Subcutaneous low molecular weight heparins (LMWH) are frequently prescribed for the prevention of deep vein thrombosis and other cardiovascular conditions. One of the most commonly encountered adverse physiological responses to this intervention is the formation of haematomas at the injection site. This creates challenge for the nurses attempting to minimise haematoma formation and/or patient discomfort during the treatment regimen.

The subcutaneous administration of the anticoagulant LMWH, frequently performed nursing intervention often causes problems such as bruise, pain, indurations and haematoma at injection site. Bruising (bluish discolouration) occurs after sometime but not for all such injections, and not for all the patients. This has implications for nursing; not only patient experiences the physical discomfort and the psychological impact of visible body trauma, but bruising and indurations limit the possible sites for future injections. Bruising from heparin injections may lead to anxiety, disruption of body image, reaction of the treatment in patients and reduced reliance of patient.

Ecchymosis resulting from LMWH reaches its peak at 48 hours and begins to resolve around 72 hours of injection. In order to comply with treatment modality, pain reduction and thereby physical and psychological comfort to the patients, it is incumbent upon health care professional to be knowledgeable and sensitive towards adverse outcomes result from LMWH therapy and promote safety and comfort to the patients.

The researcher selected the cheapest, easily available, non-invasive, non-pharmacological object (ice cube) for control of pain and ecchymosis in patients receiving LMWH prior to giving injection.

**Objectives**

1. To assess and evaluate the levels of pain perception and ecchymosis among experimental and control group of patients suffering from cardiovascular problems with or without application of ice cube prior to injection of heparin.

2. To determine the association between levels of pain perception of patient suffering from cardiovascular problems with selected demographic variables among experimental and control group

---

**Application of Ice Cube prior to Subcutaneous Injection of Heparin in Pain Perception and Ecchymosis of Patients with Cardiovascular Problems**

Gaytri Batra

**Abstract**

In this experimental study of patients with cardiovascular problems, conducted at Safdarjung Hospital, New Delhi, purposive sampling technique was done from cardiology ward and CCU to obtain adequate samples. The sample comprised of 30 experimental group patients and 30 control group patients. The conceptual framework was based on the system model proposed by Ludwig Van Bertalanffy in 1957. Quasi experimental research approach was adopted for the study with post-test only control group design. The independent variable for the study was the ice cube application for 3 min and the dependent variables were pain perception and ecchymosis. The tools used for data collection were, structured interview schedule for sample characteristics, numerical rating scale for pain for subjective assessment, transparent ruler scale to measure the total surface area of ecchymosis, and for treatment ice-cubes in latex glove for giving cold compress. Subjects were asked to rate pain by showing the flash chart of standard pain rating scale immediately after the needle was withdrawn and ecchymosis was observed 48 hrs after the day of injection. The obtained difference between experimental and control group ecchymosis score and pain perception score was statistically significant as evident from t-value at 0.05 level of significance.
**Research Hypotheses**

**H1:** There will be a significant difference in pain perception levels score between experimental and control groups of patients suffering from cardiovascular problems as measured by numerical pain intensity scale at 0.05 level of significance.

**H2:** There will be a significant difference in ecchymosis level score between experimental and control groups of patients with cardiovascular problems as measured by transparent ruler scale at 0.05 level of significance.

**H3:** There will be a significant association between pain perception level scores of experimental group and control group patients with selected demographic variables as evident from pain intensity scale at 0.05 level of significance.

**Methodology**

The research approach used for the present study was evaluative experimental study and research design was quasi experimental, post-test only control group design.

The sample consisted of 60 patients - 30 each for experimental and control groups. Purposive sampling technique was employed.

Inclusion criteria: Patients who were getting LMWH injection; absence of other problems resulting in pain; ability to give adequate response; willingness to participate; and understanding of Hindi or English.

Tools used: (a) Structured interview schedule for sample characteristics; (b) Numerical rating scale for pain for subjective assessment was developed (Standard scale by National Institute of Health Pain Consortium, Pain intensity instrument); (c) Transparent ruler scale to measure the total surface area of ecchymosis; (d) For treatment Ice cube in latex glove for giving cold compress.

Content validity of structured interview schedule was performed by nine experts from the field of medicine, nursing and statistics. For observational checklist the inter-rater reliability was obtained.

The null hypotheses of the present study were stated as follows:

**H01:** There will be no significant difference in mean pain perception levels score between experimental and control groups of patients with cardiovascular problems as measured by numerical pain intensity scale at 0.05 level of significance.

**H02:** There will be no significant difference in mean ecchymosis level score between experimental and control groups of patients with cardiovascular problems as measured by transparent ruler scale at 0.05 level of significance.

**H03:** There will be no significant association between pain perception levels score of experimental group and control group patients with selected demographic variables as evident from pain intensity scale at 0.05 level of significance.

**Data analysis:** The obtained data were analysed, tabulated and interpreted using descriptive and inferential statistics, organised under following sections:

**Section I:** Description of sample characteristics by their age, sex, educational status, marital status, religion, diagnosis and the dosage, day of dosage.

**Section II:** Comparison of the level of perception of pain among experimental and control group suffering from cardiovascular problems with or without application of ice cube prior to injection of heparin.

**Section III:** Comparison of total surface area of ecchymosis among experimental and control group of patients with cardiovascular problems with or without application of ice cube prior to injection of heparin.

**Section IV:** Description of association between level of pain perception of patients with cardiovascular problems with selected demographic variables among experimental and control group.

**Results & Discussion**

Findings related to demographic data: Maximum number of patients (46.7%) in experimental group were 55 to 65 years of age and 20 percent each in 35 to 45 years and 45 to 55 years of age respectively. Majority (53.3%) in experimental group were males and 46.7 percent were female whereas in control group 76.7 percent were males.

Maximum patients (40%) were illiterate and 26.7 percent had primary and senior secondary level education in experimental group whereas 43.3 percent were matriculate in control group and (33.3%) were illiterate. In both experimental and control groups (100%) were married. As per religion, majority of the patients were Hindu (i.e. 70% and 80% respectively) in both the groups. Regarding diagnosis majority of them were with diagnosis of myocardial infarction (66.7% and 63.3% respectively) in both experimental and control groups and 33.3 percent in experimental group and 36.7 percent in control group were having hypertension and CAD.
As per doses of LMWH majority of patients 73.33% and 63.3% in experimental and control group respectively received 40mg.

**Findings related to pain perception level**

Table 1 depicts that in experimental group majority (93.3%) had mild pain whereas in control group majority (53.3%) had moderate pain. In experimental group only 6.7 percent had moderate pain, so it can be concluded that ice cube application prior to injection was effective in reducing pain at injection site.

<table>
<thead>
<tr>
<th>Levels of pain perception</th>
<th>Experimental group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild (1-3)</td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>93.3</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>46.7</td>
</tr>
<tr>
<td>Moderate (4-6)</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>53.3</td>
</tr>
<tr>
<td>Severe (7-10)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The mean pain perception level score (1.5) was lower in experimental group than mean perception level of pain score (3.0) in control group (Table 2) indicating that ice cube application prior to injection is effective in decreasing the perception of pain with mean difference of 1.5. Findings in Table 3, related to ecchymosis development show that mean ecchymosis score (100 mm square) is lower in experimental group than mean ecchymosis score (115 mm square) in control group, indicating that ice cube application prior to injection is effective in decreasing the development of ecchymosis with mean difference of 15 mm square.

**Association between experimental and control group regarding perception of pain and ecchymosis**

In order to determine the significance of difference in experimental and control group regarding total surface area of ecchymosis and pain, t value was computed.

Tables 4 & 5 reveal that the obtained difference between experimental and control group ecchymosis scores of cardiovascular patients was found to be statistically significant as evident from t value of 4.4 at df 28 at 0.05 level of significance. It also shows, the obtained difference between experimental and control group in pain perception score of cardiovascular patients was found to be statistically significant as evident from t-value of 5 at df 28 at 0.05 level of significance.

**Association between levels of pain perception of patients with cardiovascular problems in both experimental and control group with selected variables**

These R-values were found non-significant at 0.05 level. Hence the null hypothesis H3 is failed to be rejected and research hypothesis H1 is not accepted. Thus it was shown that the selected variables i.e. age, sex, educational status, marital status, religion, diagnosis, dosage of drug, did not have any significant association with pain perception level of the patients in both experimental and control group.

**Conclusion**

Majority of patients felt relaxed due to decrease in pain by the technique of injection given by
researcher and application of ice cube was accepted. Therefore it can be concluded that ice cube application was effective in reducing pain and Ecchymosis and enhancing comfort of patients.

Implications

Nursing practice
The nursing personnel working in cardiology wards need to be made aware of beneficial effect of prior ice application at injection site. Staff nurses in all clinical settings can be encouraged to test the effectiveness of ice application in reducing pain associated with various invasive procedures.

Nursing education
In order to provide evidence-based nursing, the nurse educator should teach and provide learning experience to students nurses regarding proper technique of giving heparin injection and different measures with proper method of cold application at injection site and preventing ecchymosis. Patients and their relatives need to be educated accordingly.

In-service Nurses can be taught about advantages of applying ice cube, application at injection site prior to giving injection.

Nursing administration
As administrators, to ensure quality care, nurses should utilise and rely upon evidence-based nursing practice. The nurse administrator should communicate this knowledge to her ‘clinical staff and ensure practice of use of ice cube application for patients getting heparin injection. She should organise in-service education programme for nurses to teach them proper technique of giving subcutaneous heparin injection and use of ice cube application.

They should coordinate with other departments having cardiovascular patients admitted or prone to get vascular problems like orthopaedic medicine and surgery etc. There should be policy and guidelines to carry out the application of ice cube at site prior to giving subcutaneous heparin injection. Nursing administrators should procure good quality of latex gloves for covering the ice cube before application or commercially prepared ice.

Nursing research
More studies can be conducted in this aspects of decrease pain perception and prevent formation of Ecchymosis as well as for development of meta-analysis

Recommendations
Based on findings of the study, following recommendations are made:

- The study can be replicated on a larger sample for making generalisation.
- A comparative study can be done (i) to evaluate effectiveness of ice cube application prior and after giving subcutaneous injection of heparin on pain perception and prevention of ecchymosis; (ii) on effectiveness of cold application by using different modalities; (iii) on patients in CCU and cardiac wards.

- Similar study can be conducted (i) in more than one setting e.g. in private and government hospitals in which patients from different backgrounds can be selected; (ii) in different hospital so that extraneous factors of one particular area like improper technique performance by other staff can be excluded.

References
1. Polit DF, Beck CT. Nursing Research. 8th edn, Philadelphia Lippincott Co. 2011

### Table 4: Mean, standard deviation and t value of level of pain perception among patients in experimental and control groups in relation to low molecular heparin injection

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>‘t’ test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>1.5</td>
<td>0.99</td>
<td>5 (s)</td>
</tr>
<tr>
<td>(n=30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control group</td>
<td>3.0</td>
<td>1.83</td>
<td></td>
</tr>
<tr>
<td>(n=30)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*‘s-Significant; t(28) >2.5 at p=0.05 level

### Table 5: Mean, standard deviation and t value of level of ecchymosis among patients in experimental and control groups in relation to low molecular heparin injection

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>‘t’ test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>100</td>
<td>12.9</td>
<td>4.4 (s)</td>
</tr>
<tr>
<td>(n=30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control group</td>
<td>115</td>
<td>13.78</td>
<td></td>
</tr>
<tr>
<td>(n=30)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*‘s-Significant; t(28) >2.5 at p=0.05 level


Unpublished thesis
- Nisha Thomas, Study pain during administration of intramuscular inj. of Benzathine penicillin with cold needle, Available from nursing thesis 2010


Kuzu M, Ucar H. The effect of cold on the occurrence of bruising, hematoma and pain at the injection site in subcutaneous low molecular weight heparin

---

**The New Arrival of TNAI Publication**

**Medical Surgical Nursing: A Nursing Process Approach**

Advances in medicine and nursing have led to emergence of medical-surgical nursing as a specialty of choice among nursing students, attracting them in large numbers. It is also being increasingly opted by as career. Considering the importance of the subject, TNAI took up the elaborate project of drafting and publishing a textbook on it.

Highly valuable publication for students of Nursing, this 2-volume text book has 15 units further divided into 47 chapters in both. Unit I dwells on concept of wellness and maintenance of Health including care of the elderly, Unit II, III and IV cover nursing processes, quality management, common problems of nursing practitioners and peri-operative nursing; Units V to XV describe various health disorders in surgical nursing and their management.

The anatomical and physiological aspects essential for grasp of health disorders as well as methods of assessment have been well covered in the book. The chapters of the book have been contributed by different experts acknowledged in their field, so that the information being conveyed through text and illustrations is authentic and relevant to the students.

As the entire book is in multi-colour, the illustrations come out clearly for easy understanding of the students. It is a ‘must’ book for nursing students on all counts: contents, coverage, treatment of subject, clarity of expression and price.