



Original article

Effectiveness of Transcutaneous Electrical Acupoint Stimulation for prevention of Post Operative Nausea and Vomiting after abdominal surgeries

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ABSTRACT

Introduction: Postoperative Nausea and Vomiting are common complications following surgery and anesthesia. Postoperative Nausea and Vomiting is treated with antiemetic, but pharmacological interventions may be only partially effective. An alternative approach is to stimulate the P6 acupoint on the wrist. **Methodology:** 30 patients underwent abdominal surgery were taken from Surgery Inpatient Department, Gynecology Inpatient Department of Guru Gobind Singh Medical College and Hospital, Faridkot based upon inclusion and exclusion criteria. Patients were equally divided into two groups. In Group A, P6 stimulation was given by Transcutaneous Electrical Nerve stimulator. In Group B, Placebo Transcutaneous Electrical Nerve stimulator was used. Assessment was carried out through Mc Gill assessment for postoperative nausea and vomiting. **Result:** There was no significant difference between the two groups in nausea and vomiting scale at 2 hours after surgery. While there was a significant difference between the two groups after 6 and 24 hours of treatment as p value was (<0.005) and (<0.005) respectively. This study showed that P6 acupoint stimulation reduced the risk of Postoperative Nausea and Vomiting in Group A as compared to Group B following Transcutaneous Electrical Acustimulation treatment. **Conclusion:** The application of Transcutaneous Electrical Acustimulation at the P6 acupoint after surgery reduced the occurrence and severity of postoperative nausea and vomiting.

KEYWORDS: Postoperative Nausea and Vomiting; Transcutaneous Electrical Acustimulation; Transcutaneous Electrical Nerve Stimulator.

INTRODUCTION

Postoperative nausea and vomiting (PONV) are the most common problems after receiving anesthesia in surgical patients. It is a limiting factor in the early discharge of ambulatory patients after surgery and is a leading cause of unanticipated hospital admission [1, 2]. Nausea is the urge to vomit while vomiting is the reflex act of forceful expulsion of stomach contents through the mouth. According to the report from Science Daily on April 16, 2009, with up to 80% of surgical patients are being affected [3].

It can occur up to 24 hours after surgery and can cause serious complications like aspiration pneumonia, dehydration, malnutrition, metabolic disturbances and disruption of the surgical site which results in prolonging length of stay in the hospital and increasing medical expenses. Pharmacological treatment is the most common

strategy for preventing PONV. Some patients may not tolerate antiemetic because of adverse effects such as headache, agitation, or tachycardia; whereas PONV develops in others despite use of antiemetic [4]. These concerns have led researchers to investigate alternative approaches to the treatment of nausea and vomiting.

Pericardium Meridian 6 (P6), also known as Nei Guan is located on the palmar aspect of the forearm, and is approximately 2 cun "Chinese inches" (the width of the proximal interphalangeal thumb joint) above the transverse crease of the wrist in the med-line of the forearm, approximately 1 cm deep to the skin, between the tendons of M. Flexor Carpi radialis and M. Palmaris longus [5]. Stimulation of this point is reported to reduce nausea, and anti-sea sickness [6].

Transcutaneous electrical acupoint stimulation (TEAS) is non-invasive and effective stimulation in treating nausea (morning sickness). It decreases peristaltic velocity and increases the basal tonus of the oesophagus as well as reduces the preparation during gut distention, indicating that somatic stimulation may increase the visceral threshold [7].

A TENS device consists of an electrical signal generator that transmits pulses of electrical current to electrodes on the skin. The TENS unit is programmable, and the generators are capable of delivering stimulation in different rates and intensities. TENS is closely related to the techniques of acupressure and acupuncture since some TENS devices are designed to stimulate the area of the wrist that corresponds to the suspected acupoint that prevent nausea and vomiting. This form of TENS is also referred to as electroacupoint stimulation or acustimulation [8].

The purpose of the current study was to evaluate the efficacy of P6 acupoint stimulation versus placebo for the prevention of PONV in patients undergoing abdominal surgeries and to compare the efficacy of non-invasive TENS on P6 acupoint stimulation with routine antiemetic in preventing PONV.

MATERIALS AND METHODS

Design: An experimental study design was used for the purposes of the current study. 30 patients who underwent abdominal surgery were taken from inpatient Department (IPD) of Surgery and Gynecology of GGS Medical College and Hospital, Faridkot, Punjab. Patients were randomly divided into two groups, Group A (TENS group) and Group B (Placebo group) based on randomization. Randomization was done by simple random sampling. After initial assessment, participants drew one of 30 pre-printed cards in opaque sealed envelopes from a box (15 labeled 'Group A' and 15 labeled 'Group B') and were placed in the TENS and Placebo Group in accordance with the card drawn.

Eligibility Criteria

Inclusion Criteria: Patients of both genders were taken, Patients with age group 18-45, Patients underwent

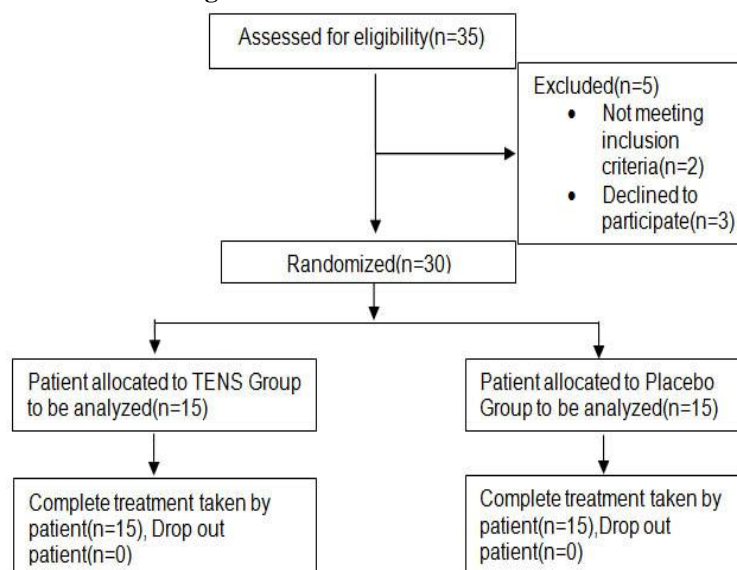
abdominal surgeries such as laparoscopic surgeries (such as cholecystectomy), hysterectomy, appendectomy, C- section (laprotomy, hysterotomy), and inguinal hernia surgery, Patients underwent day surgeries, Without medical history of gastric or intestinal diseases.

Exclusion Criteria: Pregnancy, Any Defibrillation device, If patient has taken antiemetic, glucocorticosteroids, or psychoactive medication within 24 h before the operation, Having an implanted cardiac pacemaker, Patients who will experience vomiting or retching within 24 h before surgery were excluded, History of motion sickness, Smokers, Previous history of PONV.

Intervention: Patients in Group A received therapy consisting of TENS. After applying a hypoallergic conductive gel to the skin surface, the transcutaneous electrical stimulation unit having two electrodes was attached around the wrist with an adjustable Velcro strap. One electrode was placed at the p6 acupoint of the dominant hand [9] on the palmer aspect of the forearm [5] and the other electrode was placed at the dorsal aspect of the wrist directly opposite to the P6 acupoint of the patient. For the purpose of this study, the device was set at an average intensity of 10Hz-15Hz [10].

In the Placebo group, an inactivated TENS (NUMISMA Electronics) device was used for the therapy. Positions of the electrodes were same as in Group A. Each participant was informed that special acupoint stimulation is used in the treatment which could not be felt by human sensory perception. The treatment time of stimulation was same for both groups that was for 10 minutes and was continued during wakening of patient after every 2 hours for 10 hours. Treatment was started as the patient gained consciousness. Treatment was given in addition to post-operative antiemetic drugs. Assessment of all patients in both the groups (Group A and Group B) was carried out after 2 hours, 6 hours and 24 hours of the treatment through Mc Gill assessment [11] for PONV that scores from 0 to 5 in which 0 stands for no nausea and vomiting where as 5 stands for excruciating nausea and vomiting.

Figure 1: Flow Chart of Procedure



RESULTS

The changes in nausea and vomiting scale from 2 hours after the surgery to 6 and 24 hours after treatment were revealed by using the Friedman test in each group. A pair wise comparison was conducted using the Mann-Whitney test to compare between two groups. Data was analyzed using SPSS version 20 software. The results of this study showed that, nausea and vomiting scales improved in Group A after treatment as shown in Table 1 and 2. P- value <0.05 is considered as significant in this study.

In group A (15 patients), 7 males (47%) and 8 were females (53%) with the mean age of 29.3 and S.D is 7.7244 where as in Group B (15 patients), 8 were male (53%) and 7 were females (47%) with mean age of 28.0 and S.D is 8.3066.

Nausea scale: There was no significant difference between the two groups in nausea scale before the treatment at 2 hours after surgery as p value was (< 0.005). While there was a significant difference between the two groups after 6 and 24 hours of treatment as p value was (<0.005) and (<0.005) respectively. A pair wise comparison was conducted using the Mann-Whitney test to compare between both groups at 2 hours, 6 hours and 24 hours after treatment. At 2 hours and after treatment at 6 hours and 24 hours, group A showed statistically significant improvement with a decrease in mean value that is 3.93, 1.93, 0.33 respectively than group B having mean values 3.93, 2.93, 1.93 at 2 hours and after treatment at 6 hours and 24 hours respectively (table 1).

Table 1: Mann Whitney test for comparison after 2 hours, 6 hours, after 24 hours score measurement of Nausea among Group A and Group B

Time of comparison	Group A	Group B	p- value
	Mean ± SD	Mean± S.D	
After 2 hours	3.93±.799	3.93±.799	<0.05
After 6 hours	1.93±.799	2.93±.799	<0.05
After 24 hours	.33±.488	1.93±.799	<0.05

Vomiting scale: There was no significant difference between the two groups in vomiting scale before the treatment at 2 hours after surgery as p value was (<0.005). While there was a significant difference between the two groups after 6 and 24 hours of treatment as p value was (<0.005) and (<0.005) respectively. A pair wise comparison was conducted using the Mann-Whitney test to compare

between both groups at 2 hours, 6 hours and 24 hours after treatment. At 2 hours and after treatment at 6 hours and 24 hours, group A showed statistically significant improvement with a decrease in mean value that is 4.07, 2.07, 0.60 respectively than group B having mean values 4.07, 3.07, 2.07 at 2 hours and after treatment at 6 hours and 24 hours respectively (table 2).

Table 2: Mann Whitney test for comparison after 2 hours, 6 hours, after 24 hours score measurement of Vomiting among Group A and Group B

Time of comparison	Group A	Group B	p- value
	Mean ± SD	Mean ±SD	
After 2 hours	4.07± .799	4.07± .799	<0.05
After 6 hours	2.07± .799	3.07±.799	<0.05
After 24 hours	.60±.507	2.07± .799	<0.05

DISCUSSION

Results of the presenting study revealed that, transcutaneous electrical acupoint stimulation of P6 point appeared to be more effective in alleviating post-operative nausea and vomiting after abdominal surgeries as an adjunct to routine

antiemetic drug therapy. There was statistically significant decrease in nausea and vomiting scales for group A, that was treated by TEAS with the help of TENS in addition to anti-emetic drug. The results of the present study were

similar to the study by Wang et al who concluded that, the prevalence of nausea, vomiting was significantly lower with TEAS at the P6 acupoint. TENS had been used to control postoperative pain, nausea, vomiting and discharge following various surgical procedures [9]. In addition, all patients were told that the TENS produce a sensation which they “might or might not feel” [12, 13 and 14].

We had shown that P6 acupoint stimulation reduced the risk of PONV in TENS Group as compared to Placebo Group treatment. Reduction of nausea, vomiting, and need for rescue antiemetic with P6 acupoint stimulation reduced the antiemetic drug cost, length of stay in hospital) as well as improved quality of the patient care [15]. The reason why we chose 2 hours, 6 hours and 24 hours postoperatively as the observation points are because: 1) Volatile anesthetics might be the main cause for early (within 2 hours after the surgery) but not delayed postoperative nausea and vomiting [16]; 2) The half-life of ondansetron was approximately 6 hours based on pharmacokinetics [17]; and 3) PONV is defined as vomiting and/or nausea occurring within 24 hours after surgery [18].

In this study, the intervention was started right after the patient regained consciousness as in the TCM (Traditional Chinese Medicine) theory, it was important to locate the right acupoint with the *de qi* sensation (the sensation of numbness, heaviness or distention associated with correct identification of an acupuncture point) to enhance efficacy and this could not be accomplished when the patient was unconscious [19].

Previous studies had not indicated whether the duration of P6 acupoint stimulation alters its effect on PONV. A long duration of acupoint stimulation would increase patient's discomfort and pain, especially for those in the TENS group. However, if the stimulation time was too short, the therapeutic effect of acustimulation on PONV would be uncertain. In this study, we believed the most reasonable duration of P6 acupoint stimulation to be 10 minutes, which was the common acustimulation treatment time [20].

Liu et al evaluated the efficacy of transcutaneous electroacupoint stimulation for the prevention of postoperative nausea and vomiting (PONV) in patients undergoing laparoscopic cholecystectomy [21]. The incidence of nausea and vomiting, the dose of antiemetic and the occurrence of severe nausea were all significantly lower in the treated group compared with the control group and the score for pain was reduced in patients of the treated group at 24 hours post-operation.

Cekmen et al stated that, TENS decreased postoperative nausea and vomiting, frequency of dizziness, additional antiemetic and analgesic needs. Also, Electrical stimulation of the vestibular system might be useful in the prevention of PONV [22].

Lee and Done showed that non-pharmacologic techniques (acupuncture, electro acupuncture, transcutaneous electrical nerve stimulation, acupoint stimulation, and acupressure) were equivalent to commonly used antiemetic drugs in preventing vomiting after surgery. Non-pharmacologic techniques were more effective than placebo in preventing

nausea and vomiting within 6 h of surgery in adults, but there was no benefit in children [5].

The antiemetic effectiveness of electrical stimulation at the P6 acupuncture point used in adults at high risk for PONV was controversial. However, in a recent systematic review, Lee and Done concluded that acustimulation appeared to prevent PONV in adults [5]. Similarly, Vicker concluded from an analysis of 21 controlled trials in adults that P6 acupuncture point stimulation decreased emetic symptoms [23].

A cross-over design was not used for this study because patients could have become aware of the differences in the sensation produced by the electrical stimulation in the active treatment group. The failure to include a bilateral P6 acupoint stimulation group, as well as a second control group having an active device at a “dummy point” (non acupoint site), may also be considered deficiencies in the study design. However, previous studies have demonstrated efficacy with unilateral stimulation [5, 23], and application of an active device at the non acupoint chosen for the Placebo group could have transmitted electrical impulses through the wrist to the P6 acupoint

CONCLUSION

The application of TEAS at the P6 acupoint after every two hours for ten hours after surgery when the patient fully regained consciousness reduced the overall incidence and severity of postoperative nausea and vomiting when assessed after 6 hours and 24 hours of the surgery through Mc Gill assessment for postoperative nausea and vomiting (PONV).

Implications for practice: No major side effects were associated with P6 acupoint stimulation. P6 acupoint stimulation was found to be a suitable alternative or addition to antiemetic drugs for preventing postoperative nausea and vomiting in patients undergoing abdominal surgeries.

Limitations of the study: The sample size for the study was small. We did not find any interaction between the effect of P6 acupoint stimulation and age (children versus adults); type of P6 acupoint stimulation (invasive versus noninvasive); quality of sequence generation (adequate versus unclear or inadequate).

Future scope: Further research should investigate whether the duration of P6 acupoint stimulation alters its effect on PONV. Future research should shed light in other acupuncture points for nausea and vomiting management. The role of TEAS and acupressure in managing pregnancy-related nausea and vomiting should be explored in future research.

Conflicts of Interest: NIL

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