Acupuncture in the Management of Postoperative Nausea and Vomiting in Patients Receiving Morphine via a Patient-Controlled Analgesia System

Paul McConaghy, David Bland, Hilary Swales

Summary
This single-blind, randomised, controlled trial was undertaken to assess the efficacy of acupuncture (ACP) at the PC.6 (Neiguan) point in the management of established postoperative nausea and vomiting (PONV) in patients receiving parenteral morphine via a Patient-Controlled Analgesia System (PCAS). Eighty patients were recruited on the first postoperative day and 30 were treated with ACP after developing PONV lasting more than 10 min. Patients were randomly allocated to receive ACP bilaterally at either PC.6 or at a dummy point near the elbow, with manual stimulation for a total of 4 min. Only patients with no knowledge of ACP antiemesis were studied, and each patient was thus unaware of the group to which they were allocated. Patients treated with PC.6 ACP had a greater mean improvement in their visual analogue score for nausea (p < 0.05). All patients in the PC.6 group improved their score by 20% or more, while only one third in the control group did so (p < 0.001). In the PC.6 group 53% of patients did not require any further antiemetic while receiving PCAS morphine. All patients in the control group required further antiemetic treatment (p < 0.001). No adverse effects were recorded.

Key words
Acupuncture, Antiemetic, Nausea, Patient-controlled analgesia, Postoperative analgesia.

Introduction
The commonest and most distressing symptoms which follow anaesthesia and surgery are pain and emetic problems (1). Developments in the management of pain after major surgery have resulted in the frequent use of parenteral opioids via a patient-controlled analgesia system (PCAS). This has been shown to be a safe and effective method of parenteral administration (2). In our hospital, morphine is the opioid most frequently used for this purpose. While morphine via PCAS may provide effective analgesia, like all opioids it is associated with an increased incidence of nausea and vomiting after operation (3,4). These symptoms are two of the most unpleasant experienced by patients and are regarded by some as the worst feature of postoperative recovery (5). They are distressing and humiliating for patients, put additional demands on nursing time, and may delay discharge from hospital with substantial economic consequences (6). Patients may also decrease their morphine consumption in an attempt to lessen these symptoms with consequent suboptimal analgesia.

Many drugs are available to treat postoperative nausea and vomiting (PONV) but they are of limited efficacy with troublesome side-effects (7). Acupuncture (ACP) at the PC.6 (Neiguan) point has been shown in previous studies to be an effective prophylactic treatment in the management of PONV, and has been extensively studied by Dundee and colleagues who have shown that needling of PC.6 before induction of anaesthesia reduced the incidence of PONV over control values (8-16). The usefulness of ACP in the management of established PONV is less clear, with clinical studies suggesting that it is effective only if applied before the emetic stimulus (17-19). This study was thus undertaken to assess the efficacy of PC.6 acupuncture in relieving established PONV in patients receiving parenteral morphine via a Patient-Controlled Analgesia System.

Method
After obtaining Ethics Committee approval, 80 patients gave written, informed consent and were recruited to the study on the first day after operation. Patients were ASA 1-3, aged 16-75 years and receiving parenteral morphine via PCAS for postoperative analgesia. Patients were excluded if there was any contraindication to needling of the arms (anticoagulation, arm surgery) or if they had any knowledge of ACP antiemesis. A note was made on the patient's drug chart to contact a member of the research team if the patient developed PONV which required treatment. A 100 mm Visual Analogue Score for nausea (VAS-nausea) was explained at the initial visit, where 0 = no nausea and 100 = worst possible nausea.

If nausea requiring treatment developed, a member of the research team was contacted. Patients were included in the study when their symptoms persisted for at least 10 minutes, and were randomly allocated to either the active treatment or control groups. It was explained to patients that one of the treatments involved using a "dummy" acupuncture point. An attempt was made to standardise the interactions between acupuncturist and patients in an effort to reduce any possible bias in this single-blinded study.
A VAS-nausea was obtained before treatment was started. Standard, single-use, 30mm long, 28swg ACP needles, were inserted at one of 2 sites without local anaesthetic.

1. PC.6 (active treatment): This point lies two “Chinese inches” proximal to the distal wrist crease, a Chinese inch (Cun) being the width of the interphalangeal joint of the patient’s thumb, and between the tendons of flexor carpi ulnaris and palmaris longus (20). The ACP needle was inserted until an unusual sensation developed frequently described as a tingling, heaviness or numbness, and which was occasionally propagated along lines which did not follow any anatomical structure. The needle was then manually rotated for 2 minutes, and the procedure repeated on the other arm. Both needles were removed and the areas rubbed with an alcohol wipe. A VAS-nausea was then obtained.

2. Control Group: The needles were inserted at the lateral side of the arm just proximal to the elbow crease, at a point which has previously been shown not to have any antiemetic effect (11,21). They were inserted to a depth of several millimetres and were manually stimulated as in the PC.6 group. A VAS-nausea was obtained after their removal.

All patients were then prescribed an antiemetic (metoclopramide 10mg) to be administered pro rae nata and those patients whose VAS-nausea improved with ACP were visited daily for as long as they were using their PCAS. A note was made of the duration of benefit of the ACP treatment, which was taken as the time lapse before they required rescue antiemetic.

The data were analysed using the χ² test, Student’s t-test and paired t-test where appropriate. p<0.05 was regarded as significant.

Results
Thirty patients were treated with ACP. The two groups were similar in sex and weight but patients in the PC.6 group were significantly younger than those in the control group (Table 1). The surgical specialities to which the patients belonged (Table 2) showed an even distribution.

Before treatment with ACP the mean VAS-nausea scores in each group were similar. The scores following treatment were significantly lower in the PC.6 group (p<0.001) (Table 3). The mean improvement in VAS-nausea score in each group was also different (Table 3) with the PC.6 group being significantly larger (p<0.05). In the PC.6 group all patients showed an improvement of 20% or greater in their VAS-nausea while only one third in the control group showed such an improvement (p<0.001). All patients in the control group subsequently required antiemetic while they were receiving PCAS morphine, while only 7 patients (47%) in the active treatment group did so (p<0.001) (Table 4).

Five patients in the PC.6 group had vomiting and nausea before treatment and seven patients in the control group had both symptoms. No patient vomited during the ACP treatment. Four patients in each group vomited following treatment (p>0.05). For those patients who received antiemetic following their ACP treatment, the duration of benefit varied from 30min to 360min in both groups. No adverse effects were reported in either group.

Discussion
Antiemesis using acupuncture has been studied previously in several clinical situations including chemotherapy, motion sickness, morning sickness and PONV (21). This is the first study to assess its benefit in treating established PONV in patients receiving parenteral morphine. The results have shown that needling of PC.6 for a period of 2min in each arm provides significant relief of symptoms over placebo. There was a greater mean improvement in VAS-nausea, a larger number of patients whose VAS-nausea improved by 20% or more, and fewer patients who subsequently required an antiemetic. The number of patients studied was

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### Table 1
**PATIENT DATA**

<table>
<thead>
<tr>
<th></th>
<th>PC.6 (n=15) mean (SD)</th>
<th>Control (n=15) mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>40.4 (17.8)</td>
<td>54.4 (15.6)**</td>
</tr>
<tr>
<td>Sex M:F</td>
<td>8.7</td>
<td>8.7</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>66.7 (11.5)</td>
<td>70.3 (10.1)</td>
</tr>
</tbody>
</table>

*p<0.05 between groups

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### Table 2
**TYPE OF OPERATION**

<table>
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<tr>
<th></th>
<th>PC.6 (n=15)</th>
<th>Control (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General surgery</td>
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<td>11</td>
</tr>
<tr>
<td>Vascular surgery</td>
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<td>2</td>
</tr>
<tr>
<td>Plastic surgery</td>
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<td>1</td>
</tr>
<tr>
<td>Gynaecology</td>
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</tbody>
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### Table 3
**VAS-NAUSEA VALUES BEFORE AND AFTER TREATMENT WITH ACUPUNCTURE**

<table>
<thead>
<tr>
<th></th>
<th>PC.6 mean (SD)</th>
<th>Control mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS before treatment (mm)</td>
<td>55.6 (18.9)</td>
<td>55.7 (15.8)*</td>
</tr>
<tr>
<td>VAS after treatment (mm)</td>
<td>18.8 (19.6)</td>
<td>48.4 (23.7)**</td>
</tr>
<tr>
<td>Difference (mm)</td>
<td>36.7 (21.1)</td>
<td>7.3 (16.6)**</td>
</tr>
</tbody>
</table>

*not significant, **p<0.05, ***p<0.001

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### Table 4
**BENEFIT DIFFERENCES BETWEEN GROUPS**

<table>
<thead>
<tr>
<th></th>
<th>PC.6 (n=15)</th>
<th>Control (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20% reduction in VAS</td>
<td>15***</td>
<td>5</td>
</tr>
<tr>
<td>required metoclopramide</td>
<td>7***</td>
<td>15</td>
</tr>
</tbody>
</table>

***p<0.001 between groups
relatively small, but was the sample size initially calculated to show with 80% power and 5% significance a difference of 20% in the VAS-nausea between groups, assuming a standard deviation (SD) of approximately 19mm (this figure was obtained from an audit of PONV carried out previously in this hospital and correlates well with results obtained in this study). We studied patients whose nausea persisted for at least 10 minutes, in order to exclude patients suffering from transient nausea associated with head movement (23). A possible drawback in this study was the younger age of the PC.6 group, but we feel that this does not detract from the results of the study since both groups had comparable surgery and the mean VAS scores before treatment were also comparable between groups.

The scientific evaluation of ACP antiemesis therapy presents several problems as described by Dundee and McMillan (24). One of the pitfalls is that the person carrying out the treatment is not blinded and is thus aware of the group to which the patient has been allocated. A possible approach to this problem is to have a blinded observer to assess the patients before and after treatment. However this was not a practical option for this research group and we thus decided to use an unblinded, though randomised and prospective, approach in this study. As with previous ACP studies this remains a potential criticism of this study. We feel that any possible bias was minimised by careful explanation of the 100mm VAS at the initial visit and by giving standard instructions as to its use during the trial period.

The physiological basis for the antiemetic action of ACP remains unknown. While 33% of patients in the control group responded initially to placebo needling, the duration of improvement was less than 1 hour for 75% of them, and all patients required metoclopramide. In the active treatment group all patients responded and 53% of these did not need metoclopramide. The duration of benefit from PC.6 ACP in those patients who did require antiemetic drug ranged from 1 hour to greater than 4 hours. We believe that the significant difference between the groups points to a physiological change in those patients receiving PC.6 ACP, with a 33% placebo-response in the control group.

Dundee and Yang have previously demonstrated that the duration of action of PC.6 ACP is limited to 6 hours in patients receiving chemotherapy, but may be prolonged to 24 hours by the application of PC.6 acupressure every 2 hours (25). As pressure over PC.6 is both easy for patients to learn and to carry out on themselves, it is an option worth further study to prolong the duration of benefit in the postoperative period.

Conclusion

Acupuncture at PC.6 significantly reduced the mean VAS-nausea compared to needling of a dummy ACP point. All patients responded significantly to PC.6 ACP and were less likely to require subsequent antiemetic. There was no significant reduction in the number of patients who vomited following treatment, which suggests that PC.6 ACP is more effective at reducing nausea than in decreasing the incidence of emesis. We believe that while the results of our work are encouraging, further study of this complex topic is warranted.

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References

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