

# Acupressure and the prevention of nausea and vomiting after laparoscopy

D. Harmon<sup>1\*</sup>, J. Gardiner<sup>1</sup>, R. Harrison<sup>2</sup> and A. Kelly<sup>3</sup>

<sup>1</sup>Department of Anaesthesia and <sup>2</sup>Department of Obstetrics and Gynaecology, Rotunda Hospital, Dublin, Ireland. <sup>3</sup>Department of Community Health and General Practice, Trinity College, Dublin, Ireland

\*To whom correspondence should be addressed at: Department of Anaesthesia, Beaumont Hospital, Beaumont Road, Dublin 9, Ireland

The efficacy of currently available antiemetics remains poor. Concern with their side effects and the high cost of the newer drugs has led to renewed interest in non-pharmacological methods of treatment. We have studied the efficacy of acupressure at the P6 point in the prevention of nausea and vomiting after laparoscopy, in a double-blind, randomized, controlled study of acupressure vs placebo. We studied 104 patients undergoing laparoscopy and dye investigation. The anaesthetic technique and postoperative analgesia were standardized. Failure of treatment was defined as the occurrence of nausea and/or vomiting within the first 24 h after anaesthesia. The use of acupressure reduced the incidence of nausea or vomiting from 42% to 19% compared with placebo, with an adjusted risk ratio of 0.24 (95% CI 0.08–0.62;  $P=0.005$ ). Other variables were similar between groups.

*Br J Anaesth* 1999; **82**: 387–90

**Keywords:** vomiting, nausea, acupressure; vomiting, incidence; surgery, laparoscopy

Accepted for publication: November 9, 1998

In 1848, 1 yr after the introduction of general anaesthesia in Great Britain, John Snow published an article on the phenomenon of postoperative nausea and vomiting (PONV).<sup>1</sup> Since that time, repeated efforts have been made to reduce the incidence and intensity of this problem. However, Rowbotham, in his review of the management of PONV, concluded that the efficacy of currently available antiemetics remains poor.<sup>2</sup> These drugs also cause a variety of side effects, such as dystonic reactions, restlessness and tachycardia.

Postoperative emetic symptoms are influenced by many factors and these must be carefully controlled when studying PONV.<sup>3</sup> An important influence is the type of surgery.<sup>4</sup> Laparoscopy for diagnostic and therapeutic gynaecological purposes is associated with a 36–60% incidence of PONV.<sup>5</sup>

Acupressure, a non-invasive type of acupuncture, has been reported as a potential non-pharmacological method of preventing nausea and vomiting. In acupressure, manual stimulation is applied, unlike acupuncture where the skin is pierced with a needle. Studies have shown that acupressure can decrease nausea caused by morning sickness,<sup>6</sup> general anaesthesia<sup>7</sup> and chemotherapy.<sup>8</sup> But other studies of this technique have had unfavourable results, including those of Yentis and Bissonnette<sup>9</sup> and Lewis and colleagues.<sup>10</sup> Acupuncture has been shown to be effective in the prevention of PONV in patients undergoing laparoscopic gynaecological procedures.<sup>11</sup> There are no randomized, controlled

studies comparing acupuncture and acupressure in the prevention of PONV.

The potential side effects of acupuncture include nerve damage,<sup>12 13</sup> pneumothorax<sup>14</sup> and infectious disease transmission.<sup>15</sup> These side effects are rare and possibly only relevant to patients with diabetes mellitus or those with risk factors for endocarditis.<sup>16</sup> There are only relative contraindications with the sterile needles used in modern day practice. In contrast, there are no reported adverse effects of acupressure in the literature. Acupressure has thus far not been studied after gynaecological surgery and holds the potential for being a simpler but effective therapy.

## Patients and methods

After obtaining approval from the Hospital Ethics and Research Committee, and written informed consent, we conducted a prospective, randomized, double-blind study. The study was planned with a power of 0.9 to detect a 20% difference in the incidence of PONV, with a significance level of 0.05. This required recruitment of 104 patients.

We studied ASA I–II patients, aged 19–43 yr, undergoing laparoscopy and dye investigation at the Rotunda Hospital. This procedure was part of a series of infertility investigations. Criteria for exclusion included obesity (BMI >35 kg m<sup>-2</sup>), diabetes mellitus and a previous history of PONV. Patients with diabetes mellitus are predisposed to

peripheral vascular disease and were therefore excluded because of the risk of blood flow impairment to the digits.

Patients were allocated randomly to either an acupressure or control group. Randomization was conducted by computer and the code was sealed until arrival of the patient in the operating theatre. Patients were told that a form of acupuncture (using wrist bands instead of needles) may reduce the incidence of postoperative sickness and we were investigating the most appropriate site for this to be placed. In both groups, acupressure bands (Sea band UK Ltd, Leicestershire, UK) were placed on the right forearm, immediately before induction of anaesthesia. The acupressure band has an adjustable strap with a spherical plastic bead attached to it. In the acupressure group, wrist bands were placed with the plastic bead positioned at the P6 point. The treatment point P6 (Nei-Guan) is the number 6 meridian point in the pericardium channel; it is located on the anterior surface of the forearm between the tendons of the extensor carpi radialis and palmaris longus 2 'cun' (a cun is a Chinese measurement equal to the width of the interphalangeal joint of the thumb) from the distal wrist crease.<sup>17</sup> In the control group, wrist bands were placed with pressure at a non-acupoint site.

Anaesthesia was administered by different anaesthetists using a standardized technique. No antiemetic medication was given before or during operation. All patients received diazepam 10 mg, 1 h before operation. Anaesthesia was induced with thiopental 0.3–0.5 mg kg<sup>-1</sup> i.v. and fentanyl 1.5 µg kg<sup>-1</sup> i.v., and maintained with 0–1.5% enflurane and 60% nitrous oxide in oxygen. Neuromuscular block was provided by atracurium 0.3 mg kg<sup>-1</sup>. Diclofenac 100 mg rectally was given at the end of the procedure, with prior consent. Acupressure bands were removed 20 min after induction of anaesthesia, before emergence. Bands removed before the end of anaesthesia helped the double-blind aspect of the study and maintained the simplicity of the technique. Residual neuromuscular block was antagonized in all patients with neostigmine 2.5 mg and glycopyrrolate 0.5 mg. All procedures were carried out by experienced surgeons.<sup>18</sup>

All patients received fentanyl i.v. for pain relief in the recovery room. Pethidine 1 mg kg<sup>-1</sup> i.m. was prescribed with simple analgesics (mefenamic acid 500 mg 6 hourly/solpadeine 500 mg 6 hourly) as required. Ondansetron 4 mg i.v. and prochlorperazine 12.5 mg i.m. were prescribed for PONV in the recovery room and ward, respectively. Patients and nurses were informed that an antiemetic should be given in the presence of intolerable nausea or vomiting.

Both patients and nurses were unaware of patient group allocation. The incidence of nausea and vomiting at three times during the first 24 h was determined. At the three times (in the recovery room, and at 2 and 24 h after operation), an anaesthetist blinded to the therapy registered whether nausea, retching or vomiting had occurred. The results were scored in a manner similar to that of Allen, Kitching and Nagle<sup>19</sup> as none, nausea, retching/vomiting. If a patient experienced both nausea and vomiting, they

**Table 1** Patient characteristics and duration of surgery (mean (SD or range)). Data were compared using the unpaired *t* test ( $P^1=0.285$ ,  $P^2=0.0837$ ,  $P^3=0.197$ )

	Acupressure (n=52)	Control (n=52)
Age (yr) <sup>1</sup>	33 (19–41)	32 (27–43)
Weight (kg) <sup>2</sup>	62 (10)	64 (9)
Duration (min) <sup>3</sup>	20 (5)	21 (5)

**Table 2** Distribution of patients and risk factors. F=Follicular, L=luteal, IR=irregular

	Menstrual phase (F/L/IR)	Postop. opioid	Postop. simple analgesia
Acupressure	(27/21/4)	14	8
Control	(27/19/6)	11	11

were recorded as having vomiting. To examine the severity of nausea and vomiting, nausea was classified as none, mild, moderate or severe. Vomiting and retching were not distinguished and severity was classified by the number of episodes over 24 h: none, mild (0–2), moderate (3–5) or severe (>5).<sup>20</sup> At the end of the 24-h period, patient charts were assessed for antiemetic and analgesic requirements.

### Statistical analysis

Patient characteristics in the two groups were assessed using the unpaired Student's *t* test. Comparison between groups was performed for overall nausea, retching and vomiting and then separately for nausea and vomiting. Initially, Pearson's chi-square test was used to investigate the association between nausea and vomiting in the acupressure and control groups. Then the odds ratio for acupressure and control of nausea/vomiting was estimated using a logistic regression model controlled for opioid and duration of anaesthesia. The latter was categorized into three groups. A significance level of 0.05 was chosen.

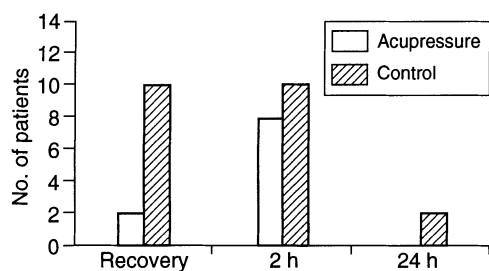
## Results

We studied 104 patients: 52 in the acupressure group and 52 in the control group. The groups were comparable in age, weight and duration of surgical procedure (Table 1).

The incidence of risk factors for postoperative nausea and vomiting are shown in Table 2. They were similar between groups.

The incidence of postoperative nausea and/or vomiting is shown in Figure 1. In the acupressure group, 10 (19%) patients had nausea/vomiting in the first 24 h after operation compared with 22 (42%) in the control group. In Figure 1, data are not stratified for variables which may influence the incidence of nausea or vomiting. The acupressure group had a significantly lower incidence of nausea and vomiting compared with the control group ( $P=0.011$ ) (Fig. 1).

Multivariate analysis of the data is presented in Table 3. These results demonstrated a statistically significant



**Fig 1** Incidence of nausea/vomiting in the acupressure and control groups at the three times. Statistical analysis of acupressure treatment for postoperative nausea and vomiting: chi-square test=5.56,  $P=0.011$ , absolute difference 23% and 95% confidence interval 0.17–0.23.

**Table 3** Odds ratio (95% confidence interval) of efficacy of acupressure in preventing nausea/vomiting after laparoscopy, after adjustment for opioid and duration of anaesthesia. Odds ratios were derived from a logistic regression model.  $P$  values were computed controlling for the other variables presented

Variable	Odds ratio	95% CI	$P$
Nausea/vomiting	0.24	0.08–0.62	0.005
No opioid vs opioid	0.65	0.22–1.88	0.41
Duration			
(1–15 min)	1	–	–
(15–20 min)	1.59	0.35–11.4	0.59
(20+ min)	4.09	1.39–13.00	0.01
Nausea	0.28	0.08–0.79	0.02
Vomiting	0.40	0.07–1.70	0.23

**Table 4** Severity of nausea and vomiting, and antiemetic requirements. Score is the maximum reported score over 24 h.  $n$ =number of patients

	Acupressure	Control
Nausea only	$n=44$	$n=39$
None	37	25
Mild	4	11
Moderate	3	5
Severe	0	0
Vomiting	$n=47$	$n=47$
None	44	41
Mild	2	4
Moderate	1	1
Severe	0	0
Antiemetic (1 dose)	3	9

reduction in nausea and vomiting in the acupressure group compared with the control group ( $P=0.005$ ). There was also a statistically significant reduction in nausea in the acupressure group compared with controls ( $P=0.02$ ).

Severity of nausea and vomiting and antiemetic requirements in both groups are shown in Table 4. There were no side effects or complications caused by placement of the acupressure band in either group.

## Discussion

The mechanism of action of acupressure remains speculative. Peripheral nerve stimulation is an integral part of the mechanism as it is not clinically effective if the nerve supply is disrupted.<sup>21</sup> Clement-Jones and colleagues reported increased beta-endorphin concentrations in human cerebrospinal fluid after acupuncture stimulation.<sup>22</sup> It is

postulated that opioids may also have an antiemetic effect mediated by the action of beta-endorphin on mu receptors. Acupressure may result in the release of beta-endorphin with increased antiemetic tone. Acupuncture has been shown to enhance gastric motility.<sup>23</sup>

Most studies indicate the efficacy of acupressure or acupuncture at the P6 meridian. Fan and colleagues,<sup>7</sup> Belluomini and colleagues<sup>6</sup> and Al-Sadi, Newman and Julious<sup>11</sup> found this technique to be effective. Important components of this treatment include the timing of stimulation<sup>24</sup> and correct point location.<sup>25</sup> P6 manual stimulation had a maximal effect in the first hour, as was demonstrated previously by Dundee and colleagues.<sup>26</sup> Acupressure studies which did not report favourable results<sup>9 10</sup> applied the technique after induction of anaesthesia. This stresses the importance of applying the technique before the emetic stimulus.

Difficulties in acupuncture and acupressure research have been highlighted.<sup>27 28</sup> Many of these are relevant to the use of acupuncture for analgesia research. The standard control in acupuncture research is 'sham' acupuncture. In analgesia research, simple stimulation by inserting the needle may have a counter-irritation effect which may have an effect on the gate control theory of pain.<sup>29</sup> Such a physiological mechanism does not exist for nausea and vomiting. Additional problems with 'sham' acupuncture occur in patients who have experienced acupuncture therapy. Experienced patients are able to identify the feeling of 'chi' if the needle is placed appropriately. Acupuncture has the potential to elicit very powerful non-specific effects, it raises expectations and involves sensation in addition to time and empathy. Almost 100% of patients treated with sham acupuncture may respond positively.<sup>30</sup> In our study, acupressure was applied simultaneously with induction of anaesthesia and removed before emergence to overcome some of these problems. Blinding is also affected by patient experience.

Up to 70% of patients report emetic symptoms as the postoperative outcome they would most like to avoid.<sup>31</sup> In most cases, it is not justified to use antiemetics routinely before operation.<sup>32</sup> Yet patients are often reassured that the latest available antiemetic medications will be administered. Many factors influence the incidence of PONV, including age, sex, type of surgery,<sup>33</sup> administration of opioids,<sup>34</sup> history of PONV<sup>35</sup> and phase of the menstrual cycle.<sup>36 37</sup> Therefore, it is important that studies evaluating PONV are carefully designed to avoid bias.

The 43% incidence of nausea and vomiting after laparoscopy in our study is similar to other studies.<sup>5</sup> We were able to demonstrate the effectiveness of P6 acupressure in reducing nausea and vomiting after laparoscopy, with an adjusted risk ratio of 0.24 (95% CI 0.08–0.62;  $P=0.005$ ). When nausea and vomiting were analysed separately, a protective effect of acupressure in preventing nausea persisted, with an adjusted risk ratio of 0.28 (95% CI 0.08–0.79;  $P=0.02$ ). For vomiting, the point estimates suggested a protective effect of acupressure, but the wide confidence

interval reflected the small number of events. Controlled studies comparing acupressure with standard doses of commonly used prophylactic antiemetic drugs (e.g. droperidol 0.65 mg i.v. and ondansetron 4 mg i.v.) are needed. A combination of acupressure and prophylactic antiemetic drugs should also be investigated.

In summary, the non-pharmacological technique of acupressure at the P6 point was effective in preventing nausea and vomiting after laparoscopy. Acupressure is devoid of possible side effects, is easy to apply and economical.

## References

- 1 Snow J. *On Narcotism by the Inhalation of Vapours*, facsimile Edn, 1991. London: Royal Society of Medicine Services Ltd, 1848
- 2 Rowbotham DJ. Current management of postoperative nausea and vomiting. *Br J Anaesth* 1992; **69** (Suppl. 1): 46–59S
- 3 Korttila K. The study of postoperative nausea and vomiting. *Br J Anaesth* 1992; **69** (Suppl. 1): 20–23S
- 4 Knapp MR, Beecher HK. Postanesthetic nausea, vomiting and retching. *JAMA* 1956; **160**: 376–85
- 5 Lerman J. Surgical and patient factors involved in postoperative nausea and vomiting. *Br J Anaesth* 1992; **69** (Suppl. 1): 24–32S
- 6 Belluomini J, Litt RC, Lee KA, Katz M. Acupressure for nausea and vomiting of pregnancy: a randomised, blinded study. *Obstet Gynecol* 1994; **84**: 245–8
- 7 Fan CF, Tanhui E, Joshi S, Trivedi S, Hong Y, Shevde K. Acupressure treatment for prevention of postoperative nausea and vomiting. *Anesth Analg* 1997; **84**: 821–5
- 8 Dundee JW, Ghaly RG, Fitzpatrick KTJ. Optimising antiemesis in cancer chemotherapy. *BMJ* 1987; **294**: 179
- 9 Yentis SM, Bissonnette B. P6 acupuncture and postoperative vomiting after tonsillectomy in children. *Br J Anaesth* 1991; **67**: 779–80
- 10 Lewis IH, Pryn SJ, Reynolds PI, Pandit UA, Wilton NCT. Effect of P6 acupressure on postoperative vomiting in children undergoing outpatient strabismus correction. *Br J Anaesth* 1991; **67**: 73–8
- 11 Al-Sadi M, Newman B, Julious SA. Acupuncture in the prevention of postoperative nausea and vomiting. *Anaesthesia* 1997; **52**: 658–61
- 12 Keane JR, Ahmadi J, Gruen P. Spinal epidural hematoma with subarachnoid hemorrhage caused by acupuncture. *Am J Neuroradiol* 1993; **14**: 365–6
- 13 Sobel E, Huang EY, Wieting CB. Drop foot as a complication of acupuncture injury and intragluteal injection. *J Am Podiatr Med Assoc* 1997; **87**: 52–9
- 14 Gray R, Maharajh GS, Hyland R. Pneumothorax resulting from acupuncture. *Can Assoc Radiol J* 1991; **42**: 139–40
- 15 Ernest E, White A. Acupuncture: safety first. *BMJ* 1997; **314**: 1362
- 16 Lee RJE, McIlwain JC. Subacute bacterial endocarditis following ear acupuncture. *Int J Cardiol* 1985; **7**: 62–3
- 17 Giovanni M. *The Foundations of Chinese Medicine*. Amersham: Churchill Livingstone, 1989; 435–6
- 18 McKenna P, Harrison RF. Laparoscopic findings in 375 women attending the Rotunda Hospital infertility clinic. In: Harrison RF, Bonnar J, Thomson W, eds. *Studies in Fertility and Sterility. Diagnosis and Management of Tubo-Uterine Factors in Infertility*. Lancaster: MTP Press, 1984; 177–80
- 19 Allen DL, Kitching AJ, Nagle C. P6 acupressure and nausea and vomiting after gynaecological surgery. *Anaesth Intensive Care* 1994; **22**: 691–3
- 20 Tigerstedt I, Salmela L, Aromaa U. Double-blind comparison of transdermal scopolamine, droperidol and placebo against postoperative nausea and vomiting. *Acta Anaesthesiol Scand* 1988; **32**: 454–7
- 21 Dundee JW, Ghaly G. Local anesthesia blocks the antiemetic action of P6 acupuncture. *Clin Pharmacol Ther* 1991; **50**: 78–80
- 22 Clement-Jones V, Tomlin S, Rees LH, McLoughlin L, Besser GM, Wen HL. Increased  $\beta$ -endorphin but not met-enkephalin levels in human cerebrospinal fluid after acupuncture stimulation for recurrent pain. *Lancet* 1980; **2**: 946–9
- 23 Lin X, Liang J, Ren J, Mu F, Zhang M, Chen JDZ. Electrical stimulation of acupuncture points enhances gastric myoelectrical activity in humans. *Am J Gastroenterol* 1997; **92**: 1527–30
- 24 Dundee JW, Ghaly RG. Does the timing of P6 acupuncture influence its efficacy as a postoperative anti-emetic? *Br J Anaesth* 1989; **63**: 630P
- 25 Fitzpatrick KTJ, Dundee JW, Ghaly RG, Patterson CC. Is it necessary always to use the right forearm for acupuncture antiemesis? *Br J Anaesth* 1988; **61**: 117–18P
- 26 Dundee JW, Ghaly RG, Bill KM, Chestnutt WN, Fitzpatrick KTJ, Lynas AGA. Effect of stimulation of the P6 antiemetic point on postoperative nausea and vomiting. *Br J Anaesth* 1989; **63**: 612–18
- 27 Ernst E, White AR. A review of problems in clinical acupuncture research. *Am J Chin Med* 1997; **25**: 3–11
- 28 Harden RN. The pitfalls of clinical acupuncture research: can east satisfy west? *Arthritis Care Res* 1994; **7**: 115–17
- 29 Melzack R, Stillwell DM, Fox EJ. Trigger points and acupuncture points for pain: correlations and implications. *Pain* 1977; **3**: 3–23
- 30 Taub HA, Mitchell JN, Stuber FE, Eisenberg L, Beard MC. Analgesia for operative dentistry: a comparison of acupuncture and placebo. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1979; **48**: 205–10
- 31 Orkin FK. What do patients want? Preferences for immediate postoperative recovery. *Anesth Analg* 1992; **74**: S225
- 32 Watcha MF, White PF. Postoperative nausea and vomiting. Its etiology, treatment and prevention. *Anesthesiology* 1992; **77**: 162–84
- 33 Pataky AO, Kitz DS, Andrews RW, Lecky JH. Nausea and vomiting following ambulatory surgery: are all procedures created equal? *Anesth Analg* 1988; **67**: S163
- 34 Rabey PG, Smith G. Anaesthetic factors contributing to postoperative nausea and vomiting. *Br J Anaesth* 1992; **69** (Suppl. 1): 40–5S
- 35 McKenzie R, Wadhwa RK, Lim NT, *et al.* Antiemetic effectiveness of intramuscular hydroxyzine compared with intramuscular droperidol. *Anesth Analg* 1981; **60**: 783–8
- 36 Beattie WS, Lindblad T, Buckley DN, Forrest JB. The incidence of post-operative nausea and vomiting in women undergoing laparoscopy is influenced by the day of the menstrual cycle. *Can J Anaesth* 1991; **38**: 298–302
- 37 Honkavaara P, Lehtinen AM, Hovorka J, Korttila K. Nausea and vomiting after gynaecological laparoscopy depends upon the phase of the menstrual cycle. *Can J Anaesth* 1991; **38**: 876–9