International Journal of Practical Nursing

Volume 10 Number 2, May - September 2022
DOI: http://dx.doi.org/10.21088 ijpn.2347.7083.10222.4

Original Article

Icepack Application on Pain and Bruising Complications Associated with Subcutaneous Heparin in Critical Care Patients

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How to cite this article:
Settepalli Jasmindebora, Sneha Jannu / Icepack Application on Pain and Bruising Complications Associated with Subcutaneous Heparin in Critical Care Patients / Int J Practical Nurs. 2022; 10(2):45–53.

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Received on: 25.02.2022

Accepted on: 28.03.2022

Abstract

Heparin administered subcutaneously, may cause adverse effects like pain, local irritation, erythema, hematoma and bruising at the site of injection. The researcher aimed to assess the effectiveness of the icepack application before and after administration of subcutaneous heparin injection on pain and bruise. Quantitative True experimental post-test only control group design was adopted and Systematic Random Sampling Technique

With Kth sample was employed and 59 subjects were seggregated in to experimental and control groups by Flip a Coin method. The report of this study was found that there was a significant reduction of pain and bruise complications associated with subcutaneous heparin in critical care patients in Experimental and Control group with icepack application. Icepack application (cryotherapy) is a safe, non-invasive, pain-free, easy to self-administer therapy it can enhance patients sense of Control over there management side effects, it is cost effective and improves quality of life

Keywords: Icepack, Pain and Bruising, Subcutaneous, Heparin, Critical Care Patients.

Introduction

Back ground of the study

Subcutaneous injection is an invasive method used to administer medication into a loose connective tissue just below the dermis of the skin. Heparin is an anticoagulant medicine, frequently used for prophylaxis of venous thromboembolism, in patients with medical illness, coronary and neurological disorders. Two types of heparin are commonly used as anticoagulants i.e Low Molecular Weight Heparin (LMWH) and Unfractionated Heparin (UH). Pain, bruise, hematoma are the most

common complications detected at subcutaneous injections site of heparin among the patients. Icepack application aims to reduce inflammation, decrease spasm, pain and stimulate vasoconstriction. It is a safe, non-invasive, pain-free, easy to self-administer therapy it can enhance patients sense of Control over there management side effects, it is cost effective and improves quality of life.

Significance of the study

When heparin is administered subcutaneously, it may also cause adverse effects including pain, local irritation, erythema, hematoma and bruising at the site of injection.[5] The incidence levels of local hematomas after administration of subcutaneous heparin is reported between 40% and 88% and between 26.6% and 88.9% for bruising. These problems are disturbing the patient and endanger patient safety which results in the patient's avoidance of future injections.[6] In Our setting 40 cases of subcutaneous heparin receiving patients are accounted every month in the critical care units. The primary physiological response of the icepack application results in reducing the initial inflammatory response to trauma, thus minimizing the barriers to wound healing and facilitate tissue repair. Bugaj reported that, the cooling and analgesic effect of applying ice to the skin is very beneficial, causing a numbing sensation and relieves pain.[8] The application of an icepack has been found to have various therapeutic benefits. Cold can reduce the sensitivity of pain through decreasing the level of catecholamine, increasing endorphin levels and delaying the transmission of pain signals to the central nervous system.[9] Cold also constricts the blood vessels, reduces blood flow to the tissues and decreases the hematoma formation.[10] Indian study stated that there is an impact of moist icepacks on the prevention and reduction of pain and bruising which was examined in interventional and Control groups, at 12, 48 and 72 hours following injection.[2] After an extensive review of the literature and witnessing the clinical cases; the researcher aimed to assess the effectiveness of the icepack application before and after administration of subcutaneous heparin injection on pain and bruise, in order to accomplish this study was carried in critical care units of NRI General Hospital.

Objectives of the Study

- To assess the difference of means after ice pack application on pain and bruising complications associated with subcutaneous heparin in critical care patients in series of observations (0 hour, 12 hours, 48 hours, and 72 hours respectively) in the Experimental group and without intervention in the Control group.
- To determine the association between post-interventional scores of subcutaneous heparin receiving patients with their selected variables in Experimental group.

Hypothesis

- **H1:** There willbe a significant difference of means after icepack application on pain and bruising complications associated with subcutaneous heparin injection in critical care patients (Experimental Group) in series of observations (0 hour, 12 hours, 48 hours and 72 hours respectively) with 95% of CI at ≤0.05 level of significance than in the Control group.
- **H2:** Significant association will be there between post-interventional scores of a patient receiving subcutaneous heparin injection with their selected variables with 95% of CI at ≤0.05 level of significance than in the Control group.

Mehods and Materials

- *Research Approach:* Quantitative evaluative research approach.
- *Research Design:* True experimental post-test only control group
- *Setting of the Study:* Critical care units of NRI General Hospital, Chinakakani, Guntur district, Andhra Pradesh.
- *Population:* Subcutaneous heparin receiving patients who are admitted in Critical Care Units of NRI General Hospital with the age between 30-70 years.

Sample and Sampling Technique

Sample: Subcutaneous heparin receiving patients aged between 30-70 years.

- **Sampling Design:** Probability sampling design.
- **Sampling Technique:** Systematic Random Sampling Technique
- **Sampling Method:** Random sampling with Kth sample to segregated the subjects in to experimental and control groups by Flip a Coin method.
- **Sample Size:** 60, subcutaneous heparin receiving patients; out of which 30 subjects

were in the Experimental group and 30 subjects in the Control group. Where one attrition was noted in Control group due to death.

Criteria for Selection of Sample

Inclusion Criteria

The inclusion criteria in the present study included subcutaneous heparin receiving patients who are:

- ✓ Hospitalized and admitted in the critical care units at NRI General Hospital, Chinakakani, Guntur.
- ✓ With the age between 30-70 years.
- ✓ Willing to participate in the study.
- ✓ Available at the time of data collection.
- ✓ Able to understand and speak Telugu.
- ✓ Male and female
- ✓ With PPT levels less than 90 seconds.

Exclusion Criteria

The study excluded the patients who are:

- ✓ Admitted in other than Coronary Care Units in NRI General Hospital.
- ✓ People not admitted to NRI General Hospital.
- ✓ Below 30 years and above 70 years.
- ✓ Not available during the period of data collection.
- ✓ Not willing to participate in the study.
- ✓ Not able to understand and speak Telugu.
- ✓ Transgender
- ✓ Patient with communication problems like mental and psychiatric disorders.
- ✓ Clients suffering from abdominal and thigh problems.
- ✓ With partial thromboplastin time more than 90 seconds.

Description of Tool

Based on the study objectives the tool was divided into two sections.

Section - I(A): It consists of a structured Interview Schedule to collect the socio-demographic variables. It had four items such as:

Age , Gender, Education, and Family income per month

Section - I(B): It consists of questions related to the clinical data which is gathered from clinical records and reports. It had nine items such as:

Dosage of heparin administration, Indication of heparin administration , Type of heparin, Type of syringe, Needle gauze, Presence of any chronic illness, BMI, Prothrombin time (PTT), and Platelet count.

Intervention Protocol: Application of icepack

Pilot Study

After obtaining prior permission from the authorities and consent from the subjects the pilot study was conducted from 23/01/2019 to 07/02/2019 (16 days); Where the results revealed that the present study is feasible and these subjects were not included in the final study.

Ethical Considerations

- Obtained from institutional ethical committee; and informed consent from participants.

Procedure of Data Collection

Written permission was obtained from the authorities. The subjects were employed by using a systematic random sampling technique and every K th person admitted in critical care units, receiving subcutaneous heparin injection was selected and segregated into an Experimental group (n=30) and Control groups (n=29) randomly by Flip a Coin method.Informed consent was obtained from the subjects. The effectiveness of an icepack application on pain and bruising complications associated with subcutaneous heparin was assessed during the period 10/02/19 to 24/03/19; (42 days). Initially, the treatment protocol was given to the Experimental group i.e application of moist icepack, before administration of subcutaneous heparin injection for 3 minutes twice daily for 3 days and second application after 12 hours.For each subject in Experimental and Control groups, the subcutaneous heparin injection site was rotated and the treatment protocol was followed for 3 minutes twice daily for 3 days for each site in the Experimental group. There was one attrition in the Control group due to death. Data collection was closed by thanking the participants.

Results

Tab: 1 Frequency and percentage distribution of socio-demographic variables of subcutaneous heparin receiving patients in both experimental & control groups.

Socio Demographic Variables	Experimental Group (n=30)		Control Group (n=29)	
	f	%	f	%
Age				
30-40years	8	26.7	3	10.5
41-50years	7	23.3	7	24
51-60years	3	30	11	38
61-70 years	12	40	8	27.5
Gender				
Male	21	70	18	62
Female	9	30	11	38
Education				
Illiterate	9	30	9	31
Knows read and write	4	13.3	7	24
Primary education	7	23.4	5	17.5
Secondary education	4	13.3	7	24
Intermediate and above	6	20	1	3.5
The family income per month				
5000/- and below	1	3.33	1	3.33
5,001/- to 15,000/-	8	26.7	20	69
15,000/- to 25,000/-	12	40	5	17.5
Above 25,000/-	9	30	3	10.2

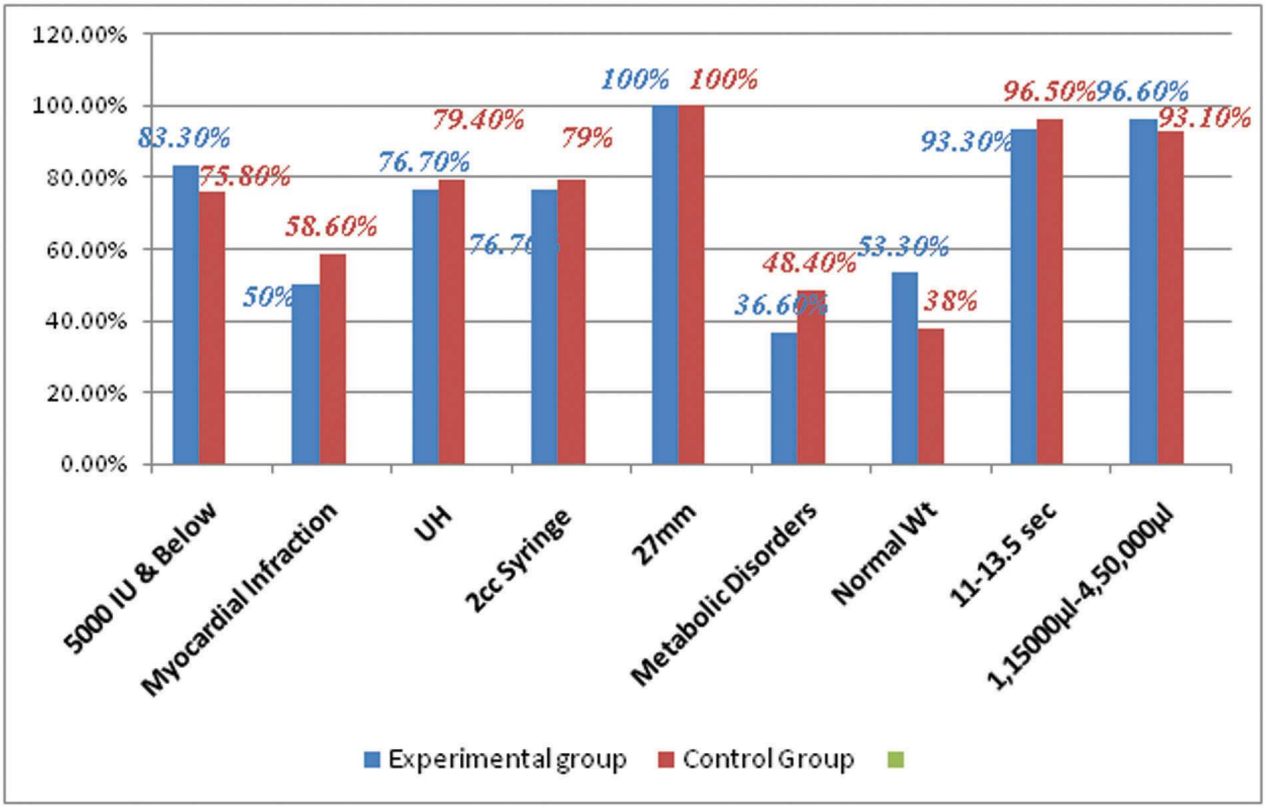

Fig. 1: Frequency and Percentage Distribution of Clinical Data

Tab.2: Mean and standard deviation of post-interventional scores of the Numerical pain rating scale

N=59

Group	0 Hours		12 Hours		48 Hours		72 Hours	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Experimental group (n=30)	2.15	0.64	0.07	0.11	-	-	-	-
Control group (n=29)	3.99	0.57	1.14	0.62	0.03	0.09	-	-

Tab.3: Mean and standard deviation of post-interventional bruise scores

N=59

Group	12 Hours		48 Hours		72 Hours	
	Mean	SD	Mean	SD	Mean	SD
Experimental group (n=30)	1.06	0.40	2.22	0.56	1.94	0.903
Control group (n=29)	2.01	0.51	3.49	0.50	2.2	0.59

Table 4: Chi-square showing association between post-interventional pain scores at 12 hours in the Experimental group with selected variables

N=59

Selected Variable	Pain		Chi-Square	P<0.05
	With Pain	With Out Pain		
Type of heparin				
a. LMWH	1	6	2.541	5.99 df:2
b. HMWH	0	0		
c. Un-fractioned heparin	11	12		
Type of syringe				
a. Pre-filled syringe	1	6	2.541	5.99 df:2
b. Heparin syringe	0	0		
c. 2cc syringe	11	12		
BMI				
a. Under weight	1	1	2.654	7.82 df:3
b. Normal weight	11	5		
c. Over weight	5	3		
d. Obese	1	3		

Tab.5: Chi-square showing association between post-interventional bruise scores at 48 hours in the Experimental group with selected variables

N=59

Selected Variable	Bruise		Chi-Square	P<0.05
	With Bruise	Without Bruise		
Type of heparin				
a. LMWH	4	3	0.0308	5.99 Df:2
b. HMWH	0	0		
c. Un-fractioned heparin	14	9		
Type of syringe				
a. Pre-filled syringe	4	3	0.0308	5.99 Df:2
b. Heparin syringe	0	0		
c. 2cc syringe	14	9		
BMI				
a. Under weight	1	1	10.41*	7.82 Df:3
b. Normal weight	13	3		
c. Over weight	1	7		
d. Obese	2	2		

Note: * Significant

Tab.6: The difference in means of pain and bruise complications by using Z-score

N=59

	Experimental Group (n=30)				Control Group (n=29)			
	Mean		Z Score		Mean		Z Score	
Pain								
0 Hours	2.15	0.64	-1.506	0.131	3.99	0.057	-1.426	0.152
12 Hours	0.07	0.11	-0.66	0.509	1.14	0.62	-1.504	0.133
48 Hours	-	_	-	-	0.03	0.09	-0.538	0.589
72 Hours	-	-	-	-	-	-	-	-
Bruise	1.06	0.40	-0.124	0.904	2.01	0.51	-0.377	0.703
12 Hours								
48 Hours	2.22	0.56	-5.813*	0.00001	3.49	0.50	-1.370	0.170
72 Hours	1.94	0.903	-4.219*	0.00006	2.2	0.59	-1.472	0.141

Note: * Significant

Discussion

Discussion on description of socio-demographic characteristics and clinical data of sample:

Regarding socio-demographic character-istics out of 59 respondents in both the groups majority of clients were between the ages 61-70 years; Males; illiterates; and had family income between 5,001/- to 15,000/- per month.

Regarding clinical data out of 59 respondents in both the groups majority of clients were receiving the dosage of heparin 5000 IU & below; most of them were indicated Myocardial Infraction; received Un-fractionated heparin; with 2cc syringe; with 27 gauze needle; suffering from Metabolic disorders; with both Normal and Over weight; Prothrombin level between 11-13.5 sec; Platelet count 1,15,000µl to 4,50,000 µl.

Discussion on a description of the level of pain and bruising complications after intervention

among subcutaneous heparin receiving patients at 0 - 12 - 48 - 72 hours respectively:

The high pain scores were noted at 0 hour and pain scores were decreased gradually in both experimental and control groups. When compared to the experimental and control groups mean pain scores the high scores were noted in the control group at all intervals (0 hour, 12 hours, 48 hours and 72 hours respectively). In regard to pain score, the study relieved that, pain was higher with patients who did not receive the cold therapy. It was statically significant without cold therapy. According to the result, it can be said that especially the cold therapy before the injection has both an analgesic effect and is effective in decreasing the pain perception in the study group. A study by NevinKuzu showed that, pre and post-injection cold therapy is effective in decreasing the pain during the procedure which was statistically significant.A study stated that the pain scores in the intervention with the cold application were lower than those in the intervention without cold application.The bruise scores gradually increased from 12 hours to 48 hours in both experimental and control groups and mean bruise scores were slightly decreased at 72 hours. The high bruise scores were noted at 48 hours after subcutaneous heparin injection. When compared to the experimental and control groups high bruisescore were noted in the control group at all intervals (12 hours, 48 hours and 72 hours respectively).

Discussion on a description of the effectiveness of icepack application on pain and bruising complications among subcutaneous heparin injection in both experimental and control groups by comparing the differences of means:

There was a significant difference in mean scores of a bruise at 48 hours and 72 hours in the experimental group among subcutaneous heparin receiving patients. Hence researcher accepted the research hypothesis (H1) and rejected the null hypothesis (H01). On the other hand no significant difference in mean scores of pain at 0 hour, 12 hours,48 hours and 72 hours respectively and bruise at 12 hours in the experimental group. Hence researcher accepted the null hypothesis (H01) and rejected the research hypothesis (H1).Whereas in terms of control group there was no significant difference in mean scores of pain at 0 hour, 12 hours, and 48 hours. No pain was noted at 72 hours. On the other hand, there was no significant difference in bruise scores at 12 hours, 48 hours and 72 hours respectively. A Study stated that, for both intervention groups, the peak of bruising was at 48 hours after injections, and the beginning of the disappearing process was within 24 hours after this peak. This finding was consistent with the finding of previous studies (BalciAkpinar&Celebioglu, de Campos, Chan, Dadaeen, Varghese, et al. However, contrary to the findings of those studies, the study of the control group also demonstrated increasing bruise size 72 hours after the injections, which is accordance with our present study.The current study where the size of the bruise was increased at 48 hours and decreased in size at 72 hours.The study stated that the effects of cold application on the formation of bruising in relation to its physiological effects can be shown as evidence in nursing practices. The first reaction to cooling the skin in studies that have been conducted is vasoconstriction in surface arterioles. As a result of this, blood flow in capillaries in the area and capillary permeability are reduced, leucocytes leave the blood vessel wall with greater difficulty, and in this way haemorrhaging in reduced. This reduces the formation of bruising, which is compliance with present study.The drug dose administered, the frequency, airlock and aspiration technique, the injection area, the duration of administering the drug, the time the needle was left in the tissue before withdrawal, and the bruise measuring instrument also influenced the results of the study, which is coherence with the present study.

Discussion on a description of the association between post-interventional scores of subcutaneous heparin receiving patients with their selected variables in the experimental group:

There is an association between post-interventional bruise scores at 48 hours among subcutaneous heparin receiving patients with BMI at 3 degrees of freedom. Hence researcher accepted the research hypothesis (H2) and rejected the null hypothesis (H02). There is no association between post-interventional bruise scores at 48 hours among subcutaneous heparin receiving patients with their selected variables i.e., Type of heparin, Type of syringe. There is no association between post-interventional pain scores at 12 hours among subcutaneous heparin receiving patients with their selected variables i.e., Type of heparin, Type of syringe, and BMI. Hence researcher accepted the null hypothesis (H02) and rejected the research hypothesis (H2).A study stated that a statistically significant difference was observed between the two groups in terms of prevention and reduction of pain and bruise at the subcutaneous heparin injection site.

Limitations

The study was conducted in NRI General Hospital, Chinakakani, Guntur. Small sample size (n=59) and randomization with single blindness was used in the study due to time constraints to complete my study.

Recommendations of the Study

1. Icepack application before and after subcutaneous heparin injection and followed after 12 hours of injection for 3 minutes twice daily for 3 days for the injection site.
2. Inject the medication with the airlock technique and slowly administer the medication over 30 seconds and needle left in the tissue for 10 seconds before with drawl.
3. Assess the pain immediately after needle with a drawl (0 hour), 12 hours, 48 hours, and 72 hours respectively with a numerical pain rating scale.
4. Assess the bruise after 12 hours of injection, 48 hours, and 72 hours respectively with millimetric graph paper.
5. Rotation of site is necessary for each dose of injection to reduce complications like pain, bruise, and hematoma at the injection site.

Conclusion

Icepack application (cryotherapy) is a safe, non-invasive, pain-free, easy to self-administer therapy it can enhance patients sense of Control over there management side effects, it is cost effective and improves quality of life. It is also an innovative idea to involve patients in their own care to play a major role in relieving their distressing symptoms through a simple procedure like an Icepack application (cryotherapy).[10]

The present study was intended to assess the effectiveness of icepack application on pain and bruising complications associated with subcutaneous heparin in critical care patients at a selected hospital, Chinakakani, Guntur (DT), A.P. The report of this study was found that there was a significant reduction of pain and bruise complications associated with subcutaneous heparin in critical care patients in Experimental and Control group with icepack application.

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