The Effectiveness of Using Ice Cold Packs and Slow Deep Breathing on Pain During Puncture in Patients with *Arterivenosus Fistula* (Cimino)

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Abstract.

Pain during arteriovenous fistula (Cimino) puncture in chronic kidney failure patients undergoing regular hemodialysis can cause discomfort, anxiety, depression, and low self-esteem. This study aims to determine the effectiveness of using ice cold pack therapy and slow deep breathing on pain during puncture in patients with arteriovenous fistula (Cimino). The research design used was a quasi-experimental research design with two groups pre-post test conducted at Efarina Etaham Berastagi Hospital. One group was given experimental treatment, namely ice cold pack therapy and slow deep breathing, while the other group as the control group was only given slow deep breathing treatment. Data analysis was carried out to see the relationship between the independent and dependent variables using the independent samples t-test at a significance level of α = 0.05. The independent samples t-test results obtained a p value> 0.05, namely 0.104, meaning that statistically there was no significant difference in the average pain scale between patients given ice cold pack therapy and slow deep breathing with patients only given slow deep breathing. Nurses are advised to continue to carry out slow deep breathing therapy and ice cold packs to overcome pain during puncture in patients with arteriovenous fistula (Cimino).

Keywords: *Pain management; ice cold pack and slow deep breathing.*

I. INTRODUCTION

The number of patients with chronic kidney failure is increasing year by year. According to data from the Indonesian Nephrology Association (Pernefri), in 2023, the cumulative number of patients undergoing dialysis reached 60,526, with a total prevalence of 127,900. Meanwhile, according to BPJS Kesehatan data, in 2024, there were 134,057 patients with chronic kidney failure undergoing hemodialysis. The Indonesian Renal Registry (IRR) recorded 1,526,022 implants in patients in 2023, and this number is likely to increase as the number of kidney patients in Indonesia continues to grow.*Arterial venous fistula*(Cimino) is one of three vascular accesses used for patients with chronic kidney disease (CKD) who require renal replacement therapy (RRT) through hemodialysis. Cimino is the gold standard for creating vascular access for hemodialysis in patients with chronic kidney disease. Cimino was designed to improve the effectiveness of dialysis and reduce the risks and complications that can occur with other vascular accesses.(1)The Cimino valve causes higher pressure to flow through the connected veins, causing a "thrill" during auscultation of the Cimino area. The enlarged veins allow for easier needle puncture access.(2) Vascular access through the cimino is achieved through a needle puncture procedure, which can be painful for the patient. Pain is an uncomfortable sensation and emotional experience caused by tissue damage.(3)Pain during hemodialysis procedures using Cimino access can cause discomfort, anxiety, depression, and low self-esteem.(2) Previous research has shown the effectiveness of various non-pharmacological therapies in reducing various pain responses caused by patients' illnesses.

One example is slow deep breathing therapy to relieve pain after double-lumen catheter insertion.(4)and pain from the stabbing of the cimino,(5)music therapy in overcoming cimino puncture pain,(6)Yoga therapy in overcoming physical complaints in pregnant women in the third trimester.(7)Another non-pharmacological therapy is ice cold pack therapy to overcome pain during blood

sampling in school children.(8)perineal pain in postpartum mothers,(9)as well as in preventing hematoma and reducing pain in post-cardiac catheterization patients.(3)Ice and cold pack therapy is a simple method that can be used to naturally reduce pain by applying a cold compress to the wound. This is a natural and simple alternative that quickly reduces pain, in addition to using medication. Cold therapy produces an analgesic effect by slowing the speed of nerve conduction, thus reducing the number of pain impulses reaching the brain.(10) Slow deep breathing (SDB) therapy can inhibit vasoconstriction of blood vessels through baroreceptor stimulation, resulting in a decrease in heart rate, stroke volume, and cardiac output, which results in a decrease in blood pressure.(5)Breathing exercises physiologically activate the sympathetic nervous system to maximize muscle relaxation. This relaxation approach using SDB is easy to use, easy to learn, safe, and economical. SDB therapy can be performed briefly before, during, and after treatment, and at home. SDB therapy can also improve pulmonary ventilation and increase blood oxygenation.(3)SDB therapy is a natural method that can be used to treat acute pain in patients undergoing hemodialysis therapy.

II. METHODS

This study aims to see the effectiveness of the use of ice cold pack therapy and slow deep breathing on pain during puncture in patients with arteriovenous fistula (cimino) installed. The study design used was a quasi-experiment with a two-group pre-post test design. This study design involved two groups of subjects where the intervention group was given ice cold pack therapy for 5 minutes and slow deep breathing just before the cimino puncture, while the control group was given slow deep breathing therapy just before the cimino puncture. The population of this study was all patients undergoing regular hemodialysis at Efarina Etaham Berastagi Hospital, totaling 54 people, while the sample was determined using a purposive sampling method. The sample inclusion criteria used were cimino installed and undergoing regular hemodialysis, compos mentis awareness, stable general condition, and able to communicate. The sample in this study was determined using the Slovin calculation and obtained a total of 46 people, where 24 people in the control group, while 22 people in the intervention group.The instruments used in this study were numeric pain scale measurement indicators and demographic data questionnaires.

The study was conducted after being free of ethical issues with the results of the ethical test from the Medan Polytechnic Research Ethics Commission with No. 01.26.2491 / Kepk / Poltekkes Kemenkes Medan 2025. Data analysis was performed using univariate and bivariate analysis. Univariate analysis was conducted descriptively to determine the frequency and distribution of each dependent and independent variable. Bivariate analysis was conducted to determine the effectiveness of the use of ice cold packs and slow deep breathing in overcoming pain during puncture in patients with arteriovenous fistula (cimino). Before conducting the bivariate test, the Shapiro-Wilk normality test was first performed.The results of the Shapiro-Wilk normality test obtained a sig value = 0.016 < 0.05 in the intervention group and sig = 0.026 < 0.05 in the control group so it can be concluded that the data in both the intervention group and the control group were not normally distributed. So the bivariate analysis of the data in this study was carried out using the non-parametric Mann-Whitney Test. The hypothesis of this study is: if the p value > 0.05, then H0 is accepted meaning there is no effectiveness of the use of ice cold packs and slow deep breathing on pain during puncture in patients with arteriovenous fistula (Cimino), whereas if the p value < 0.05, then H0 is rejected meaning there is effectiveness of the use of ice cold packs and slow deep breathing on pain during puncture in patients with arteriovenous fistula (Cimino).

III. RESULT AND DISCUSSION

Description of Respondent Characteristics Frequency

This study found that of the 46 respondents, the majority were male (57%), pre-elderly (30%), Karo Batak (72%), hypertension (72%), duration of regular hemodialysis >1 year (63%), undergoing hemodialysis for 5 hours each time (87%), and being accompanied during hemodialysis (52.2%). The data can be seen in Table 1 below.

Table 1. Frequency Distribution of Respondent Characteristics

Variables	Intervention Group (n=22)		Control Group (n=24)	
	Σ	%	Σ	%
Gender				
Man	14	63.6	11	45.8
Woman	8	36.4	13	54.2
Age				
Early Adulthood	8	36.4	4	16.7
Late Adulthood	5	22.7	7	29.2
Pre-Elderly	5	22.7	9	37.5
Elderly	4	18.2	4	16.7
Ethnic group				
Karo Batak	15	68.2	18	75
Simalungun Batak	1	4.5	-	-
Toba Batak	5	22.7	4	16.6
Java	1	4.5	-	-
Minang	-	-	1	4.2
Nias	-	-	1	4.2
Etiology of HD				
Hypertension	16	72.7	17	70.8
Diabetes mellitus	2	9.1	6	25
And others	4	18.2	1	4.2
Length of time undergoing HD				
< 1 year	5	22.7	12	50
>1 year	17	77.3	12	50
HD Duration				
5 hours	18	81.8	22	91.7
< 5 hours	4	18.2	2	8.3
Accompanied During HD				
Accompanied	8	36.4	16	66.7
Independent	14	63.6	8	33.3

Pre- and Post-Intervention Pain During Puncture in Patients with Arterial Venous Fistula (Cimino)

The pain scale before and after ice cold pack therapy and slow deep breathing during puncture in patients with arteriovenous fistula (cimino) in both the intervention and control groups can be seen in table 2 below.

Table 2. Frequency Distribution of Respondents Based on Pre and Post Intervention Pain Scales

Variables	Intervention Group (n=22)		Control Group (n=24)	
	Σ	%	Σ	%
Pre-pain				
Mild pain	6	27.3	6	25
Moderate pain	12	54.5	17	70.8
Severe pain	4	18.2	1	4.2
Post Pain				
Mild pain	17	77.3	13	54.2
Moderate pain	4	18.2	11	45.8
Severe pain	1	4.5	-	-

The pain scale in the intervention group before therapy was found to be mostly in the moderate pain range (54.5%), while after ice cold pack therapy and slow deep breathing, it was found that most were in the mild pain range (77.3%). The pain scale in the control group before ice cold pack therapy and slow deep breathing was mostly in the moderate pain scale (70.8%), while after slow deep breathing therapy, it was found that most were in the mild pain scale (54.2%).

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Table 3. Distribution of Average Post-Intervention Pain Scale During Puncture in Patients with Arteriovenous Fistula (Cimino)

Intervention	Mean	Elementary School	P Value
Ice Cold Pack + Slow Deep Breathing	2.82	1,593	0.060
Slow Deep Breathing	3.50	1,180	

Based on the table, it is known that the average pain scale in patients given ice cold pack therapy and slow deep breathing is slightly lower, namely 2.82 with a variation of 1.593, compared to patients who were only given slow deep breathing therapy, which is an average of 3.50 with a variation of 1.180. The results of the Maan-Whitney Test obtained a p value = 0.060 (p> 0.05), meaning that statistically there is no significant difference in the average pain scale between patients given ice cold pack therapy and slow deep breathing with patients who were only given slow deep breathing. Each group was tested with a Wilcoxon Signed Rank Test to see the effect of each intervention, and obtained a p value = 0.000 in the intervention group and a p value = 0.000 in the control group, meaning that both the administration of a combination of ice cold packs and slow deep breathing and the administration of single slow deep breathing therapy are effective in reducing the pain scale of puncture in patients with arteriovenous fistula (cimino).

Discussion

The results of pain scale measurements in this studyBefore the ice cold pack therapy and slow deep breathing were carried out, 6 people (27.3%) suffered from mild pain, 12 people (54.5%) suffered from moderate pain and 4 people (18.2%) suffered from severe pain in the intervention group; 6 people (25%) suffered from mild pain, 17 people (70.8%) suffered from moderate pain and 1 person (4.2%) suffered from severe pain in the control group. Meanwhile,pain scale measurement results afterThe use of ice cold packs and slow deep breathing resulted in 17 people (77.3%) suffering from mild pain, 4 people (18.2%) suffering from moderate pain and 1 person (4.5%) suffering from severe pain in the intervention group; 13 people (54.2%) suffering from mild pain, 11 people (45.8%) experiencing moderate pain and no one experiencing severe pain (0%) in the control group. This shows a difference in the pain scale in respondents both before and after the intervention.The level of pain sensation varies from person to person and is influenced by various factors. The characteristics of the 46 respondents in this study were:The majority were male (57%), pre-elderly (30%), Karo Batak (72%), hypertension (72%), duration of regular hemodialysis was >1 year (63%), hemodialysis was for 5 hours each time (87%), and being accompanied during hemodialysis (52.2%). This is in line with the results of Sari's (2023) study which found that factors significantly related to pain levels were age, gender, coping style, family support, anxiety, and fatigue.(11) This study administered ice cold pack therapy to respondents for 5 minutes and slow deep breathing immediately before performing a Cimino puncture.

The results of pain scale measurements before and after the intervention were carried out using a numeric pain scale, the results of which were recorded on a numeric pain scale assessment sheet for each respondent both before and after the intervention. After the administration of ice cold pack therapy and slow deep breathing, the intervention group experienced a decrease in pain scale. The number of respondents experiencing mild pain increased to 17 people (77.3%) from previously.6 people (27.3%),moderate pain 4 people (18.3%) from before12 people (54.5%)and severe pain decreased to 1 person (4.5%) from before4 people (18.2%). This result is in line with the research resultsconducted by Khusna, et al.(5)who conducted research using the case report method on the use of combination therapy of cryotherapy and slow deep breathing for pain during Cimino puncture, that before the intervention, the pain scale of both respondents was moderate pain (scale 6), whereas after the intervention the pain scale decreased to mild pain (scale 2). It is thought that giving ice cold pack therapy will have an analgesic effect by slowing down the speed of nerve conduction so that fewer pain impulses reach the brain.Reduces prostaglandins, which increase the sensitivity of pain receptors and other subcutaneous tissues at the site of injury by inhibiting the inflammatory process. Ice cold pack therapy aims to minimize pain by producing physiological effects.. Another mechanism at work is that the perception of cold becomes dominant and reduces the perception of pain.(12) In dealing with pain, in addition to pharmacological pain management, pharmacological techniques can be used, including warm and cold compresses.

The effectiveness of cold compresses using various methods has been widely researched and applied in nursing service settings.(13) Providing slow deep breathing therapy canreducing pain intensity, increasing lung ventilation and increasing blood oxygenation and can reduce stress hormone levels, namely cortisol, reducing sources of depression so that pain can be controlled and body function improves and can restore emotions that will make the body relax.(4.5)The effectiveness of non-pharmacological therapy in pain

management using slow deep breathing has been proven by various previous studies.(14) Bivariate tests on the data in this study used the testnon-parametric Mann-Whitney Testand the results showed that in the intervention group after ice cold pack therapy and slow deep breathing during puncture in patients who had an implantedArteriovenous fistula (Cimino) experienced an average pain scale of 2.82 with the most severe pain level being 7and the mildest pain level was 1 with SD 1.593. Meanwhile, in the control group given slow deep breathing therapyexperienced an average pain scale of 3.50 with the most severe pain level being 6and the mildest pain level is 2 with SD 1.180. The statistical test results obtained P Value 0.060 > (α = 0.05), then statistically H0 is accepted which means there is no significant difference before and after the intervention is given to reduce the pain scale during puncture in patients with arteriovenous fistula (cimino), meaning that the administration of ice cold packs and slow deep breathing has no effect in reducing pain during cimino puncture.

This is not in line with the results of research conducted by Khusna(5)who found that there was an effect of providing a combination of ice cold pack therapy and slow deep breathing in overcoming pain during Cimino puncture in patients who had an implanted catheter.arteriovenous fistula (Cimino). This study was a case report involving two respondents. The results showed that after administeringCombination therapy with ice cold packs and slow deep breathing for four sessions, administered 15 minutes before the Cimino puncture, reduced the pain experienced by both patients during the Cimino puncture. The pain scale at the first session was moderate (scores 4 and 5) and became mild (score 2) in both respondents at the fourth session.Another study that is not in line with this study is Siahaan's study.(12)who found that giving a combination of ice cold pack therapy and slow deep breathing was effective in treating painpost Open Reduction Internal Fixation (ORIF). This study was a quasi-experimental study using one group pre and post test and found thatof 37 respondents after compression therapycold pack and deep breathing relaxation techniques resulted in a decrease in pain levels, with 20 people experiencing mild pain (54.1%), 13 people experiencing moderate pain (53.1%) and 4 people experiencing severe pain (10.8%). The results of the statistical test using the paired T Test obtained a P Value of 0.003 < (α = 0.005) so statistically H0 was rejected, meaning there was a significant difference before and after the intervention was given to reduce pain in patients.The difference in the results of this study compared to previous studies is likely due to differences in research methods and sample size. The sample used in this study was 46 people, and based on the test results,The Shapiro-Wilk normality test obtained a sig value of 0.016 < 0.05 in the intervention group and a sig value of 0.026 < 0.05 in the control group, thus concluding that the data in the intervention and control groups were not normally distributed.

Therefore, further research regarding combination therapy is recommended.*ice cold pack*and slow deep breathing in overcoming this pain by using a larger sample assuming the data is normally distributed and repeated therapy is given more than once.Each group was tested with a Wilcoxon Signed Rank Test to see the effect of each intervention, and a p-value of 0.000 was obtained in the intervention group and a p-value of 0.000 in the control group. This indicates that mAlthough there was no significant difference in the reduction in pain scale between the intervention group and the control group in this study, the measurement results found that each therapy, both the combination therapy of ice cold packs and slow deep breathing and the single therapy of slow deep breathing alone, were effective inreducing the pain scale of puncture in patients with arteriovenous fistula (cimino)overcome pain during cimino puncture.This is in line with research conducted by Kristanto(13)which attempted to compare the differences in effectiveness between ice cold pack therapy and slow deep breathing therapy in managing post-Open Reduction Internal Fixation (ORIF) pain. The study found thatThe administration of ice cold packs was more effective than slow deep breathing. The intervention was administered four times to respondents, and a reduction in pain was found in both groups (the ice cold pack group and the slow deep breathing group). The reduction in pain in those receiving ice cold pack therapy was greater, at 2-3 points, while the reduction in pain in those receiving slow deep breathing therapy was 1 point. Previous research on the effectiveness of ice cold pack therapy in managing pain in patients has shown that ice cold pack therapy is effective in reducing pain in patients.(3,8,9,15–17)Likewise, providing slow deep breathing therapy to overcome pain was found to be effective in reducing the pain scale in patients.(4,14,18–20)

IV. CONCLUSION

Administering ice cold pack therapy or slow deep breathing separately has an effect on reducing pain levels in patients, but the administration of ice cold pack therapy and slow deep breathing as a combination therapy in reducing pain during puncture in patients with arteriovenous fistula (Cimino) did not provide a significant difference compared to the administration of slow deep breathing therapy alone. Further research is needed to strengthen the results of this study using a larger sample, different therapy delivery techniques and research methods. It is recommended that nurses continue to use ice cold pack therapy and slow deep breathing, especially in treating hematomas that may arise in patients with difficult vascular access.

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