



Research Article

The Effects of Auriculotherapy on Shoulder Pain After a Cesarean Section



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ABSTRACT

Background: Postcesarean section shoulder pain caused by constrained upper extremity movement limits the maternal activities of breastfeeding and neonatal care.

Objectives: This study aims at investigating the effects of auriculotherapy on shoulder pain after a cesarean section.

Methods: In this randomized controlled trial, 90 candidates for a cesarean section were selected according to the inclusion and exclusion criteria and randomly allocated into control and intervention groups by the minimization method. In the intervention group, ear seeds were placed on shoulder and muscle relaxation points from two hours prior to surgery until 24 hours after it. In the control group, ear seeds were placed on placebo points. Shoulder pain was assessed on a numerical pain scale in 1, 6, and 24 hours after surgery.

Results: There was no significant difference between the two groups 1 and 6 hours after surgery. However, there was a significant difference between the two groups 24 hours after surgery and the mean pain score was lower in the intervention group (independent *t*-test, $p < 0.001$).

Conclusion: The use of auriculotherapy is recommended for the prevention and alleviation of shoulder pain after a cesarean section.

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1. Introduction

Shoulder pain is one of the common complications after a cesarean section, which is usually ignored [1]. Patients experience extreme pain that is sometimes referred to as chest or neck pain, which limits maternal activities like breastfeeding and care of their babies [2,3]. Many studies have reported the high incidence of shoulder pain (30–50%) following a cesarean section [1,4–6]. Although several postsurgical causes have been suggested for shoulder pain, which include the effects of CO₂

pneumoperitoneum, peritoneal stretching, and diaphragmatic irritation, the precise mechanism of shoulder pain remains unclear [7].

Controlling postoperative pain is one of the major goals of nursing care [8]. Opioids, especially in their injectable forms, are commonly used to relieve postoperative pain, including pain due to cesarean sections [9]. However, using opioids is associated with dose-related complications such as respiratory depression, nausea, vomiting, urinary retention, itching, drowsiness, or ileus [10]. Nevertheless, the purpose of pain control is to reduce pain with minimum side effects [11,12]. For this reason, much attention is nowadays paid to complementary medicine-based approaches, with auriculotherapy being one of these methods.

Auriculotherapy, a variant of acupuncture rooted in traditional Chinese medicine (TCM), uses noninvasive acupoints on specific areas of the outer ear to treat a disease [13]. According to TCM, a

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disease is caused by the imbalance of a person's energy or qi. The stimulation of auricular acupoints regulates qi, activates energy pathways (meridians) and collateral systems, and has been proved effective in treating health problems [14]. In 1950, Dr Paul Nogier, a French neurosurgeon, theorized that the outer ear represents an inverted fetus within the womb, so he proposed the somatotopic correspondence of specific parts of the body to specific parts of the ear [15,16].

Auriculotherapy could be delivered via auricular acupuncture, electroacupuncture, and acupressure. In contrast to auricular acupuncture and electroacupuncture that are practiced by licensed practitioners, auricular point acupressure applies acupuncture-like stimulation to specific points on the ear (acupoints) without using needles. The stimulation is provided by small spherical *Vaccaria* seeds placed on the outer ear with small pieces of an adhesive tape [17].

Studies on auriculotherapy have reported promising effects in pain management, which include immediate relief for migraine pain [18], postsurgical pain [19–21], and chronic pain [22,23]. However, the authors of this research did not find a research in the literature to have assessed the effects of this method on shoulder pain after a cesarean section. Therefore, because of the high incidence of cesarean section in Iran, 65% of Iranian pregnant women underwent cesarean section [24], and the importance of shoulder pain and limitations of study about it, this study aims at investigating the effects of auriculotherapy on shoulder pain after a cesarean section.

2. Materials and methods

2.1. Design and settings

This study is a randomized controlled trial registered at the Iranian Registry for Clinical Trials under code IRCT20150713023190N8. The research population included pregnant women candidates for a cesarean section, who were hospitalized in an educational hospital affiliated to Rafsanjan University of Medical Sciences in the southeast of Iran.

2.2. Inclusion and exclusion criteria

The inclusion criteria of this study were being 18 to 40 years of age, having the gestational age of more than 36 weeks, having healthy points on the ear for fixing ear seeds to them, having no contraindication for spinal anesthesia, having no addiction, taking no tranquilizers prior to surgery, having no fractures or dislocations in the shoulder, having no chronic pain in the shoulder or the neck, having no history of shoulder trauma, having no history of mental illnesses, and having no history of abdominal surgeries other than the cesarean section. In contrast, unwillingness to keep participating in the research, showing an allergic reaction to ear seeds, and removing ear seeds prior to the end of the study (24 hours) were the exclusion criteria.

2.3. Sampling and randomization

We calculated the sample size by comparing two mean formulas with the effect size of 1.5 for shoulder pain and a standard deviation of 2.10, based on previous research [5]. The significance level was set at $p < 0.05$, and the study power was assumed to be 90%. The sample size was determined to be $n = 41.14$. Given the possibility of sample dropout, 45 patients were allocated to each group.

Of the total of 130 candidates for a cesarean section in the noted center during the study phase, 40 were not included in the study for failing to meet the eligibility criteria, and 90 patients were then

randomly allocated to the two intervention and control groups using categorization and minimization methods [25]. Using these methods, the patients were initially categorized based on key variables, such as the history of a cesarean section and the number of pregnancies. Next, the first participant was chosen out of those patients who met the inclusion criteria and placed in the intervention or control group by coin tossing. In addition, other participants were allocated to the study group with a smaller number of variables (a history of a cesarean section and the number of pregnancies). In the case of equality, random allocation was repeated. There were no cases of sample withdrawal throughout the study (Fig. 1).

2.4. Intervention and data collection

Data collection tools included a demographic questionnaire for patients (age, education, gestational age, history of a cesarean section, and the number of deliveries) and the numerical pain rating scale.

To implement the method, the researcher (the first author) was referred to the hospital according to the cesarean surgery program. Following the selection of the samples according to the inclusion and exclusion criteria, informed consent forms were obtained from the participants, and demographic data forms were completed through face-to-face interviews. Next, the patients were assigned to intervention and control groups at random. In the intervention group, ear seeds were purchased from the Iranian HAMI (IHA) Medical Equipment Company, Tehran, Iran and placed on the shoulder (between the fourth and the fifth portion of the scapha) and muscle relaxation points (medially to the spleen point toward the root of the helix) of both ears two hours prior to surgery until 24 hours after surgery using a small piece of an adhesive tape. In the control group, the same ear seeds were placed on the placebo points (inner ear C and E) of both ears using a small piece of an adhesive tape [13]. Patients in both groups were asked to press the ear seeds whenever they had shoulder pain (Fig. 2).

Patients in both groups were placed in the supine position at zero degree to the horizon. The operating room temperature ranged from 18°C to 22°C for all patients. At the end of the surgery, patient placement was performed in accordance with all standards, without the elongation of the head, neck, and shoulder muscles. At the next stage, 1, 6, and 24 hours after surgery, shoulder pain was evaluated using a numerical pain scale in both groups. It is worth noting that patients in both groups received 50 mg of pethidine routinely two hours after surgery. To minimize the confounding effects of the surgeon type, only patients of two gynecologists (authors 2 and 3) were selected.

2.5. Ethical considerations

To meet the ethical requirements of the present study, an ethics code was received from the Ethics Committee of Rafsanjan University of Medical Sciences (IR.RUMS.REC.1397.166), informed consent forms were received from the participants, the participants were briefed on the study goals, and they were assured that their information would be kept confidential.

2.6. Data analysis

The data were analyzed using descriptive statistics, such as the mean and standard deviation, as well as analytical statistics, including the independent *t*-test and the repeated measures ANOVA with SPSS V.18.0. The normal distribution of data was assessed using the Kolmogorov–Smirnov statistical test ($p > 0.05$). The significance level was set at less than 0.05.

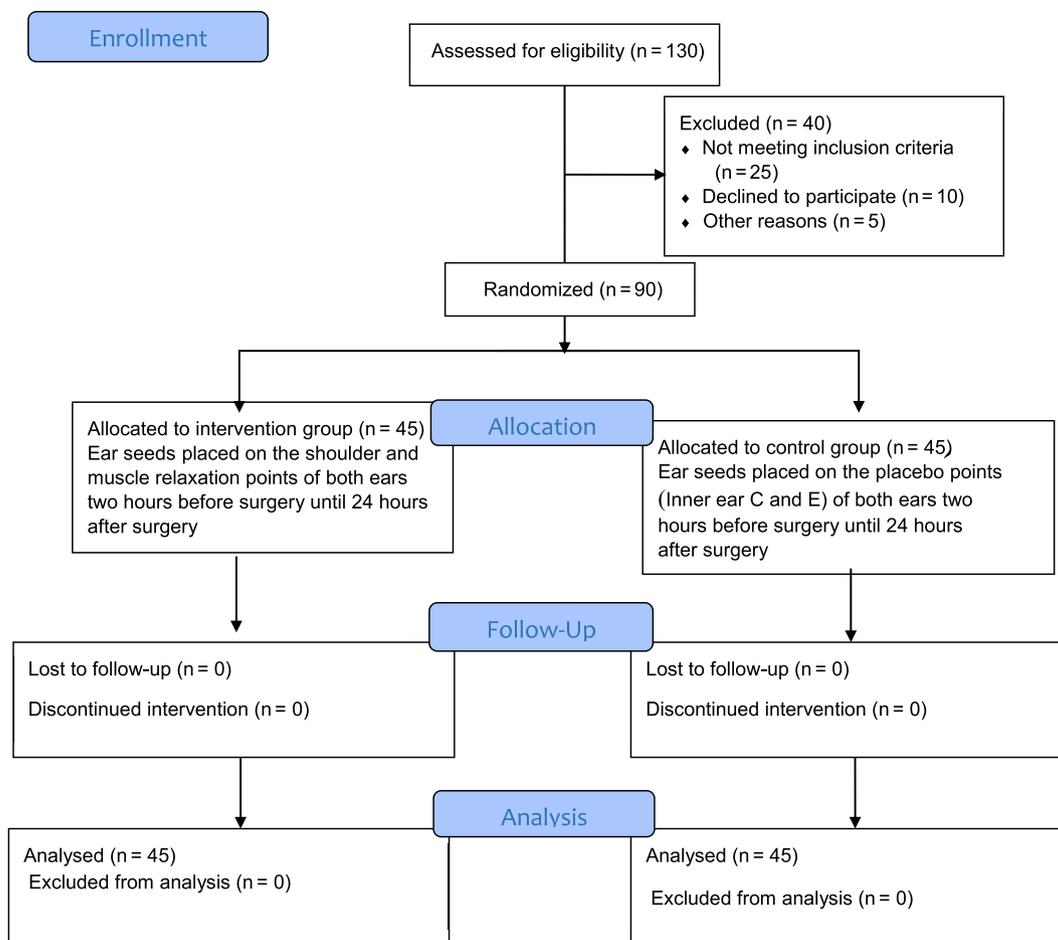


Figure 1. Flow diagram of the study.

3. Results

According to the demographic results, the mean age and mean gestational age of the patients in the intervention group were 32.64 ± 4.77 years and 38.44 ± 0.58 weeks, respectively. In the control group, the mean age and mean gestational age of the patients were 31.20 ± 5.07 years and 38.66 ± 0.73 weeks, respectively. In addition, they were homogeneous in terms of demographic characteristics (Table 1).

According to the results, there was a statistically significant difference between the two groups in the frequency of post-operative shoulder pain. In addition, the frequency of shoulder pain was lower in the intervention group than in the control group. Moreover, the frequency of right shoulder pain was higher than that of left shoulder pain in both groups (Table 2).

The normal distribution of data was confirmed according to the Kolmogorov–Smirnov statistical test ($p > 0.05$). Based on the results, no significant difference was found between the two groups one hour after surgery (the independent t -test, $p = 0.92$). Furthermore, no significant difference was observed between the two groups 6 hours after surgery (the independent t -test, $p = 0.55$). However, there was a significant difference between the two groups 24 hours after surgery, and the mean pain score was lower in the intervention group than in the control group (the independent t -test, $p < 0.001$). Intra-group comparisons and the interactive effects of the time and group were evaluated using the repeated measures ANOVA. According to the results, time exerted a significant effect ($p = 0.001$); in addition, interactive effects were

significant ($p = 0.001$). Pairwise comparisons in the control group indicated that the mean pain score increased over time, but it did not change in the intervention group over time (Table 3).

4. Discussion

Based on the results of this study, no significant difference was found between the two groups 1 and 6 hours after surgery. However, there was a significant difference between the two groups 24 hours after surgery, and the mean pain score was lower in the intervention group than in the control group. In the present research, we found no study to have used traditional medicine for alleviating shoulder pain after a cesarean section. Nevertheless, we found studies that used different chemical therapeutic approaches, such as the injection of ketorolac [26] or the injection of low-pressure carbon dioxide [27], which reported positive effects for these approaches in alleviating shoulder pain 24 hours after surgery, having been consistent with the present study. However, the use of auriculotherapy that is safer than pharmaceutical methods is one of the strengths of the present study. Thus, it is suggested that similar studies be conducted at other clinical centers to confirm these results.

Based on the results, the mean pain score increased over time in the control group, but it did not differ in the intervention group over time. Therefore, it could be concluded that auriculotherapy effectively decreases pain, which is suggested to be used to prevent an increase in pain. In this regard, two meta-analyses of the use of auriculotherapy in pain reduction

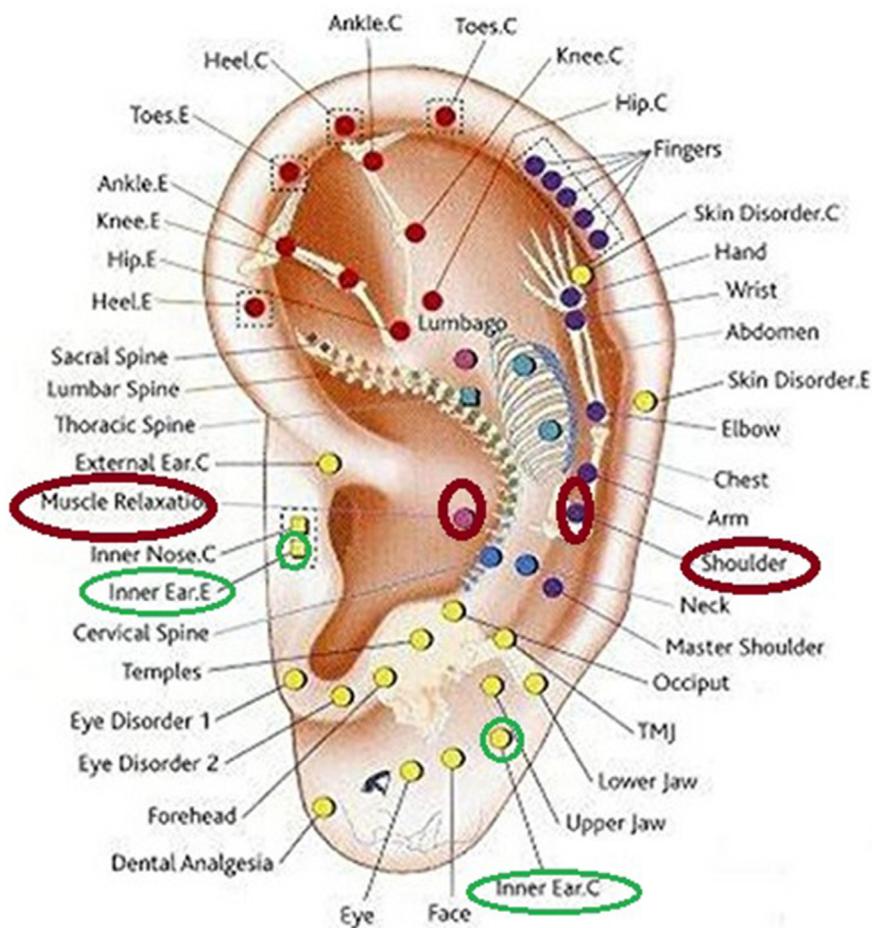


Figure 2. Muscle relaxation, shoulder, and placebo points (from: <https://www.amazon.in/Generic-Massage-Auricular-AcupunctureStickers/dp/B07MBT1TRC>).

Table 1
Comparison of demographic characteristics of patients in the intervention and control groups.

| Variable | | Intervention group | Control group | p value |
|-------------------------------|---------------------|--------------------|---------------|-------------------|
| Age (years) | Mean ± SD | 32.64 ± 4.77 | 31.20 ± 5.07 | 0.16 ^a |
| Gestational age (weeks) | Mean ± SD | 38.44 ± 0.58 | 38.66 ± 0.73 | 0.11 ^a |
| Duration of surgery (minutes) | Mean ± SD | 33.67 ± 6.06 | 33.89 ± 7.75 | 0.88 ^a |
| Gravida | 1 N (%) | 4 (8.9) | 6 (13.3) | 0.91 ^b |
| | 2 N (%) | 26 (57.8) | 26 (57.8) | |
| | 3> | 15 (33.3) | 13 (28.9) | |
| History of cesarean section | Yes | 41 (91.1) | 39 (86.7) | 0.73 ^c |
| | No | 4 (8.9) | 6 (13.3) | |
| Educational level | Under diploma N (%) | 8 (17.8) | 8 (17.8) | 0.11 ^b |
| | Diploma N (%) | 11 (24.4) | 20 (44.4) | |
| | Above diploma N (%) | 26 (57.8) | 17 (37.8) | |
| Gynecologist | Number 1 N (%) | 18 (40) | 18 (40) | 1 ^b |
| | Number 2 N (%) | 27 (60) | 27 (60) | |

^a Independent t-test.
^b Chi-square test.
^c Fisher test.

reported that it could reduce both analgesic use for preoperative and postoperative pain and pain intensity for acute and chronic pain [28,29]. Although the study populations and intervention groups in the aforementioned studies were different from those of the present one, all of them were consistent with the present study in confirming the positive effects of auriculotherapy on pain mitigation.

Based on the results, the prevalence of shoulder pain was higher in the control group that received the placebo than in the intervention group (68.9% vs. 37.7%). The frequency of right shoulder pain was higher than that of left shoulder pain in both groups. In this regard, according to the results of the study by Abedian et al, who examined the relationship between the type of delivery and the postpartum quality of life, shoulder pain was significantly

Table 2
Comparison frequency of shoulder pain post cesarean section in the intervention and control groups.

| Variable | | Intervention group N (%) | Control group N (%) | ^a p value |
|---------------|---------------------|--------------------------|---------------------|----------------------|
| Shoulder pain | Painless | 28 (62.3) | 14 (31.1) | 0.008 |
| | Right shoulder pain | 15 (33.3) | 20 (44.4) | |
| | Left shoulder pain | 1 (2.2) | 8 (17.8) | |
| | Both shoulders | 1 (2.2) | 3 (6.7) | |

^a Chi-square test.

Table 3
Comparison mean score of pain in patients of both groups after the cesarean section.

| Group | Time | | | Repeated Measures ANOVA | |
|----------------------|--------------------------------|--------------------------------|---------------------------------|-------------------------------------|----------------------|
| | 1 h after surgery Mean ± SD | 6 h after surgery Mean ± SD | 24 h after surgery Mean ± SD | ^b Declaration of p value | ^c p value |
| Intervention group | 1.27 ± 1.15 | 1.42 ± 1.13 | 2.04 ± 2.07 | 0.001 | 0.001 |
| Control group | 1.24 ± 1.15 | 1.60 ± 1.67 | 4.82 ± 3.40 | | |
| ^a p value | 0.92 | 0.55 | <0.001 | | |

^a Independent t-test.

^b Repeated measures ANOVA (intra-group comparison).

^c Repeated measures ANOVA (interactive effect).

higher in the cesarean section group than in the natural delivery group [4]. Based on the results of the study by Zirk et al, which were consistent with the present study, the prevalence of postoperative shoulder pain was significantly higher in the right shoulder than in the left shoulder, having been 39.45% [6]. Kikuchi et al investigated the prevalence of shoulder pain after a cesarean section using the spinal epidural technique and reported a prevalence of about 50% for this pain, which was in line with the present study [1].

The incidence of pain after a cesarean section was 29.2% in another study in this urban region of Iran, which was lower than the results of the present study; however, right shoulder pain was higher than left shoulder pain, which was in line with the present study [5]. According to the results of the study by Yu et al, in line with the present study, shoulder pain, especially right shoulder pain, was a major problem during laparoscopic cholecystectomy, so most patients needed opioid injection to relieve their pain [30].

The results of the present study and those of the aforementioned ones confirm the high prevalence of this type of pain as well as the need for interventions to reduce it. Since this study is among the first ones to have investigated this issue by adopting a complementary medicine approach, it could pave the way for further studies in this field.

Some of the limitations of the present study included the non-follow-up of pain over a longer period of time after surgery. Therefore, conducting similar studies with multiple groups, such as using auricular acupuncture, electroacupuncture, acupressure, and sham groups at other centers, considering other variables, such as requesting for sedatives and analgesics, and longer follow-ups on pain intensity are recommended. The comparison of auriculotherapy with other interventions, such as reflexology, is another recommendation for future studies.

5. Conclusion and implications for nursing

According to the results, the use of auriculotherapy can decrease shoulder pain after a cesarean section. Given its simplicity of application, inexpensiveness, and safety, this intervention can be used as a complementary therapy for reducing shoulder pain after a cesarean section. Nurses can benefit from the present findings for reducing their patients' postcesarean shoulder pain and improving their wellbeing and caring for neonates.

Declaration of competing interest

None declared.

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