Effectiveness of Cryotherapy on Pain during Arteriovenous Fistula Puncture among Haemodialysis Patients

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Abstract

Patients with end-stage renal disease undergoing hemodialysis are repeatedly exposed to pain from approximately 300 punctures per year to their AV Fistula associated with the insertion of large-gauge needles. Nurses play a pivotal role in pain assessment and intervention. The complementary therapies are used to relieve the symptoms of pain. One of these therapies, which are used to reduce the pain, is cryotherapy.

A quantitative pre-experimental research design was used. A total of 60 Haemodialysis patients with AV fistula were selected by non-probability purposive sampling. Data was collected from selected hospitals of Pune City. Pain scale was used for data collection and cryotherapy as an intervention in relation to assess the level of pain during AV fistula puncture. A highly significant difference was found between pre test and post test mean score on level of pain (p<0.05 at 5% level of significance). It is concluded that cryotherapy is an effective tool in improving level of pain during AV fistula puncture and has a valuable implications for nursing practice, education, administration and nursing research.

Key words: Pain, Cryotherapy, AV fistula puncture, Haemodialysis
BACKGROUND

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. Chronic Kidney Disease (CKD) is a progressive irreversible deterioration in renal function in which body’s ability to maintain metabolic, fluid and electrolyte balance fails. Most patients are in the final stage of CKD where the glomerular filtration rate is less than 15 ml/hr. It is now emerging as a public health problem globally.

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 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). The 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 transplantation. According to National Kidney Foundation, Dialysis Outcome Quality Initiative (DOQI) 2005, AV fistula remains as a gold standard for vascular access in haemodialysis patients.

Cold application as a cutaneous stimulation technique is an inexpensive nursing intervention that is advocated to minimize the pain in patients. The effect of cutaneous stimulation is best explained through gate control theory proposed by Melzac in 1965. According to this theory the pain signals carried by the small fibers (A-delta and C fibers) are less intense compared to the other non-pain sensory signals like touch, pressure and temperature; the inhibitory neurons prevent the transmission of the pain signals through the T cells. The non-pain signals override the pain signals and thus the pain is not perceived by the brain by closing a gate consisting of specific nerve cells in dorsal horn of spinal cord. The conduction rate of touch stimulus is more and the large intestine meridian point is the acupressure points present in arms, extending up to the nose. There are 20 large intestine meridian points. L14 is the point present on the medial midpoint of the first metacarpal between 3 to 4 mm of the web of skin between thumb and forefinger on either hand. Its dominant users
are to relieve pain in arms, legs and scapula for reducing labor pain and rigidity of neck as a treatment measure⁹.

OBJECTIVES

1. To assess pain related to AV fistula puncture among patients undergoing haemodialysis before application of cryotherapy.
2. To assess pain related to AV fistula puncture among patients undergoing haemodialysis after application of cryotherapy.
3. To compare the level of pain before and after application of cryotherapy.
4. To determine the association between demographic variables and level of pain.

HYPOTHESIS

H₀ - There will be no significant difference in pain during AV fistula puncture among Haemodialysis patients after cryotherapy.

H₁ - There will be a significant difference in pain during AV fistula puncture among Haemodialysis patients after cryotherapy.

MATERIALS AND METHODS

RESEARCH DESIGN

The research design adopted for the study was “pre-experimental one group pretest-posttest design”. In pre-experimental one group pretest-posttest design a single case is observed at two time points, one before the treatment and one after the treatment. Changes in the outcome of interest are presumed to be the result of the intervention or treatment. No control or comparison group is employed.

VARIABLES

Dependent variable- pain related to AV fistula puncture
Independent variable- Cryotherapy

POPULATION

In the present study, findings of the study will be generalized for patients undergoing haemodialysis with AV fistula.

SAMPLE

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Figure 1: Conceptual Model: the General Systems Model
SAMPLE

The sample for the study comprised of patients undergoing haemodialysis with AV fistula, at selected hospitals of Pune City.

SAMPLE SIZE- 60

SAMPLING TECHNIQUE

A non-probability purposive sampling technique was used for selecting samples.

INCLUSION CRITERIA

1. Patient having A-V fistula at the forearm and undergoing haemodialysis.
2. Both male and female patients will be included in the study.
3. Patients with age group between 20-80 years will be included in the study.

EXCLUSION CRITERIA

1. Patients with neurological disorders who are not able to perceive pain.
2. Patients who are receiving opioid analgesics.

SETTING OF THE STUDY

The study samples were patients undergoing Haemodialysis with AV fistula from selected hospitals in Pune city like Bharati hospital and research centre and Shri Anandpurcheritable Trust.

DEVELOPMENT AND DESCRIPTION OF THE TOOL

Study instruments used by the researcher consisted of three sections.

Section A: Demographic Variables.
Section B: Modified Mcaffery’s numeric pain rating scale.
Section C: Scale for objective assessment for pain.

Formal administrative permission was obtained from selected hospitals in Pune city and the main study was conducted for a period of six weeks. The investigator approached the subjects and obtained the consent after assuring the subjects about the confidentiality of the data. The data was collected through a structured Performa. For data collection as per the availability of the
sample pre-test was administered. Post-test was given after administration of cryotherapy on the next day when patient came for next dialysis.

CONTENT VALIDITY

The experts were selected on the basis of their clinical expertise, experience and interest in the problem under study. They were requested to give their opinion on the appropriateness and relevance of items in the tool.

To ensure content validity of the tool it was submitted to fifteen experts along with scoring sheet. The experts were-

- Nursing Experts-11
- Statistician-1
- Nephrologists -2
- Anesthesiologist (Pain Clinic)-1

RELIABILITY

In order to establish the reliability of the tool inter-rater method was used with the help of Spearman’s Rank Correlation formula.

The correlation coefficient of r –values were 1 (subjective numerical pain) and 0.88 (objective assessment of pain). If value of r is greater than 0.70 then the test is reliable, hence instrument was found reliable.

ETHICAL CONSIDERATION (BVDU/MC/09)

- Researcher has obtained approval from appropriate review boards to conduct the study.
- Researcher has obtained permission from the administration of selected Hospitals in Pune city to conduct study.
- Researcher duely explained the purpose of the study.
- Confidentiality of the data is maintained strictly.

FINDINGS-
Description of samples
Figure 2: Demographic description of samples

Figure 2 revealed that the majority, i.e., 45% were in the age group of 40-60 years, 71.66% were Male, 58.33% were having CKD since 1-3 years, 58.33% were undergoing Haemodialysis since <2 years, 46.66% were having A-V fistula since <1 year, 65% were undergoing Haemodialysis 2 times in a week and 53.33% had a history of no other illness.

Comparison in the level of Pain before and after the Cryotherapy

A) Subjective assessment of pain (N=60)

<table>
<thead>
<tr>
<th>Administration</th>
<th>Mean</th>
<th>SD</th>
<th>Wilcoxon test (Z)</th>
<th>Table value (z score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>4.01</td>
<td>1.31</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Post test</td>
<td>2.98</td>
<td>0.59</td>
<td>2.75</td>
<td>1.96</td>
</tr>
</tbody>
</table>

Researcher applied Wilcoxon test (Z) for comparison of the subjective pain level before and after the Cryotherapy among patients undergoing Haemodialysis with AV fistula. Z values corresponding to this comparison were 2.75. Corresponding table values were 1.96 (less than 0.05), the null hypothesis is rejected.
Figure 3: Comparison of the subjective Pain before and after the Cryotherapy

Figure 3 shows that, an average subjective assessment of pain before Cryotherapy was 4.01 which decreased to 2.98 after Cryotherapy. This indicates that the Cryotherapy is significantly effective in improving the level of pain among patients undergoing Haemodialysis with AV fistula.

B) Objective assessment of Pain-

<table>
<thead>
<tr>
<th>Administration</th>
<th>Mean</th>
<th>SD</th>
<th>Wilcoxon test(Z)</th>
<th>Table value (Z)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>3.71</td>
<td>1.12</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Post test</td>
<td>2.66</td>
<td>0.62</td>
<td>5.758</td>
<td>1.96</td>
</tr>
</tbody>
</table>

Researcher applied Wilcoxon test (Z) for comparison of the objective pain level before and after the Cryotherapy among patients undergoing Haemodialysis with AV fistula. Z values corresponding to this comparison were 5.758. Corresponding table values were 1.96(less than 0.05), the null hypothesis is rejected.
Figure 6: Comparison of the objective Pain before and after the Cryotherapy.

Figure 6 shows that, an average objective assessment of pain before Cryotherapy was 3.71 which decreased to 2.66 after Cryotherapy. This indicates that the Cryotherapy is significantly effective in improving the level of pain among patients undergoing Haemodialysis with AV fistula.

**Association between subjective assessment of pain and demographic variables:**

Demographic variables duration of CKD and duration of AV fistula were found to have significant association with subjective pain level during AV fistula puncture among Haemodialysis patients.

**Association between objective assessment of pain and demographic variables:**

Demographic variables duration of CKD and duration of AV fistula were found to have significant association with objective pain level during AV fistula puncture among Haemodialysis patients.

**CONCLUSION**

Results revealed that an average subjective assessment of pain before Cryotherapy was 4.01 which decreased to 2.98 after Cryotherapy and an average objective assessment of pain before Cryotherapy was 3.71 which decreased to 2.66 after Cryotherapy. This indicates that the Cryotherapy is significantly effective in improving the level of pain among patients undergoing Haemodialysis with AV fistula.
Limitation

The limitation of the present study is as follows:

- The present study is limited to assessment of specific aspect i.e. level of pain of the patients suffering from Chronic Kidney Disease undergoing haemodialysis.
- It is confined only to the persons suffering from Chronic Kidney Disease undergoing haemodialysis.
- The present study is limited to the patients those were having AV fistula on their arm.
- The present study is limited to the small sample size (60).

Recommendations

Keeping in view the findings of the present study, the following recommendations were made.

- A similar study can be replicated in different setting to strengthen the findings.
- The same study could be replicated on a large sample size with newly cannulated patients.
- Comparison may be done on the efficacy of Cryotherapy and local anesthetic cream on AV fistula puncture pain.
- Same study can be replicated on dental pain and for IV cannulation procedures.
- Haemodialysis units should involve Cryotherapy for managing needle puncture pain in the routine care for hemodialysis patients.
REFERENCES


   URL: http://www.patient.co.uk/doctor/Chronic-Kidney-Disease and Management.htm

3. Ilango Van Veerappan, Georgi Abraham, Chronic Kidney Disease: Current Status, Challenges and Management in India

4. Ajay K Singh, Youssef MK Farag, Epidemiology and risk factors of chronic kidney disease in India – results from the SEEK (Screening and Early Evaluation of Kidney Disease) study
   URL: http://www.biomedcentral.com/1471-2369/14/114


   URL: http://medind.nic.in/iby/t07/i4/ibyt07i4p498.pdf

7. Ilango Van Veerappan, Georgi Abraham, Chronic Kidney Disease: Current Status, Challenges and Management in India

8. National kidney foundation, clinical practice guidelines and recommendation