

# Assessing the Impact of Foot Massage on Pain Reduction in Patients After Cardiothoracic Surgery

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## Abstract

*In the United States, it is stated that cardiac surgery can result in various sources of pain. Inevitably, there is pain associated with the wound, and beyond the sternotomy incision, there may be an extensive leg wound from vein harvesting. Other contributors to pain and discomfort include drains in the mediastinal and pleural regions, tracheal tubes, and urethral catheters. Activities such as physiotherapy, movement, and tracheal toileting (suctioning of secretions) can contribute to the patient's distress. Typically, acute pain from the incisions becomes more manageable after the third day, but complications may arise, leading to additional pain. These complications encompass wound infection, hematoma formation, sternal dehiscence, pleural effusion, pneumonia, and myocardial infarction. Bacterial mediastinitis and pericarditis occasionally serve as significant sources of severe pain, and patients who have recently experienced a myocardial infarction may develop Dressler's syndrome. Intraoperative chest wall retraction can result in trauma to the thoracic cage, potentially causing the development of conditions such as costochondritis or musculoskeletal and myofascial pain postoperatively. **H1:** The pain score following a foot massage is expected to be notably reduced compared to the pain score before receiving the foot massage. **H2:** A significant correlation is anticipated between the post-foot massage pain score and certain variables like age and type of surgery. Indeed, associations were identified between the pre-foot massage pain score and age ( $\chi^2 = 52.7344$ ), previous analgesic use ( $\chi^2 = 14.9246$ ), non-pharmacological management ( $\chi^2 = 22.5466$ ), and previous surgery ( $\chi^2 = 18.7098$ ). Consequently, the research hypothesis was accepted, and the null hypothesis was rejected. Conversely, no significant associations were observed between pre-foot massage pain and demographic variables such as age, education ( $\chi^2 = 1.4284$ ,  $P > 0.05$ ), occupation ( $\chi^2 = 3.1677$ ,  $P > 0.05$ ), sex ( $\chi^2 = 0.033879$ ), and type of surgery ( $\chi^2 = 5.9$ ). **Recommendations:** This research can be conducted again with a broader sample size that includes patients undergoing general surgery to enhance its applicability. Additionally, replicating this study with a larger participant pool and incorporating a control group would be beneficial.*

**Keywords:** Cardiac surgery, demographic variables, foot massage pain, musculoskeletal and myofascial pain, sternotomy incision

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## INTRODUCTION

The researcher encountered instances where patients did not experience sufficient pain relief using only pharmacological methods during the postoperative phase. The challenge in incorporating complementary practices like foot massage into nursing lies in the scarcity of empirical evidence supporting its efficacy. Additionally, it is noted that research studies and trials on foot massage within the Indian context are notably limited. Therefore, this study holds significance in offering empirical evidence regarding the effectiveness of foot massage in alleviating postoperative pain for

patients undergoing abdominal surgery. Mumbai states that in India, there appears to be an epidemic of cardiovascular diseases. Because of industrialization, urbanization, and evolving lifestyles, there is a growing prevalence of cardiovascular and pulmonary diseases, reaching unprecedented levels. Annually, 50,000 new cases of lung carcinoma and 20,000 cases of esophageal carcinoma are diagnosed. More than six million individuals are affected by coronary artery disease, and approximately five million people suffer from rheumatic heart disease. Although specific data on the incidence of congenital heart diseases is unavailable, it is estimated that around 200,000 babies are born each year with some form of congenital cardiothoracic defect. The aging population is contributing to the increasing occurrence of degenerative diseases of the aorta. Presently, more than 60,000 open-heart procedures are performed every year in our country, the majority of which are due to these conditions.

### NEED FOR THE STUDY

Wang HL and Keck JF, based in the United States, highlight that the efficacy of pain medication can be enhanced when it is combined with additional pain management strategies [1]. Adjusting the patient's position, providing back or foot massages, or even engaging in simple conversation with the patient can amplify the pain relief effects of medications. Specifically, foot and hand massages are noted for their potential to assist in alleviating pain. In their study, conducted within a 39-bed unit of a prominent teaching hospital in the Midwest from May 1, 2000, to May 1, 2001, they aimed to evaluate the impact of foot and hand massages on reducing pain levels in postoperative patients. These patients had undergone surgeries related to gastroenterology, gynecology, head and neck plastics, or urology. Each participant received a 20-minute session of foot and hand massage, dedicating five minutes to each limb, to assess changes in pain intensity and distress. Measurements were taken using a numerical scale ranging from 0 to 10 in the adapted brief pain inventory. Results showed a significant reduction in pain intensity, with average scores dropping from 4.65 to 2.35, marking a 56% decrease ( $t = 8.154$ ,  $P < 0.001$ ). Pain distress also fell from 4.00 to 1.88 ( $t = 5.683$ ,  $P < 0.001$ ). Additionally, physiological responses to pain, such as heart rate and respiratory rate, showed significant improvements ( $P < 0.05$ ).

According to researchers, massage could stimulate cutaneous mechanoreceptors, subsequently activating large primary afferents. Widely employed as a complementary therapy in nursing, massage plays a crucial role in conveying care to patients, with touch being integral to the nurse's healing responsibilities. Viewed as an extended form of touch, massage facilitates a reciprocal exchange of energy. It has a calming effect on pain and induces relaxation, raising pain thresholds and influencing an individual's perception of pain [2].

### OBJECTIVES OF THE STUDY

- Evaluate the postoperative pain levels in patients undergoing cardiothoracic surgery both prior to and following the introduction of foot massage.
- Examine the efficacy of foot massage in diminishing pain levels among post-operative cardiothoracic surgery patients.
- Investigate potential associations between postoperative pain and specific demographic variables.

### HYPOTHESES

$H_1$ : The pain score after receiving a foot massage will notably decrease compared to the score before the foot massage.

$H_2$ : A notable correlation is expected between the pain score after foot massage and specific factors including age and the type of surgical procedure.

### REVIEW OF THE LITERATURE

In a study conducted by Bruce J in Scotland [3], an analysis was performed on the follow-up of a cohort consisting of 1348 patients who had undergone cardiac surgery between 1996 and 2000 at a cardiothoracic unit in northeast Scotland. The cumulative prevalence of post-cardiac surgery pain was found to be 39.3% (CI 95 36.4–42.2%) with a mean duration of 28 months since the surgery (SD 15.3

months). The prevalence of chronic pain exhibited a decreasing trend with age, declining from 55% in individuals under 60 years to 34% in patients aged over 70 years. Notably, chronic pain was more prevalent in cases involving median sternotomy and saphenous vein harvesting compared to other procedures, highlighting the importance of informing patients undergoing coronary artery bypass grafting (CABG) about the potential likelihood of experiencing such chronic pain.

Sue C. Ho in the United Kingdom conducted pain surveys among patients who had undergone coronary artery bypass graft surgery between 1997 and 1999 under the care of a single surgeon [4]. The study revealed that the incidence of persistent pain at any site was 29%, with sternotomy accounting for 25% of cases. The reported pain intensity was mild, with only 7% indicating interference with daily activities. Other common sites of persistent pain included the shoulders (17.4%), back (15.9%), and neck (5.8%). Additionally, symptoms suggestive of the internal mammary artery syndrome were reported by twenty patients (8%).

Vibhu R. Kshetry, MD, in the United States assessed the feasibility, safety, and impact of a complementary alternative medical therapy package for patients undergoing heart surgery [5]. The study involved prospectively randomizing 104 patients undergoing open heart surgery into two groups: one receiving complementary therapy (preoperative guided imagery training with gentle touch or light massage and postoperative music with gentle touch or light massage and guided imagery), and the other receiving standard care. The results indicated a significant reduction in pre-treatment and post-treatment pain and tension scores in the complementary alternative medical therapies group on postoperative days 1 ( $p < 0.01$ ) and 2 ( $p < 0.038$ ).

Polly E. Bijur from France conducted a study to evaluate the comparability of the Numerical Rating Scale (NRS) and Visual Analog Scale (VAS) as measures of acute pain [6]. The goal was also to identify the minimum clinically significant difference in pain detectable on the NRS. Among 108 entered patients, 103 provided data at 30 minutes, and 86 at 60 minutes. The NRS scores exhibited a strong correlation with VAS scores across all time periods ( $r = 0.94$ , 95% CI = 0.93 to 0.95). The regression line showed a slope of 1.01 (95% CI = 0.97 to 1.06) and an intercept of  $-0.34$  (95% CI =  $-0.67$  to  $-0.01$ ). The study concluded that the verbally administered NRS could effectively substitute for the VAS in measuring acute pain, with a minimum clinically significant difference of 1.3 (95% CI = 1.0 to 1.5) on the NRS and 1.4 (95% CI = 1.1 to 1.7) on the VAS.

## LITERATURE ON THE EFFICACY OF FOOT MASSAGE ON PAIN

Kim JH from Korea conducted a non-equivalent control group, pre-test, post-test design study at a university hospital in Seoul, Korea [7]. The research involved 40 patients who underwent general anesthesia and abdominal surgery between July 7, 2000, and Feb 20, 2001. The study aimed to investigate the effects of foot massage on postoperative pain in abdominal surgery patients. Pain severity was assessed using the Visual Analog Scale (VAS), and vital signs, including pulse rate (PR), systolic blood pressure (SBP), and diastolic blood pressure (DBP), were measured. Data analysis was performed using chi-square, Fisher's exact test, t-test, and repeated measures ANOVA. The results showed a significant decrease in pain severity in the experimental group compared to the control group following foot massage ( $t = -3.37$ ,  $p = .002$ ). Additionally, the pulse rate in the experimental group was lower than that in the control group after foot massage ( $F = 7.73$ ,  $P = .008$ ). Moreover, the systolic blood pressure in the experimental group was lower than that in the control group following foot massage ( $F = 25.75$ ,  $P = .000$ ).

## MATERIALS AND METHODS

### Source of Data

Postoperative cardiothoracic surgery patients in selected hospitals in Guntur district.

## Research Approach and Research Design

The present study employed a qualitative research approach, utilizing a one-group pre-test and post-test design as the chosen research design.

## Setting of the Study

The research will take place in specific hospitals within the Guntur district.

## Population

The study included individuals who had undergone cardiothoracic surgery in the postoperative phase.

## Sampling Technique

This study employed a non-probability purposive sampling technique for sample selection.

## Sample Size

The study included a sample of 60 patients who underwent postoperative cardiothoracic surgery and met the inclusion criteria at a selected hospital in Guntur.

## TOOL FOR DATA COLLECTION

### Numerical Pain Scale to Assess the Level of Pain Intensity

The numerical rating scale comprised of a 10 cm horizontal line with end points marked as '0' and '10.' An increase in score denotes an increase in pain level, and the score ranges from 0–10 (Table 1).

**Table 1.** Numerical pain scale.

0	No pain
1–3	Mild pain
4–6	Moderate pain
7–9	Severe pain
10	Worst pain possible

For analysis, a score of 1–5 was given to no pain, mild pain, moderate pain, severe pain, and the worst pain possible, respectively.

## DATA ANALYSIS AND INTERPRETATION

### Plan for Data Analysis

Data analysis and its methods are discussed in Table 2.

**Table 2.** Data analysis and methods.

S.N.	Data analysis	Method
1.	Descriptive statistics	Frequencies and percentages: mean, deviation, and standard
2.	Inferential statistics	Paired 't' test Chi-square test

## DISCUSSION

### Major Findings of the Study

*The first objective of the study was to assess the level of post-operative pain in cardiothoracic surgery patients before and after the implementation of foot massage.*

The research findings indicate that prior to the intervention, 46 (76.67%) of the participants reported severe pain, while 14 (23.3%) reported moderate pain. After the intervention, 34 (56.7%) reported experiencing mild pain, while 26 (43.3%) reported moderate pain. These results suggest that foot massage significantly reduced pain levels among postoperative cardiothoracic surgery patients [8, 9].

*The second objective was to determine the effectiveness of foot massage on the level of pain among post-operative cardiothoracic surgery patients.*

The analysis revealed that the observed 't' values exceeded the critical 't' value ( $t(59) = 12.7, P < 0.05$ ), indicating a statistically significant difference in pain scores before and after foot massage.

Consequently, the null hypothesis was dismissed, and the research hypothesis was affirmed.

The investigation into the pain levels of 60 patients undergoing cardiothoracic surgery, before and after receiving a foot massage, was conducted using a numerical pain scale and analyzed through both descriptive and inferential statistical methods [10–13].

To determine the statistical significance of the change in pain levels pre- and post-foot massage among these 60 postoperative cardiothoracic surgery patients, the following null hypothesis was proposed.

*The third objective was to find out the association between pain and the selected demographic variables.*

The study found a significant correlation between pre-foot massage pain scores and factors such as age ( $\chi^2 = 52.7344$ ), use of prior analgesics ( $\chi^2 = 14.92460$ ), application of non-pharmacological management techniques ( $\chi^2 = 22.5466$ ), and history of previous surgery ( $\chi^2 = 18.7098$ ), leading to the acceptance of the research hypothesis and the rejection of the null hypothesis.

Conversely, there was no significant link between pre-foot massage pain scores and certain demographic factors, including education level ( $\chi^2 = 1.4284$ ,  $P > 0.05$ ), occupation ( $\chi^2 = 3.1677$ ,  $P > 0.05$ ), gender ( $\chi^2 = 0.033879$ ), and type of surgery ( $\chi^2 = 5.9$ ,  $P > 0.05$ ) [14, 15].

## CONCLUSION

This study aimed to assess the influence of foot massage on the pain levels of postoperative patients undergoing cardiothoracic surgery.

- The pain level before foot massage was notably higher compared to after foot massage.
- The most substantial difference in pain level was observed between the period before foot massage and 10 minutes after the foot massage.
- A significant correlation was identified between demographic variables, specifically age and gender, and the pain score before foot massage.

## Nursing Implications

This study has revealed insights with significant implications for nursing across practice, education, administration, and research domains.

## Nursing Practice

In the current landscape of healthcare, there is a pressing demand for nursing to deliver cost-efficient care. The pursuit of complementary and alternative medicine by many is driven by concerns over drug treatment side effects and the financial burden of medical expenses, as pain encompasses physical, psychological, social, and spiritual aspects, potentially diminishing life quality. Pain-induced anxiety and insomnia trigger the release of stress hormones, adversely affecting postoperative recovery. Foot massage, supported by recent research, presents a viable option for nurses to incorporate into their caregiving routines. Its advantages include being cost-effective, simple to master, devoid of negative side effects, and requiring no special equipment or additional resources. Foot massage as a means of touch can be used by the nurses to communicate care and concern for the patients.

## Nursing Education

The interest in alternative and complementary therapies has been growing, as noted by the British Medical Association in 1993. Nurses are well-positioned to champion pain management strategies, evaluating and mitigating patient discomfort. Incorporating non-pharmacological approaches, such as foot massage, into nursing education alongside other complementary treatments is a viable option. To equip nurses to provide holistic care, the nursing curriculum needs to cover non-pharmacological measures such as foot massage for pain management. Nurse educators need to highlight non-pharmacological pain relief measures like foot massage in the curriculum of basic nursing education as

part of pain assessment and management. Ongoing education can be planned for graduate students. Students can be given project work to experiment with the need for foot massage in pain management. Foot massage as a non-pharmacological pain management method can be highlighted as a part of an in-service education programme. Educating family members on the techniques of foot massage can empower them to support and care for loved ones experiencing pain, thus extending the benefits of these practices to the wider community.

### **Nursing Administration**

In the contemporary healthcare landscape, there is a growing demand for comprehensive and high-quality care. The results of this study hold valuable implications for both nursing and non-nursing professionals. Nursing administrators play a crucial role in shaping policies and implementing evidence-based nursing practices. They are encouraged to enact changes in nursing education and practice based on research findings. Formulating nursing practice standards, protocols, and manuals for effective pain assessment and management is essential. Raising awareness through media channels, including newspapers, magazines, television, and the internet, can contribute to disseminating valuable information. Additionally, organizing in-service education programs for nursing staff, with a specific focus on the use of foot massage for alleviating postoperative pain, is recommended.

### **Recommendations**

- The study can be replicated on a larger sample with general surgery to make generalization.
- A similar study can be replicated on a larger sample with a control group.
- The study could be undertaken during chronic painful experiences like cancer pain.
- A study could be conducted with a control group to assess the effects of other complimentary therapies such as acupressure, progressive muscle relaxation, and guided imagery.
- A comparative study can be conducted with more than one intervention.

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