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ORIGINAL ARTICLE

Acupressure for intrathecal narcotic-induced nausea and vomiting after caesarean section

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SUMMARY. In this randomized double-blind trial we investigated the effect of acupressure on the incidence of nausea and vomiting after caesarean section under spinal anaesthesia with added intrathecal morphine. Parturients wore either acupressure or placebo wristbands during surgery and postoperatively for at least 10 h. There was no significant difference overall betweeen the two groups in the incidence of intra- or postoperative nausea or vomiting/retching. Demand for antiemetic medication was also similar in the two groups. However, in the sub-group of parturients who gave a previous history of postoperative nausea or vomiting, there was a statistically significant reduction in both postoperative nausea and vomiting/retching in the acupressure group. Further investigations are needed to see whether acupressure may be an effective non-pharmacological, non-invasive treatment for a common problem in this sub-group of patients.

INTRODUCTION

In recent years there has been a growing interest in the use of non-pharmacological remedies for the management of a wide range of medical problems. This is particularly true in the field of obstetrics, where there is concern about the potential adverse effects of maternally administered drugs on the fetus, via placental transfer. Many nursing mothers also wish to avoid medication post partum, for fear of any adverse effects on the neonate caused by drug excretion in breast milk. This project was designed to test the efficacy of a non-pharmacological intervention, acupressure, in the management of post-caesarean section nausea and vomiting, a relatively common complication in obstetric anaesthesia.

Both acupuncture and its non-invasive version, acupressure, have been the subject of trials in a variety of patient groups suffering from a high incidence of nausea and vomiting. The point chosen for the application of pressure or insertion of a needle has been P6 (also known as Neiguan) on the pericardial meridian. This point lies between the tendons of flexor carpi radialis and palmaris longus, two Chinese inches proximal to the distal wrist skin crease,[1] a Chinese inch being the width of the interphalangeal joint of the subject's thumb. In randomized, placebo-controlled trials P6 acupressure has been shown to reduce nausea after gynaecological[2] and general surgery[3] and was reported, in a brief letter by Fry,[4] to reduce nausea and vomiting significantly in a group of patients undergoing a wide range of surgical procedures. Acupressure also significantly reduced the incidence of 'morning sickness' in early pregnancy when compared to placebo, and this is rapidly becoming a popular indication for the technique.[5,6] Another non-invasive variation of acupuncture involves transcutaneous electrical stimulation of the skin over P6. This has also been shown to reduce vomiting after hysterectomy,[7] and nausea and vomiting following minor gynaecological surgery,[1] although Dundee et al found that the antiemetic effect of invasive acupuncture outlasted that of non-invasive stimulation.

In our hospital, the majority of elective caesarean sections are now performed under spinal anaesthesia. The only previous trial of acupressure for nausea related to regional procedures was a preliminary

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report showing that intraoperative nausea and vomiting were significantly reduced during caesarean section under spinal anaesthesia.[8] In contrast, the present study was designed to see whether prophylactic acupressure would reduce the nausea and vomiting that typically persist for several hours following spinal caesarean section when intrathecal morphine is added for postoperative analgesia.

PATIENTS AND METHODS

Patients

Following Ethical Review Committee approval, informed consent was sought from healthy (ASA 1 & 2), term parturients scheduled to undergo elective caesarean section under spinal anaesthesia. Patients were not approached if they gave a history of hyperemesis gravidarum or if they had received antiemetic medication during the 48 h preceding surgery. Women in whom the use of intrathecal opiates was contraindicated were not recruited. A calculation of power was performed before the study, based on an estimated incidence of vomiting of 44% in our patients after caesarean section. One hundred and twenty-two subjects were deemed necessary per group to give 80% power to detect a 50% decrease in the incidence of postoperative vomiting in the treatment group, based on an α of 0.0083 two-tailed (Bonferroni's correction, 0.05/6), because measurements were being made six times.

Protocol

A table of random numbers was used to allocate patients to one of two groups: acupressure (group A) or placebo (group P). Group A patients wore a pair of single-size elasticated acupressure wristbands (Seabands®) that exert pressure on the skin via a plastic stud, and group P a pair of similar-looking placebo wristbands from which the plastic studs were missing. In all patients the bands were positioned over the P6 acupuncture point using the manufacturer's guidelines that the stud should lie three fingers' width proximal to the distal wrist skin crease. A nurse (who took no further part in the study) applied the bands as the patient was about to enter the operating room. The nature of the bands was therefore unknown to the patient, anaesthetist and investigators for the duration of the study.

Anaesthesia

Following oral pre-medication with 30 ml of 0.3 M sodium citrate and pre-loading with 20 ml/kg intravenous 0.9% saline, spinal anaesthesia was induced with hyperbaric 0.75% bupivacaine via a 25 gauge Whitacre spinal needle. The dose of bupivacaine was determined by the individual anaesthetist, but all patients received 10 μg fentanyl and 250 μg morphine intrathecally at the same time, as is the usual practice at our hospital. The anaesthetist recorded any other medication administered, maximum block height, duration of surgery, incidence of brief or prolonged hypotension and any potentially emetogenic visceral stimulation, such as tubal ligation or exteriorization of the uterus. If patients complained of intraoperative nausea, any coincidental potential precipitating factors were recorded, as well as the number of bouts of vomiting or retching. Antiemetic medication was not given prophylactically in this study but it was available for relief of intraoperative symptoms at the discretion of the anaesthetist.

Postoperative assessment

The incidence of postoperative symptoms was recorded by patients on a questionnaire 2, 4, 6, 8 and 10 h after the insertion of the spinal, as well as the following morning. At each assessment time patients recorded the number of bouts of dizziness, retching and vomiting since last questioned and indicated the severity of nausea for the time period on a horizontal 10 cm Visual Analogue Scale (VAS). The wristbands were collected the following morning when patients were also asked about side-effects or problems associated with wearing them for the stipulated minimum of 10 h after insertion of the spinal. All medication administered postoperatively was also recorded.

Statistical analysis

Normality of distributions was assessed by the Martinez–Iglewicz, Kolmorgorov–Smirnov and D'Agostino–Pearson Omnibus K2 normality tests as performed by the NCSS computer program (version 5.03). Continuous, normally distributed variables (age, height, gestational age and bupivacaine dose) were analysed for between-group differences using Student's unpaired *t*-test. Mann-Whitney tests were used for analysis of weight, duration of surgery and dermatomal block height. Categorical data (ASA grade, race, indication for surgery, previous use of Seabands, history of postoperative nausea and vomiting (PONV), drugs used, side-effects, nausea, vomiting/retching and dizziness) were analysed using χ^2 or Fisher exact tests, as appropriate. Some categories were condensed for small cell-size as necessary. VAS nausea had to be converted to a 'yes' (> 1.0 cm) or 'no' (up to 1.0 cm) response due to the dichotomous nature of the zero-heavy distributions. The lack of normal

distributions, compound symmetry and homogeneity of variance precluded the use of repeated measures analysis of variance on these data. Interactions between treatment groups and history of PONV were assessed for nausea and vomiting/retching at any time using Mantel-Haenszel χ^2 analysis. $P<0.05$ was considered significant except where Bonferroni's correction was used.

RESULTS

Patients

A total of 263 patients were initially recruited for the study but eight patients were excluded for failing to wear the wristbands for the minimum of 10 h, three had received prophylactic antiemetics and eight were not given the standard combination of intrathecal drugs. The remaining 244 patients whose data are presented in the final analysis were equally divided between groups A (Acupressure) and P (Placebo). Demographic analysis revealed no statistically significant difference between subjects in the two groups (Table 1). Patients were questioned preoperatively about a history of nausea and vomiting associated with surgery, travel and pregnancy, as well as previous use of Seabands. Table 2 shows that the patients in the two groups were also comparable in these respects.

Intraoperative data

The incidence of potentially emetogenic stimuli such as tubal ligation, uterine exteriorization and prolonged surgery, was found to be similar in the two groups (Table 3) as were the dose of bupivacaine and the height of sensory block achieved. The number of patients experiencing intraoperative hypotension and receiving vasopressors did not differ significantly between the two groups. The vasopressor initially used was ephedrine in all but one patient who received phenylephrine instead. In addition, three group P and seven group A patients received both drugs. The administration of supplementary analgesia (i.v. fentanyl) was also similar in the two groups.

There was no statistically significant inter-group difference in the intraoperative incidence of nausea, vomiting or retching, or the amount of antiemetic medication administered. Thirty-seven patients in group P and 33 in group A reported nausea intraoperatively. In 24 patients in group P and 28 patients in group A this was associated with hypotension or visceral traction. Only eight patients in each group vomited or retched during surgery, an incidence of 6.6%.

Postoperative data

The incidence of postoperative nausea and vomiting/retching is shown in Figures 1 and 2. No inter-group difference was found at any of the individual times of measurement or during the postoperative period as a whole (Table 4).

Analysis of the interaction between treatment and a previous history of PONV revealed a statistically significant reduction in the incidence of postoperative nausea ($P<0.05$) and postoperative vomiting/retching ($P<0.025$) in the acupressure group. In this subset, 20 of 36 patients in group A had nausea compared with 34 of 40 in group P. The incidence of vomiting/retching was 15 out of 36 patients (group A) against 27 out of 40 (group P).

Table 1. Demographic data

	Placebo (n = 122)	Acupressure (n = 122)
Mean age (years) ± S.D.	32 ± 5	32 ± 5
Mean height (cm) ± S.D.	160 ± 7	161 ± 7
Median weight (kg) with range	72 (52–122)	75 (51–129)
Mean gestational age (weeks) ± S.D.	38.4 ± 1	38.4 ± 1.2
Primiparous	23 (19%)	34 (28%)
Multips	99 (81%)	88 (72%)

No significant differences between groups

Table 2. Preoperative history (numbers of patients)

	Placebo (n = 122)	Acupressure (n = 122)
Previous postoperative nausea or vomiting	40	36
Previous motion sickness	46	39
Nausea or vomiting in present pregnancy:		
none	47	45
up to 20/40 gestation	58	61
beyond 20/40 gestation	17	16
Seabands® used previously	5	6

No significant differences between groups

Table 3. Intraoperative details

	Placebo	Acupressure
Tubal ligation performed (*n*)	36	29
Uterus exteriorised (*n*)	23	19
Median duration of surgery (min) and range	35 (13–70)	35 (16–142)
Mean dose of bupivacaine (ml) ±S.D.	1.34 ± 0.13	1.34 ± 0.12
Median dermatomal block height and range	T3 (T1–T6)	T3 (C8–T6)
Patients with hypotension:		
< 1 min duration (*n*)	28	39
> 1 min duration (*n*)	26	22
Patients given vasopressors (*n*)	67	68
Patients given supplementary analgesia (*n*)	9	15
Patients with nausea (*n*)	37	33
Patients with vomiting/retching (*n*)	8	8
Patients given antiemetics (*n*)	11	21

No significant differences between groups

Postoperative medication

Forty-two patients in group P received antiemetics postoperatively compared with 33 in group A. In addition, nalbuphine or naloxone was administered to relieve postoperative itching to 57 patients in group P and 45 in group A. Neither of these differences was statistically significant.

Side-effects

On the whole, the wristbands were relatively well tolerated. The incidence of side-effects reported by the patients in the two groups is shown in Table 5.

DISCUSSION

The results of this study suggest that the use of prophylactic P6 acupressure is not associated with a reduction in the incidence of nausea or vomiting during or after caesarean section under spinal anaesthesia with added intrathecal narcotics. However, postoperative nausea and vomiting were significantly reduced in a sub-group of patients who gave a history of previous PONV.

In the present study, acupressure was not associated with a decrease in nausea or vomiting during surgery when compared with placebo. These results contrast with the findings of a preliminary report by Birnbach et al who demonstrated a highly significant reduction in both nausea and vomiting during caesarean section under spinal anaesthesia with bupivacaine and fentanyl.[8] It is difficult to draw comparisons between the two studies because of several factors. Firstly, Birnbach's results were obtained from a much smaller sample size of 20 patients per group in which the incidence of intraoperative nausea in the placebo group was extraordinarily high (85% as compared with 30% in ours). Furthermore, it is not clear from the brief report of the previous study whether comparisons were made between groups to exclude confounding factors such as the incidence of hypotension, administration of supplementary opiates or occurrence of potentially emetogenic visceral stimulation. Finally, unlike those in our study, their patients did not receive a second, longer-acting intrathecal opiate (morphine).

In contrast, the main aim of our study was to examine nausea and vomiting occurring during the first few hours after surgery. Postoperatively, we found that the incidence of dizziness, nausea and vomiting/retching was similar in the two groups at all six times of measurement. The incidence of vomiting/retching at any time postoperatively in the placebo group (45.9%) is very close to the estimated occurrence of 44% on which our power calculation was based. The incidence of nausea at any time postoperatively in the placebo group was 65.6%. In the acupressure group postoperative vomiting/retching occurred in 41% and nausea in 56.6% of patients.

The number of patients in this study was calculated on the basis that a 50% reduction in vomiting compared with the placebo group would be regarded as clinically significant. Clearly, the observed changes in overall vomiting/retching (10.7%) and nausea (13.7%) fall well short of this. Although this degree of effect may be seen as clinically useful by some practitioners and patients, it would be hard to justify a larger study to see whether the observed difference is statistically significant or a chance finding, as it would require a very large number of patients. For example, 1502 patients would be needed per group in a study designed to give 80% power to validate whether the observed difference in postoperative vomiting (46% vs 41%) was a chance finding or a true effect associated with acupressure ($P<0.05$).

On the other hand, one sub-group of patients in this study would merit further investigation. Acupressure

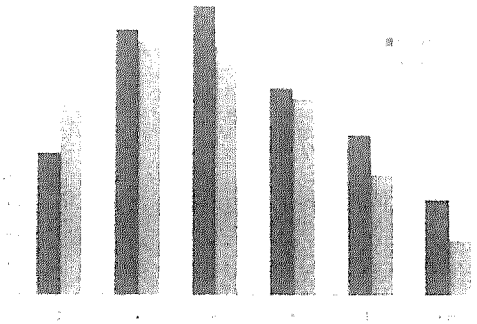

Fig. 1 Incidence of postoperative nausea (n = 122 in both groups).

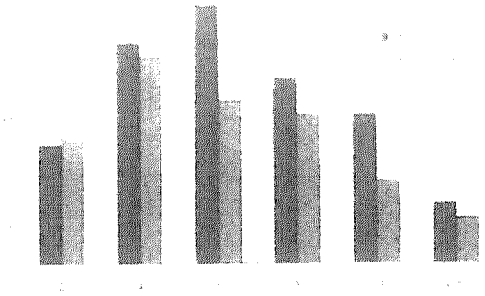

Fig. 2 Incidence of postoperative vomiting or retching (n = 122 in both groups).

Table 4. Incidence of nausea or vomiting/retching at any time postoperatively

	Placebo	Acupressure	P
Nausea	80 (66%)	69 (57%)	0.1487
Vomiting/retching	56 (46%)	50 (41%)	0.4384

Table 5. Numbers of patients reporting side-effects

	Placebo (n = 122)	Acupressure (n = 122)
Tightness	10 (8.2%)	12 (9.8%)
Swollen hands	26 (21.3%)	17 (13.9%)
Problems with infusion	1 (0.8%)	3 (2.5%)
Itching wrists	4 (3.3%)	5 (4.1%)

No significant differences between groups

was associated with a statistically significant reduction in nausea postoperatively when compared with placebo (55.6% vs 85%, $P<0.05$) in the patients who had experienced nausea or vomiting after previous surgery. Furthermore, in the same group of patients the incidence of postoperative vomiting/retching was lower in the acupressure group (41.7% vs 67.5%, $P<0.025$). This was the only sub-group of patients we examined. Although this is a post-hoc finding and must therefore be interpreted cautiously, it would justify a larger study of such a population to see whether acupressure could be a useful clinical tool in these patients.

In the light of the relative similarity of the incidence of symptoms in the two groups in this study, it is perhaps not surprising that the overall use of antiemetic medication was also not significantly different. Intraoperatively, more patients in the acupressure group were given antiemetic drugs (21 vs 11 patients, P=0.0579, NS) whereas the situation was reversed postoperatively (33 vs 42 patients). All postoperative medication was recorded so that, overall, the two groups were known to have received comparable amounts of other drugs with potential emetogenic (antibiotics, opioids, non-steroidal anti-inflammatory drugs) or antiemetic (nalbuphine, naloxone) effects.

In keeping with our usual clinical practice, no restrictions were placed on the intraoperative administration of antiemetics by the (blinded) anaesthestist in this study, except for the avoidance of prophylactic treatment. The results show that more patients in the acupressure group received antiemetics intraoperatively (21 vs 11) although, curiously, this discrepancy does not reflect such a difference in the intraoperative incidence of symptoms. The fact that more patients in the acupressure group received intraoperative antiemetics could possibly have contributed to the tendency for slightly less postoperative symptoms in this group. However, this possibility is not supported when comparing the subsequent incidences of postoperative vomiting in patients who received only intraoperative antiemetic medication. In the placebo group, five of the seven patients who received only

intraoperative antiemetics went on to vomit post-operatively compared with only three out of the 17 such patients in the acupressure group.

Overall, patient acceptability of the wristbands was high and consent for the study was very rarely refused by women presenting for elective caesarean section who satisfied the inclusion criteria. The most common side-effect reported (by 17.6% of patients overall) was swelling of the hands with prolonged wearing of the wristbands. This had not occurred in non-pregnant volunteers when assessing the feasibility of wearing the bands before the study commenced (personal observation). Nor did we encounter any complaints of hand-swelling in several hospital staff who were coincidentally using Seabands® for control of morning sickness in early pregnancy. Clearly this may be a side-effect that limits the prolonged use of such wristbands in the term parturient.

In summary, the present study has shown that the use of prophylactic acupressure is not associated with a statistically significant reduction in intrathecal narcotic-induced nausea and vomiting after caesarean section. However, it may be of benefit in a sub-group of patients with a previous history of postoperative nausea or vomiting, which would merit further investigation.

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