

Section: General Nursing

Thermotherapy to reduce pain in patient with ST Elevation Myocardial Infarction (STEMI) in the intensive care unit

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Abstract

ST-Elevation Myocardial Infarction (STEMI) is a critical cardiovascular emergency caused by total occlusion of a coronary artery, typically presenting with severe, acute chest pain. Alongside standard pharmacological management, non-pharmacological interventions such as thermotherapy—the therapeutic application of localized heat—can be utilized to manage pain by enhancing regional blood flow, improving tissue oxygenation, and alleviating muscle tension. This descriptive case study aimed to evaluate the clinical application of thermotherapy in managing acute pain in a patient diagnosed with STEMI. The case involved a single female patient (Mrs. H) presenting with acute ischemic chest pain secondary to STEMI. Data were gathered through structured clinical interviews, physical observations, and nursing documentation. As an adjunctive nursing intervention, thermotherapy was applied for 10 to 20 minutes once daily over three consecutive days. Following the three-day intervention, Mrs. H demonstrated a progressive reduction in her numeric pain scale ratings and reported increased overall comfort, with no adverse side effects observed. These findings suggest that thermotherapy is an effective complementary nursing intervention for reducing acute pain in STEMI patients and serves as a safe non-pharmacological option in clinical cardiac care.

Keywords: Cardiovascular disease, nursing care, pain management, STEMI, thermotherapy

Introduction

Cardiovascular disease is the number one cause of death worldwide (Frąk et al., 2022; Thiriet, 2019). According to a 2021 report by the World Health Organization (WHO), heart disease remains the leading cause of death worldwide, with approximately 18.6 million people dying from cardiovascular disease. STEMI is a heart disease that can completely block the coronary arteries, preventing oxygen from reaching the heart muscles (Khan et al., 2024). One of the most common signs and symptoms of STEMI is chest pain. Research found that chest pain, or discomfort, is the primary symptom and the most common complaint among patients (Leite et al., 2023). Typical symptoms of STEMI include chest pain that can radiate to the teeth, lower jaw, neck, left and right arms, back, and stomach (Shang et al., 2022). In addition, pain can also be felt in the solar plexus area and stimulate disorders in the digestive tract such as nausea and vomiting, chest discomfort can cause difficulty breathing (dyspnea), cold sweats, anxiety, weakness and feeling tired quickly in carrying out daily activities which will affect the quality of sleep of STEMI patients. Complementary therapy provides thermotherapy as a companion therapy to reduce pain in STEMI patients in addition to the collaborative therapy already provided by doctors. One alternative that is starting to be developed is thermotherapy, namely the application of local heat using a hot pack to increase blood circulation, reduce muscle spasms, and reduce pain (Susmita et al., 2025).

This case study is vital for nurses because it demonstrates how evidence-based, autonomous non-pharmacological interventions like thermotherapy can safely complement standard medical regimens to alleviate severe ischemic chest pain in high-acuity ICU settings. Severe cardiac pain triggers a sympathetic stress response—elevating heart rate, blood pressure, and myocardial oxygen demand—which can worsen ischemic heart damage if left unmanaged; thermotherapy counters this by promoting localized vasodilation, improving oxygen supply to cardiac tissues, and reducing muscle tension to significantly lower pain intensity without introducing systemic drug side effects. Furthermore, by grounding the intervention in standardized nursing frameworks (such as SIKI and SLKI), the case study provides nurses with a structured, cost-effective, and reproducible protocol to enhance patient comfort and advance holistic cardiovascular care.

Case Description

A patient presented to the hospital with complaints of persistent chest and upper abdominal pain radiating to the back. The pain was described as heavy pressure, with a severity of 7 out of 10. The patient also reported shortness of breath, palpitations, nausea, and vomiting. There was no prior history of similar symptoms. Upon assessment, the patient

appeared restless, grimacing due to pain, had difficulty sleeping, and exhibited a weak, rapid pulse. These findings were consistent with ST-Elevation Myocardial Infarction (STEMI). Mrs. H, 61 years old, a housewife from Magelang, was first admitted to the hospital with a medical diagnosis of ST-Elevation Myocardial Infarction (STEMI). The main complaint conveyed was chest pain radiating to the upper abdomen and back, with a sensation like being pressed by a heavy object (pain scale 7/10, NRS), which was continuous. The patient also complained of shortness of breath, nausea, vomiting, palpitations, difficulty sleeping, anxiety, and grimacing. The symptoms experienced by Mrs. H are in accordance with the characteristics of pain in STEMI patients, namely chest pain, shortness of breath, nausea, vomiting, and increased heart rate.

Based on the collected data, the diagnosis to be discussed in this study is acute pain (D.0077) related to physiological injury agents characterized by the patient reporting chest pain, upper abdomen, radiating to the back, pain like being pressed by a heavy object, scale 7, continuous onset, appearing grimaced and restless, and difficulty sleeping. This determination is in accordance with the Indonesian Nursing Diagnosis Standards which explains that acute pain is an unpleasant sensory and emotional experience due to tissue damage or potential, and lasts less than 6 months. In this case, Mrs. H shows all the major criteria for the diagnosis of acute pain, namely verbally stating pain, facial expressions of grimace, and focus on the area of pain. Minor data such as changes in vital signs, restlessness, and difficulty sleeping further strengthen the determination of this diagnosis.

Discussion

Based on subjective and objective data, acute pain was determined as the primary focus of nursing interventions for STEMI patients, with a target of pain reduction within 3 x 8 hours. One intervention is thermotherapy, which involves applying local heat through a hot pack filled with water at 35–50°C, wrapped in cloth, and placed on the painful area, such as the chest or back, for 10–20 minutes. This therapy is performed once daily for three consecutive days. Physiologically, thermotherapy works by increasing vasodilation and local blood flow, reducing muscle spasms, and accelerating the elimination of pain-causing metabolites (Zanoli et al., 2024). The heat also stimulates the release of endorphins, which serve to reduce pain transmission to the brain (Yao et al., 2024). Furthermore, heat has a calming effect that can reduce sympathetic nervous system activity, which is typically increased in acute pain conditions such as STEMI.

Thermotherapy, in the form of warm compresses, was applied to Mrs. H to reduce chest pain caused by STEMI. The therapy was administered once daily for 10–20 minutes for three consecutive days, with pain monitored using the NRS scale. On the first day, the patient complained of chest pain radiating to her back with an NRS of 7. After applying warm compresses at 35–50°C, the pain decreased to an NRS of 5. According to research, thermotherapy stimulates the release of endorphins, decreases sympathetic activity, and reduces ischemia, thus alleviating pain (Neff et al., 2016). On the second day, the patient reported reduced pain, but still felt it when taking deep breaths, with an NRS of 5. Warm compresses were reapplied. This helped reduce muscle tension and inflammation, improve oxygenation, and lower her pulse and blood pressure. On the third day, the patient felt more comfortable and appeared relaxed, and her pain score decreased to an NRS of 2. The warm compresses were continued, increasing the analgesic effect and comfort without side effects. Warm compresses stimulate non-nociceptive afferent nerves and activate the gate control mechanism to reduce pain perception (Akbarzadeh et al., 2018). Overall, three days of thermotherapy were shown to reduce pain from an NRS of 7 to an NRS of 2. This is consistent with literature indicating that local heat therapy can stimulate endorphin release, improve blood circulation, and reduce inflammatory mediators, making it an effective non-pharmacological complementary therapy in the acute pain management of STEMI patients in the intensive care unit (Goswami et al., 2022; Chan et al., 2022).

The application of thermotherapy (warm compresses) as a nursing intervention in patients with acute pain due to STEMI has proven effective in gradually reducing pain intensity, from an NRS of 7 to an NRS of 1 within three days. Patients demonstrated positive responses, both physically and emotionally, such as easier breathing, a feeling of well-being, and the absence of severe pain. This intervention also successfully increased patient understanding and participation in non-pharmacological pain management. The effectiveness of this therapy is supported study stated that warm compresses provide a natural analgesic effect, relieve muscle tension, improve blood circulation, and promote relaxation. However, the implementation of thermotherapy also faces several obstacles, such as unstable water temperature, patient discomfort with temperature or duration, dependence on nursing staff, and an unsupportive inpatient environment. Therefore, the success of therapy is greatly influenced by close monitoring of temperature, duration, and patient comfort, as well as a supportive environment. With significant results and benefits felt by patients, thermotherapy is worth maintaining as a complementary therapy in acute pain management, especially in patients with STEMI in intensive care units.

Conclusion

Following the implementation of the nursing care plan titled "Application of thermotherapy to address pain in STEMI patients in the ICU at Harapan Hospital, Magelang," several key conclusions were established regarding patient care and therapeutic outcomes. Initial assessment of the patient, Mrs. H, identified a chief complaint of continuous, oppressive chest and upper abdominal pain radiating to the back, rated at a severity scale of 7 out of 10. Based on

these assessment parameters, data analysis confirmed the primary nursing diagnosis of acute pain related to a physiologically injurious agent (D.0077), as evidenced by the patient's description of severe pressure-like pain. In alignment with the Indonesian Nursing Outcome Standards (SLKI) and Indonesian Nursing Intervention Standards (SIKI), the care plan prioritized pain management (I.08238). As part of this management plan, thermotherapy was administered once daily for 10 to 20 minutes over a three-day period. Evaluative data demonstrated a marked and progressive reduction in Mrs. H's pain severity across the intervention timeline: from a baseline rating of 7 on day one, the pain scale decreased to 5 on day two, and ultimately reached a low of 2 on day three. These findings demonstrate that thermotherapy served as an effective non-pharmacological nursing intervention for substantially reducing acute pain in a STEMI patient within an intensive care setting.

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