

THE EFFECT OF COLD COMPRESS THERAPY ON REDUCING INCISION PAIN IN PATIENTS POST PERCUTANEOUS CORONARY INTERVENTION (PCI) AT DR. SARDJITOP GENERAL HOSPITAL

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ABSTRACT

Introduction

Percutaneous Coronary Intervention (PCI) is a revascularization procedure performed on patients with coronary artery disease to restore blood flow in coronary arteries that have narrowed or become blocked. A common issue following PCI is pain at the vascular access site due to tissue trauma during the procedure. Cold compresses are a nonpharmacological nursing intervention that can help reduce pain through vasoconstriction and by slowing the transmission of pain impulses.

Method

This case study involved two post-PCI patients complaining of pain. The intervention involved applying ice gel wrapped in a protective cloth to the vascular access site for 15–20 minutes over two days. Evaluation was conducted using the Numeric Rating Scale (NRS) and observation of the patients' responses.

Result

The acute pain nursing issue in both patients was resolved. In the first patient, pain intensity decreased from a score of 5 to 1 on the second day following the application of the cold compress. In the second patient, pain intensity decreased from a score of 5 to 0 on the second day. Grimacing decreased on the second day, and anxiety levels decreased starting from the first day of the intervention. Both patients appeared more relaxed, calm, and comfortable during treatment.

Conclusion

So it can be concluded that there is a relationship between diet and the incidence of obesity in school children at MI Hidayatul Mutaalimin and there is a relationship between physical activity and the incidence of obesity in school children at MI Hidayatul Mutaalimin.

INTRODUCTION

Coronary Artery Disease (CAD) remains one of the leading causes of morbidity and mortality worldwide. The disease develops progressively due to atherosclerotic plaque accumulation within the coronary arteries, resulting in reduced myocardial perfusion and ischemia. According to the World Health Organization, cardiovascular diseases account for approximately 20 million deaths annually, with coronary artery disease representing the largest proportion of these deaths. The increasing prevalence of CAD continues to impose substantial clinical, social, and economic burdens on healthcare systems worldwide.

Percutaneous Coronary Intervention (PCI) has become the preferred revascularization strategy for patients with obstructive coronary artery disease because of its high success rate in restoring coronary blood flow while requiring only minimally invasive vascular access. Compared with coronary artery bypass grafting, PCI offers shorter hospitalization, faster recovery, and lower procedural morbidity. Nevertheless, despite these advantages, patients frequently experience postoperative discomfort, particularly pain localized at the arterial puncture site after catheter removal.

Pain following PCI primarily results from mechanical injury to the skin, subcutaneous tissue, vascular wall, and surrounding soft tissues during arterial cannulation and sheath removal. Tissue injury initiates an inflammatory cascade involving the release of prostaglandins, histamine, bradykinin, serotonin, and other inflammatory mediators that activate peripheral nociceptors. Pain impulses are subsequently transmitted through A-delta and C fibers to the spinal cord and cerebral cortex, where pain perception occurs. According to the Gate Control Theory proposed by Melzack and Wall, modulation of nociceptive transmission at the spinal cord level can alter pain perception through both pharmacological and non-pharmacological interventions.

Inadequately controlled pain after PCI may negatively influence patients' physiological and psychological conditions. Pain stimulates sympathetic nervous system activity, resulting in increased heart rate, blood pressure, myocardial oxygen demand, anxiety, sleep disturbance, and delayed recovery. Consequently, effective pain management constitutes an essential component of comprehensive nursing care following PCI.

Although pharmacological analgesics remain the primary approach to postoperative pain control, their use may be associated with undesirable adverse effects, including nausea, vomiting, respiratory depression, hypotension, and increased healthcare costs. Therefore, complementary non-pharmacological interventions have received increasing attention due to their safety, simplicity, and cost-effectiveness. Among these interventions, cold compress therapy has demonstrated promising clinical benefits in reducing pain and vascular complications after invasive cardiovascular procedures.

Cold compress therapy produces local vasoconstriction, decreases tissue metabolism, suppresses inflammatory mediator release, reduces edema formation, and slows peripheral nerve conduction velocity. These physiological effects contribute to diminished nociceptor stimulation and decreased pain perception. Furthermore, cold application has been reported to reduce minor bleeding, hematoma formation, and ecchymosis at vascular access sites following PCI.

Several previous studies have consistently demonstrated the effectiveness of cold therapy in patients undergoing PCI. Pamuk (2024) reported that cold sand pack application significantly reduced pain intensity and vascular complications compared with conventional sand packs. Similarly, Kareem and Al-Kassar (2023) found that direct cold compress application effectively reduced hematoma, bleeding, and local pain following femoral sheath removal.

Additional studies by Widodo (2023), Baidhowy et al. (2021), Wicaksono and Djamil (2020), and Kristiyan et al. (2020) further confirmed that cold compress therapy significantly lowers pain scores among post-PCI patients.

Despite growing evidence supporting cold therapy, its implementation as part of routine nursing care remains limited in many clinical settings. Therefore, evaluating its clinical application through nursing case studies is important to strengthen evidence-based nursing practice and encourage wider adoption of simple, low-cost interventions that improve patient outcomes.

Accordingly, this case study aimed to describe the effectiveness of cold compress therapy in reducing pain intensity among patients following Percutaneous Coronary Intervention. The findings are expected to contribute to evidence-based nursing practice by providing practical recommendations for integrating non-pharmacological pain management into routine post-PCI nursing care.

METHOD

This study employed a qualitative approach using a descriptive case study design to explore the implementation of evidence-based nursing care through cold compress therapy in patients experiencing acute pain following Percutaneous Coronary Intervention (PCI). A case study design was selected to facilitate an in-depth understanding of nursing assessment, diagnosis, intervention, implementation, and evaluation while comparing the clinical responses of two post-PCI patients receiving the same nursing intervention.

RESULT

Two patients diagnosed with Coronary Artery Disease (CAD) who underwent Percutaneous Coronary Intervention (PCI) were included in this case study. Both patients were admitted to the Kesawamurti Ward of Dr. Sardjito General Hospital and experienced acute pain at the radial artery puncture site following the PCI procedure. Based on the initial nursing assessment, both

patients reported intermittent stabbing pain that worsened with movement of the affected upper extremity. Using the Numeric Rating Scale (NRS), both patients reported a pain intensity score of 5, indicating moderate pain. Physical examination revealed facial grimacing during pain episodes, while no signs of active bleeding, hematoma, or impaired peripheral circulation were observed. Hemodynamic parameters remained stable throughout the assessment period, allowing the implementation of cold compress therapy as a complementary non-pharmacological nursing intervention.

Cold compress therapy was administered using an ice gel pack wrapped in a protective towel and applied directly to the radial artery access site for 15–20 minutes over two consecutive days, in addition to standard post-PCI nursing care. Throughout the intervention, the patients were continuously monitored for pain intensity, skin integrity, vascular complications, and overall comfort. Neither patient experienced adverse events such as excessive vasoconstriction, skin injury, bleeding, hematoma, or allergic reactions during or after the intervention, indicating that the therapy was safely tolerated.

Progressive pain reduction was observed in both patients following the implementation of cold compress therapy. On the first day of intervention, both patients reported a decrease in pain intensity from an NRS score of 5 to 3, accompanied by reduced facial grimacing and improved comfort. Following the second day of intervention, Patient 1 reported further improvement, with the pain score decreasing to 1, while Patient 2 achieved complete pain relief with an NRS score of 0. In addition to the reduction in pain intensity, both patients appeared calmer and more relaxed and were able to move more comfortably without experiencing significant discomfort at the vascular access site. The nursing evaluation indicated that the diagnosis of acute pain had been successfully resolved by the end of the observation period.

Overall, the findings of this case study demonstrate that cold compress therapy effectively reduced acute pain following PCI

when used as an adjunct to standard nursing care. The consistent reduction in pain intensity observed in both patients, together with the absence of vascular complications or adverse effects, suggests that cold compress therapy is a feasible, safe, and effective evidence-based nursing intervention for improving patient comfort during the early recovery period after Percutaneous Coronary Intervention.

DISCUSSION

This case study demonstrated that cold compress therapy effectively reduced pain intensity in both patients following Percutaneous Coronary Intervention (PCI). Both patients initially reported moderate pain with a Numeric Rating Scale (NRS) score of 5 at the radial artery access site after the procedure. Following the implementation of cold compress therapy for 15–20 minutes over two consecutive days, pain intensity progressively decreased. Patient 1 experienced a reduction in pain from an NRS score of 5 to 1, while Patient 2 reported complete pain relief, with the NRS score decreasing from 5 to 0. In addition to pain reduction, both patients appeared more relaxed, comfortable, and demonstrated reduced facial grimacing without evidence of vascular complications such as bleeding or hematoma. These findings indicate that cold compress therapy may serve as an effective complementary nursing intervention for managing acute pain following PCI.

Pain experienced after PCI is primarily associated with tissue trauma caused by arterial puncture and catheter manipulation during the procedure. Damage to the skin, subcutaneous tissue, blood vessels, and surrounding structures initiates an inflammatory response characterized by the release of prostaglandins, histamine, bradykinin, serotonin, and other inflammatory mediators. These substances stimulate peripheral nociceptors, generating pain impulses that are transmitted through A-delta and C nerve fibers to the dorsal horn of the spinal cord before reaching higher brain centers where pain is consciously perceived. Consequently, patients commonly experience moderate pain during the first 24 hours after PCI, particularly at the vascular access site.

The observed reduction in pain can be explained by the physiological effects of cold

compress therapy. Local cooling induces vasoconstriction, decreases tissue metabolism, and suppresses the release of inflammatory mediators responsible for pain sensitization. Cold application also reduces peripheral nerve conduction velocity, thereby slowing the transmission of nociceptive impulses from peripheral tissues to the central nervous system. As a result, patients perceive less pain and experience greater comfort. Furthermore, cold therapy minimizes local edema and tissue swelling, which further contributes to pain relief at the puncture site.

The findings of this case study are consistent with the Gate Control Theory proposed by Melzack and Wall, which suggests that pain perception can be modulated before nociceptive signals reach the brain. Cold stimulation activates large-diameter A-beta sensory fibers that inhibit the transmission of pain impulses carried by smaller A-delta and C fibers within the dorsal horn of the spinal cord. This inhibitory mechanism effectively "closes the gate" to nociceptive transmission, thereby reducing the intensity of pain perceived by patients. The progressive decline in pain scores observed in both patients supports the application of this theoretical framework in clinical nursing practice.

The present findings are also consistent with previous evidence regarding the effectiveness of cold therapy following PCI. Pamuk (2024) reported that cold sand pack application significantly reduced post-procedural pain and vascular complications compared with conventional sandbags. Similarly, Kareem and Al-Kassar (2023) demonstrated that localized cold application after femoral sheath removal effectively reduced pain, bleeding, hematoma formation, and ecchymosis among patients undergoing coronary angiography and PCI. These studies support the use of localized cooling as a safe adjunctive intervention during the immediate postoperative period.

Comparable results have also been reported in Indonesian studies. Baidhowy et al. (2021) found that cold compress therapy significantly decreased pain intensity among patients after cardiac catheterization. Likewise, Wicaksono and Djamil (2020) reported that applying cold compresses to the vascular access site effectively reduced acute pain and improved

patient comfort. Kristiyan et al. (2020) further demonstrated that cold therapy accelerated pain reduction and promoted patient relaxation without causing adverse effects. The consistency between these previous findings and the present case study strengthens the evidence supporting cold compress therapy as an effective nursing intervention following PCI.

Although both patients experienced pain reduction, slight differences in recovery were observed. Patient 2 achieved complete pain relief by the second day, whereas Patient 1 continued to report mild residual pain. This variation may be associated with differences in individual pain perception, age, extent of coronary artery disease, tissue injury during catheterization, psychological factors, and physiological responses to inflammation. Pain is a subjective and multidimensional experience influenced not only by tissue damage but also by emotional state, anxiety, previous pain experiences, and coping mechanisms. Therefore, individual variability in treatment response should be expected despite receiving identical nursing interventions.

From a nursing perspective, cold compress therapy offers several clinical advantages. The intervention is inexpensive, easy to perform, non-invasive, and does not require sophisticated equipment. It can be incorporated into routine nursing care without increasing healthcare costs while reducing dependence on pharmacological analgesics and their associated adverse effects. During this case study, no complications related to cold application, including skin injury, excessive vasoconstriction, allergic reactions, or impaired circulation, were observed. These findings further support the safety and feasibility of implementing cold compress therapy in cardiovascular nursing practice.

This case study has several limitations. First, the study involved only two patients, limiting the generalizability of the findings to broader patient populations. Second, the observational nature of the case study precludes causal inference regarding the effectiveness of cold compress therapy. Third, pain perception is inherently subjective and may have been influenced by psychological factors, pharmacological analgesics, and individual pain tolerance. Future studies employing randomized controlled trials with larger sample sizes are

recommended to establish stronger evidence regarding the effectiveness of cold compress therapy in reducing post-PCI pain and preventing vascular complications.

CONCLUSION

This case study demonstrated that cold compress therapy was effective in reducing pain intensity among patients following Percutaneous Coronary Intervention (PCI). Both patients experienced a progressive decrease in pain after receiving cold compress therapy for 15–20 minutes over two consecutive days, with pain scores decreasing from 5 to 1 in Patient 1 and from 5 to 0 in Patient 2. In addition to pain reduction, both patients reported improved comfort without experiencing bleeding, hematoma, or other adverse effects at the vascular access site. These findings suggest that cold compress therapy is a safe, simple, low-cost, and evidence-based nursing intervention that can be integrated into routine post-PCI care to enhance pain management and improve patient comfort. Further studies with larger sample sizes are recommended to strengthen the evidence regarding its clinical effectiveness.

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