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ICU Director 2013 4: 82 originally published online 24 January 2013
DOI: 10.1177/1944451612472700

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>> Version of Record - Mar 19, 2013
OnlineFirst Version of Record - Jan 24, 2013
What is This?
A Preliminary Investigation on the Acceptance and Feasibility of Acupuncture in the Intensive Care Unit

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Abstract: Objective. Acupuncture has been shown to decrease opioid requirements and respiratory distress in selected patients, and it may be helpful as an adjunctive therapy to sedatives and analgesics in the ICU. This preliminary study investigated the acceptance and feasibility of acupuncture in the ICU. Design. Forty-eight patients in a 12-bed medical–surgical ICU at Cedars-Sinai Medical Center who met eligibility criteria were offered the opportunity to receive free-of-charge daily acupuncture treatments during their time in the ICU. Primary endpoints were percentage of patients offered acupuncture who accepted treatment, the percentage of eligible days acupuncture therapy was received, and the incidence of adverse events related to acupuncture treatment. Main Results. Of the 48 patients who were eligible and offered acupuncture therapy, 20 (41%) patients enrolled in the study with an average age of 56 years (range = 18-91 years). The median and average number of days which patients received acupuncture was 2 and 3, respectively (range = 0-11 days), and a majority of patients (13/20) received acupuncture for each of the days for which they were eligible. One patient reported dizziness, which resolved spontaneously and was not associated with hemodynamic changes. No other adverse effects occurred in a total of 64 acupuncture treatments. Conclusions. This preliminary study demonstrates that acupuncture therapy in the ICU is a feasible treatment modality. Further clinical trials are warranted to determine the efficacy of acupuncture therapy as an adjunct to sedative and analgesics in critically ill patients.

Keywords: acupuncture, intensive care unit, sedation, mechanical ventilation, and analgesia

Introduction

Patients undergoing mechanical ventilation in the ICU often require sedatives and analgesics to facilitate care, prevent self-injury, and relieve suffering. In addition, the use of these medications is important to allow ventilator synchrony and improve oxygenation. Current clinical practice guidelines outlined by the Society of Critical Care Medicine recommend intravenous analgesic therapy with opioids in combination with sedatives such as benzodiazepines or propofol for patients on mechanical ventilation.1

Data regarding the use of complementary and alternative medicine therapies in Western medicine settings such as acupuncture are incomplete. Many studies lack adequate power, duration, or controls.2 Current data on acupuncture and acupressure therapy have supported its use in pain control, anxiety, and improving respiratory symptoms. Chen et al3 demonstrated that transcutaneous electrical nerve point stimulation at particular acupuncture points or acupoints was effective in decreasing postoperative opioid analgesic requirements in women undergoing abdominal surgeries. Acupuncture has also been proposed as a potentially effective therapy in the management of pain in neonates.4 In patients with severe obstructive
pulmonary disease, acupuncture and acupressure may relieve dyspnea.3

Current research, although incomplete, suggests that acupuncture therapy may be an effective method for decreasing pain, anxiety, and sedation requirements.4 The application of acupuncture therapy as an adjuvant therapy to medications for sedation and analgesics in the ICU may prove beneficial. In this preliminary study, we sought to determine the acceptance and feasibility of acupuncture in a medical-surgical critical care unit.

Materials and Methods

This study was conducted after approval was given from our institutional review board (IRB), and informed written agreement was obtained from the patient or patients surrogate decision maker. The purpose of this preliminary study was to gather pilot data to demonstrate feasibility, assess patient acceptability, and verify safety of conducting acupuncture on patients in the ICU.

All patients admitted to a 12-bed medical–surgical ICU at Cedars-Sinai Medical Center from November 1, 2008 to February 10, 2009 were screened for eligibility. Patients were considered eligible unless one of the exclusion criteria was present: age less than 18 years, status epilepticus, evidence of increased intracranial pressure, or evidence of acute occlusive myocardial infarction as demonstrated by electrocardiogram (ST segment elevation or other changes determined by primary physicians to indicate acute occlusion) or troponin level greater than 0.5 ng/mL within the prior 24 hours. The physician of record was contacted for his or her approval prior to approaching the patient. Once the physician of record approved, the patient or the patient’s proxy was approached by a study staff member and offered daily free-of-charge acupuncture treatments as part of a research study.

Enrolled patients who were capable of answering questions were evaluated using a brief questionnaire prior to the initiation of acupuncture for whether or not they had any prior experience with acupuncture, and whether they thought it would be beneficial. We asked the question, “Do you believe that acupuncture could be helpful to your care in the hospital?” and patients responded on a Likert-type scale option from 1 = not at all to 10 = very much.

Baseline characteristics of all patients, including age, gender, Acute Physiology Age Chronic Health Evaluation Second Version (APACHE II) score, reason for admission to the ICU, past medical history, length of stay in the hospital and the ICU, and select laboratory data (international normalized ratio, partial thromboplastin time, platelet count, white blood cell count) were recorded. Basic information on patient’s cultural background and religious preferences were also collected by the initial questionnaire.

After enrollment, a licensed staff acupuncturist visited the patient and determined a treatment plan that best addresses that patient’s needs. For example, patients with pneumonia would receive an acupuncture treatment using the acupuncture points as listed below, additionally the acupuncturist would use acupoints that may accelerate phlegm expectoration or augment oxygenation in the lungs. Enrolled patients received daily acupuncture treatments lasting 30 minutes each morning for the duration of his or her stay in the ICU. The acupuncture sites were cleaned with alcohol swabs and sterile single use acupuncture needles were used.

The acupuncture points used included the following: DU 20 (baihui) located on the top of the head, DU 23 (shangxing) located on anterior the head, Yin Tang located at the forehead, LI 11 (quchi) located on the elbow, LU 5 (chize) located on the humerus, LI 4 (hegu) located on the hand, LI 1 (shangyang) located on the index finger, LU 11 (shaoshang) located on the thumb, SP 6 (sangjinjiao) located on the medial aspect of the lower leg, ST 36 (zusanli) located on the anterior aspect of the lower leg, and LIV 3 (taichong) located on the foot (Figure 1). No acupuncture points on the chest or neck were used in this study. Any possible adverse events or findings were recorded and informed to the nursing staff and/or ICU physicians.

The primary outcomes that were assessed included percentage of patients offered acupuncture who accepted treatment, proportion of days that acupuncture treatment was actually delivered, and incidence of any adverse events related to acupuncture treatment.

In addition, we collected data on the amount of benzodiazepine and opioid medications administered during the eligible days of receiving acupuncture therapy, and compared their respective use on days for which acupuncture was received versus days for which acupuncture treatment was not received. We converted all benzodiazepine medications to lorazepam milligram oral equivalent, and converted all opioid medications to morphine milligram oral equivalent.7

Numerical variables were summarized using descriptive statistics, including means, medians, standard deviations, and ranges. Categorical variables were summarized using frequencies and percents.

Results

Patient Demography and Medical Data

A total of 48 patients in a 12-bed medical–surgical ICU at Cedars-Sinai Medical Center were determined to be eligible and were offered to receive daily acupuncture treatments during their time in the ICU.

All eligible patients were first approached within 48 hours of admission to the ICU. Of the 48 eligible, 20 patients (41%) agreed to enroll in acupuncture treatments, with equal numbers of men (10) and women (10). The average age of patients receiving acupuncture was 55.8 years (standard deviation = 16.3), with a median age of 56 years, and range 18 to 91 years. The majority of patients in the study were Caucasian, and most patients were Christian (Table 1). On admission to the ICU, the average APACHE II score for the patients in the study was 14.4 (moderate risk of mortality) and the indications for admission to the ICU were diverse, with the largest percentage of patients...
(35%) admitted for respiratory disease (Table 2). There were a total of 5 patients (25%) who were mechanically ventilated.

Most patients had laboratory values within normal parameters for platelets, prothrombin time, partial thromboplastin time, and white blood cell count (Table 2). However, 1 patient in our cohort was neutropenic and 2 patients were thrombocytopenic.

**Patient Acupuncture Therapy Data**

The average number of received days of acupuncture was 3 (standard deviation = 3.4), with a median of 2 days and range of 0 to 11 days. Of the 91 eligible days of acupuncture treatment for all the patients in the study, 64 days of treatment were actually given; most patients (13/20, or 65%) received acupuncture for all of the days for which they were eligible. The remaining 35% of patients received acupuncture 53% of the days for which they were eligible. Patients who were mechanically ventilated received acupuncture 76% of the days for which they were eligible.

There were 12 treatment days that were refused by 3 separate patients, 1 treatment day not given due to hemodialysis, 1 treatment day not given due to a bronchoscopy...
procedure, 1 treatment day not given because of respiratory isolation, 10 treatment days not documented to as why there were not done, and 2 treatment days not given because of patient unavailability.

There was a single adverse effect with a patient reporting dizziness 15 minutes after the end of the acupuncture treatment session. There was no evidence of hemodynamic instability and the symptoms resolved spontaneously within several minutes. No other adverse effects occurred in a total of 64 acupuncture treatments, including no bleeding, bruising, or infection.

We found no significant difference between benzodiazepine and opioid medication use on acupuncture received days versus non-acupuncture received days in patients who did not receive acupuncture 100% of the time. Sixteen patients (80%) received opiates and 8 patients (40%) received benzodiazepines during acupuncture therapy. Other medications that were used by a minority of patients included propofol (3/20, 15%), haloperidol (1/20, 5%), olanzapine (2/20 patients, 10%), and toradol (1/20, 5%).

**Pre-Acupuncture Questionnaire Data**

Prior experience with acupuncture varied: 9 patients did not have prior exposure, 1 patient with 1 or 2 prior experiences, 3 patients with 3 to 10 prior experiences, and 2 patients had received acupuncture therapy on a regular basis. There were 15/20 patients who completed the prequestionnaire survey. Prior to treatment, patients gave a mean score of 6.8

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**Table 2. Patient Medical Data**

<table>
<thead>
<tr>
<th>Patient Medical Data</th>
<th>Mean ± SD, Median (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>APACHE II score; mean ± SD, median (range)</td>
<td>14.4 ± 6.5, 15 (3-26)</td>
</tr>
<tr>
<td>White blood cell count; mean ± SD, median (range)</td>
<td>9.2 ± 4.0, 9 (0.6-15.5)</td>
</tr>
<tr>
<td>International normalized ratio; mean ± SD, median (range)</td>
<td>1.5 ± 0.6, 1.3 (1-3)</td>
</tr>
<tr>
<td>Partial thromboplastin time; mean ± SD, median (range)</td>
<td>39.2 ± 14.1, 35.5 (21-83)</td>
</tr>
<tr>
<td>Platelet count; mean ± SD, median (range)</td>
<td>170 050 ± 86 313, 182 000 (19 000-340 000)</td>
</tr>
<tr>
<td>Glasgow Coma Score; mean ± SD, median (range)</td>
<td>14.4 ± 1.5, 15 (11-15)</td>
</tr>
<tr>
<td>Intensive care unit admission diagnosis; n (%)</td>
<td></td>
</tr>
<tr>
<td>Pulmonary disease</td>
<td>7 (35)</td>
</tr>
<tr>
<td>Sepsis</td>
<td>4 (20)</td>
</tr>
<tr>
<td>Gastrointestinal pathology</td>
<td>4 (20)</td>
</tr>
<tr>
<td>Heart failure</td>
<td>1 (5)</td>
</tr>
<tr>
<td>Diabetic ketoacidosis</td>
<td>1 (5)</td>
</tr>
<tr>
<td>Hydrocephalus</td>
<td>1 (5)</td>
</tr>
<tr>
<td>Hypertensive emergency</td>
<td>2 (10)</td>
</tr>
<tr>
<td>Length of stay in days; mean ± SD, median (range)</td>
<td></td>
</tr>
<tr>
<td>Hospital</td>
<td>37.5 ± 48.4, 14 (3-158)</td>
</tr>
<tr>
<td>ICU</td>
<td>11 ± 11.8, 4 (2-46)</td>
</tr>
<tr>
<td>Opioid and benzodiazepine medication usage; mean ± SD, median (range)</td>
<td>43.1 ± 59.2, 20 (1.25-180)</td>
</tr>
<tr>
<td>Morphine (average mg/ICU day)</td>
<td>7.4 ± 12.7, 2 (0.5-37.5)</td>
</tr>
</tbody>
</table>
enrollment rate is higher than that seen in other clinical trials. Daily free acupuncture therapy in the ICU accepted it. Our preliminary study aimed to address this limitation by investigating the feasibility and acceptance of acupuncture in the ICU. However, to date there are no research studies pertaining to the acceptance, safety, or feasibility of acupuncture in the ICU.

Our preliminary study aimed to address this limitation by investigating the feasibility and acceptance of acupuncture in the ICU. In our study, 41% of the patients who were offered daily free acupuncture therapy in the ICU accepted it. Our enrollment rate is higher than that seen in other clinical trials on critically ill patients; Cooke et al. noted that only 10.4% of patients with acute lung injury screened for participation in ARDS Clinical Trials Network trials were enrolled. Other clinical trials of critically ill patients report enrollment rates of 20% or less. These rates are comparable to enrollment rates seen in oncology trials.

In contrast, enrollment rates for acupuncture studies are much higher. Two large clinical trials examining the effects of acupuncture for patients with chronic pain due to osteoarthritis of the knee reported rates of enrollment of more than 75%. Very high enrollment rates have also been documented in acupuncture studies on patients with sleep apnea (94%) and migraines (90%). Therefore, the enrollment rate of 41% for this current acupuncture study is lower than enrollment rates in other acupuncture studies not involving the ICU. The disparity in participation may be because of the critical illness of the patients, and future research will seek to address this question.

Although our numbers were limited, acupuncture was acceptable in a range of religious and ethnic backgrounds. Our patient population’s level of acuity was relatively low with an average APACHE II score of 14. We did not collect demographic data on patients who declined enrollment at the discretion of our IRB, and therefore are unable to comment on whether the level of patient acuity affects patient acceptance for acupuncture therapy in the ICU. Further research will need to address if patient acuity is a factor in acceptance of acupuncture therapy in the ICU.

Overall, 65% of the patients received acupuncture each of the days for which they were eligible, and the remaining 35% received acupuncture 53% of the days for which they were eligible. Factors that contributed to the lost days of acupuncture treatment in our study include patient refusal (12 days) or unavailability because of procedures such as hemodialysis (1 day) or bronchoscopy (1 day). Our data suggest that logistical challenges in providing acupuncture in an ICU are not frequent, but that patient refusal may be a barrier to providing consistent treatment.

Previous research studies addressing the safety of acupuncture therapy demonstrated a very low risk of adverse effects, about 1 per 1000 treatments. The rare adverse effects that have been reported with acupuncture are minor (bruising, nausea); very rarely, more significant adverse effects have been reported (broken needles, infections, or nerve damage). In our study, we had only one patient with a single adverse effect of reporting dizziness, but there was no evidence of hemodynamic instability and the symptoms resolved within several minutes. There were no other adverse effects in our total of 64 acupuncture treatments during the course of our study, including 1 neutropenic patient and 2 thrombocytopenic patients.

We were not able to detect a significant difference in benzodiazepine and opioid medication use during acupuncture treatment days versus non-acupuncture treatment days. However, our small sample size and wide range of medication use precluded further analysis. The average daily dosage of opiates and benzodiazepines required by patients in our study are comparable to that found in other reports.

**Study Limitations**

This study was not designed to assess the efficacy of acupuncture in reducing ICU sedative and analgesic medication use, which will require a larger, randomized, controlled trial. Instead, we sought to determine whether acupuncture was even feasible or would be accepted by critically ill patients. Our patients had a relatively low severity index of 14.4, and it is unclear whether severity of illness would play a role in the acceptance and feasibility of daily acupuncture in the ICU. In addition, because of IRB concerns regarding the privacy of patients who declined participation in this study, we were not able to obtain demographic data or their reasons for declining participation. Therefore, we were unable to determine if there are patient characteristics that correlate with acceptance of acupuncture. Although there were no serious adverse effects reported during the 64 acupuncture treatment sessions, the rate of adverse events with acupuncture is very low in the general population. As such, this pilot study was not powered to detect an increased rate of adverse events in critically ill patients because of acupuncture treatments.

**Implications and Conclusions**

This preliminary study demonstrates that acupuncture therapy in the ICU setting is an acceptable and feasible treatment modality. A relatively high rate of acceptance of acupuncture by patients when offered may be considered for clinical trial pur-
poses in the ICU. Further randomized controlled studies are warranted to investigate the efficacy of acupuncture therapy as an adjunct to sedatives and analgesics in critically ill patients.

Acknowledgments

The authors would like to thank the nursing staff of the 8 North Saperstein Intensive Care Unit at Cedars-Sinai Medical Center for their support, without which this research would not have been possible. Financial support for the study was provided by NIH NCRR GCRC Grant M01-RR00425.

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