



COLD PACK APPLICATION REDUCING PAIN AND HEMATOMA AFTER PERCUTANEOUS CORONARY INTERVENTION PROCEDURES

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ABSTRACT

Percutaneous coronary intervention (PCI) is the standard reperfusion therapy in ST-Elevation Myocardial Infarction (STEMI) patients, but local complications such as pain and hematoma in the access area, especially femoral access, are still common. Non-pharmacological interventions in the form of cold packs are known to have benefits in reducing inflammation and reducing hematoma formation through local vasoconstriction mechanisms. This study aims to describe the application of cold packs in reducing pain and hematoma in posterior STEMI patients after PCI procedures. Method: This study used a single-case design on a 58-year-old female patient post-PCI through femoral access at Haji Adam Malik Hospital Medan. The cold pack intervention was wrapped in a towel or sterile gauze and applied for 15-20 minutes with the patient in a supine position. Pain assessment was performed using the Numeric Rating Scale (NRS), while hematoma was evaluated through diameter and skin discoloration. Monitoring was done before and after the intervention and for three days. There was a significant reduction in pain from NRS 5 to 1-2 and hematoma shrinkage from ± 5 cm to ± 2 cm without active bleeding or side effects. Cold pack is effective, safe, and easy to apply as a nursing intervention in reducing pain and hematoma post-PCI. Cold packs are recommended as a nonpharmacologic nursing intervention that can reduce pain and hematoma post-PCI.

Keywords: cold compress; hematoma; pain; percutaneous coronary intervention

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INTRODUCTION

Coronary heart disease (CHD) is a disruption of blood flow to the heart muscle due to narrowing or blockage of the coronary arteries, which leads to a reduced myocardial oxygen supply. CHD is still the number one cause of death in the world and accounts for more than 17.9 million deaths every year according to a World Health Organization (WHO, 2023) report. Among cases of acute coronary syndrome, ST-Elevation Myocardial Infarction (STEMI) is the most fatal form and requires immediate reperfusion. Globally, more than three million cases of STEMI occur each year, and the number of Percutaneous Coronary Intervention (PCI) procedures continues to increase as the primary reperfusion therapy (Herrera et al., 2025).

Advances in cardiovascular technology have made percutaneous coronary intervention (PCI) one of the main therapies to unblock coronary arteries, reduce ischemic symptoms, and lower mortality rates (Patel et al., 2020). Although PCI provides significant clinical benefits, the PCI procedure is inseparable from the risk of complications, especially vascular complications in local access such as pain and hematoma, particularly in femoral access. Trauma due to arterial cannulation leads to tissue inflammation, subcutaneous hemorrhage, and activation of local nociceptors. If left untreated, pain interferes with mobilization, decreases comfort, and prolongs the length of treatment. Research by Wajih-your-Rehman et al., (2011) shows that the incidence of major bleeding and vascular complications after PCI is in the range of 0.2% to 9.1%, while the incidence of hematoma can reach 10-15% of all PCI patients. Hematoma at the site of vascular access (e.g. femoral or radial access)

is also common, with a number of reports stating that the incidence of hematoma can reach around 10–15% of PCI patients (Sugiharto et al., 2025).

Research by Asy'ary et al., (2024) shows that certain non-pharmacological interventions, such as the use of cold compresses, are more effective in reducing the incidence of hematoma than sandbags that often cause discomfort and increase pain perception when used for a long time. A poorly treated hematoma is at risk of developing into massive bleeding or pseudoaneurysms, requiring follow-up medical intervention and prolonging the length of treatment.

Non-pharmacological interventions in the form of cold compress/cold pack/cryotherapy have been extensively studied in the context of cardiac catheterization and PCI post-catheterization treatment. Physiologically, cold packs work through vasoconstriction mechanisms, decreased local blood flow, decreased capillary permeability, and slowing down the transmission of pain impulses, thus potentially lowering pain and preventing the formation of hematoma (Cameron, 2017; Sugiharto et al., 2025). Cold pack application for 15-20 minutes is effective in reducing pain and preventing hematoma after removal of the femoral and radial sheath (Wicaksono et al., 2020; Sugiharto et al., 2025). Therefore, this study aims to describe the effectiveness of cold pack application in reducing pain intensity and hematoma formation at the vascular access site in post-PCI patients, particularly those undergoing femoral access. The findings are expected to support the use of cold packs as a safe and evidence-based nursing intervention in post-PCI care.

METHOD

The study employed a single-case design in a post-STEMI patient to describe the implementation of Evidence-Based Nursing (EBN) using cold pack intervention to reduce pain and hematoma following PCI procedures. Data analysis was performed using univariate descriptive analysis by comparing changes in pain intensity scores and hematoma characteristics before and after the intervention across sequential observation times.

The study was conducted in the Cardiac Care Room of Haji Adam Malik Hospital Medan. Data were collected through interviews with the patient and family, direct observation of the femoral access site, focused physical examinations, and review of medical records, laboratory results, PCI reports, and daily progress notes. Observations were carried out at 15 minutes, 4 hours, and 24 hours after the intervention and continued until the second day to monitor pain and hematoma progression.

Pain intensity was assessed using the Numeric Rating Scale (NRS), while hematoma was evaluated using an observation sheet documenting diameter, color, and extent of spread, supported by clinical photographic records. Cold packs at -15°C to -25°C were wrapped in a thin cloth and applied to the access site for 15–20 minutes per session, adjusted to patient tolerance. Parameters observed included pain intensity, hematoma size, skin condition, distal perfusion, and vital signs.

RESULT

A preliminary assessment was carried out on Mrs. A, a 65-year-old female patient who was treated after the PCI procedure through right femoral access. The patient had a medical diagnosis of three-vessel Coronary Artery Disease (CAD 3VD) post POBA in LCx with 42-hour onset posterior STEMI, Killip I, as well as left ventricular dysfunction, with the ejection fraction increasing from 42% to 47%. The patient's history of comorbidities was hypertension for approximately five years, without a history of diabetes mellitus. Initial laboratory examinations showed relatively stable hematological and coagulation conditions. Hemoglobin levels were recorded at 13.7 g/dL, hematocrit 41%, leukocyte count 11,870/ μL , and platelets 231,000/ μL . Coagulation parameters were within normal limits with INR values of 0.97 and APTT 23.7 seconds. Renal function showed urea of 18 mg/dL and creatinine of 0.92 mg/dL, while electrolyte examination showed sodium of 141 mmol/L, potassium of 3.9 mmol/L, and chloride of 106 mmol/L. Blood glucose was recorded

at 157 mg/dL, as well as cardiac markers showed a significant increase with Troponin I levels > 15 ng/mL. These findings describe the patient's stable systemic condition despite being undergoing antiplatelet and anticoagulant therapy.

About two hours after the femoral sheath was removed, Mrs. A complained of pain in the folding area of her right thigh. Pain is felt throbbing and increases when moving, with an NRS intensity of 5 out of 10. Local examination showed the presence of a bluish ±5 cm diameter hematomas, accompanied by mild swelling and positive compressive pain, with no signs of active bleeding. The vital signs at that time showed a stable hemodynamic condition, with a blood pressure of 150/90 mmHg, a pulse rate of 95 x/min, a respiratory rate of 18 x/min, and an oxygen saturation of 98%.

Based on the results of the study, a nursing diagnosis of acute pain and the risk of bleeding related to tissue trauma due to invasive procedures and femoral sheath removal was established. As part of the implementation of EBN, a non-pharmacological intervention was carried out in the form of cold pack application in the femoral access area. The cold pack is wrapped in a thin cloth and applied for 15-20 minutes with the patient in a supine position, accompanied by monitoring of skin condition, puncture area, and vital signs before and after the intervention.

During the three-day observation period, no advanced vascular complications were found, such as active bleeding, hematoma expansion, distal perfusion disorders, or hemodynamic instability. Patients appear more comfortable and are able to perform light mobilizations gradually without complaints of significant pain. A summary of the progression of pain intensity and changes in the size of the hematoma is presented in table 1.

Table 1.
Pain Intensity and Hematoma Monitoring

Date	Monitoring Day	NRS (Pre Intervention)	NRS (Post Cold Pack)	Hematoma Size (cm)	Clinical Conditions of Hematoma
25 November 2025	Day 1	5	3	± 5.0 cm	Bluish, compressive pain (+), no there active bleeding, hardening
26 November 2025	Day 2	3	2	± 2.5 cm	Color reduced bluishness, no Growing bigger, flaccid
27 November 2025	Day 3	2	1	± 2.0 cm	Yellowish color (phase resolution), no pressure pain, stable

Table 1. shows that cold pack intervention can reduce pain and hematoma in post-PCI patients with 3 days of monitoring.



Clinical evaluation shows a progressive patient response to the intervention. The intensity of the pain decreased on the first day, to NRS 3, while the size of the hematoma remained stable with no signs of enlargement. The pain decreased on the second day, namely to NRS 2, accompanied by a reduction in the size of the hematoma to ±2 cm and a reduction in bluish color. On the third day, patients reported minimal pain (NRS 1), compressive pain was no longer found, and the size of the hematoma decreased to ±2 cm with a yellowish discoloration indicating a resolution phase.

DISCUSSION

The results of this study show that acute pain in patients after femoral sheath removal is closely related to local tissue trauma, inflammatory response, and nociceptor stimulation due to invasive actions. After the application of cold packs for 15-20 minutes, there was a gradual decrease in pain intensity until it reached NRS 1 on the third day. This decrease in pain is in line with the physiological mechanisms of cold therapy that cause local vasoconstriction, a decrease in the speed of transmission of nerve impulses, and inhibition of inflammatory processes (Cameron, 2017). These results are consistent with the findings of Kurt et al., (2019) who reported that the application of cold packs to the catheterization access area significantly decreased pain intensity in post-PCI patients.

These findings are also strengthened by the research of Wicaksono et al., (2020) which showed that the use of cold compresses with ice gel significantly reduced pain intensity in post-PCI patients compared to the control group. The reduction in pain experienced by Mrs. A reflects a positive individual response to cold therapy and supports the use of cold packs as an effective nonpharmacological nursing intervention in the management of post-cardiovascular surgery.

The development of a hematoma in Mrs. A also showed progressive clinical improvement. At the beginning of observation, the hematoma was ± 5 cm in diameter with a bluish color and positive pressure pain. During the three days of monitoring, the size of the hematoma gradually shrunk to ± 2 cm, accompanied by a yellowish change that indicates a phase of physiological resolution. This condition suggests that cold pack application plays a role in lowering subcutaneous blood flow and capillary permeability, thereby preventing the expansion of the hematoma (Sugiharto et al., 2023). These results are in line with the research of Al-Bayati and Al-Kassar (2023) which proved that the application of cold compresses for 15-20 minutes after the release of the femoral sheath significantly reduced the incidence of hematoma in post-PCI patients.

Asy'ary et al., (2024) reported that cold compresses are more effective than sandbags in reducing the incidence of hematoma and improving patient comfort after PCI. These findings are relevant to Mrs. A's condition, which shows the stability of the hematoma with no signs of active bleeding during the observation period. The safety of the cold pack intervention was also an important concern in this case, considering that Mrs. A underwent post-PCI antiplatelet and anticoagulant therapy. The results of laboratory examinations showed relatively stable hematology and coagulation parameters, and no advanced vascular complications were found during treatment.

From a nursing perspective, the success of this intervention is determined not only by the physiological effects of cold therapy, but also by the holistic approach applied during treatment. Education about the purpose of cold pack applications, monitoring access areas, and signs of complications that need to be watched out for plays a role in increasing patient safety and comfort (Ciraci & Rizalar, 2023). In Mrs. A, the decrease in pain was followed by an increase in mild mobilization ability and reduced anxiety, which indirectly supported the post-transplant recovery process. This is in line with the EBN concept that integrates scientific evidence, the clinical expertise of nurses, and the needs and comfort of patients.

CONCLUSION

These results show that the application of cold packs has a positive clinical impact in reducing pain intensity and stabilizing hematoma after the PCI procedure.

REFERENCES

Al-Bayati, H. M., & Al-Kassar, R. A. H. (2023). Effect of Direct Cold Compress for Femoral Arterial Sheath Removal on Reduction of Local Vascular Complications in Patients after Percutaneous Coronary Intervention: A Randomized Controlled Trial. *Kufa Journal for Nursing Sciences*, 13(2). <https://doi.org/10.36321/kjns.vi20232.12477>

- Asy'ary, Q., Wihastuti, T. A., Dewi, D., & Lestari Ismail, S. (2024). Comparison of Sand Pillows and Cold Compresses in Reducing The Incidence of Hematoma in Post Percutaneous Coronary Intervention (PCI) Patients: A Scoping Review. *Journal of Health Sciences*, 5(5), 299–306. <https://doi.org/10.46799/JHS.V5I5.1266>
- Cameron, M. H. (2017). *Physical Agents in Rehabilitation - E Book: Physical Agents in Rehabilitation - E Book*. Saunders. <https://books.google.co.id/books?id=5nc2DwAAQBAJ>
- Çıracı, B., & Rızalar, S. (2023). Patient comfort in percutaneous coronary interventions. *Saudi Medical Journal*, 44(5), 471.
- Herrera, C. J., Levenson, B. J., Natcheva, A., Lucca, A. C., Olsson, K., Miki, K., Fong, A., Jollis, J. G., McCormick, A., & Wilson, B. H. (2025). Improving STEMI Management Internationally: Initial Report of the American College of Cardiology-Global Heart Attack Treatment Initiative. *JACC: Advances*, 4(1). <https://doi.org/10.1016/j.jacadv.2024.101438>
- Kurt, Y., sciences, M. K.-I. *journal of nursing*, & 2019, undefined. (n.d.). The effect of the application of cold on hematoma, ecchymosis, and pain at the catheter site in patients undergoing percutaneous coronary intervention. ElsevierY Kurt, M KaşıkçıInternational Journal of Nursing Sciences, 2019. Elsevier. Retrieved May 8, 2025, from <https://www.sciencedirect.com/science/article/pii/S2352013219301607>
- Patel, D. B., Shah, R., & Jovin, I. S. (2020). Improving outcomes of percutaneous coronary interventions in patients with stable ischemic heart disease. *Journal of Thoracic Disease*, 12(4), 1740–1749. <https://doi.org/10.21037/JTD.2019.11.17>
- Sugiharto, F., Trisyani, Y., Nuraeni, A., Mirwanti, R., Melati Putri, A., & Aghnia Armansyah, N. (2023). Factors associated with increased length of stay in post primary percutaneous coronary intervention patients: a scoping review. *Vascular Health and Risk Management*, 329-340. doi: 10.2147/VHRM.S413899
- Wajih-Ur-Rehman, Hameed, S., & Naveed, T. (2011). Bleeding in patients undergoing percutaneous coronary intervention (PCI). *Pakistan Journal of Medical Sciences*, 27(5), 958–962. <https://doi.org/10.1161/CIRCINTERVENTIONS.108.846741;CTYPE:STRING:JOURNAL>
- WHO. (2023). Cardiovascular diseases (CVDs). [https://www.who.int/news room/fact- sheets/detail/ cardiovascular-diseases-\(cvds\)](https://www.who.int/news room/fact- sheets/detail/ cardiovascular-diseases-(cvds))
- Wicaksono, G., Ta'adi, T., & Djamil, M. (2020). Effectiveness of Cold Compress with Ice Gel on Pain Intensity among Patients with Post Percutaneous Coronary Intervention (PCI). *International Journal of Nursing and Health Services (IJNHS)*, 3(6), 680–686. <https://doi.org/10.35654/IJNHS.V3I6.366>.

