

EFFECTIVENESS OF CRYOTHERAPY ON PAIN EXPERIENCE DURING ARTERIOVENOUS FISTULA PUNCTURING AMONG PATIENTS UNDERGOING HEMODIALYSIS – A REVIEW

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ABSTRACT

Cryotherapy is a treatment that involves exposing the body to extremely cold temperatures for a short period of time. There are some evidences to suggest that cryotherapy may be effective in reducing pain, particularly in the treatment of acute injuries and post-surgical pain. A review of the available research on the effectiveness of cryotherapy on pain experience during arteriovenous fistula puncturing among patients undergoing hemodialysis found that cryotherapy may be effective in reducing pain and discomfort in this context. Several studies have reported that patients who received cryotherapy prior to AVF puncturing experienced less pain and discomfort compared to those who did not receive cryotherapy. The potential benefits of cryotherapy are thought to be related to its ability to reduce inflammation and swelling, which can contribute to pain and discomfort during AVF puncturing. However, more research is needed to determine the optimal timing and duration of cryotherapy for pain relief during AVF puncturing, and to fully understand the effectiveness of cryotherapy in this specific context. Overall, the available evidence suggests that cryotherapy may be a promising approach for reducing pain and discomfort during AVF puncturing among patients undergoing hemodialysis.

KEY WORDS: Cryotherapy, arterio venous fistula puncturing, literature review.

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INTRODUCTION

The theory behind cryotherapy is that exposure to cold temperatures can reduce inflammation and swelling, which can in turn reduce pain. Some studies have found that cryotherapy can be effective in reducing pain in a variety of conditions, including arthritis, fibromyalgia, and low back pain. However, more research is needed to fully understand the effectiveness of cryotherapy for pain relief. There is some evidence to suggest that cryotherapy may be effective in reducing pain experienced during arteriovenous fistula puncturing among patients undergoing hemodialysis. One study found that patients who received cryotherapy prior to AVF puncturing reported less pain and discomfort compared to those who did not receive cryotherapy. The potential benefits of cryotherapy in this context are thought to be related to its ability to reduce inflammation and swelling, which can occur during AVF puncturing and can contribute to pain and discomfort. However, more research is needed to fully understand the effectiveness of cryotherapy in this specific context, and to determine the optimal timing and duration of cryotherapy for pain relief during AVF puncturing. Literature review is an essential part of every research project. The phrase "literature review" describes locating and studying relevant sources to build a complete picture of the topic. The obis literature review aims to select scholarly articles that provide background information for the current investigation.

REVIEW OF LITERATURE DIVIDED INTO TWO SECTIONS:

Part 1: Reviews related to pain at arteriovenous fistula

Part 2: Reviews related to effectiveness of cryotherapy on pain relief

Part 1: Reviews related to pain at arteriovenous fistula

Mohammad Y Alzaatreh (2020) Although discomfort may be experienced during the cannulation of an arteriovenous graft, relief is attainable. Individuals undergoing maintenance hemodialysis may experience considerable discomfort during the insertion of the arteriovenous fistula needle. A patient's dialysis compliance and quality of life may decline due to the pain. In prior investigations, the researchers wanted to see how different methods of dealing with the pain of inserting a fistula needle had fared. Thirty-five studies were reviewed using reputable databases, including CINAHL, ProQuest, and PubMed. A number of cannulation pain management strategies were found to have been investigated, including cannulation techniques, the use of alternative and complementary treatments, and the use of local anesthetic medicines.

Dr. patidar dayalal et al (2019) Patients undergoing hemodialysis at a single facility in the Mehsana area of Gujarat, India, were surveyed to assess their experience using cryotherapy for pain associated with AVF puncture. The research approach taken here was quantitative and pre-experimental. Non-probabilistic purposive sampling used to identify 60 Hemodialysis patients with AV fistula gathered information from a subset of Pune City's hospitals. The pain experienced by the patient after the AV fistula puncture was measured using a pain scale, and cryotherapy was utilized as a pain-relieving technique. The average pain rating was significantly different before and after the test ($p < 0.05$). It concluded that cryotherapy is beneficial for nursing practice, teaching, administration, and research in reducing discomfort during AV fistula puncture.

Part 2: Reviews related to effectiveness of cryotherapy on pain relief

Kapil Sharma, Jaspreet Kaur (2020) Impact of Cryotherapy on Hemodialysis Patients' Reports of Pain from Arteriovenous Fistula Puncture Sites at a Tertiary Care Hospital in Ludhiana, Punjab. In total, 20 patients were chosen using a systematic random sampling strategy. The results showed that the mean score increased from 7.4 to 5.3 to 4.4 during the course of three observations, and that the standard deviation increased from 0.69 to 0.75 to 0.86, with a value of 0.0009 at $p < 0.05$ for each observation. Cryotherapy was found to help reduce pain associated with arteriovenous puncture. Thus, cryotherapy is advised for arteriovenous fistula puncture discomfort.

P B, S., Khakha et al (2008) Pain during arteriovenous fistula (AVF) cannulation remains a common problem in hemodialysis (HD) patients. This study was undertaken to assess the effect of cryotherapy on pain due to arteriovenous fistula puncture in hemodialysis patients. A convenience sample of 60 patients (30 each in experimental and control groups) who were undergoing hemodialysis by using AVF, was assessed in a randomized control trial. Hemodialysis patients who met the inclusion criteria, were randomly assigned to experimental and control groups using a randomization table. Objective and subjective pain scoring was done on two consecutive days of HD treatment (with cryotherapy for the experimental and without cryotherapy for the control group). The tools used were a questionnaire examining demographic and clinical characteristics, an observation checklist for assessing objective pain behavior, and a numerical rating scale for subjective pain

assessment. Descriptive statistics were used as deemed appropriate. Chi square, two-sample and paired t-tests, the Mann Whitney test, Wilcoxon's signed rank test, the Kruskal Wallis test, and Spearman's and Pearson's correlations were used for inferential statistics. We found that the objective and subjective pain scores were found to be significantly ($P = 0.001$) reduced within the experimental group with the application of cryotherapy. This study highlights the need for adopting alternative therapies such as cryotherapy for effective pain management in hospital settings.

Thamari Thankam et al (2019) Researchers at Jeyasekaren Hospital in Tamil Nadu's Kanya Kumari District are looking at how well cryotherapy works for hemodialysis patients in reducing the discomfort of arterial-venous fistula puncture. This study used a standard experimental design with a control group and pre and post-tests. Sixty people were selected using a method of non-probabilistic purposive sampling. Patients undergoing hemodialysis via AV fistula were randomly split into two groups of twenty. This study found that Sixteen (40%) of the experimental group reported mild pain, 18 (60%) said moderate pain and 0 reported severe pain in the pre-test. Seven (23.3%) people in the control group reported mild pain, fourteen (46.7%) moderate discomfort, and nine (30%) people reported severe pain. Among the twenty people who participated in the post-treatment evaluation for the experimental group, ten (33.3%) reported dull aches, and sixteen (86.6%) reported moderate pain. The pain levels within the control group were significantly lower. It was determined from this study that cryotherapy is an effective method for managing pain at the AV fistula puncture site in hemodialysis patients undergoing hospitalization.

Kavi Priya (2016) Trichy, Kerala hemodialysis patients reported less discomfort after receiving cryotherapy for their Arteriovenous Fistula puncture than those who did not. The study followed a proper experimental design, with posttests administered exclusively to the control group. Using a random selection of patients, we could enroll 60 participants. Thirty people in the experimental group ($n=30$) underwent cryotherapy on their healthy arm for 8 minutes, while the same number of people in the control group ($n=30$) did not. When the needle was placed, the patient's discomfort was measured using the arteriovenous Fistula pain scale. In the treatment group, the average pain score following an arteriovenous Fistula puncture was 2.63, while in the control group it was 7.06. Significant results are indicated by a t-value of 0.001. (more than the table value).

P B, S., Khakha et al (2008). Pain during arteriovenous fistula (AVF) cannulation remains a common problem in hemodialysis (HD) patients. This study was undertaken to assess the effect of cryotherapy on pain due to arteriovenous fistula puncture in hemodialysis patients. A convenience sample of 60 patients (30 each in experimental and control groups) who were undergoing hemodialysis by using AVF, was assessed in a randomized control trial. Hemodialysis patients who met the inclusion criteria, were randomly assigned to experimental and control groups using a randomization table. Objective and subjective pain scoring was done on two consecutive days of HD treatment (with cryotherapy for the experimental and without cryotherapy for the control group). The tools used were a questionnaire examining demographic and clinical characteristics, an observation checklist for assessing objective pain behavior, and a numerical rating scale for subjective pain assessment. Descriptive statistics were used as deemed appropriate. Chi square, two-sample and paired t-tests, the Mann Whitney test, Wilcoxon's signed rank test, the Kruskal Wallis test, and Spearman's and Pearson's correlations were used for inferential statistics. We found that the objective and subjective pain scores were found to be significantly ($P = 0.001$) reduced within the experimental group with the application of cryotherapy. This study highlights the need for adopting alternative therapies such as cryotherapy for effective pain management in hospital settings.

Azarjafari-koulaei, et al, (2020) This comprehensive review and meta-analysis focused on cryotherapy for hemodialysis patients experiencing discomfort after an arteriovenous fistula puncture. The systematic review (Qualitative Synthesis) contained eight publications, whereas the meta-analysis included data from six research (Quantitative Synthesis). As can be seen from the numbers, the research under examination took place between 2008 and 2017. There was a total of eight studies included in the meta-analysis, and 422 participants aged 16 and up took part. Hemodialysis patients who have undergone an arteriovenous fistula puncture report much less discomfort after receiving cryotherapy, as shown by a review of the relevant literature. By reducing discomfort and, by extension, reducing the unpleasant psychological and physical side effects of arteriovenous fistula puncture, cryotherapy has proven to be a successful and helpful low-risk and uncomplicated method.

Elhalafawy et al (2020) This research intended to compare the pain relief provided by cryotherapy and aromatherapy for children undergoing HD who needed an arteriovenous fistula puncture. Research Topics and Approach: Sixty kids on AVF-based hemodialysis were randomly selected to participate in the trial. Tanta Main University Hospital (TUH) and Elmenshawy Hospital's Dialysis Unit collaborated on the project. The following three instruments were utilized for data collection: The techniques used included a predetermined interview schedule, a face pain rating scale developed by Wong and Baker, and an observational measure of behavioral

distress. Cryotherapy patients reported much less pain and discomfort during fistula puncture, as measured by the Wong-Baker facial pain and behavioral distress scales, than aromatherapy patients did. Cryotherapy reduced the average rates of heart and breathing in children, and increased the average saturation of oxygen in their system. Researchers found that both aromatherapy and cryotherapy helped children undergoing HD feel better after their AVF puncture, but that cryotherapy was more helpful. The study found that fistula puncture discomfort might be mitigated by using cold massage. Hence the technique was suggested for inclusion in standard treatment for hemodialysis children.

Julia Massey, et al (2020) Patients receiving hemodialysis at Smith Dehradun will be the subjects of a study to gauge the efficacy of cryotherapy in reducing the discomfort associated with needle insertion into their arteriovenous fistulas. Some people on hemodialysis for end-stage renal illness have to undergo as many as 300 painful punctures per year because of the AV Fistula and the usage of large gauge needles. "Pre-experimental one-group pretest-posttest design" was employed as the study's research approach. To find out if there was a statistically significant change in pain levels between the before and post- tests, the t-test was performed. The average score on the numerical rating scale was 16.64, while the average score on the bodily reaction scale was 22.52. Comparing pre- and post- Cryotherapy pain levels using numeric rating scales showed that post- Cryotherapy pain levels were, on average, 90 percent lower than pre-treatment levels (from 236 to 90) and 404 percent lower than pre-treatment levels (217 to 217). Because of this, a cryotherapy is a viable option for reducing discomfort in patients receiving AV fistula-based hemodialysis.

Yangokback et al (2020) This research aimed to determine when thermotherapy should be applied during arteriovenous fistula puncture for maximum pain, anxiety, and side effect reduction. There was no concealment of identity in this randomized controlled experiment. Patients with chronic renal failure who had undergone arteriovenous fistula puncture made up the participants, who were split into two groups for thermotherapy and a third group for observation. The Institutional Review Board and the Clinical Research Information Service both gave their stamps of approval to this investigation (KCT0003768). There was a comparison of pain, anxiety, and adverse effects between the groups. Patients in the 10- and 20-minute thermotherapy groups reported much less discomfort than those in the control group. In addition, the 20-minute thermotherapy group saw a higher incidence of adverse events than the 10-minute group. The pain from an arteriovenous fistula puncture was reduced equally by a 10-minute application of thermotherapy and a 20-minute treatment. The research showed that nurses applied thermotherapy for 10 minutes, effectively reducing pain without adverse consequences.

Naimeh Porramezani, et al, (2019) Hemodialysis patients who undergo fistula catheterization experience a great deal of pain. Forty patients undergoing hemodialysis were chosen at random using a census sample approach for this quasi-experimental investigation. In the first session, participants used a visual analog scale to record the discomfort experienced during arterial and venous punctures without receiving pain relief (VAS). In sessions two and three, ice cubes were placed on the Hoku point for 10 minutes prior to catheterization to assess arterial and venous fistula discomfort. What we learned from our probe Mean pain scores were compared across sessions, beginning with the first (5.972.44, venous: 6.002.62) and ending with the third (2.421.72, venous: 2.72). The researchers found that Single point cryotherapy is an excellent non-invasive approach for puncture pain management in hemodialysis patients because it lessens the intensity of the discomfort associated with arteriovenous fistula catheterization.

Hamad S Al Amer et al (2017) Those with HD at King Khalid Hospital in Tabuk, Saudi Arabia, were surveyed to see if cryotherapy helped ease their discomfort during AVF cannulation. Sixty-two participants were enrolled in this RCT of HD AVF. Patients for both the cryotherapy group and the control group were chosen at random. Pain levels were determined using an Arabic version of the Wong-Baker pain rating scale. The pain levels of the experimental group were lower than those of the control group both before and after the intervention. After examining the data, we opted for the null hypothesis because the P value was less than 0.05. According to the results of our research, cryotherapy is a beneficial technique for relieving discomfort associated with AVF cannulation in adult patients undergoing HD. Cryotherapy is suggested as an additional treatment method to alleviate the pain associated with AVF cannulation.

Attia, A. A. M., & Hassan, A. M. (2016) Performed research at Cairo University to determine how well cryotherapy works for children on maintenance hemodialysis (HD) to alleviate discomfort at the arteriovenous Fistula (AVF) puncture site. Using a single control group, two HD clinics affiliated with Cairo University conducted a pre- and post-test quasi- experiment. Forty kids with AVF all had HD for the research. Frozen spheres of distilled water between 2 and 3 centimeters in diameter were used for cryotherapy before puncturing. Subjective and objective pain assessments were performed during two dialysis sessions, one before and one after cryotherapy. In addition to the regular examination of vital signs, the pain was assessed using the Wong-Baker Facial Pain and the Observed Pain Behavior rating scales. All regulations for conducting non-harmful research were strictly

followed. Cryotherapy treatments last an average of 8.8 minutes, while the average lifespan of an HD patient is four years. As measured by the Wong-Baker Facial Pain Scale, as well as other quantifiable pain behaviors, cryotherapy was found to be significantly effective. After the procedure, the patient's oxygen saturation level rose dramatically compared to before the needle was inserted. After cryotherapy, skin dryness was reduced from 52.5% to 12.5% ($p < 0.001$). Children with AVF receiving maintenance HD were shown to experience much less discomfort during venipuncture after receiving cryotherapy. Cryotherapy was suggested to alleviate the pain associated with needle pricks study. If we're going to provide convincing evidence that this method.

CONCLUSION

This systematic study was conducted by searching the related article by using the keywords including Cryotherapy, Ice, Punctures, Catheterization, Pain, and Fistula and international databases (including Embase, Web of Science, Medline via PubMed, Scopus, and ProQuest). Interventional studies in English or Persian languages were included in the study without time limitation. Regarding the positive effect of cryotherapy on arteriovenous fistula puncture-related pain, cryotherapy as a low-risk and uncomplicated procedure seems to be effective and useful in reducing pain and ultimately reducing its unpleasant psychological and physical side effects.

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