A Malaysian retrospective study of acupuncture-assisted anesthesia in breast lump excision

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Abstract
Introduction: The objective of this retrospective study was to evaluate the effectiveness and safety of acupuncture-assisted anesthesia (AAA) in breast lump excision.

Methods: The medical records of all patients who underwent breast lump excision under AAA in combination with electrical stimulation at traditional acupuncture points in 2016 were examined. All of them (n = 17) received electro-stimulation (2–4 Hz) using single needles inserted at bilateral LI4 and PC6. They also underwent insertion of four acupuncture needles at the lump site, which were electrically stimulated at 30 Hz frequency.

Results: All surgical procedures were successful with minimal use of analgesics and local anesthetic. The median pain score reported was 1/10 (interquartile range (IQR) = 2/10) at the first hour, and slightly increased to 2/10 (IQR = 2/10) between 24 and 48 h of the surgery. No major postoperative adverse events were documented, except for drowsiness in one case.

Conclusion: AAA was found to be generally safe and effective for anesthesia and analgesia in breast lump excision. However, a large-scale randomized controlled study is required to verify the findings.

Keywords
acupuncture, anesthesia, electroacupuncture, breast lump excision, retrospective study

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Introduction
Acupuncture has been used, mainly in China, for more than 2500 years. The technique involves inserting thin needles into the skin, most commonly at traditional acupuncture point locations, and stimulating them either manually or electrically. The manual stimulation technique involves the manipulation of needles through rotation, lifting and thrusting,1 while the electrical stimulation technique applies a small electrical current to stimulate the needles. As electrical stimulation has relatively quantifiable parameters, including frequency, intensity, and duration, it is now widely used in both clinical practice and research worldwide.1

The analgesic properties of acupuncture have been extensively explored. As demonstrated by a study using functional magnetic resonance imaging, the descending anti-nociceptive pathway was activated and the limbic areas associated with pain were deactivated when needles were inserted at ST36 (Zusanli) and LI4 (Hegu).2 Concurrent electrical stimulation was also shown to facilitate the release of specific neuropeptides in the central nervous system, contributing to the analgesic effect.3
The use of perioperative acupuncture was first reported for tonsillectomy in the late 1950s. However, it was later found that acupuncture alone did not provide an adequate analgesic effect in surgery. Subsequently, acupuncture was incorporated into conventional anesthesia and this modality was termed “acupuncture-assisted anesthesia” (AAA). In addition to providing comparable pain control effects, it allows a lower consumption of anesthetics and analgesics. Since then, the use of AAA during surgical procedures has become increasingly acceptable.

While high-dose opioids are associated with a wide range of adverse events, such as postoperative nausea and vomiting (PONV) and prolonged recovery, AAA could potentially yield a similar analgesic effect with less drug use and thus fewer adverse events. Despite being self-limiting, it is also noteworthy that PONV is sometimes perceived to be even more undesirable than incisional pain. As an alternative to conventional anesthesia, acupuncture applied at PC6 (Neiguan) alone, or at several traditional acupuncture points simultaneously, is effective at lowering the risk of PONV.

AAA is also generally safe, with only mild adverse events including hematoma, bleeding and pain occasionally reported. By allowing the use of a lower dose of anesthetics, it is also safer than general anesthesia (GA), particularly for the elderly and patients with ischemic heart disease, chronic lung failure or chronic obstructive lung disease. Furthermore, as intubation is not required, AAA is potentially beneficial for obese patients with obstructive sleep apnea. The reduced use of ventilators can also lower the risk of pulmonary infections in patients, resulting in a shorter hospitalization period, less use of antibiotics and a lower healthcare cost. Moreover, AAA could also serve as an alternative to GA when certain anesthetics, such as lidocaine, are not tolerable.

In Malaysia, acupuncture services have been made available in several public tertiary care centers since 2015. As the cornerstone of the Traditional and Complementary Medicine (TCM) Program, acupuncture is now primarily used in pain management for both surgical and non-surgical cases. As the information about the usefulness and safety of acupuncture in surgery is still limited in Malaysia, this article describes the experience of a public tertiary hospital using AAA together with electrical stimulation in breast lump excision.

Methods

This retrospective study was undertaken at Raja Permaisuri Bainun Hospital, one of the public tertiary care centers pioneering the use of acupuncture for surgical procedures in Malaysia. The study protocol was registered with the National Medical Research Register (NMRR-18-3681-45376) and ethical approval was obtained from the Medical Research and Ethics Committee (MREC). The data were gathered from the medical records of all patients who underwent breast lump excision procedures under AAA together with electrical stimulation in 2016.

For breast lump excision, AAA was only used in patients who provided consent, were aged 18 years and above, had a breast lump ≤4 cm in size, had an expected duration of surgery of ≤2 h, and were fit for day-care surgery. Its use was avoided in those who had a histologically confirmed malignant breast lesion, arthritis, psychiatric problems or needle phobia. All the patients included in this study had AAA performed by a trained anesthetist. All patients received standard AAA treatment regardless of the size of their breast lumps; stainless steel, single-use acupuncture needles (0.3 mm × 40 mm; Huan Qiu, China) were inserted at LI4 and PC6 subcutaneously. The frequency of electrical stimulation used ranged from 2 to 4 Hz, guided by the tolerability reported by the patients. An additional four acupuncture needles were inserted intradermally around the skin incision site and electrically stimulated at a frequency of 30 Hz (Figure 1). The electrical
stimulation was started 60 min before the surgery and was continued until the end of the surgery. In addition, the patients received local anesthesia (LA) at the excision sites and intermittent intravenous anxiolytics and analgesics, with the dosage adjusted and titrated by an anesthetist, taking account of patient-reported pain, anxiety, blood pressure and heart rate.

An 11-point numeric rating scale (NRS) was used by the patients to report their pain score at rest, with a score of “0” indicating “no pain at all” and “10” indicating “worst pain imaginable.” As routinely practiced, the pain scores were taken three times by nurses (1 h before and 1 h after the surgery in the surgical ward, and between 24 and 48 h after the surgery through phone calls).\(^{17}\) The presence of adverse drug events within 48 h of surgery was also recorded.

Information about the surgical procedures, AAA, drug use, pain control and adverse drug events was retrospectively collected from the medical reports of the patients. Data management and analysis were performed using Microsoft\(^2\) Excel 2016. Categorical variables were summarized as frequencies and percentages. Numerical variables were summarized as mean values and standard deviations (SDs) if the data were normally distributed, or as medians and interquartile ranges (IQRs) if the data were not normally distributed.

### Results

A total of 17 patients were included in the study. Their ages ranged widely from 20 to 83 years, with a median of 35 years (IQR = 19 years). The most common ethnicity was Malay (n = 8), followed by Chinese (n = 6) and Indian (n = 2), consistent with the multi-racial composition of the Malaysian population. Five of the patients had at least one comorbidity, including hypertension (n = 3), dyslipidemia (n = 2), diabetes mellitus (n = 1), anemia (n = 1) and gastritis (n = 1). The sizes of the excised lumps ranged from 1 cm \(\times\) 1.5 cm to 4 cm \(\times\) 4 cm, while the median duration of surgery was 35 min (IQR = 23 min). The median length of hospital stay was 7.12 h (IQR = 2.38 h) (Table 1).

During the surgery, 13 of the patients received both intravenous midazolam (2–5 mg) as the anxiolytic and fentanyl (25–100 \(\mu\)g) as the analgesic, and 3 received either one. Lidocaine 1% (1–6 mL) was used in all the patients as the LA, except for one who received 10 mL of bupivacaine 0.5% with adrenaline 1: 200,000 (Table 2).

None of the patients reported having any pain before the surgery. The median pain score was 1/10 (IQR = 2/10) at the first hour, and increased slightly to 2/10 (IQR = 2/10) between 24 and 48 h following the surgery (Table 3). Six of the patients had taken one to four doses of paracetamol within 48 h of the surgery, while the rest did not require additional analgesics.

No adverse events were detected when the patients were in the hospital, except for a case of drowsiness. Furthermore, only one patient reported experiencing mild PONV after being discharged from the hospital.
Discussion

While AAA was shown to be effective at pain control following breast lump excision, the dose of anesthetics and analgesics required during the surgery was considerably low. Moreover, no major adverse events were reported following the use of AAA. Despite the need for further investigation to substantiate the findings, it is suggested that AAA could be incorporated into breast lump excision.

Although breast lump excision is commonly conducted as a day-care procedure worldwide,18 GA has been widely used.19 AAA has been shown to facilitate reduced use of anesthetics when it is used concurrently with GA during surgery.8 Reports have also documented successful open heart surgery15 and craniotomy20 performed under AAA without GA. Our findings further suggest that perioperative pain could be effectively managed with AAA in the absence of GA. Such analgesic effects are likely to be mediated by encephalin and endorphins following the use of AAA with a low (2–4 Hz) to medium (15–30 Hz) frequency of electrical stimulation.21 Thus, this study suggests that AAA could reduce the use of volatile anesthetics in breast lump excision in general. Furthermore, as intubation is most likely not required in breast lump excision with the use of AAA, the risk of pulmonary infection is lower.15 This could eventually shorten the length of hospital stay. Overall, AAA could potentially serve as a more cost-effective alternative to GA in breast lump excision.

While PONV remains a common side effect of opioids,22 this study also shows that AAA could lower the use of analgesics without compromising pain control in breast lump excision. Only one patient was found to experience PONV following the surgery. Besides improving the quality of life of patients, a lower incidence of PONV would be expected to result in a reduced use of rescue anti-emetics, and consequently lower overall health expenditure.

However, it is also notable that the median pain score had slightly increased to 2/10 at 24 h after surgery. This is attributable to the subsiding analgesic effects of AAA, which normally last 2–12 h after discontinuation.21,23,24 Despite similar findings with the use of GA,25 more attention should be given to postoperative pain management following the discontinuation of AAA. Within this context, it is important to educate patients about the use of oral analgesics, such as paracetamol, as and when needed.

Despite the positive findings, this study was limited by its single-center, retrospective design and the lack of a control group not receiving AAA. The use of analgesics varied slightly across cases.

Conclusion

The findings suggest that AAA is generally effective for pain control and safe among patients undergoing breast lump excision. Incorporating AAA into the conventional anesthesia modality is also likely to reduce the use of anesthetics and analgesics during surgery. However, further investigation using a randomized controlled trial design is required to confirm these findings.

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