



# Comparing the effects of cold therapy and hand and foot massage on postoperative pain among patients with major surgeries

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## Abstract

**Background and aims:** Surgery is a main treatment for some illnesses. Postoperative pain (POP) is a major postoperative concern for patients and healthcare providers. The present study aimed at comparing the effects of cold therapy and foot and hand massage on POP among patients with major surgeries.

**Methods:** This quality improvement study was conducted in 2019 on ninety patients who underwent thoracoabdominal surgeries in Kashani teaching hospital, Shahrekord, Iran. Participants were randomly assigned to a control, a cold therapy, and a foot and hand massage group through block randomization with a block size of six. Participants in the control group received routine care services, while participants in the cold therapy group received twenty-minute local cold therapy three times a day for 48 hours and participants in the massage group received twenty-minute hand and foot massage three times a day for 48 hours. POP was assessed before and 48 hours after the study intervention using the McGill Pain Questionnaire. The SPSS software was used to analyze the data through the Kolmogorov-Smirnov, Fisher's exact, chi-square, Kruskal-Wallis, paired-sample *t*, and Wilcoxon's sign-ranked tests as well as the one-way analysis of variance.

**Results:** There was no significant difference among the groups respecting the pretest mean score of POP ( $P > 0.05$ ). The mean score of POP significantly decreased in all groups ( $P < 0.05$ ) and the amount of decrease in the intervention groups was significantly more than the control group ( $P < 0.05$ ).

**Conclusion:** Cold therapy and foot and hand massage are effective in significantly reducing POP among patients with major thoracoabdominal surgeries.

**Keywords:** Cold therapy, Massage, Pain, Major surgery

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## Introduction

Hospitalization and surgery are among significant life events and are associated with stress, disturbances of personal and familial life, and functional impairments (1). Each year, around 234 million major surgeries are performed worldwide, mostly in high-income countries (2). Statistics provided by the Ministry of Health of Iran also show that 1.5 million major surgeries are annually performed in Iran (3). These surgeries include cardiovascular, abdominal, thoracic, orthopedic, spinal, and brain surgeries (2).

Pain is a major postoperative problem and is considered as the fifth vital sign (4). By definition, pain is an unpleasant subjective sensory-emotional experience caused by potential or actual tissue injury self-reported by patients. Pain is broadly classified as acute and chronic. Acute pain is caused by acute injury and is alleviated with the healing of the underlying injury. Pain at the site

of surgical incision is the most important postoperative concern from the perspectives of patients (5). More than 80% of patients who undergo surgery experience acute postoperative pain (POP) and 75% of these patients report moderate to very severe POP; nonetheless, only less than 50% of them report that POP management is effective (6).

POP is a physiologic response to tissue injury and is often associated with the manifestations of autonomic nervous system activity such as tachycardia, tachypnea, high blood pressure, and increased basal metabolism rate. It can reduce patient satisfaction, endanger patient safety, reduce quality of life, and impose heavy costs on patients. POP management is a significant challenge for nurses (7). Unmanaged pain is associated with many different negative consequences such as respiratory infections, immobility, thrombosis, prolonged hospital stay, and patient and family dissatisfaction. On the other hand, effective pain management facilitates respiration, improves

coughing ability, promotes mobility, and thereby, reduces postoperative complications. Therefore, effective pain management is considered as an important component of nursing care. Pharmacological pain management strategies are usually associated with different side effects. A previous study reported that these strategies had negative effects on patients' physical and mental health, increase the risk of medication dependence, reduce blood pressure and suppress other vital signs, and cause nausea, vomiting, and even shock (8). Therefore, non-pharmacological pain management strategies have received great attention in recent years (9). Cold therapy and massage therapy are two non-pharmacological pain management strategies. The present study aimed at comparing the effects of cold therapy and foot and hand massage on POP among patients with major surgeries.

## Methods

### Design

This quality improvement study was conducted in 2019.

### Participants and setting

Participants were ninety patients who had undergone thoracoabdominal surgeries in Kashani teaching hospital, Shahrekord, Iran. They were randomly assigned to a control, a cold therapy, and a foot and hand massage group through block randomization with a block size of six.

### Intervention

Participants in the control group received routine care services. Participants in the cold therapy group received routine care services and local cold therapy. The local cold therapy intervention consisted of putting an ice bag on the surgical incision site for twenty minutes three times a day for 48 hours. Participants in the massage group received routine care services and superficial hand and foot massage in twenty minutes (in four five-minute cycles) three times a day for 48 hours.

### Data collection

The McGill Pain Questionnaire was used for pain assessment before and 48 hours after the intervention. This questionnaire contains twenty items for assessing sensory pain perception, emotional pain perception, evaluative pain perception, and miscellaneous aspects of pain perception. It was developed and used by Melzack for pain assessment among patients with different types of pain (10) and has two main factors, namely sensory pain which describes pain perception, and affective pain which describes the affective effects of pain experience (11). Items are scored from 0 ("Absent") to 3 ("Severe") (12). Pretest pain assessment was performed after participants regained full postoperative consciousness. Moreover, body temperature, arterial oxygen saturation, and blood pressure were measured and documented before and 48 hours after the intervention. Pain assessment was done by the first author, while other measurements were done by a

research assistant.

### Data analysis

All data analyses were performed using the SPSS software and at a significance level of less than 0.05. The Kolmogorov-Smirnov test was used for normality testing. Among-group comparisons were performed using the Fisher's exact and the chi-square tests for categorical variables, the one-way analysis of variance for numerical variables with normal distribution, and the Kruskal-Wallis test for numerical variables with non-normal distribution. Within-group comparisons were also performed using the paired-sample *t* test for numerical variables with normal distribution and the Wilcoxon's sign-ranked test for numerical variables with non-normal distribution.

## Results

Most participants in the cold therapy, massage, and control groups were female (63.3%, 56.7%, and 56.3%, respectively) and received general anesthesia (100%, 93.3%, and 96.4%, respectively). The mean of participants' age was  $47.4 \pm 13.2$  years in total (in the range of 18–65 years),  $46.1 \pm 14.2$  years in the cold therapy group,  $45.3 \pm 13.7$  years in the massage group, and  $50.9 \pm 11.2$  years in the control group. There were no significant differences among the groups respecting participants' age, gender, type of surgery, surgeon, and type of anesthesia ( $P > 0.05$ ; Table 1).

Study groups did not significantly differ from each other respecting the pretest mean score of POP ( $P > 0.05$ ). The mean score of POP significantly decreased from  $43.4 \pm 10.5$  to  $9.6 \pm 4.5$  in the cold therapy group, from  $46.1 \pm 9.4$  to  $9.1 \pm 3.1$  in the massage group, and from  $41.7 \pm 11.4$  to  $14.2 \pm 6.0$  in the control group ( $P < 0.001$ ; Table 2). The one-way analysis of variance showed a significant difference among the groups respecting the amount of decrease in the mean score of POP ( $P < 0.001$ ; Table 2). The results of the Dunn post hoc test illustrated that the amount of decrease in the mean score of POP in the cold therapy and the massage groups was significantly more than the control group ( $P < 0.05$ ).

**Table 1.** Group comparisons respecting participants' characteristics

Characteristics	Group			P value	
	Cold therapy	Massage	Control		
	No. (%)	No. (%)	No. (%)		
Gender	Female	11 (36.7)	13 (43.3)	14 (46.7)	0.727
	Male	19 (63.3)	17 (56.7)	16 (56.3)	
Type of surgery	Abdominal	22(78.6)	23(76.7)	23(76.7)	0.98
	Thoracic	6(21.4)	7(23.3)	7(23.3)	
Surgeon	1	13(43.3)	12(40.0)	13(43.3)	1
	2	9(30.0)	9(30.0)	8(26.6)	
	3	4(13.3)	5(16.7)	5(16.7)	
	4	4(13.3)	4(13.3)	4(13.3)	
Type of anesthesia	General	30(100.0)	28(93.3)	27(96.4)	0.533
	Spinal	0(0.0)	2(6.7)	1(3.6)	

**Table 2.** Within- and among-group comparisons respecting the mean score of postoperative pain

Time	Group			P value <sup>a</sup>
	Cold therapy	Massage	Control	
	Mean±SD and Median (interquartile range)	Mean±SD and Median (interquartile range)	Mean±SD and Median (interquartile range)	
Before	43.4±10.5 43.5 (38.8–51.0)	46.1±9.4 44.5 (40.0–54.3)	41.7±11.4 41.5 (32.0–49.0)	0.283
After	4.5±9.6 8.0(6.5–13.5)	3.1±9.1 9(8.0–11.0)	6.0±14.2 14 (11.3–15.0)	< 0.001
P value <sup>b</sup>	< 0.001	< 0.001	< 0.001	—
Pretest posttest mean difference	9.0±33.6 34.0(32.0–39.0)	8.1±37.4 37(33.3–43.8)	10±26.9 27(19.3–34.8)	< 0.001

<sup>a</sup> Among-group comparisons; <sup>b</sup> Within-group comparisons

### What does this paper contribute to the wider global clinical community?

- Local cold therapy is effective in significantly reducing POP among patients with major thoracoabdominal surgeries.
- Hand and foot massage is effective in significantly reducing POP among patients with major thoracoabdominal surgeries.
- Local cold therapy and hand and foot massage can be used in adjacent to pharmacological therapies for POP management among patients with major surgeries.

### Discussion

This study compared the effects of cold therapy and foot and hand massage on POP among ninety patients with major thoracoabdominal surgeries. Findings indicated that both local cold therapy and foot and hand massage had significant positive effects on POP. In line with our findings, a randomized controlled trial in Iran showed that cold therapy had significant positive effects on deep breathing and coughing abilities after coronary artery bypass graft surgery (13). Another randomized clinical trial on 62 women with Cesarean section in Iran also found that foot reflexology in two thirty-minute sessions held in two consecutive days significantly reduced POP (14). Similarly, a study in the United States reported the significant positive effects of hand massage on POP among patients with cardiac surgeries (15). Moreover, a clinical trial on 60 patients in Egypt found that hand and foot massage in three consecutive days after abdominal surgeries significantly reduced POP (16). A study also reported that local pressure and cold therapy before intramuscular injection were effective in significantly reducing procedural pain and its associated behavioral responses among ninety 5–12 year-old children in an outpatient clinic in Iran (17).

### Conclusion

This study suggests that both local cold therapy and hand and foot massage are effective in significantly reducing POP among patients with major thoracoabdominal surgeries.

### Conflict of Interests

The authors declare no conflict of interests.

### Ethical Approval

The Ethics Committee of Shahrekord University of Medical Sciences, Shahrekord, Iran, approved this study (code: IR.SKUMS.REC.1398.110). Participants were informed about the study aim and their written informed consent was secured.

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