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PERSPECTIVE

# Narrative Review of Perioperative Acupuncture for Clinicians

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**Abstract**
Acupuncture is one of the oldest forms of the natural healing arts. The exact mechanisms of action are unknown at this time; however, current theories to explain the benefits experienced after acupuncture include Traditional Chinese Medicine and Western medicine concepts. Acupuncture may improve the quality of perioperative care and reduce associated complications. Perioperative acupuncture is apparently effective in reducing preoperative anxiety, postoperative nausea and vomiting, and postoperative pain. The *Pericardium-6* (P-6; *Nei Guan*), *Yintang* (Extra 1), and *Shenmen* acupuncture points are the most studied and effective acupuncture points in reducing preoperative anxiety, postoperative nausea and vomiting, and postoperative pain experiences. Intraoperatively administered acupuncture may reduce immunosuppression in patients and lessen intraoperative anesthetic requirements, although the clinical usefulness of acupuncture in the intraoperative period remains inconclusive. Perioperative acupuncture is a promising intervention, but additional studies are needed to further understand and define acupuncture's role throughout the perioperative period and determine its clinical usefulness. The purpose of this article is to provide a brief clinical review concerning acupuncture and its application for common issues that occur in the perioperative period.

## 1. Introduction

Acupuncture is described as "a family of procedures involving the stimulation of anatomical points on the body using a variety of techniques" [1]. There are multiple forms of specific acupuncture practice such as needle acupuncture, acupuncture point injection, and auricular acupuncture. Acupuncture is a main pillar of Traditional Chinese Medicine, which also includes acupressure, moxibustion, cupping, and use of medicinal herbs. The most common

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types of acupuncture utilized in Western medical practice and research are needle acupuncture and auricular acupuncture. These techniques entail manually inserting small needles superficially into the skin at specific anatomical points throughout the body [1]. Once the needles are properly placed, they are commonly manipulated by hand or connected to electrical stimulation [1].

Acupuncture is one of the oldest forms of the natural healing arts. Its use may date to as early as the 4th or 3rd century BC [2]. In 1971, the practice of acupuncture and its benefits gained much attention in the United States after reporter James Reston developed acute appendicitis while covering President Nixon's visit to China. It has been documented that acupuncture treatment was an integral component of his postoperative care [2,3]. Mr. Reston's experience was described in an article publicized in the New York Times, which created a surge in American research interest that prompted Western scientists to study its potential contribution to Western medicine [2,3]. The introduction of advanced imaging modalities such as magnetic resonance imaging (MRI) and positron emission tomographic (PET) scanning in the following years further aided the interest and study of acupuncture [2,4–8]. At this time, a significant collection of scientific literature has been accumulated concerning the implications of acupuncture for the management of multiple ailments such as postoperative pain, nausea and vomiting, osteoarthritis pain, rheumatoid arthritis pain, low back pain, headaches, knee pain, depression, and anxiety. In addition, multiple studies have investigated the physiological mechanism of acupuncture. However, it remains to be completely understood.

Traditional Chinese Medicine theory recognizes the concept of *qi*, which is described as "life force" or "energy." Traditional Chinese Medicine treatments attempt to identify energetic imbalances within a patient and subsequently restore the discovered disharmonies [9]. Traditional acupuncture treatments consist of stimulating specific points on any of 12 individual "meridians" that control the flow of *qi* throughout the body. Each meridian has a distinct number of points located along it, and it passes through or near a related organ for which the meridian is named [2]. There are 365 common points that inhabit the 12 meridians, with each point denoted by the meridian name followed by a specific number [e.g., *Lung-7* (LU-7)] [2]. In addition to points within the meridian system, several points and systems exist on "extra" meridians and anatomical regions such as the ear (i.e., auricular acupuncture).

Western science has attempted to understand the physiological mechanisms to explain the benefits experienced after acupuncture treatment. Based upon the results of multiple scientific studies, various theories on the analgesic mechanism of action have been concluded. Such theories include the release of endogenous opioids such as beta-endorphins, stimulation of descending antinociceptive pathways, release of inhibitory neurotransmitters such as norepinephrine and serotonin, modulation of the hypothalamic-limbic system, activation of the pain neuromatrix, and a placebo effect [2,4,8,10,11]. However, the mechanisms of these actions are yet to be fully identified and understood.

## 2. Application of acupuncture in the perioperative period

Acupuncture appears to be a promising intervention for various uses throughout the stages of perioperative care. Acupuncture utilization can be assigned and grouped into three perioperative application periods: (1) preoperative preparation; (2) intraoperative; and (3) postoperative care [2] (Table 1).

## 3. Preoperative preparation period

The application of acupuncture during the preoperative period appears to effectively reduce preoperative anxiety, enhance analgesia, minimize postoperative pain, and

**Table 1** Application of perioperative acupuncture.*

| Perioperative stage treatment was applied | Rationale | Body acupoints | Auricular acupoints |
|---|---|---|---|
| Preoperative period | Preoperative anxiety | *Yintang* (Extra-1) | Relaxation Point |
| Pre- and postoperative periods | Postoperative nausea and vomiting | P-6 | |
| Intraoperative period | Intraoperative immunosuppression | LI-4, TE-5, BL-63, LR-3. ST-36, GB-40, BL-10, GB-20, BL-2, EX-HN4 | |
| Intraoperative period | Intraoperative anesthetic requirements | SP-6 | Lateral Control Point, Shenmen, Thalamus, Tranquilizer, Master Cerebral Point |
| Pre- and postoperative periods | Postoperative pain | P-6, GB-21, LU-1, LI-11, LI-4, TE-3, TE-5 | Shenmen, Heart, Lung, Tooth, Mouth, Uterus, Cushion, Thalamus, Hip, Knee, Forehead |

* The information is derived from references 12-17, 22-48, 55-57, 59, and 62-64.

diminish postoperative nausea and vomiting (PONV) [12—17]. These beneficial effects of preoperative acupuncture may be attributed to the sedative effects of treatment. Studies indicate that increased anxiety may be related to increased pain levels, particularly postoperative pain and subsequent analgesic consumption [2,18—21].

According to recent studies, body and auricular acupuncture point treatments are both effective in modulating anxiety in preoperative patients. Multiple studies have indicated that acupuncture administered at the *Yintang* (Extra 1) point effectively decreases anxiety such as preoperative anxiety [22—26] (Fig. 1). In addition, stimulation of auricular acupuncture points such as the *Relaxation point* is effective in treating preoperative anxiety [27—29].

Preoperative acupuncture treatment is a valuable intervention in reducing PONV. Acupuncture intervention for PONV yields a positive influence when administered administration in the pre- and postoperative periods. Other acupuncture points have been studied in this context, although the P-6 (*Nei Guan*) point is the most effective of the studied points [12,13,30—48].

## 4. Intraoperative period

The clinical usefulness of acupuncture in the intraoperative period remains inconclusive [49]. Some studies have shown that intraoperative acupuncture combined with orthodox anesthetic practices is safe, can reduce the required dose of opioids, and may yield a higher level of comfort during the postoperative period in comparison to the unaccompanied administration of anesthesia [50,51]. However, some studies have yielded dubious outcomes and further research is necessary [52—54].

Acupuncture may reduce immunosuppression in patients and decrease intraoperative anesthetic requirements [55—59]. According to a study by Li et al [55], electroacupuncture applied during supratentorial craniotomy surgery to the points LI-4 (*Hegu*), TE-5 (*Weiguan*), BL-63 (*Jinme*), LR-3 (*Taichong*), ST-36 (*Zusanli*), GB-40 (*Quixu*), BL-10 (*Tianzhu*), GB-20 (*Fengchi*), BL-2 (*Cuanzhu*), and EX-HN4 (*Yuyao*) appears to reduce immunosuppression of humoral and cellular constituents in patients. Perioperative acupuncture has also been shown to decrease intraoperative anesthetic requirements, but outcomes illustrating clinical translation and significance are variable [56—59]. The body acupuncture point SP-6 (*San Yin Chiao*) and the auricular acupuncture points Lateral Control Point, Shenmen, Thalamus, Tranquilizer, and Master Cerebral Point decrease intraoperative anesthetic requirements [56,57,59] (Fig. 2).

## 5. Postoperative care period

Postoperative nausea and vomiting continues to be a very common challenge during the postoperative period. There is a variety of available prophylactic antiemetic interventions and the incidence of PONV has been significantly reduced in recent years; however, it has been reported that up to 70% of high-risk patients are still affected [2,60,61]. Acupuncture for the treatment of PONV is an effective intervention. The use of preoperatively administered acupuncture and/or postoperative administered acupuncture both effectively reduce PONV. Multiple acupuncture points have been investigated regarding their role in treating and preventing PONV; however, stimulation of the P-6 (*Nei Guan*) point appears to be the most effective method in reducing PONV with acupuncture intervention [12,13,30—48] (Fig. 3).

Postoperative pain is a regular concern in the perioperative period. Acupuncture may be an effective adjunctive intervention for postoperative pain by reducing the required doses of analgesics (primarily opioids) and subsequent complications. The use of acupuncture could be especially valuable for high-risk patients such as patients who have chronic obstructive pulmonary disorder or obstructive sleep apnea, which may be prone to complications (primarily respiratory depression) from analgesics [62]. Stimulation of multiple body acupuncture points appear to be capable of reducing postoperative pain. Based on a systematic review and meta-analysis of randomized controlled trials concerning auricular acupuncture for pain management, Asher et al [63] concluded that auricular acupuncture may be valuable in the treatment of a variety

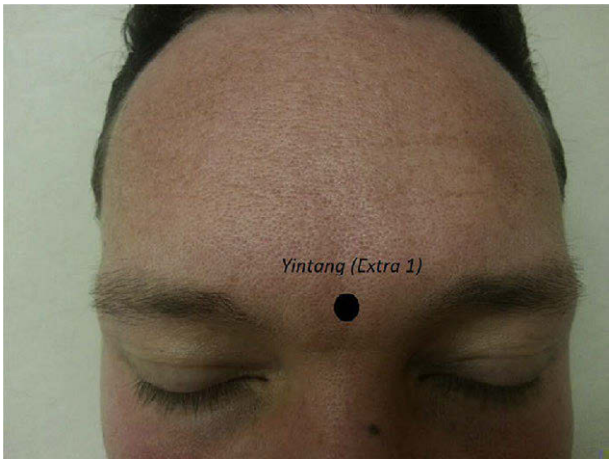


**Figure 1** *Yintang* (Extra 1) acupoint.


**Figure 2** *Shenmen* auricular acupoint.

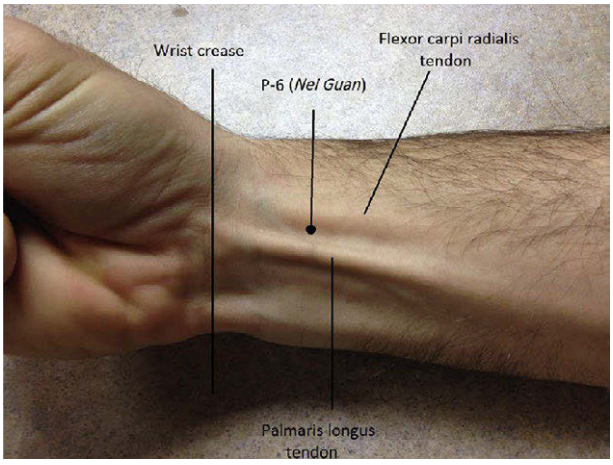


**Figure 3** P-6 (*Nei Guan*) acupoint.

of types of pain, particularly postoperative pain [63]. Various studies have shown reduced postoperative pain after the stimulation of several acupuncture points such as the body acupuncture points P-6 (*Nei Guan*), GB-21 (*Jinajing*), LU-1 (*Zhongfu*), LI-11 (*Quchi*), LI-4 (*Heu*), TE-3 (*Zhongzhu*), TE-5 (*Waiuan*), and the auricular acupuncture points Shenmen, Heart, Lung, Tooth, Mouth, Uterus, Cushion, Thalamus, Hip, Knee, and Forehead [47,48,62—64]. The acupuncture points that have been most studied and have demonstrated the greatest influence on reducing postoperative pain are P-6 and *Shenmen*. Future studies are necessary to further develop an understanding of the clinical importance.

## 6. Discussion

Approximately 240 million surgical procedures are performed annually worldwide [65]. Severe pain after surgical procedures is a major factor causing patient dissatisfaction, delayed recovery, immobility, and prolonged hospital stay in the postoperative period and is associated with severe complications such as chronic pain. [66,67]. Gerbershagen et al [68] showed that severe pain is an issue after major surgery and after many minor surgeries. Optimal perioperative pain management is an ethical issue and a medical and economic concern [69]. Despite the implementation of guidelines on postoperative pain, many patients continue to experience severe postoperative pain [67,70,71]. A recent study demonstrates that a young age, preoperative chronic pain intensity, and female sex are associated with a higher postoperative pain intensity and that these associations are consistent for a large number of different types of surgery [69].

Acupuncture is one of the oldest forms of healing and its acceptance in Western medicine is rapidly increasing. Perioperative acupuncture appears to be effective in reducing preoperative anxiety, PONV, and postoperative pain. Preoperative stimulation of the *Yintang* (Extra 1) point and *Relaxation* point seem to positively influence preoperative anxiety. Stimulation of P-6 (*Nei Guan*) appears to be the most effective acupuncture method in reducing PONV. The clinical usefulness of acupuncture administered to LI-4, TE-5, BL-63, LR-3, ST-36, GB-40, BL-10, GB-20, BL-2, and EX-HN4 in the intraoperative period remains unclear; however, this treatment may improve immunosuppression in patients and decrease intraoperative anesthetic requirements, particularly with the stimulation of SP-6, (*San Yin Chiao*), Lateral Control Point, Shenmen, Thalamus, Tranquilizer, and Master Cerebral Point. Acupuncture administered in the postoperative period, particularly through stimulation of P-6 (*Nei Guan*) and *Shenmen* points, effectively reduce postoperative pain levels, and may be particularly beneficial for patients at a high risk of complications from analgesics. Acupuncture treatment in the perioperative period appears to be a promising intervention in positively influencing various perioperative issues. Patients with significant preoperative anxiety, who are at high risk for PONV, have a high tolerance of opioids, or are expected to have significant postoperative pain may receive the most benefit from perioperative acupuncture.

There is a significant lack of high-quality research with regards to perioperative acupuncture, particularly in the area of intraoperative acupuncture. Further studies are needed to assess the safety and efficacy of intraoperative acupuncture and to predict patient subgroups that are most likely to respond positively to perioperative acupuncture. In particular, the at-risk demographics, young age, high preoperative chronic pain intensity, and the female sex should be targeted in larger scale trials.

## Disclosure statement

The authors declare that they have no conflicts of interest and no financial interests related to the material of this manuscript.

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