



## **Effectiveness of Cold Compress with Ice Gel on Pain Intensity among Patients with Post Percutaneous Coronary Intervention (PCI)**

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**Abstract.** Coronary heart disease is caused by narrowing the coronary arteries due to atherosclerosis or spasms, or a combination of both. A non-surgical intervention to reopen narrowed coronary arteries by Percutaneous Coronary Intervention (PCI) and pain is one of the common symptoms. Interventions were carried out to reduce pain by using cold compresses with ice gel. This study aimed to examine the effect of cold compress with ice gel on pain intensity among patients with aff femoral sheath post-Percutaneous Coronary Intervention (PCI). True experimental approach post-test only with control group design was applied in this study. Independent t-test showed a significant difference p-value 0.000 ( $<0.05$ ) that the pain intensity of the intervention group decreased from 4.53 to 2.40 ( $p=0.000$ ) with a mean delta value of -2.13. The mean pain intensity control group also reduced from 4.40 to 4.27 ( $p=0.334$ ) with a mean delta value of -0.13. Conclusion cold compresses with ice gel effectively reduce pain intensity in aff femoral sheath patients with post percutaneous coronary intervention (PCI). Cold compress (ice gel) is a nurse's independent action to reduce the pain intensity scale and increase comfort during the treatment phase but still requires collaboration with doctors to provide analgesics.

**Keywords:** Cold Compress, Ice Gel, Pain Intensity, Aff Femoral Sheath, Percutaneous Coronary Intervention (PCI).



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## INTRODUCTION

Coronary heart disease is a disease caused by narrowing of the coronary arteries due to atherosclerosis or spasm or a combination of both. Coronary heart disease is a severe threat to society because it is one condition with high mortality and morbidity globally, including Indonesia

(1). World Health Organization (WHO) in 2016 showed coronary heart disease is the leading cause of death worldwide. About 17.5 million deaths due to cardiovascular disease in the world are caused by coronary heart disease. Given that coronary heart disease is one of the risk factors for cardiac arrest. In Indonesia, heart and blood vessel disease increases and will burden illness, disability, and socioeconomic burdens to the sufferer's family, society, and the country. The prevalence of coronary heart disease in Indonesia in 2018 based on a doctor's diagnosis or symptoms is around 1.5%(2). Basic Health Research data in 2018 shows that in Indonesia, the prevalence of coronary heart disease is 1.5%, and in Central Java, it is 1.9% (Basic Health Research, 2018). In Central Java Province, based on reports from Hospitals and Public Health Center in 2018, coronary heart disease cases were 26.38 per population per 1.000 (2).

Plaque detection atherosclerotic by coronary angiography is the "gold standard" in coronary heart disease (3). This procedure is a standard examination to diagnose coronary heart disease and abnormalities and is also used as the primary method for viewing coronary artery anatomy. Coronary angiography is a diagnostic, while procedure percutaneous coronary intervention (PCI) is a non-surgical intervention to reopen coronary arteries. This is narrowed or blocked by inserting a balloon or stent through catheters inserted into the artery's lumen through a small incision in the skin. This procedure reduces coronary artery disease symptoms such as chest pain, shortness of breath, and heart failure. Percutaneous Coronary Intervention (PCI) can prevent myocardial infarction and reduce mortality. Cardiac catheterization has the highest speed rate (96-99%) to detect abnormalities in the heart blood vessels, especially coronary heart disease(4).

According to The Pennsylvania Patient Safety Reporting System (PA-PSRS) Patient Safety Advisory, Percutaneous Coronary Intervention (PCI) actions can cause various complications, including blood vessel access to catheters, arrhythmias, transient ischemic attacks, impaired kidney function, infections, and complications minor. Complications with catheter access to blood vessels include bleeding, hematoma, hemorrhage retroperitoneal, and pseudoaneurysm. PA-PSRS Patient Safety Advisory explained the blood vessel complications among cardiac catheterization were associated with anticoagulant therapy and vascular closure devices. A common complication in patients after removing the femoral sheath post-Percutaneous Coronary Intervention (PCI) is painless (5).

Another complication that is often felt by patients after removal post PCI femoral sheath is pain. Pain caused by the procedure to remove the femoral sheath from the femoral access to the femoral artery. Problem is an unpleasant sensory and emotional experience due to actual or potential tissue damage. The use of ice gel in cold temperatures to treat injury or tissue damage affects the surface of body tissues, such as pain reduction, muscle relaxation, changes in blood vessels, and the effect on connective tissue. In cold temperatures, the nerve pain sensation is inhibited by reducing the speed of the impulses that are conducted by the nerve fibers. Cold temperatures also cause vasoconstriction of arteries and veins to stimulate the smooth muscles in the blood vessels' lining. Vasoconstriction causes decreased bleeding and swelling of the injured tissue (6).

The application of cold compresses can increase the release of endorphins, which block the transmission of pain stimuli and stimulate the large diameter A-beta nerve fibers, thus reducing pain implants' transmission through the small A-delta and C nerve fibers (7). In Gate Control theory, cold compress pain acts on taste receptors. pain to dull the perception of

other mechanical and chemical stimuli, including pain, close the pain control gates to the different central nervous system (8).

Regarding the incidence of pain intensity, post-cardiac catheterization is administered to reduce pain intensity through manual and/or mechanical compression (9). Manual reduction is performed by pressing the femoral artery for 20 minutes or more to control bleeding until coagulation occurs and is one of the standard measures after removing the sheath (10). Mechanical compression is also useful in achieving the femoral artery's hemostasis after cardiac catheterization (10-12). Mechanical pressing requires a tool such as a sand pillow or ice gel.

A study on the use of sand pillows was conducted by Yilmaz, Gurgun, and Dramali in 2007 on patients undergoing invasive cardiac procedures by evaluating sand pillows and changes in the patient's position on the incidence of vascular complications and back pain. This study indicates that sand pillows are not effective in reducing the incidence of vascular complications. There is no significant difference in the incidence of vascular complications in the group using sand pillows and the group that does not use sand pillows (13). Sand pillows also increase patient discomfort. Mechanical pressure using a sand pillow is a Standard Operating Procedure (SOP) in caring for post-cardiac catheterization patients at Kardinah Hospital, Tegal City.

Another study explained the differences between sand pillows and cold packs for preventing post-cardiac catheterization complications. The differences in the incidence of vascular local and femoral neuropathy complications on mechanical compression using cold packs for 20 minutes with mechanical pressure using two sand pillows 5 kg for 1 hour. The results showed no significant difference in the group using sand pillows or cold packs on the incidence of complications vascular local and femoral neuropathy. After removing the femoral sheath in post-cardiac catheterization patients (P-value = 0.196), the cold packs patient felt more comfortable with (14).

Nurses must answer this phenomenon by conducting scientific studies. One of them is this study to determine the effectiveness of cold compresses with ice gel on patients' pain intensity.

## **OBJECTIVE**

This study aimed to examine the effect of cold compress with ice gel on pain intensity among patients with aff femoral sheath post-Percutaneous Coronary Intervention (PCI).

## **METHODS**

This study uses true experimental research with approach randomized post-test only with control group design. Researchers compiled two groups, namely, the intervention group given cold compress therapy with ice gel, and the control group was assigned compress therapy with a sand pillow. The cold compress therapy with ice gel and sand pillow compresses was done by pressing it for 20 minutes.

Pain measurement using the instrument Numeric Pain Rating Scale (NPRS) with a scale of 0-10. Numeric Rating Scale (NRS) scale that is 0 = no pain, 1-3 = mild pain, 6-7 = moderate pain, 8-9 = severe pain controlled and 10 = severe uncontrolled pain. The respondent's pain measurement was carried out after 4 hours of action post-Percutaneous Coronary Intervention (PCI) is a post-test.

Population in this study were all patient post PCI (Percutaneous coronary intervention) who still attached had a femoral sheath and were undergoing treatment in the Preoperative in Room (RPO) of the *Kardinah* Hospital, *Tegal* City. Determination of the minimum sample size using technique probability sampling with method simple random sampling and based on

inclusion and exclusion criteria as many as 30 respondents divided into two groups with 15 respondents each in the intervention group (cold compress therapy with ice gel) and 15 respondents in the control group (sand pillow compress therapy).

In this study, researchers collected data using observation, identification, interview, and filling out observation sheets. The collected data were analyzed through the IBM SPSS version 24.0 program and continued with different parametric and non-parametric (Paired t-test, Independent t-test, and Mann Withney). The processed data is used to discuss the problem statement, which is then presented in tabular form to conclude.

## RESULTS

### Characteristic of respondents

Table 1 described the Frequency of respondents from gender and mean age and body mass index (BMI). The findings showed that most of respondents among the intervention group (93.3%) and control group (86.7%) were male. More than half of respondents both the intervention group was 55.07 and control group 57.4. Regarding the BMI level, in the experimental group was 24.74 and the control group was 23.65

Table 1 Frequency of respondents from gender and mean age and body mass index (BMI)

Characteristics	Intervention (n=15)		Control (n=15)		P
	N	%	N	%	
<b>Gender</b>					0.237*
Male	14	93.3	13	86.7	
Female	1	6.7	2	13.3	
<b>Total</b>	15	100	15	100	
	Mean ± SD		Mean ± SD		
<b>Age</b>	55.07± 4.574		57.40±9.077		0.154*
<b>BMI</b>	24.7438±1.81676		23.6511±1.00632		0.077*

\*Homogeneity Test

### Mean difference of pain before and after treatment among the intervention group and control group

Table 2 showed mean difference of pain reduction before and after receiving the treatment. The results found that the mean of pain among intervention group before receiving the treatment was 4.53±0.915 and after receiving the treatment was 2.40 ±0.986 with a p-value <0.05. Otherwise, patients in the control group showed the mean was 4.40±0.828 and the control group was there was 4.27±1.033

Table 2. mean difference of pain before and after treatment among the intervention group and control group

Group	Pretest Mean ± SD	Post-test Mean ± SD	P- value
Intervention	4.53±0.915	2.40 ±0.986	0.000*
Control	4.40±0.828	4.27±1.033	0.334*

\*Paired t-test

Table 4.3 Analysis of the differences in mean pain between the intervention group and the control group

Variable	Intervention Group	Control Group	Mean Difference	t	P-value
	Mean ± SD	Mean ± SD			
Pain scale	2.40±0.986	4.27±1.033	-1.867	-5.064	0.000*
Delta pain scale	2.13±0.743	0.13±0.516	-	-	0.000* *

\*Independent t-test

\*\*Mann Withney test

Based on the table above shows that there is a significant difference in pain reduction between the intervention group and the control group with a p-value of 0.000 (<0.05) and a mean difference p-value of 0.000 (<0.05), the conclusion is that the intervention group is better at reducing pain than the control group.

## DISCUSSION

The statistical analysis results with the Paired t-test show significant effectiveness between cold compresses with ice gel for 20 minutes on pain intensity in patients before and after aff femoral sheath post PCI compared to the control group using a sand pillow. This can be seen in the mean value (mean) pain scale in the control group from 4.40 to 4.27 and the mean value (mean) pain scale in the intervention group than 4.53 becomes 2.40 with a mean value of delta pain scale relief was 2.13 for the intervention group and 0.13 for the control group and the p-value = 0.000 (<0.05). From these results, it can be concluded that there is a significant (significant) effectiveness between cold compresses ice gel on pain intensity in patients after aff femoral sheath post-Percutaneous Coronary Intervention (PCI).

In this study, both intervention and control groups experienced pain. The pain after aff femoral sheath in the intervention group was lower than the control group, with a mean value of 2.40 (mild pain), while the mean problem in the control group was 4.27 (moderate pain). Pain experienced by the intervention group decreased more than the control group, where the delta value obtained in the intervention group (2.13) while the control group (0.13) proved to be p-value (= 0.000). This means a significant difference between the reduction in pain in the intervention group and the control group.

Related research on the effectiveness of cold compresses on reducing pain intensity by Novita (2010) the results of cold compresses performed on fracture patients for 5 - 15 minutes can reduce pain intensity more effectively than the control group with a value (p = 0.000).

This study is supported by the results of this study conducted by Fauzi & Hendayani (2013) regarding the effect of cold compresses on pain levels in invasive infusion procedures with an average pain level of children in the control group 6.4, including moderate pain. The mean pain level in the treatment or intervention group was 2.7, including mild pain. The difference in the average pain level in the treatment group and the control group was 3.7. The Independent t-test was obtained with a p-value of 0.000, indicating an effect of cold compresses on pain levels in invasive infusion procedures (15).

Another study was conducted by Derya (2017) on the effects of cold application to the perineum on pain relief after vaginal birth. In the experimental group, the first visual analog scale score was 6.73±1.68; after applying a cold compress, the pain level decreased to 2.59±1.20, and the difference was statistically significant (p <0.001) (16). In accordance with Wnorowsky (2011) statement, cold applications given in dealing with pain influence the surface of body tissues, such as pain reduction, muscle relaxation, changes in blood vessels, and an impact on connective tissue (17).

Research Curuk (2017) related to the effect of ice bag application to the femoral region on pain in patients undergoing percutaneous coronary intervention. The results showed that the difference in pain between the intervention group who received cold compresses had a higher pain reduction than the control group proved to value ( $p = 0.000$ ) (18).

The results of this study confirm that cold compresses with ice gel are one of the nursing or non-pharmacological actions that can be done in the management of pain aff femoral sheath post-*Percutaneous Coronary Intervention* (PCI).

The study was consistent with the previous study explained that cold compresses have a positive physiological aspect, including vasoconstriction, lowering capillary permeability. Besides that, it also affects lowering cellular metabolism, relaxing muscles, slowing bacterial growth, reducing inflammation, relieving pain by numbing the area, slowing down the flow of pain impulses, and increasing the pain threshold and local anesthetic effect (19).

Following the opinion of Bayindir (2017), which states that pain in patients undergoing aff femoral sheath post, *Percutaneous Coronary Intervention* (PCI) can increase the incidence of vasovagal or other vascular complications so that the patient's pain must be addressed immediately. Unresolved vasovagal reactions will lead to irreversible shock and, ultimately, death. Pain can also cause anxiety in patients to prolong patient care and healing, which will increase the cost of treating patients in the hospital (18).

Cold compress (ice gel) is a nurse's independent action to reduce the pain intensity scale and increase comfort during the treatment phase but still requires collaboration with doctors to provide analgesics. Ice gel can also be used in patients with kidney failure undergoing hemodialysis because the insertion is the same for coronary heart patients undergoing percutaneous coronary intervention (PCI), namely through the femoral artery.

## CONCLUSION

In conclusion explained that the mean reduction of pain in the intervention group with a difference -2.13 more than the mean reduction of pain in the control group -0.13 with a p-value of 0.000 ( $<0.05$ ). In conclusion, complementary therapy with cold compresses with ice gel effectively reduces pain, so the intervention group is better than the control group.

Cold compress intervention with ice gel for patients after femoral sheath surgery needs gradual evaluation so that complications do not occur due to cold compresses (hypothermia, frostbite). Subsequent research on cold compresses (ice gel) in patients with angiography and diagnostic interventions with more than one puncture insertion can risk bleeding and hematoma.

## REFERENCES

- (1) Harselia S. Tindakan Percutaneous Coronary Intervention Pada Pasien Stenosis Arteri Koroner Kanan. *Arkavi [Arsip Kardiovaskular Indonesia]*. 2018;3(1):186-91.
- (2) Kementrian Kesehatan Republik Indonesia. Hasil Utama Riskesdas 2018. Jakarta [Id]: Balitbangkes Kementerian Kesehatan. 2018.
- (3) Grossman W. *Grossman's Cardiac Catheterization, Angiography, And Intervention*: Lippincott Williams & Wilkins; 2006.
- (4) Osborn Ks, Wraa Ce, Watson As, Holleran Rs. *Medical-Surgical Nursing*: Pearson Higher Ed; 2013.
- (5) Kristiyan A, Purnomo Hd, Ropyanto Cb. Pengaruh Kompres Dingin Dalam Penurunan Nyeri Pasien Post Percutaneous Coronary Intervention (Pci): Literature Review. *Holistic Nursing And Health Science*. 2019;2(1):16-21.

- (6) Wnorowski D. Heat And Cold Therapy. 2002.
- (7) Tamsuri A. Konsep Dan Penatalaksanaan Nyeri. Jakarta: EGC. 2007:1-63.
- (8) Algaflly Aa, George Kp. The Effect Of Cryotherapy On Nerve Conduction Velocity, Pain Threshold And Pain Tolerance. *British Journal Of Sports Medicine*. 2007;41(6):365-9.
- (9) Chair Sy, Fernandez R, Lui Mhl, Lopez V, Thompson Dr. The Clinical Effectiveness Of Length Of Bed Rest For Patients Recovering From Trans- Femoral Diagnostic Cardiac Catheterisation. *International Journal Of Evidence- Based Healthcare*. 2008;6(4):352-90.
- (10) Advisory P-Pps. Strategies To Minimize Vascular Complications Following A Cardiac Catheterization. *Pa Psrs Patient Saf Advis*. 2007;4(2):58-63.
- (11) Simon A, Bumgarner B, Clark K, Israel S. Manual Versus Mechanical Compression For Femoral Artery Hemostasis After Cardiac Catheterization. *American Journal Of Critical Care*. 1998;7(4):308.
- (12) Jones T, Mccutcheon H. Effectiveness Of Mechanical Compression Devices In Attaining Hemostasis After Femoral Sheath Removal. *American Journal Of Critical Care*. 2002;11(2):155-62.
- (13) Yilmaz E, Gurgun C, Dramali A. Minimizing Short-Term Complications In Patients Who Have Undergone Cardiac Invasive Procedure: A Randomized Controlled Trial Involving Position Change And Sandbag/Kardiyak Invazif Girişim Yapılan Hastalarda Kısa Donem Komplikasyonları Azaltma: Kum Torbasi Ve Pozisyon Degisikligini İceren Randomize Kontrollu Bir Calisma. *The Anatolian Journal Of Cardiology (Anadolu Kardiyoloji Dergisi)*. 2007;7(4):390-7.
- (14) Manik MJ. Perbedaan Bantal Pasir Dan Cold-Pack Dalam Mencegah Komplikasi Pasca Kateterisasi Jantung. *Jurnal Keperawatan Soedirman*. 2015;10(2):105-13.
- (15) Fauzi H, Hendayani N. Pengaruh Kompres Dingin Terhadap Tingkat Nyeri Pada Prosedur Invasif Pemasangan Infuse Anak Usia Sekolah. *Diperoleh Pada Tanggal*; 2013.
- (16) Senol DK, Aslan E. The Effects Of Cold Application To The Perineum On Pain Relief After Vaginal Birth. *Asian Nursing Research*. 2017;11(4):276-82.
- (17) Wnorowski D. Heat And Cold Therapy. *Runner Foot And Ankle Problems*. 2006.
- (18) Bayındır SK, Çürük GN, Oguzhan A. Effect Of Ice Bag Application To Femoral Region On Pain In Patients Undergoing Percutaneous Coronary Intervention. *Pain Research, And Management*. 2017;2017.
- (19) Kozier E, Erb G. *Fundamental Of Nursing: Concept And Practice*. California: Addison-Wesley; 2013.