises from diverse mechanisms, including inflammatory, nociceptive, neuropathic, and central sensitization processes. By combining medications with distinct mechanisms of action, clinicians can achieve synergistic pain relief while minimizing the dosage and side effects of any single drug. Common components include:

- Acetaminophen and NSAIDs to reduce inflammation and peripheral sensitization
- Opioids for moderate to severe pain when necessary
- Regional anesthesia techniques such as nerve blocks
- Adjuvant medications including gabapentinoids or local anesthetics

This layered approach addresses pain at peripheral, spinal, and central levels.

2. Opioid-Sparing Strategies

Given concerns regarding opioid-related adverse effects and dependency, modern protocols emphasize opioid-sparing techniques. Reducing opioid use decreases risks of respiratory depression, nausea, constipation, sedation, and delayed mobilization. Multimodal regimens often allow lower opioid doses while maintaining adequate analgesia.

3. Enhanced Recovery After Surgery (ERAS) Protocols

Enhanced Recovery After Surgery (ERAS) protocols are evidence-based perioperative care pathways designed to reduce surgical stress, accelerate recovery, and shorten hospital stay. Pain management is a central component of ERAS programs.

Key ERAS principles include:

- Preoperative patient education
- Minimally invasive surgical techniques
- Early mobilization and nutrition
- Optimized fluid management
- Multimodal, opioid-sparing analgesia

By minimizing physiological stress and improving pain control, ERAS protocols promote faster functional recovery and reduce postoperative complications.

4. Role of Non-Pharmacological Interventions

Non-pharmacological approaches are increasingly integrated into multimodal analgesia frameworks. Techniques such as relaxation training, cold therapy, transcutaneous electrical nerve stimulation, and acupressure may complement pharmacological methods. These

interventions can modulate pain perception, reduce anxiety, and enhance patient engagement in recovery.

5. Clinical Outcomes and Benefits

Studies have shown that multimodal analgesia within ERAS protocols can lead to improved pain scores, reduced opioid consumption, earlier ambulation, shorter hospitalization, and higher patient satisfaction. Importantly, comprehensive pain control reduces the risk of chronic postsurgical pain development.

multimodal analgesia and enhanced recovery protocols represent a modern, patient-centered approach to postoperative care. By addressing multiple pain mechanisms and minimizing reliance on opioids, these strategies create an opportunity to incorporate complementary therapies such as acupressure as safe and supportive components of comprehensive pain management.

Conclusion

Postoperative pain is a multifactorial physiological response resulting from tissue injury, inflammation, nociceptive activation, and central sensitization. If inadequately managed, it can delay mobilization, prolong hospitalization, impair recovery, and increase the risk of chronic postsurgical pain. Although pharmacological therapies, particularly opioids, remain central to postoperative analgesia, their associated adverse effects and potential for dependency highlight the need for balanced and integrated pain management strategies. Multimodal analgesia and enhanced recovery protocols have shifted clinical practice toward combining different therapeutic approaches to optimize pain control while minimizing drug-related complications. Within this framework, complementary interventions such as acupressure offer a promising adjunctive option. By potentially stimulating endogenous opioid release, modulating autonomic nervous system activity, and influencing central pain-processing pathways, acupressure may contribute to reduced pain intensity and lower analgesic requirements. Current evidence suggests that integrating acupressure into postoperative care is safe, feasible, and cost-effective. It aligns well with opioid-sparing strategies and patient-centered recovery models. However, further high-quality randomized controlled trials are needed to establish standardized application techniques, optimal timing, and long-term outcomes. incorporating acupressure into multimodal analgesic protocols represents a supportive and holistic approach that may enhance recovery, improve patient comfort, and reduce reliance on pharmacological analgesics in the postoperative setting.

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