



Review

Acupuncture and related techniques during perioperative period: A literature review



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ABSTRACT

Acupuncture has been used in the Far East for more than 2000 years. Since the early 1970s, this technique has been gaining popularity among Western medical community. A number of studies suggest that its mechanism of effect can be explained in biomedical terms. In this context, a number of transmitters and modulators including beta-endorphin, serotonin, substance P, interleukins, and calcitonin gene-related peptide are released. For that reason, acupuncture can be used in a wide variety of clinical conditions. Studies showed that acupuncture may have beneficial effect in perioperative period. It relieves preoperative anxiety, decreases postoperative analgesic requirements, and decreases the incidence of postoperative nausea and vomiting. In this review article, we examine perioperative use of acupuncture for a variety of conditions.

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1. Introduction

Acupuncture has been a major therapeutic method for thousands of years in the Far East. Traditional Chinese Medicine (TCM) including acupuncture is based on the concept of vital energy (*qi*) flows throughout the body by multiple channels (meridians).¹ When there is an interruption in this flow, it can cause disease. Stimulation of points located on meridians is believed to restore Yin-Yang balance and to have a therapeutic effect.

The use of acupuncture gained popularity in the early 1970s. After a meeting in 1979, the WHO published a list of diseases that can be treated with acupuncture.² Most importantly, FDA approved acupuncture needles as a medical device in 1996.³ The NIH published a report concluding that “there is sufficient evidence of acupuncture’s value to expand its use into conventional medicine”.⁴

Both central and peripheral mechanisms may contribute to the therapeutic effects of acupuncture.⁵ Studies have shown that acupuncture exerts its effect at three different levels: the peripheral site, spinal cord and supraspinal structures.⁶ Acupuncture stimulation promotes the release of endogenous opioids from lymphocytes, monocytes/macrophages and granulocytes at the peripheral site, which in turn suppresses nociception in the

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peripheral nerve terminals. Serotonin, nerve growth factor and bradykinin, as well as opioids and cannabinoids, may also be responsible for the analgesic effect. At the spinal cord level, noxious input transmission was blocked after acupuncture stimulation, an effect that increases the levels of opioids, noradrenaline and 5-hydroxytryptamine (5-HT). The main effect of acupuncture in supraspinal structures is to inhibit sensorial and affective components of pain. A number of nuclei, including the nucleus raphe magnus, periaqueductal gray, locus coeruleus, arcuate, preoptic area, accumbens, caudate, and amygdala, are responsible for this effect.⁶

In this literature review, our aim is to discuss the effects of acupuncture and related techniques during perioperative period. Although there are several other reviews on this topic, a large number of papers were published in recent years, too. So, it is a necessity to discuss up-to-date information on this area in the light of current information.

2. Acupuncture and anesthesia

The use of acupuncture for the perioperative period has a history of more than 50 years. “Acupuncture anesthesia” was first used in Shanghai, China, in 1958.⁷ The first article in the Western medical literature was published in JAMA in 1971.⁸

While “perioperative” refers to the three phases of the surgical period, including the preoperative, intraoperative, and postoperative phases, acupuncture can be used in all of these phases for specific indications.

2.1. Preoperative period

Preoperative anxiety is the leading problem for anesthesiologists in the preoperative period. In Western literature, the first study dealing with the use of acupuncture for preoperative anxiety was performed by Wang et al.⁹ In this study, 55 volunteers were divided into three groups: *shenmen*, relaxation, and sham. Permanent ear press needles were inserted and kept in place for 48 h in all groups. The results showed that the effect of acupuncture started in 30 min and lasted for up to 48 h, while the relaxation point resulted in a lower anxiety score when the three groups were compared. Following this volunteer study, the same research group investigated anxiety in preoperative patients.¹⁰ Three groups of patients underwent unilateral acupuncture at three points for 30 min. The authors found that ear acupuncture in the relaxation group resulted in a more significant anxiolytic effect than a traditional Chinese medicine group and control group. The very first study evaluating the effects of body acupoints on preoperative anxiety was performed by Fassoulaki et al.¹¹ The authors used acupressure to stimulate the *yintang* (EX-HN3) point, which is located at the root of the nose. Ten minutes of acupressure led to a significant decrease in the bispectral index and verbal stress scale scores compared to sham acupoint stimulation. Later studies confirmed that acupuncture is an efficient nonpharmacological method for relieving anxiety in adults, children, and parents whose children are undergoing surgery (Table 1).^{12–18} However, a study that investigated the effect of stimulating body acupoints did not find a difference between true and sham acupuncture points.¹⁹

Some investigators have also suggested that acupuncture can be used for dental anxiety, anxiety before extracorporeal shock wave lithotripsy, and anxiety in prehospital transport settings.^{20–22}

2.2. Intraoperative period

General anesthesia has three main characteristics: loss of consciousness, muscle relaxation and surgical analgesia. Although numerous studies have shown that acupuncture has an analgesic

effect in animal models and humans, the current literature does not provide sufficient evidence that acupuncture is effective for loss of consciousness and muscle relaxation. Accordingly, recent acupuncture studies have focused on the use of acupuncture as an adjuvant to general anesthetics to decrease the doses of anesthetics and/or opioids intraoperatively.

Intraoperative acupuncture studies can be classified into three categories: acupuncture as an adjuvant for general anesthetics, acupuncture as an adjuvant for local anesthetics, and acupuncture as an adjuvant for intravenous analgesics/sedatives.

Early studies of intraoperative acupuncture have reported very promising results with up to 70% decreases in the anesthetic requirements.^{23–26} However, the major limitation of these studies is the low methodological quality, while most are not double-blind, placebo-controlled studies. This factor is thought to decrease the credibility of the positive results presented in these studies.

An intraoperative acupuncture study with good methodology was performed by Greif et al.²⁷ The cross-over study in volunteers has revealed that stimulation of bilateral ear acupuncture points (lateralization control point) caused an 11% decrease in the desflurane requirement. Another study with a similar design used four acupoints in the right ear and showed an 8.5% decrease in the desflurane requirement.²⁸ Another study found that preoperative electroacupuncture resulted in a decrease in the intraoperative opioid consumption.²⁹ Although these studies concluded that acupuncture might decrease the anesthetic requirements intraoperatively, other studies do not support this claim. Morioka et al. and Kvorning et al. did not find a decrease in the level of inhalation anesthetics with the stimulation of body acupoints.^{30,31}

Based on these, one may not conclude that acupuncture reduces intraoperative anesthetic/opioid consumption.^{32–34} However a recent review article emphasize the value of perioperative acupuncture in specific surgical populations.³⁵ Perioperative acupuncture may improve recovery in outpatient surgery population and may also reduce postoperative morbidity and mortality in elderly patients.

2.3. Postoperative period

A great number of studies have investigated the effectiveness of acupuncture for postoperative pain relief and postoperative nausea and vomiting (PONV), while these two indications are the most common challenges that face anesthesiologists in the postoperative period. Additionally, acupuncture is also used for postextubation laryngospasm, postoperative sore throat, emergence agitation (EA) and postdural puncture headache (PDPH).

2.3.1. Postoperative pain

A wide variety of acupuncture techniques, including manual acupuncture, electroacupuncture, acupressure, transcutaneous acupoint electrical stimulation (TAES), ear acupuncture, and the use of capsicum plasters on acupoints, have been used for relieving postoperative pain.^{36–45} Some of these studies have yielded positive results, while others have yielded negative results.^{36,38,40,42,46–48} The success of acupuncture treatment in this indication depends on several factors, such as the selection of points, timing of acupuncture, duration of sessions and selection of stimulation technique (Table 2).

2.3.1.1. Ear acupuncture. Acupuncture caused a decrease in analgesic requirements in knee arthroscopy and total hip arthroplasty patients.^{41,42} These two studies by Usichenko et al. used permanent ear press needles that were inserted preoperatively and retained in situ for 3 days postoperatively. After knee arthroscopy, ibuprofen consumption by the acupuncture group was significantly less than the control group (500 mg vs. 800 mg, respectively).⁴¹ In the

Table 1
Acupuncture use in preoperative period.

Reference	Surgery/Subjects	Groups/Acupuncture points	Method of stimulation	Result(s)
Fassoulaki et al. ¹¹	Adult volunteers	Yintang (Extra 1) vs. sham point	Acupressure	Yintang point decreases stress
Agarwal et al. ¹⁴	Adult surgical patients	Yintang (Extra 1) vs. sham point	Acupressure	Yintang point reduces preoperative anxiety
Fassoulaki et al. ¹⁵	Adult volunteers	Yintang (Extra 1) vs. sham point vs. control	Acupressure	Yintang point decreases stress
Wang et al. ¹⁶	Children undergoing gastrointestinal endoscopic procedures	Yintang (Extra 1) vs. sham point	Acupressure bead	Yintang point reduces anxiety
Dullenkopf et al. ¹⁷	Adult volunteers	Yintang (Extra 1) vs. sham point	Acupressure	Yintang point reduces stress
Acar et al. ¹⁸	Adult surgical patients	Yintang (EX HN-3) vs. sham point	Ear press needle	Yintang point reduces preoperative anxiety
Wang and Kain ⁹	Adult volunteers	(a) Shenmen (bilateral auricular "shenmen" acupoint) (b) Relaxation (bilateral auricular "relaxation" acupoint) (c) Sham (bilateral auricular "sham" point)	Ear press needle	Auricular "relaxation" acupoint decrease the anxiety level

other study, 36-h piritramide requirements were 37 mg and 54 mg in the acupuncture and control groups, respectively.⁴² However, a recent systematic review of auricular acupuncture for postoperative pain noted that the quality of these studies was poor, although most of them concluded positive results.⁴⁹

2.3.1.2. Capsicum plasters. Capsaicin, a highly selective agonist for the TRPV1 (transient receptor potential vanilloid) receptors, is a safe and effective analgesic. Following binding to TRPV-1 receptor, capsaicin causes an initial excitation of sensory neurons. Receptor desensitization and prolonged hypoalgesia occur after this initial effect.⁵⁰ Early studies in Western literature investigated the application of capsaicin plaster on Korean hand acupuncture points for PONV and postoperative sore throat.^{51,52} Kim and Nam divided abdominal hysterectomy patients into the following three groups: 1) capsicum plaster at ST 36 point (acupuncture group), 2) capsicum plaster at a non-acupoint on the shoulder (sham group), and 3) placebo plaster at ST 36 point (control group).⁵³ In all groups, treatments were started 30 min before the induction of anesthesia and maintained for 8 h/day for 3 days postoperatively. Morphine consumption during the first 24 h (31.5 vs 44.3 vs 44.6 mg), the incidences of side effects during the 72 h after surgery and the need for rescue antiemetics were significantly lower in the acupuncture group (ST 36). A similar study was conducted in orthognathic surgery patients by Kim et al.⁵⁴ They also found that fentanyl and ketorolac consumption by patient controlled analgesia, the incidence of nausea and vomiting and the need for rescue antiemetics were lower in the acupuncture group (LI 4).

2.3.1.3. TAES (Transcutaneous acupoint electrical stimulation). A study with TAES, which refers to applying cutaneous electrodes on acupoints, have positive result.⁴⁰ In this study, TAES, which was started in the recovery room and continued for 30 min every 2 h, resulted in lower PCA-analgesic consumption in patients undergoing lower abdominal surgery.

2.3.1.4. Electroacupuncture (EA). Two studies by the same group that had controversial results used this technique. In the positive one, two groups of lower abdominal surgery patients were divided into the acupuncture and control groups, while EA was applied at four points after closing the sutures.³⁷ Although one more point (ST 36) was used in addition to the abovementioned points, a better analgesic effect was not observed in the EA group in the next study.³⁸ The reason for this difference may be related to the timing of the acupuncture stimulation, as EA was started after the induction of anesthesia in the latter one. In a functional magnetic resonance imaging study, Wang et al. observed the dampening

effect of general anesthesia on the neurophysiological response to acupuncture.⁵⁵

2.3.1.5. Manual acupuncture. One study in which acupuncture was performed for 15 min after the induction of anesthesia found no significant difference between the acupuncture and control groups.³⁶ However, a recent study that was conducted in pediatric age group concluded that there was less pain, less analgesic drug consumption, and higher patient/parent satisfaction with analgesic treatment scores in acupuncture group compared to control.⁵⁶

Acupuncture studies on postoperative pain relief have yielded conflicting results.^{36,38,40,42,46–48} Although various factors can affect the outcome parameters, the most important one is the timing of acupuncture. Acupuncture seems to be an effective analgesic technique when it is applied before the induction of anesthesia and/or at the early postoperative period than after anesthesia induction.^{33,57,58}

2.3.2. Postoperative nausea and vomiting (PONV)

One of the most popular uses of acupuncture among anesthesiologists is PONV because numerous studies, reviews, and metaanalyses found that acupuncture is effective in preventing PONV (Table 3).^{59–63}

Acupuncture is already known as an effective treatment for PONV after the NIH Consensus Development Conference report in 1997.⁴ In addition to the points other than PC 6 that were used in several studies, the most commonly used acupoint was PC 6 in the majority of PONV studies. The PC 6 acupoint can be stimulated in various ways, including manual acupuncture, electroacupuncture, injection of 50% glucose, acupressure, Relief-Band, TAES, laser acupuncture and capsicum plaster.^{51,64–70}

Although studies showed that noninvasive techniques were ineffective, partially effective or less effective than invasive techniques,^{71,72} a literature review suggested to use acupressure for PONV.⁷³ Acupuncture also seemed to be ineffective when it was used after the induction of anesthesia.⁵⁹

Although early studies concluded that it was ineffective in pediatric patients, later studies and a Cochrane review supported the data showing that acupuncture is an effective way to prevent PONV in children as well as in adult patients.^{62,64–66,71,74,75}

It was noted that for practical reasons, single-point acupuncture (PC 6) is used in the majority of PONV studies. However, as might be expected, any other point or point combination based on TCM principles can be used. The use of a standard "PONV point" in all types of surgeries may not be effective because PONV may be caused by various factors, including surgical factors and anesthetic drugs. For example, two studies concluded that PC 6 acupuncture is not

Table 2
Acupuncture use for postoperative pain.

Reference	Surgery/subjects	Time of application	Groups/Acupuncture points	Method of stimulation	Result(s)
Usichenko et al. ⁴¹	Adult surgical patients (arthroscopic knee surgery)	Preoperatively	(a) Auricular acupuncture (ipsilateral knee joint, shenmen and lung points) (b) Sham (three ipsilateral nonacupuncture points of the helix)	Ear press needles	Auricular acupuncture reduces postoperative analgesic requirement. No difference in pain intensity.
Usichenko et al. ⁴²	Adult surgical patients (total hip arthroplasty)	Preoperatively (continued intraoperative period and postoperative period for three days)	(a) Auricular acupuncture (ipsilateral hip joint, shenmen, lung and thalamus points) (b) Sham (four ipsilateral nonacupuncture points of the helix)	Ear press needles	Auricular acupuncture reduces postoperative analgesic requirement. No difference in pain intensity
Lin et al. ⁴⁷	Adult surgical patients (lower abdominal surgery)	Preoperatively	(a) Control (no intervention) (b) Sham-EA (needle insertion without electrical stimulation) (c) Low-EA (needle insertion with 2 Hz stimulation)(ST 36) (d) High-EA (needle insertion with 100 Hz stimulation) (ST 36)	EA	Acupuncture with low-EA and high-EA reduces postoperative analgesic requirement
Kim et al. ⁵⁴	Adult surgical patients (orthognathic surgery)	Preoperatively and three days postoperatively	(a) Acupuncture (CP at bilateral LI 4 and inactive tape at nonacupoints in both deltoid regions) (b) Sham (CP at both deltoid regions, and inactive tape at bilateral LI 4 points) (c) Control (inactive tape at both LI 4 and both deltoid regions)	Capsicum plaster	Acupuncture decreases postoperative pain intensity and analgesic requirements
Christensen et al. ³⁷	Adult surgical patients (lower abdominal surgery)	Postoperatively	(a) Acupuncture (EA at GV 2, GV 4, UB 32, SP 6) (b) Control (no treatment)	Body needles/EA	EA reduces postoperative analgesic requirements No difference in pain intensity
Christensen et al. ³⁸	Adult surgical patients (hysterectomy)	Intraoperatively	(a) Acupuncture (EA at GV 2, GV 4, UB 32, SP 6, ST 36) (b) Control (no treatment)	Body needles/EA	No difference between groups
Gupta et al. ³⁶	Adult surgical patients (arthroscopy)	Intraoperatively	(a) Acupuncture (SP 9, SP 10, ST 34, ST 36, LI 4) (b) Control (no treatment)	Body needles	No difference between groups
Kotani et al. ⁴⁶	Adult surgical patients (upper and lower abdominal surgery)	Preoperatively (continued intraoperative period and postoperative period for four days)	(a) Acupuncture (bilateral as BL 18–24 for UAS, bilateral as BL 20–26 for LAS) (b) Control	Intradermal needles	Acupuncture reduces postoperative pain intensity and analgesic requirements
El-Rakshy et al. ⁴⁸	Adult surgical patients (laparoscopic cholecystectomy or abdominal hysterectomy)	Intraoperatively	(a) Acupuncture (GV 2, GV 4 and bilateral BL 32, BL 23, LI 4, PC 6 points in hysterectomy patients; Bilateral LR 3, SP 6, LI 4, PC 6 points in laparoscopic cholecystectomy patients) (b) Control (no treatment)	Body needles	No difference between groups
Gilbey et al. ⁵⁶	Children (tonsillectomy with or without adenoidectomy)	Postoperatively	(a) Acupuncture (LI 4, LI 11, and ST 44 bilaterally) (b) Control (no treatment)	Body needles	Acupuncture reduces postoperative pain intensity and analgesic requirements

CP – Capsicum plaster.

EA – Electroacupuncture.

UAS – Upper abdominal surgery.

LAS – Lower abdominal surgery.

Table 3
Acupuncture use for postoperative nausea and vomiting.

Reference	Surgery/subjects	Time of application	Groups/Acupuncture points	Method of stimulation	Result(s)
Kim et al. ⁵¹	Adult surgical patients (abdominal hysterectomy)	Preoperatively (continued for eight hours after surgery)	(a) K-D2 group (CP at bilateral K-D2 points) (b) PC 6 group (CP at bilateral PC 6 points) (c) Control group (inactive tape at bilateral K-D2 points)	Capsicum plaster	K-D2 acupuncture is as effective as PC 6 acupuncture in reducing PONV
Schlager et al. ⁷⁹	Children (strabismus surgery)	Preoperatively (continued for at least 24 h after surgery)	(a) Acupuncture (disc at bilateral K-K9 points) (b) Control (inactive tape at bilateral K-K9 points)	Acupressure disc	Acupuncture is effective in reducing postoperative vomiting
Boehler et al. ⁸⁰	Adult surgical patients (minor gynecological laparoscopic surgery)	Preoperatively (continued for at least 24 h after surgery)	(a) Acupuncture (seed at bilateral K-K9 points and inactive tape at sham points) (b) Control (seed at sham points and inactive tape at bilateral K-K9 points)	Acupressure seed	Acupuncture is effective in reducing PONV
Somri et al. ⁶⁴	Children (dental treatment)	Preoperatively	(a) Acupuncture (CV 13 and bilateral PC 6 points) (b) Ondansetron (c) Placebo (i.v. saline)	Body needles	Acupuncture is effective in reducing postoperative vomiting
Rusy et al. ⁶⁵	Children (tonsillectomy with or without adenoidectomy)	Intraoperatively (continued for 20 min postoperatively)	(a) Acupuncture (EA at PC 6) (b) Sham (EA at PC 2) (c) Control	Body needles/EA	Acupuncture is effective in reducing postoperative nausea but not vomiting
Wang and Kain ⁶⁶	Children (outpatient surgery)	Intraoperatively	(a) Acupoint (i.v. saline injection at bilateral PC 6 points) (b) Droperidol (i.v. droperidol + bilateral P6 sham acupuncture – superficial skin prick at PC 6-) (c) Sham point (i.v. saline + bilateral sham point injection) (d) PC 6 sham point (i.v. saline + bilateral PC6 sham acupuncture)	Acupoint Injection	PC 6 acupoint injection is as effective as droperidol in controlling PONV
Windle et al. ⁶⁷	Adult surgical patients (gynecological, plastic, or urological surgery)	Postoperatively	(a) Wristband with acupressure on both PC 6 (b) Wristband with acupressure on one PC 6 (c) Wristband without acupressure on both PC 6 (d) Wristband without acupressure on one PC 6 (e) No wristband	Acupressure wristband	No differences between groups
White et al. ⁶⁸	Adult surgical patients (plastic surgery)	Postoperatively	(a) Ondansetron (i.v. ondansetron + sham Relief Band) (b) Acustimulation (i.v. saline + active ReliefBand) (c) Combination (i.v. ondansetron + active ReliefBand)	Acupressure band	ReliefBand is more effective than ondansetron for the prevention of PONV
Gan et al. ⁶⁹	Adult surgical patients (major breast surgery)	Preoperatively (30–60 min, continued intraoperatively)	(a) EA (PC 6) (b) Ondansetron (c) Sham (inactive EA device)	Body needles/EA	Acupuncture or ondansetron is more effective than placebo for the prevention of PONV
Butkovic et al. ⁷⁰	Children (hernia repair, circumcision or orchidopexy)	Preoperatively	(a) Laser acupuncture on PC 6 bilaterally + i.v. saline (b) Metoclopramide i.v. + sham laser, (c) Sham laser + i.v. saline	Laser	Acupuncture is equally effective as metoclopramide in preventing PONV

Table 3 (Continued)

Reference	Surgery/subjects	Time of application	Groups/Acupuncture points	Method of stimulation	Result(s)
Lewis et al. ⁷¹	Children (strabismus correction)	Preoperatively (continued intraoperatively and postoperatively)	(a) Acupressure (wrist-band bilaterally) (b) Placebo (band without stud bilaterally)	Acupressure band	No difference between groups
Yentis and Bissonnette ⁷⁴	Children (tonsillectomy)	Intraoperatively	(a) Acupuncture on PC 6 (left) (b) Control	Body needles	No difference between groups
Yentis and Bissonnette ⁷⁶	Children (strabismus correction)	Intraoperatively	(a) Droperidol (b) Acupuncture + droperidol (c) Acupuncture	Body needles	Acupuncture and droperidol are equally ineffective in preventing vomiting
Chu et al. ⁷⁸	Children (strabismus correction)	Preoperatively	(a) Acupressure (Bilateral BL 10, BL 11 and GB 34 points) (b) Placebo	Plaster	Acupuncture is effective in reducing postoperative vomiting

CP – Capsicum plaster.

EA – Electroacupuncture.

an effective method for preventing PONV in pediatric strabismus surgery.^{71,76} However, Veroli and Astier suggested the use of BL 10, BL 11 and GB 34 points instead of PC 6, based on TCM knowledge.⁷⁷ A later study by another group has confirmed the effectiveness of this point combination in pediatric strabismus surgical patients.⁷⁸

The stimulation of Korean hand acupuncture points also causes a significant decrease in the incidence of PONV.^{51,79,80}

2.3.3. Others

2.3.3.1. Pediatric emergence agitation (EA). EA is described as ‘a dissociated state of consciousness in which the child is irritable, uncompromising, uncooperative, incoherent, and inconsolably crying, moaning, kicking or thrashing’.⁸¹ Its incidence varies between 10% and 80%.⁸¹ Acupuncture and related techniques (i.e., acupuncture, acupressure, and transcutaneous applications) can help reduce the incidence and severity of EA. Studies have shown that the stimulation of acupoints with acupuncture needles or capsicum plasters is an effective method for preventing EA.^{82–84} A recent study in our group demonstrated that the application of capsicum plasters on HT 7 acupoints just 30 min before the anesthesia induction significantly decreased the incidence of EA and side effects.⁸⁴

2.3.3.2. Post-dural puncture headache (PDPH). PDPH is not one of the severe complications of spinal anesthesia; however, it can be very disturbing for the patients. A few reports concluded that PDPH patients might benefit from acupuncture treatment.^{85–87}

3. Risks associated with acupuncture

Acupuncture as any other medical treatments may be associated with adverse events that can sometimes be serious. These adverse events can be classified as infectious, traumatic, and others.

A recent survey showed that the infections, mostly Mycobacterium and Staphylococcus are the most common complications of acupuncture.⁸⁸ Pneumothorax, central nervous system injury, peripheral nerve injury, heart injury as well as other organ/tissue injuries may be complicated from needling.⁸⁸ However, incidences are low and nonfatal. A survey covering more than two million acupuncture treatments showed no death or permanent disabilities.⁸⁹

Acupuncture provided by physicians is accepted as a relatively safe treatment.^{89,90}

4. Conclusion

In conclusion, acupuncture, solely or as an adjunct to conventional techniques, may help anesthesiologists to relieve conditions, including preoperative anxiety, postoperative pain, and PONV. However, more randomized, controlled studies are needed to validate the use of acupuncture in the perioperative setting.

Conflict of interest

None.

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