

Effectiveness of Cryotherapy on Pain Intensity at Puncture Sites of Arteriovenous Fistula on Patients with Hemodialysis in Dialysis Unit of a Tertiary Care Hospital, Ludhiana, Punjab

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ABSTRACT

Patients with chronic renal failure need treatments such as kidney transplantation, hemodialysis or peritoneal dialysis. The most common treatment for the disease is hemodialysis. Pain during arteriovenous fistula (AVF) cannulation remains a common problem in hemodialysis (HD) patients that leads to noncompliance to lifetime maintenance HD. The recommended hierarchy of management should consist of non-pharmacological treatment as first, then drugs and if necessary, surgery. From a review conducted, cryotherapy is the application of any material that removes heat from the body resulting in decreased tissue temperature. It decreases tissue blood flow by causing vasoconstriction and reduces tissue metabolism and muscle spasm. Total 20 patients selected by purposive sampling technique were studied on 3 successive hemodialysis sessions in dialysis unit of a tertiary care hospital, Ludhiana. On initial observation, baseline pre- and post-puncture of arteriovenous fistula vital signs parameters and post-puncture numerical pain rating scale were measured. On second observation, cryotherapy was given to the patients on the web between thumb and index finger of contralateral arm with measurement of pre- and post-intervention vital signs parameters and post-puncture of arteriovenous fistula numerical pain rating scale. On third observation, cryotherapy was given around arteriovenous fistula site with measurement of pre- and post-intervention vital signs parameters and post-puncture of arteriovenous fistula numerical pain rating scale. The findings revealed that in baseline observation, Mean score was 7.4 which decreased to 5.3 in second observation and further decreased to 4.4 in third observation and Standard Deviation was 0.69 in baseline observation which increased to 0.75 in second observation and further increased to 0.86 in third observation with t value of 0.0009 at $p < 0.05$. The study concluded that cryotherapy is effective on arteriovenous puncture pain. Hence, cryotherapy is recommended for arteriovenous fistula puncture pain.

Keywords: Arteriovenous fistula, Cryotherapy, Hemodialysis.

INTRODUCTION OR BACKGROUND

Pain during arteriovenous fistula (AVF) cannulation remains a common problem in hemodialysis (HD) patients that leads to noncompliance to lifetime maintenance HD.¹ Patients with arteriovenous fistula (AVF) and undergoing maintenance hemodialysis (HD) are exposed to an average of ten AV fistula

punctures a month, which is expected to continue for the rest of their lives. These punctures are associated with pain and stress among patients and their families, and are characterized by the use of large gauge needles. Unrelieved continuing pain may have untoward effects on the health, functional abilities and quality of life of patients. Properly managing the pain from

these punctures is associated with shorter hospital stays and lower hospital costs. Freedom from pain is a right of patients and must be considered in nursing practice.²Chronic renal failure is a multifactorial physiopathologic problem which finally results in the reduction of the number and the function of nephrons. Patients with chronic renal failure need treatments such as kidney transplantation, hemodialysis or peritoneal dialysis. The most common treatment for the disease is hemodialysis. A prerequisite to regular long-term hemodialysis is permanent vascular access, which can be established through central venous catheter, arteriovenous graft or arteriovenous fistula. The most preferred access route is arteriovenous fistula. Hemodialysis through arteriovenous fistula necessitates one arterial and one venous puncture using two large-diameter needles. These punctures usually cause severe pain and discomfort for patients. Patients who receive regular hemodialysis are frequently exposed to the pain associated with around 300 vascular punctures each year. This repetitive exposure to pain causes anxiety and depression, reduces the quality of life and interferes with effective role performance.³The painful experience may lead to patient anxiety when undergoing those procedures again. Therefore, the reduction of the sensation of pain and anxiety involved in the procedure is crucial. This can lead to improved patient cooperation and a smoother process during the procedure. So, all health professionals should know how to assess and manage it when caring for pediatric patients (Cohen et al., 2009; Sadeghi et al., 2013, and Mutlu & Balci, 2015). To this end, the American Academy of Pediatrics (AAP) and American Pain Society (APS), (2011) recommend minimizing and relieving pain and stress in minor procedures such as establishing vascular access. Therefore, pharmacologic and non-pharmacologic methods are used for relief pain during medical and nursing procedures. When used

appropriately, non-pharmacologic methods can be more effective in reducing procedural pain.⁴Chronic Kidney Disease (CKD) is 12th leading cause of death and 17th cause of disability and its approximate total burden is 800 per million. It has been reported that Diabetes mellitus is the cause of CKD and is found to be present in 31.2-41% of patients in India. In India, the projected number of deaths due to chronic disease were around 5.21 million in 2008 and is expected to rise to 7.63 million in 2020 (66.7% of all deaths). Worldwide rise in the number of patients with CKD is reflected in the increasing number of people with ESRD treated by renal replacement therapy, dialysis or renal transplantation. According to National Kidney Foundation, Dialysis Outcome Quality Initiative (DOQI) 2005, AV fistula remains as a gold standard for vascular access in hemodialysis patients.⁵ Everyone has experienced some type or degree of pain, yet the concept of pain is difficult to communicate. The experience of pain is complex, involving emotional, and cognitive components. Pain control is important because pain can affect appetite, sleep, energy, ability to do things. Pain is considered as the 5th vital sign. The recommended hierarchy of management should consist of non-pharmacological treatment as first, then drugs and if necessary, surgery. There are various non-pharmacological methods that can help to relieve the pain perception such as distraction, biofeedback, cryotherapy, hot application, music therapy, laughter therapy, touch therapy etc.

MATERIAL AND METHODS

“Quantitative Approach” was used to assess effect of cryotherapy on pain intensity at puncture sites of arteriovenous fistula as there is collection and analysis of numerical information related to pain intensity. The findings of the study were based on empirical evidence (researcher’s observation). “Pre-experimental research design” was used to conduct the present study to assess the effectiveness of

cryotherapy on arteriovenous fistula pain in hemodialysis patients at dialysis unit. This study was conducted in dialysis unit of the DMC & Hospital, Ludhiana, Punjab. The target population comprised of patients for hemodialysis with arteriovenous fistula in dialysis unit who were fulfilling the inclusion and exclusion criteria. The total samples were 20 patients with arteriovenous fistula for hemodialysis. Subjects were selected using purposive sampling technique from target population. Extensive literature review had been done to select and develop tool to assess the effect of cryotherapy on pain intensity in patients for hemodialysis with arteriovenous fistula. Besides this, experts from the field of Nephrology, Nursing and Nursing research had been consulted to construct appropriate tool for data collection. Tool was divided into four parts: Part A: Section a: Socio demographic Profile : A self report method was used to collect the socio-demographic profile of patients with arteriovenous fistula for hemodialysis. It includes 10 items obtaining information about age, gender, marital status, religion, educational status, occupation, family income per month, dietary habits, area of residence and addiction. Part A: Section b: Clinical Profile Sheet : It includes 11 items to obtain information about diagnosis, dialysis vintage, level of consciousness, site of arteriovenous fistula, intradialysis complication, postdialysis complications, Serum Sodium, S. Potassium, S. Urea, S. Creatinine and intradialysis weight gain in successive 3 observations. Part B : Section a : Vital signs parameters : It includes measurement of vital signs of the patients including heart rate, temperature, respiratory rate, blood pressure and oxygen saturation. Part B: Section b : Numerical Rating Pain Scale : It included numerical rating pain scale to assess the pain intensity experienced by the patients during arteriovenous fistula puncture during baseline, second and third observations. The maximum score for pain intensity was 10 and the minimum score considered to be 0.

It is a 4-point Numerical Pain Rating Scale which constituted of 10 items. The content validity of the tool has been established with Experts from the field of Nephrology and Medical-Surgical Nursing. The reliability of Numerical Pain Rating Scale was predetermined i.e., $r = 0.92$. Written permission was taken from the authorities to conduct the research study. Once patient's eligibility was established as per inclusion and exclusion criteria, written consent was taken from the patients, on baseline observation, baseline pre- and post-puncture of arteriovenous fistula vital signs parameters and post-puncture numerical pain rating scale were measured. On second observation, cryotherapy was given to the patients on the web between thumb and index finger of contralateral arm for 2 min. with measurement of pre- and post-intervention vital signs parameters and post-puncture of arteriovenous fistula Numerical Pain Rating Scale. On third observation, cryotherapy was given around arteriovenous fistula for 2 min. with measurement of pre- and post-intervention vital signs parameters and post-puncture of arteriovenous fistula Numerical Pain Rating Scale.

RESULT

Majority patients were in the age group of both 26-35 and 36-45 years. Majority patients were males. Majority patients were married. Majority patients belong to Sikh community. Majority patients had senior secondary educational status. Majority of the patients were housewives. Majority patients had family income between Rs.11000-20000 per month. Majority patients were vegetarian. Majority patients belonged to rural residence. Majority patients had no addiction. More than half patients had dialysis vintage of 16-25 months. Majority patients had right arm brachiocephalic vein fistula. Majority patients had no intradialysis complications while majority had postdialysis complications. Majority patients had normal serum sodium and potassium levels. Majority patients had not

normal serum urea and creatinine. Majority patients had undesirable intradialytic weight gain. Majority patients had normal vital signs pre and post intervention during all 3 observations. Majority patients had reduced

pain intensity in second and third observations than initial observation. The results were found statistically significant with $t=0.0009$ at $p<0.05$.

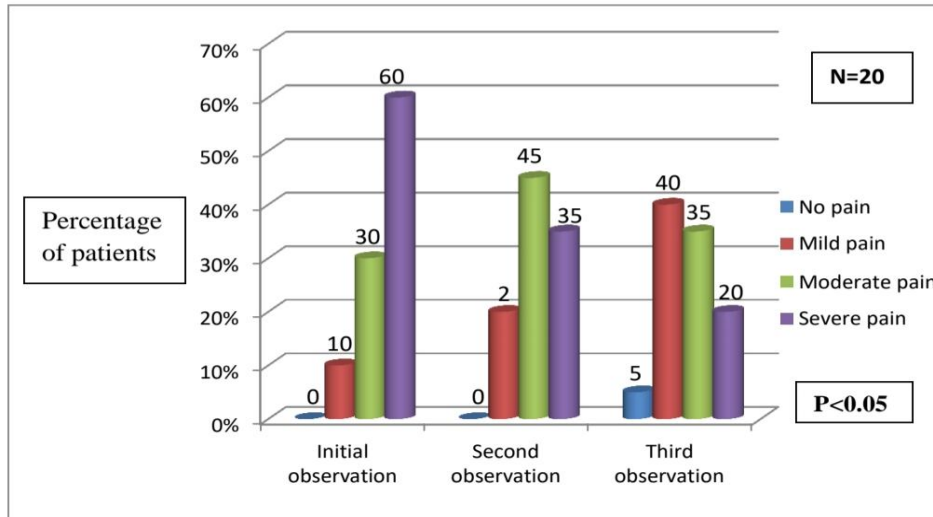


Fig. 1: Distribution of hemodialysis patients with arteriovenous fistula as per their numerical pain rating scale

Table 1: Comparison of pain intensity after cryotherapy at contralateral arm Vs. around fistula site during arteriovenous fistula puncture among patients for hemodialysis.

Variable	Pain intensity Mean±SD	Mean %	t value
O1 (Without cryotherapy)	7.4±0.69	74%	
O2 (Cryotherapy at contralateral arm)	5.3±0.75	53%	0.0009
			$p < 0.05^*$
O3 (Cryotherapy around fistula site)	4.4±0.86	44%	
50.0>p tnacifingiS*		Minimum score 0	Maximum score 10

DISCUSSION

The findings of the study had been discussed in accordance with the objectives of the study and previously reviewed literature. Review of literature enlighten that there are vast number of studies conducted on patients undergoing dialysis and various pain minimizing strategies used to reduce the pain experienced by the patients during arteriovenous fistula puncture. Quality of care is an evolving and ongoing process. In nursing care services also, we continuously strive for improving standards of care. Cryotherapy is a step in this direction. This involves application of ice pack to minimize or atleast control pain during arteriovenous fistula puncture in hemodialysis patients. By using cryotherapy, there will be increased compliance in patients with arteriovenous fistula undergoing hemodialysis. The findings show that cryotherapy is effective

on pain at arteriovenous fistula puncture. It is found that Mean score and Standard Deviation of pain intensity during arteriovenous fistula puncture after cryotherapy on contralateral arm is 5.3 and 0.75 respectively and Mean score and Standard Deviation of pain intensity at arteriovenous fistula puncture after cryotherapy around arteriovenous fistula is 4.4 and 0.86 respectively. Cryotherapy is found to be effective with statistical $t=0.0009$ at $p<0.05$. In this study, Majority patients (60%) have been found to have severe (score 7-10) baseline pain intensity in Numerical Pain Rating Scale during AVF puncture among patients for hemodialysis. Pain intensity during AVF puncture after cryotherapy on web between thumb and index finger at contralateral arm is found to be reduced than the baseline observation with Mean score of 7.4 and Standard

Deviation of 0.69 in baseline observation Vs mean score of 5.3 and Standard Deviation of 0.75 in second observation. This study found that there was significant reduction in pain intensity after cryotherapy around arteriovenous fistula site with Mean score of 4.4 and Standard Deviation of 0.86 in second observation in relation to Mean score of 7.4 and Standard Deviation of 0.69 in baseline observation. The results showed that there is significant difference in Mean score and Standard Deviation i.e., 5.3 and 0.75 in second observation and Mean score of 3.4 and Standard Deviation of 0.86 in third observation. Moreover, majority 9(45%) patients were found to have moderate pain in second observation while 8(40%) were having mild pain in third observation. Also, t value is found to be significant with value of 0.0009 at $p < 0.05$.

CONCLUSION

It is concluded in the present study that cryotherapy is effective in significant reduction in pain intensity at puncture site of arteriovenous fistula for patients undergoing hemodialysis with t value=0.0009 at $p < 0.05$. Staff nurses reported cryotherapy as easy and effective non-pharmacological measure to reduce the pain intensity experienced during arteriovenous fistula puncture in hemodialysis patients. Patients and care givers also reported that cryotherapy is an effective measure to reduce arteriovenous puncture pain in patients for hemodialysis and would help in better compliance to the hemodialysis treatment, especially in children.

Conflict of Interest- None

Source of Funding- Self

Ethical Clearance

Written permission for conducting study was undertaken from Ethical Committee of DMC & Hospital, Ludhiana. A written permission was taken from the HOD of dialysis unit. Anonymity

and confidentiality of subjects was maintained while observing.

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