Acupuncture in Preventing Postoperative Nausea and Vomiting: Efficacy of Two Acupuncture Points Versus a Single One

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Abstract
Despite recent advances in anesthesiology and postoperative care, postoperative nausea and vomiting are common complaints. Although acupuncture techniques have received attention in anesthesiology, the ideal technique and selection of the most appropriate acupuncture points are still under debate. This study compared the efficacy of two simultaneous acupuncture points with that of a single point in the prevention and treatment of postoperative nausea and vomiting following general anesthesia through a double-blind, randomized, controlled trial involving 227 surgical patients undergoing general anesthesia who were randomly assigned into two groups. The first group received acupuncture by stimulation only on the PC6 point (single group), and the second group underwent concomitant stimulation of the PC6 and the LI4 acupuncture points (combined group) during surgery under general anesthesia. The prevalences of postoperative nausea and vomiting were compared between the two groups. No significant differences were
observed between the two groups ($p > 0.05$). Of 115 patients in the combined group, 80 (69.6\%) complained about nausea and vomiting compared with 96 (85.7\%) in the single group, a significantly lower proportion ($p < 0.05$). Our findings favor a combination of PC6 and LI4 stimulation for the treatment of postoperative nausea and vomiting.

1. Introduction

Despite significant advances in anesthetics and postoperative care, nausea and vomiting still occur in surgical patients [1]. Pharmacological prevention has not been completely effective in this regard [2,3]. Antiemetic drugs, even in lower doses, may be associated with adverse effects [4]. This may lead to worsening of a condition that is already hard to manage [5].

In recent decades, alternative medicine has gained popularity in association with routine practice. Postoperative care has shown an increasing trend toward acupuncture [4–6]. Although evidence is in favor of acupuncture, especially acupressure at PC6 point (also called Neiguan), for the prevention of emesis [7–9], there are not sufficient studies to verify the most effective acupoint or to comment on the benefits of a combination approach [4–6]. Furthermore, existing studies do not consistently support each other in order to be to any extent conclusive. Hence, the present study was conducted to compare the efficacy of points PC6 and LI4 (Hegu acupoint) in the prevention of nausea and vomiting following general anesthesia for elective surgery in a tertiary care center in Iran.

2. Methods and materials

2.1. Study design

This study was a double-blind controlled randomized trial conducted between June 2011 and June 2012 at Imam Khomeini Hospital in Tehran, Iran. Inclusion criteria were having an American Society of Anesthesiologists classification I or II, receiving surgery on any site other than the eye or ear regions, and an operating time of between 1 and 2 hours. Patients who had received steroids within the previous month, undergoing an operation lasting more than 2 hours, or had a history of motion sickness were excluded from the study.

The study protocol and method of acupuncture were explained completely to the patients, ensuring they were all aware of the experimental nature of this therapeutic option. Informed consent was obtained from each patient before transfer to the operating room. Finally, the Research and Ethic Committee of Tehran University of Medical Sciences approved the study protocol.

2.2. Patients

During the study period, patients on the list for elective surgery in our department were assessed for eligibility to enter the study. Of 227 eligible patients, 115 cases were randomly assigned to the combined acupuncture group in which both P6 and LI4 were stimulated, and the remaining 112 patients were assigned to the single acupuncture group treated by stimulation of only P6.

2.3. Surgery and anesthesia

All the operations were elective surgeries under a standardized protocol performed by one of the surgeons in our department. General anesthesia was induced with 6 mg/kg thiopental sodium, 0.5 mg/kg atracurium, and 1.5 mg/kg lidocaine, and then maintained by administration of 110 µg/kg propofol, 0.5 µg/kg fentanyl, and 0.3 mg/kg atracurium, with ventilation with 30\% oxygen and 70\% nitric oxide every 30 minutes until the end of the surgery.

2.4. Randomization

Using a computer-based number-generating program, an independent researcher randomly allocated the patients to either of the two study groups following induction of anesthesia. The surgeon, patients, and investigator collecting the data were all blinded to the study groups.

2.5. Acupuncture

All acupuncture were performed by an expert acupuncturist immediately after induction of general anesthesia.

In the combined group, two sterile acupuncture needles were inserted bilaterally into PC6 and LI4. The needles remained in place until they were removed at the end of the surgery. The acupuncture sites were dressed with appropriate adhesives just before the patient left the operating theater. The same technique was performed on patients in the single group, in which only PC6 was stimulated on each side. All acupuncture techniques were performed similarly for the patients in the same group, and adherence to the care provider’s protocol was assured.

Patients were finally transferred to the recovery room and, if stable, to the surgical ward. The occurrence of nausea and vomiting was assessed subjectively within the first 24 postoperative hours by a trained nurse who was blinded to the study groups.

2.6. Objective and hypothesis

The study aimed to test the hypothesis that combined acupuncture would result in a reduced frequency of anesthesia-related postoperative nausea and vomiting.
2.7. Outcome measurement

Patients were visited by the relevant surgeon each day and evaluated for any possible complication or for fulfilling the discharge criteria. The occurrence of nausea and vomiting was assessed subjectively within the first 24 postoperative hours by an independent trained nurse who was blinded to the study groups. Other postoperative outcomes were also assessed and recorded in the study dataset.

2.8. Sample size calculation

Considering an incidence rate of 60% for postoperative nausea and vomiting, and with the assumption of a type I error of 5% and a study power of 90%, a total of 210 patients—105 patients per group—were calculated as the sample size.

2.9. Statistical analysis

Data were analyzed by using the Statistical Package for the Social Sciences (version 15; SPSS Inc., Chicago, IL, USA). Chi-square test was employed to compare categorical variables between the two groups. A statistically significant difference was considered as \( p < 0.05 \).

3. Results

A total of 227 patients were enrolled in this single-center study during a 1-year study period. No patient was excluded from the study, nor was any patient ineligible to enter this trial. Of the total, 112 patients were treated in the single group and 115 received acupuncture care in the combined group, all of whom were treated by a single acupuncturist (R.A.).

There was no statistically significant difference between the two study groups in terms of demographics or primary characteristics (\( p > 0.05 \)). The postoperative surgical and clinical outcomes were statistically similar for the two groups (Table 1).

The proportion of patients with postoperative anesthesia-related nausea or vomiting was significantly lower in the combined group compared to the single group (\( p < 0.05 \)). No remarkable postoperative incidents were noted in either group, and the frequency of early postoperative complications was similar between the two groups (Table 2).

4. Discussion

Interestingly, our results showed that combination of the LI4 acupoint with PC6 could significantly reduce the incidence of postoperative nausea and vomiting in surgical patients. To the best of our knowledge, this additive effect for prevention or treatment of postoperative nausea or vomiting has not been previously reported in the literature nor efficiently studied in any investigation. However, there is evidence suggesting that acupuncture at LI4 is effective in managing a dislocated shoulder [10], alleviating dystocia [11], reinforcing animal immune responses [12], and improving colon function in depressed rat models [13]. Further, the concise anatomic site of LI4 has not been yet determined, and this may result in general variation in the study outcomes [14].

Use of acupuncture in the treatment of emesis has a long history [15]. Although acupuncture has been previously criticized for imposing an infection, this concern has been resolved now with application of sterile needles [15–23]. Acupuncture at different points has been compared to other antiemetic medications and considered to be effective with a variety of surgeries [7,24–28]. Although it has been proposed that the antiemetic effect could be due to gastric stimulation, causing the stomach to empty itself, and increasing intestinal motility [29,30], the exact mechanism is not yet understood [4].

Progress in preventing general anesthesia-related complications has recently received much attention. Acupuncture is currently practiced in different methods including physical or electrical stimulation of the acupoints [8,31]. Our study aimed to assess whether adding of another acupoint (LI4) would result in better outcomes compared with the conventionally used single PC6 acupoint. PC6 is located 5 cm proximal to the distal crease of the wrist skin over the anterior region of the antebrachial or ulnar side of the flexor carpi radialis tendon [9,18,32,33]. Acupuncture at this point has been shown to have an antiemetic effect. However, the antiemetic effect has not yet been compared to that produced by other therapeutic methods. Compared

### Table 1 Demographics and primary characteristics of study patients.

<table>
<thead>
<tr>
<th></th>
<th>Combined group (n = 115)</th>
<th>Single group (n = 112)</th>
<th>( p )</th>
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<tbody>
<tr>
<td>Gender</td>
<td></td>
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<tr>
<td>Male</td>
<td>65 (56.5%)</td>
<td>64 (57.1%)</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Female</td>
<td>50 (43.5%)</td>
<td>48 (42.9%)</td>
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<tr>
<td>Age (y) (mean ± SD)</td>
<td>37.6 ± 13.5</td>
<td>37 ± 14</td>
<td>&gt;0.05</td>
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<tr>
<td>Type of surgery</td>
<td></td>
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<tr>
<td>Laparoscopic cholecystectomy</td>
<td>64 (55.6%)</td>
<td>59 (52.7%)</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Thyroidectomy</td>
<td>21 (18.3%)</td>
<td>18 (16%)</td>
<td></td>
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<tr>
<td>Bariatric surgery</td>
<td>17 (14.8%)</td>
<td>19 (17%)</td>
<td></td>
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<tr>
<td>Colon surgery</td>
<td>13 (11.3%)</td>
<td>14.3%</td>
<td></td>
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<tr>
<td>Early postoperative complications</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Surgical site pain</td>
<td>76 (66%)</td>
<td>72 (64.3%)</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Bleeding</td>
<td>9 (7.8%)</td>
<td>7 (6.3%)</td>
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<tr>
<td>Intensive care admission</td>
<td>3 (2.6%)</td>
<td>4 (3.6%)</td>
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### Table 2 Postoperative nausea and vomiting.

<table>
<thead>
<tr>
<th></th>
<th>Combined group (n = 115)</th>
<th>Single group (n = 112)</th>
<th>( p )</th>
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<tbody>
<tr>
<td>Nausea</td>
<td>59 (51.3%)</td>
<td>84 (75%)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Vomiting</td>
<td>21 (18.3%)</td>
<td>39 (34.8%)</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
to the conventional medicine approach, this method from alternative medicine is associated with fewer complications and adverse events [4,6].

LI4 is a commonly used acupoint in pain management acupuncture [34,35]. However, despite the fact that it has been widely implicated in reducing the level of pain, its potential effect on postoperative complications such as nausea and vomiting has not been sufficiently studied. Professor Li Shi-zhen has described his experience with the clinical impacts of acupuncture at LI4 and concluded that this acupoint has a remarkable effect on the body [34].

LI4 has been proposed to impose its analgesic effects by decreasing perfusion to the putamen in the brain [35]. Conversely, Jung et al showed an increase in cerebral perfusion after stimulation of LI4 in healthy subjects [36]. This inconsistency may be due to a variation in the definition of LI4 or different regions in the brain being considered as the target of neuroimaging studies. Our study, for the first time, measured the possible efficacy of LI4 acupuncture in addition to the traditionally practiced PC6 acupuncture. However, outcome measurement in this study was not objective, with a variety in definition of the LI4 acupoint and other acupuncture techniques being the source of concern. For this reason, there is a need for further studies, which by adopting standardized methods and globally accepted definitions, will be able to evaluate the mechanism of action of LI4 acupuncture in postoperative care.

5. Conclusion

This trial indicates the effectiveness of acupoint LI4 as an adjunct to acupoint PC6 to reduce postoperative nausea and vomiting. The results should encourage and promote the implementation of this combined technique in daily surgeries and departments of surgery.

Disclosure statement

The author affirms there are no conflicts of interest and the author has no financial interest related to the material of this manuscript.

References


