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## Original Article

# Effects of auricular-plaster therapy on pain and serum levels of cortisol and IL-6 after cesarean section<sup>☆</sup>



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## ABSTRACT

**Purpose:** To evaluate APT (APT) for its analgesic effects and influence on serum cortisol and IL-6 levels after cesarean section.

**Methods:** 108 puerperae prepared for cesarean section were randomly divided into three treatment groups: APT, patient-controlled intravenous analgesia (PCIA), and a combination of APT and PCIA. The degrees of incision pain (including pain at rest and pain evoked by changing position in bed) and oxytocin-mediated uterine cramping pain were determined using a visual analogue scale (VAS). The serum concentrations of cortisol and IL-6 were measured preoperatively and postoperatively.

**Results:** Uterine cramping pain was lower in the APT group than the PCIA group and lowest in the combination therapy group. Incision pain was similar between the APT group and the PCIA group but lower in the combination therapy group. On the second morning after surgery, the serum concentrations of cortisol and IL-6 were similar between the APT group and the PCIA group but lower in the combination therapy group. The extent of pain was highly related to cortisol levels and moderately related to IL-6 levels.

**Conclusion:** APT can relieve uterine cramping pain after cesarean section, and in combination with PCIA can decrease serum levels of cortisol and IL-6.

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## 1. Introduction

The Chinese cesarean section rate is much higher than the 10%–15% advocated by the World Health Organization [1], and minimizing postoperative pain is a key issue. After cesarean section, the pain mainly comes from the incision and the uterus. Uterine pain occurs due to intense contractions generated by a complex mechanism and is usually not addressed satisfactorily by analgesic drugs alone [2]. Auricular-plaster therapy (APT), based on traditional Chinese medicine theory, is not only analgesic for postoperative pain, but also for other acute pain. The therapy works simply, quickly, and economically, achieving sufficient analgesia with few side effects [3]. In the present study, we used APT to ease pain after cesarean section and determined the serum levels of cortisol and IL-6.

Postoperative pain is a common stress response, affecting the neuroendocrine immunoregulatory network. This leads to changes in the levels of hormones and cytokines, such as cortisol, IL-6, TNF- $\alpha$ , etc [23]. The serum cortisol level is a sensitive index, increasing with increased pain [24]. IL-6 is a pro-inflammatory cytokine that stimulates pain receptors directly and indirectly by increasing prostaglandin, as well as increasing the sensitivity of the peripheral and central nervous systems, leading to hyperalgesia [25].

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## 2. Design and methods

### 2.1. Subjects

This study included 108 puerperae in the Hangzhou Chinese Medical Hospital obstetrics ward with elective cesarean section from July 2012 to May 2013. The subjects were randomly divided into three treatment groups (36 subjects/group): patient-controlled intravenous analgesia (PCIA), APT, and combination therapy (APT with PCIA). Inclusion criteria were: primipara; 21–34 years of age; 37–42 weeks of gestation; implementation of cesarean section; and consent informed. Exclusion criteria were: other disease; mental illness; endocrine breast defects; complications; chronic pain; and history of severe dysmenorrhea. Subjects who resorted to other methods for treating pain, or had serious postoperative complications, were removed from the study. The study was approved by the ethics committee of the hospital.

### 2.2. Methods

#### 2.2.1. Interventions

The PCIA pump was turned on within 0.5 h after the subject returned to the obstetrics ward. The pump contained 100 ml of saline with 100  $\mu$ g of sufentanil and 10 mg of tropisetron. The flow rate was 2 ml/h. One press of the pump delivered 0.5 ml, and the subject had to wait  $\geq$ 15 min before receiving another delivery. In the APT group, trained researchers implemented the therapy within 0.5 h after the subject returned to the obstetrics ward. After the ear was disinfected with 75% alcohol, vaccaria seeds were positioned on

acupoints of the ear, including “zi gong”, “pen qiang”, “shen men,” and “pi zhi xia”. Pressure was applied with the index finger and thumb, causing temporary swelling and pain. The therapy was conducted by members of study group three times per day. The combination therapy group received both treatments. All treatments lasted two days, i.e. until 48 h after cesarean section.

#### 2.2.2. Observation and collection

2.2.2.1. *General information.* Information was recorded, including: age of puerperae, weight of puerperae, length of gestation, baby weight, baby gender, previous surgeries, etc.

2.2.2.2. *Degree of pain.* Pain was assessed by using visual analogue scale (VAS): a 10 cm-long ruled scale with the ends representing painless (0 cm, 0 points) and excruciating pain (10 cm, 10 points). The subject indicated the amount of pain on the scale, and the nurses noted the VAS score. VAS scores of incision pain (pain at rest and when turning) were recorded at 6, 12, 24, and 48 h after surgery and when blood was collected on the second morning after surgery. VAS scores of uterine pain were recorded within 15 min after intravenous infusion of oxytocin was started on the first and second days after surgery.

Four subjects were removed from the study: one subject in the PCIA group because of a defect in the pump, two subjects in the APT group due to the use of other analgesic measures, and one subject in the combination therapy group. Therefore, the total dropout rate was 3.7%.

2.2.2.3. *Concentrations of serum cortisol and IL-6.* Peripheral blood (4 ml) was collected at 7:30–8:00 on the day of surgery and the second day after surgery. Cortisol levels were quantified by chemiluminescence, using IMMULITE2000 Cortisol. IL-6 levels were quantified by ELISA.

### 2.3. Statistical analysis

Data were analyzed by one-way ANOVA and LSD tests, chi-square test, and linear correlation analysis using SPSS17.0 software. Statistical significance was set at  $p < 0.05$ .

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## 3. Results

### 3.1. Baseline data (Table 1)

### 3.2. Incision pain

#### 3.2.1. Comparisons of rest pain at 6, 12, and 24 h

Comparisons of the APT group to the PCIA group yielded non-significant  $p$  values of 0.07, 0.329, and 0.636 at the three time-points, respectively (Table 2). However, the combination therapy group exhibited significantly lower VAS scores of rest pain at the three time-points:  $p$  values were 0.026, 0.049, and 0.020 with respect to the PCIA group and 0.000, 0.004, 0.006 with respect to the APT group. At 48 h, there were no significant differences in rest pain among the three groups.

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