

## Original Article

# The Effects of Capsaicin Ointment Application to the K-K9 Acupressure Point on Nausea and Vomiting During Cesarean Section Under Spinal Anesthesia

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### ABSTRACT

**Background:** Nausea and vomiting are among the most important and the most common intraoperative and postoperative complications. **Objective:** This study aimed to determine the effects of capsaicin ointment application to the K-K9 acupressure point on intraoperative and postoperative nausea and vomiting associated with cesarean section (CS) under spinal anesthesia. **Methods:** This double-blind three-group randomized controlled trial was conducted on 120 women who referred to Ommolbanin Hospital, Mashhad, Iran, to undergo nonemergency CS under spinal anesthesia. Women were randomly allocated to three groups to receive capsaicin ointment on the K-K9 point (intervention group), capsaicin ointment on the K-D2 point (control group), and Vaseline ointment on the K-K9 point (placebo group). Nausea, vomiting, and retching were assessed at five time points, namely during and 30, 60, 90, and 120 min after CS. Moreover, the need for antiemetic medications was also assessed in all three groups. The data were analyzed through running the one-way analysis of variance, the Kruskal–Wallis, the Friedman, and the Chi-square tests. **Results:** There were no significant differences among the groups, respecting the scores of nausea, vomiting, and retching at different measurement time points ( $P > 0.05$ ). However, the number of women who needed antiemetic medication in the intervention group (11) was significantly less than the control (22) and the placebo (15) groups ( $P = 0.04$ ). **Conclusion:** Capsaicin ointment application to the K-K9 acupressure point is an easy-to-use noninvasive method for significantly reducing the need for antiemetic medications during and after CS under spinal anesthesia.

**KEYWORDS:** *Acupressure, Cesarean section, Capsicum, Nausea, Postoperative nausea, Vomiting*

## INTRODUCTION

Cesarean section (CS) under spinal anesthesia is usually associated with intraoperative and postoperative nausea and vomiting.<sup>[1,2]</sup> The prevalence of nausea and vomiting during CS is 80% and after CS is 66%.<sup>[3,4]</sup>

Postoperative nausea and vomiting can cause several problems and complications, from unpleasant feelings<sup>[3,5]</sup> to more serious complications such as dehydration, electrolyte imbalance, wound dehiscence,<sup>[2,3,5]</sup> bleeding from surgical wound,<sup>[5]</sup> pulmonary aspiration, esophageal

rupture, subcutaneous emphysema, pneumothorax,<sup>[6]</sup> and delayed hospital discharge.<sup>[2,5]</sup>

Currently, there are a wide variety of pharmacological therapies for nausea and vomiting management.<sup>[1,7]</sup> However, most pharmacological antiemetic therapies have different side effects.<sup>[1]</sup> Therefore, nonpharmacological

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**How to cite this article:** Abedian Z, Soltani N, Safajou F, Tara F. The effects of capsaicin ointment application to the K-K9 acupressure point on nausea and vomiting during cesarean section under spinal anesthesia. *Nurs Midwifery Stud* 2018;7:50-5.

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**DOI:**  
10.4103/nms.nms\_58\_17

therapies for nausea and vomiting management, such as electrical nerve stimulation, acupuncture, and acupressure, have received great attention in recent years.<sup>[8-10]</sup>

Acupressure is one of the nonpharmacological therapies for nausea and vomiting management. The most commonly used acupoints for nausea and vomiting management in Chinese and Korean traditional medicines are, respectively, the P6 point<sup>[11]</sup> and the K-D2 and K-K9 points.<sup>[12,13]</sup> As Figure 1 illustrates, the K-D2 and the K-K9 points are, respectively, located on the lateral side of the distal phalanx of the index finger<sup>[10]</sup> and the palmar surface of the middle phalanx of the fourth finger.<sup>[13]</sup> The K-K9 acupressure was first tested in a clinical trial on children who had undergone strabismus surgery. The results of the trial showed the effectiveness of K-K9 acupressure in reducing postoperative nausea and vomiting.<sup>[12]</sup> Another study also showed that K-K9 acupressure significantly alleviated nausea and vomiting after gynecological laparoscopy for infertility investigations.<sup>[14]</sup>

Applying capsaicin ointment to some acupoints can enhance blood flow to the chemoreceptor trigger zone in the brain and stimulate the secretion of some neurochemical substances and thereby can reduce nausea and vomiting.<sup>[15]</sup> Capsaicin is a natural substance which is derived from the plants of the *Solanaceae* family. Topical use of capsaicin has no systematic side effects and may cause just some local side effects such as irritation, itching, redness, coughing, and respiratory tract irritation due to the inhalation of its aroma.<sup>[16]</sup> Capsaicin ointment was first used on K-D2 acupoint among women who had undergone abdominal hysterectomy. The results showed the effectiveness of capsaicin in relieving postoperative nausea and vomiting and reducing the need for antiemetic medications.<sup>[10]</sup> Another study also showed that applying capsaicin ointment to the K-D2 and the K-K9 acupoints significantly reduced nausea and vomiting after cataract surgery.<sup>[17]</sup> However, there is limited evidence regarding the effects of applying capsaicin ointment to the K-K9

acupoint on intraoperative and postoperative nausea and vomiting associated with CS.

## Objectives

This study aimed to determine the effects of capsaicin ointment application to the K-K9 point on intraoperative and postoperative nausea and vomiting associated with CS under spinal anesthesia.

## METHODS

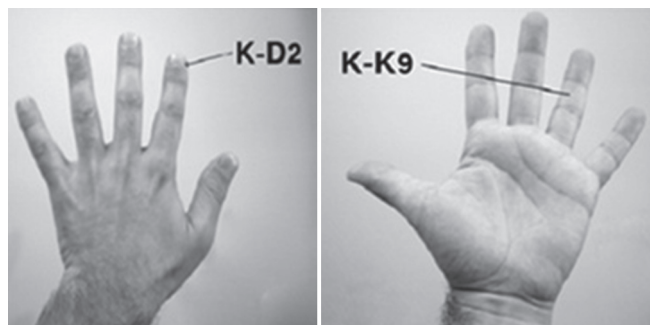
### Study design and participants

This double-blind three-group randomized controlled trial was conducted on 120 women who referred to Ommolbanin Hospital, Mashhad, Iran, to undergo nonemergency CS under spinal anesthesia.

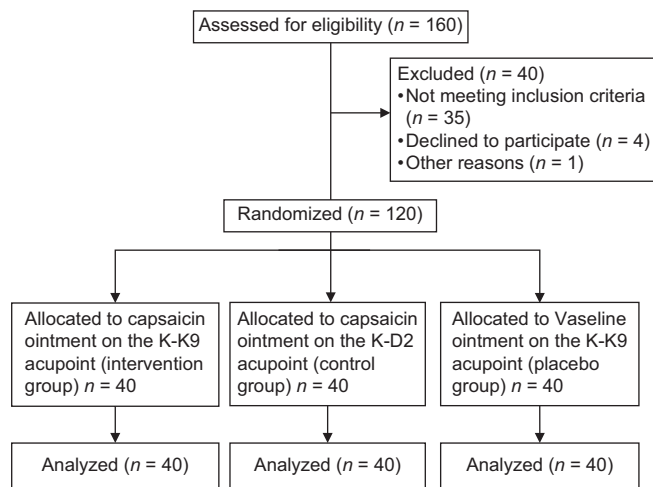
The sample size was calculated based on the results of a pilot study on 20 patients who were randomly allocated to two ten-person groups. Women in one group were provided with capsaicin ointment on the K-K9 acupoint and those in the other group with capsaicin ointment on the K-D2 acupoint. The mean scores of nausea in the K-K9 and the K-D2 groups were  $5.50 \pm 2.20$  and  $4.40 \pm 0.90$ , respectively. Using these results and with Types I and II errors of 0.05 and 0.20 and a pilot study ( $\alpha = 0.05$ ,  $\beta = 0.20$ ,  $s_1=2.2$ ,  $s_2=0.9$  and  $d=1.1$ ), sample size was determined to be 36 women for each group. However, we recruited 40 women to each group.

Inclusion criteria were patients with no history of postoperative nausea, motion sickness, diabetes mellitus, obesity, cigarette smoking, severe anxiety, gastrointestinal diseases, orthostatic hypotension, allergy to peppers, middle ear problems, dizziness, and high blood pressure (i.e. a blood pressure of 140/90 or more). Women were excluded if they developed severe itching and redness at the site of capsaicin ointment application or needed postoperative corticosteroids.

Recruited women were randomly allocated to three groups to receive capsaicin ointment on the K-K9 acupoint (intervention group), capsaicin ointment on the K-D2 acupoint (control group), and Vaseline ointment on the K-K9 acupoint (placebo group) [Figure 2]. The control group was considered to determine whether K-K9 is the specific acupoint for nausea and vomiting management or not. Random allocation was done via the block randomization method with six- and nine-person blocks and an allocation ratio of 1:1:1. For allocation concealment, 120 sealed opaque envelopes were used. The envelopes were numbered from 1 to 120 and contained cards labeled A (40 envelopes), B (40 envelopes), and C (40 envelopes). For each new participant, a new envelope was selected, and based on its card, the participant was allocated to either one of the three groups.



**Figure 1:** The locations of the K-K9 and the K-D2 acupoints



**Figure 2:** The CONSORT flow diagram of the study

Before sampling, a research assistant evacuated Vaseline and capsaicin ointments in identical plastic containers and labeled the containers A or B. The second author (who implemented the study intervention) and the participants of the study were not aware of the content of the containers. In other words, they were blind to the interventions.

### Intervention

Half an hour before CS, participants in the intervention, control, and placebo groups were provided with, respectively, 0.075% capsaicin ointment (manufactured by KishMediPharm, Iran) on the K-K9 acupoint, 0.075% capsaicin ointment on the K-D2 acupoint, and Vaseline ointment on the K-K9 acupoint. The ointments were applied to the 5 mm × 5 mm surface area on the intended points of both hands, and the points were covered with typical adhesive bandage until 8 h after CS. Throughout the intervention, all participants were continuously monitored for the side effects of the ointments or displacement of the adhesive bandage.

All participants underwent CS with the same surgical procedure and under the same spinal anesthesia protocol. Spinal anesthesia was performed for all participants in the sitting position through injecting 12–15 mg of bupivacaine (Marcaine) into the subarachnoid space using fine 25-gauge needle. The needle was inserted in the L3–L4 vertebral interspace. Moreover, each participant was provided with five units of Syntocinon and 1–1.5 l of Ringer's intravenous solution during CS. Adrenaline or ephedrine was also used to manage intraoperative hypotension (i.e. a systolic blood pressure <100 mmHg or a more than 20% decrease in systolic blood pressure compared with baseline blood pressure).

Nausea, vomiting, and retching assessments were performed once during CS and then 30, 60, 90, and

120 min after it. The severity of nausea was assessed using a visual analog scale scored 0–10. The validity and reliability of visual analog scale were confirmed in the previous studies.<sup>[18-20]</sup> Moreover, vomiting and retching assessments were performed via counting the number of their occurrence. A demographic questionnaire was also used for collecting participants' demographic data. Study intervention and data collection were performed by the second author.

### Ethical considerations

The Institutional Review Board and Ethics Committee of Mashhad University of Medical Sciences, Mashhad, Iran, approved this study (approval code: 910301.1.208). The study was also registered in the Iranian Registry of Clinical Trials (registration code: IRCT2014062918269N1). All participants were assured about the voluntariness of participation in and withdrawal from the study. Written informed consent was obtained from each participant. In case of severe nausea and vomiting, metoclopramide (plasil) ampoule was used. Moreover, to prevent respiratory tract irritation by ointments, the acupoints were covered by adhesive bandage after ointment application. Besides, at the end of the intervention and after removing the bandage, participants were asked to immediately wash the area with soap and water.

### Data analysis

Data analysis was done via the SPSS software (v. 16.0; IBM Inc., Chicago, IL, USA). Normality testing was done using the Kolmogorov–Smirnov test. The results of the test showed the nonnormal distribution of the scores of nausea, vomiting, and retching. Accordingly, the Kruskal–Wallis and the Friedman tests were used, respectively, for between-group and within-group comparisons regarding the scores of nausea, vomiting, and retching. The Chi-square test was also used to compare the groups respecting the need for antiemetic medication. Between-group comparisons respecting participants' demographic characteristics were also done by running the one-way analysis of variance, the Kruskal–Wallis, and the Chi-square tests. The level of significance was set at <0.05.

### RESULTS

The means of participants' age and gestational age were  $30.32 \pm 5.87$  years and  $38.70 \pm 1.11$  weeks, respectively. Around 95.8% of participants were homemakers and 54.2% of them had below-diploma education level. Most participants were multiparous women and had wanted pregnancy. Statistical analysis showed that the groups were homogenous respecting participants' demographic characteristics.

The results of the Kruskal–Wallis test illustrated no significant differences among the groups respecting the mean scores of nausea, vomiting, and retching at different measurement time points during and after CS ( $P > 0.05$ ) [Tables 1-3]. However, the number of women who needed antiemetic medication in the intervention group was significantly less than those in the control and the placebo groups ( $P = 0.04$ ) [Table 4]. The highest levels of nausea, vomiting, and retching were during CS and 30 min after it. Within-group comparisons revealed that the scores of nausea and

retching in all three groups significantly reduced from the first to the last measurement time points. However, the mean score of vomiting did not significantly change across the measurement time points in any of the study groups.

## DISCUSSION

The aim of this study was to determine the effects of capsaicin ointment application to the K-K9 point on intraoperative and postoperative nausea and vomiting associated with CS under spinal anesthesia. Findings

**Table 1: Comparison of the groups respecting the scores of nausea at different measurement time points**

Time	Group <sup>a</sup>			P <sup>b</sup>
	Intervention (capsaicin on K-K9)	Control (capsaicin on K-D2)	Placebo (Vaseline on K-K9)	
During CS	1.35 ± 2.49	1.25 ± 2.18	3.53 ± 2.02	0.926
30 min after CS	1.15 ± 2.41	0.80 ± 1.97	1.85 ± 2.98	0.310
60 min after CS	0.37 ± 1.46	0.00 ± 0.00	0.17 ± 0.95	0.166
90 min after CS	0.05 ± 0.31	0.20 ± 1.26	0.12 ± 0.64	0.999
120 min after CS	0.30 ± 1.32	0.00 ± 0.00	0.07 ± 0.34	0.164
P <sup>c</sup>	<0.001	<0.001	<0.001	

<sup>a</sup>All data are presented as mean ± SD, <sup>b</sup>The results of the Kruskal-Wallis test, <sup>c</sup>The results of the Freedman test. SD: Standard deviation, CS: Cesarean section

**Table 2: Comparison of the groups respecting the scores of vomiting at different measurement time points**

Time	Group <sup>a</sup>			P <sup>b</sup>
	Intervention (capsaicin on K-K9)	Control (capsaicin on K-D2)	Placebo (Vaseline on K-K9)	
During CS	0.10 ± 0.49	0.02 ± 0.15	0.07 ± 0.26	0.598
30 min after CS	0.07 ± 0.26	0.02 ± 0.15	0.07 ± 0.26	0.548
60 min after CS	0.05 ± 0.22	0.00 ± 0.00	0.02 ± 0.15	0.362
90 min after CS	0.00 ± 0.00	0.02 ± 0.15	0.00 ± 0.00	0.368
120 min after CS	0.02 ± 0.15	0.00 ± 0.00	0.00 ± 0.00	0.368
P <sup>c</sup>	0.483	0.736	0.132	

<sup>a</sup>All data are presented as mean ± SD, <sup>b</sup>The results of the Kruskal-Wallis test, <sup>c</sup>The results of the Freedman test. SD: Standard deviation, CS: Cesarean section

**Table 3: Comparison of the groups respecting the scores of retching at different measurement time points**

Time	Group <sup>a</sup>			P <sup>b</sup>
	Intervention (capsaicin on K-K9)	Control (capsaicin on K-D2)	Placebo (Vaseline on K-K9)	
During CS	0.74 ± 1.84	0.70 ± 1.80	0.62 ± 1.67	0.772
30 min after CS	0.89 ± 2.03	0.17 ± 1.10	0.55 ± 1.58	0.057
60 min after CS	0.17 ± 0.85	0.00 ± 0.00	0.00 ± 0.00	0.133
90 min after CS	0.00 ± 0.00	0.02 ± 0.15	0.00 ± 0.00	0.368
120 min after CS	0.02 ± 0.16	0.00 ± 0.00	0.02 ± 0.15	0.600
P <sup>c</sup>	<0.001	<0.001	0.008	

<sup>a</sup>All data are presented as mean ± SD, <sup>b</sup>The results of the Kruskal-Wallis test, <sup>c</sup>The results of the Freedman test. SD: Standard deviation, CS: Cesarean section

**Table 4: Comparison of the groups respecting the need for antiemetic medication**

Need for antiemetic	Group <sup>a</sup>			P <sup>b</sup>
	Intervention (capsaicin on K-K9)	Control (capsaicin on K-D2)	Placebo (Vaseline on K-K9)	
Yes	11 (27.5)	22 (55.0)	15 (37.5)	0.040
No	29 (72.5)	18 (45.0)	25 (62.5)	

<sup>a</sup>All data are presented as n (%), <sup>b</sup>The results of the Chi-square test

revealed no significant differences among the groups, respecting the mean scores of nausea, vomiting, and retching at different measurement time points. These findings are inconsistent with the findings of previous studies. For instance, the only study which assessed capsaicin-assisted acupressure on the K-K9 point reported lower postoperative nausea incidence in the intervention group both at 6 and 12 h after cataract surgery.<sup>[17]</sup> Other studies also reported the effectiveness of capsaicin-assisted acupressure in preventing or reducing nausea and vomiting after abdominal hysterectomy,<sup>[10]</sup> laparoscopic cholecystectomy,<sup>[15]</sup> and thyroid surgery.<sup>[20]</sup> The contradiction between our findings and the findings of previous studies may be due to the differences in the samples, types of surgical operations, acupressure protocols, and nausea and vomiting assessment time points in the studies.

We also found no significant difference among the groups respecting the frequency of vomiting. An earlier study also reported the same finding,<sup>[17]</sup> while two other studies reported the positive effects of capsaicin-assisted acupressure on postoperative nausea and vomiting.<sup>[15,20]</sup> Another finding of the present study was that the need for antiemetic medication in the intervention group was significantly less than the control and the placebo groups. This is in line with the findings of two earlier studies.<sup>[10,21]</sup>

Topical use of capsaicin ointment seems to reduce nausea and vomiting through enhancing blood flow to the chemoreceptor trigger zone in the brain and also through stimulating the secretion of some neurochemical substances which desensitize the trigger zone.<sup>[15]</sup>

Two limitations of this study were its small sample size and short postoperative follow-up period. More studies with larger samples and longer follow-up periods are needed to generate more reliable results.

## CONCLUSION

Capsaicin ointment application to the K-K9 acupoint is an easy-to-use noninvasive method to significantly reduce the need for antiemetic medications during and after CS under spinal anesthesia.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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