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Original Research Article

Pressure Application to Prevent Bruising in Subcutaneous Heparin Injection

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ABSTRACT

Objective: Bruising that result from heparin injections increases patients' anxiety and reduces their confidence in nurses' efficiency, resulting in refusal to further injections This undesired effect can be diminished using the proper technique and taking a few simple measures. This study aimed to examine the effect of applying pressure for a minute on bruising in subcutaneous heparin injection.
Methods: The study, experimental study with a control group, was conducted at an orthopedic clinic. The sample consisted of 49 patients who agreed to participate in this study and to whom heparin was injected subcutaneously. Experimental and control practices were performed on the abdominal area of the same patient using the same amount of heparin. The study data were collected using an information form, subcutaneous heparin observation form, and Opsite Flexigrid assessment tool. The data analysis was performed using percentage distribution, chi-square test, and Fisher's exact test.
Results: This study found that bruising occurred significantly ($p < 0,05$) less in the area on which pressure was applied for a minute using dry cotton compared with the area where pressure was applied for a short time.
Conclusions: Applying pressure on the injection area for a minute following a subcutaneous heparin injection reduced the development rate of bruising. Thus, the study concluded that this method was effective in preventing the formation of bruising in subcutaneous heparin injection practices.

Keywords: pressure, bruising, subcutaneous heparin injection, nursing

INTRODUCTION

The administration of medication is one of the basic nursing practices, and perhaps the first skill related to nursing by the society. The preparation and administration of the medication, and the evaluation of their effects are among the goals in patient safety. Nurses are responsible for effectively administering medicines, minimizing their harmful effects, and ensuring the positive effects they could lead to. [1-3] The scope of this responsibility is quite broad. In addition to preparation, administration and evaluation, it also requires making use of the proof and guides, and conducting studies to improve administration.

Subcutaneous injection is a method of parenteral injection that is used to administer certain substances including vaccines, insulin, hormone, and heparin. Heparin is one of these anticoagulant substances that reduce the rate of coagulation and can be administered orally or parenterally. [4] Heparin is used very commonly in treating diseases and as a protective intervention for people facing thromboembolism risk because it prevents

the development of thrombus and thromboembolic complications. [1,4-6] Although it has different forms, heparin with low molecular weight (HLMW), administered subcutaneously, is used more frequently in the clinics. [2,7] In addition to the desired systemic effect, complications or problems such as bruising, hematoma, and pain may emerge following subcutaneous heparin injections. [1,5,8,9]

Bruising is the bluish purple or black patch on the skin that occurs as a result of blood flowing through the tissue. [10] Bruising, which is an undesired condition developing after the subcutaneous heparin injection applications and due to the injection method in general, affects patients and practitioners negatively since it has an unpleasant appearance. [8,9] Other than the cosmetic appearance, heparin injection restricts the application area since this procedure requires changing the application site and maintains it in rings. [1,11]

Bruising that results from heparin injections increases patients' anxiety and reduces their confidence in nurses' efficiency, resulting in refusal to further injections. [12-14] This undesired effect can be diminished using the proper technique and taking a few simple measures. The formation period of bruising and hematoma (due to heparin injection) varies, but it reaches the most distinctive level in the 48th h after the injection and begins to fade no later than the 72the h. [1,15,16]

The method to be followed in heparin injections is not different from the standard procedure to be used in subcutaneous injection.

Needle-entry angle: The needle-entry angle in heparin injection is recommended to range between 45° and 90° based on the volume of subcutaneous tissue and patients' age, weight, and muscular characteristics. [2,17,18]

Protection from trauma: Interstitial needle movement should be minimized to prevent injection-based trauma. Administering heparin with a slow and constant pressure prevents tissue damage and discomfort. Applying pressure on the injection area following the subcutaneous heparin injection reduces the development rate of bruising due to its indirect effect on the physiologic process. [1,2,17,19]

The injection area should not be massaged following the heparin injection since massaging alters the normal absorption speed of the medicine and causes bleeding and bruising. [2,8,18,19] The absorption speed varies by the injection area as well. It is fastest in the abdominal area, moderate in the arms, and slower on the front side of femur and upper side of back and hips. The upper abdominal area is the best place for heparin injection for thin people since they do not have sufficient amount of subcutaneous tissues for subcutaneous injection. [2,19]

Different studies on preventing bruising are available in the relevant literature. [1,5,9,11,13,14] Some of these studies are related to the duration of injection, and these durations range between 5 and 30 seconds. [1,13,20] However, there are study results indicating that the duration of heparin injection should be at least 10 seconds, which reduces the possibility for the development of bruising. [5,11,14] All these studies indicate that pressure should be applied, without massaging, to the heparin injection area following the procedure. However, recommendations regarding how long the pressure should be applied are quite different. [2,5,11,14,18] Medicinal prospectuses do not contain any instructions regarding this issue. [21] Bruising due to heparin injection is considered to be a problem for both patients and nurses because it is an important factor for changing and adjusting clinical performance. [22]

Considering the previous studies and researchers' needs during the clinical practices, this study aimed to examine the effect of applying pressure for a minute on the development of bruising following the subcutaneous heparin injection in orthopedic patients.

MATERIALS AND METHODS

This is an experimental study with a control group which was conducted at the orthopedic clinic of a state hospital operated by the Ministry of Health.

Sample

This study sample included 49 patients who agreed to participate, met the inclusion criteria, and experienced subcutaneous heparin injection following the commencement date. Both experimental and control practices were performed on one study sample. Specific references were determined for the inclusion criteria. These criteria were as follows:

- No history of coagulopathy. (The reference range of the laboratory where the study was conducted was used for the prothrombin time, and similar values were considered for inclusion.)
- Receiving heparin treatment with low molecular weight.
- No communication difficulties for obtaining consent.
- No scar tissue, incision, or injection mark on the abdominal area where the injection was performed.
- No history of allergy.

Data Collection

The data were collected using the information form, subcutaneous heparin observation form, Opsite Flexigrid measurement tool, and acetate pen.

Introduction form: It is an eight-question form about patients' age, gender, height and weight, smoking habit and chronic diseases, and medicines they used.

Subcutaneous heparin observation form: It was prepared by the researchers to indicate the development and size of bruising.

Opsite Flexigrid measurement tool: It is a transparent assessment tool used to perform millimetric measurements for the size of bruising in the injection area. It was supported with a transparent acetate facilitate the assessment. Acetate pen is used to define the borders of bruising.

The study commenced after the permissions and consent were obtained from the relevant institution and ethics committee. The injections performed in accordance with the clinical routines consisted of the routine practices. The plan generated for the study was followed for the experimental practice. Heparin injections were administered to both sides of the abdominal area during both experimental and control practices. The left abdominal area of the patient was used for the control practice, while the right side was used for the experimental practice. Standard injectable injectors with 1.26-cm needle, 4000 IU of HLMW, and air bubble were used. [21] The injections were performed at 21.00 o'clock in accordance with the clinical routines. All injections were performed with size measurement of bruising and post-injection observations in mind. The body mass index (BMI) of the patient was evaluated using the BMI = weight (kg)/height^2 (m^2) formula, using the classification by World Health Organization (WHO). [23] The patients were classified as follows:

If the index is lower than 18.50 kg/m^2, underweight

If it is between 18.5 and 24.99 kg/m^2, normal

If it is between 25 and 29.99 kg/m^2, overweight

If it is between 30 and 34.99 kg/m^2, obese class I

If it is between 35 and 39.99 kg/m^2, obese class II

If it is over 40 kg/m^2, morbid obese class III

The following procedure was applied in each practice until the injector was extracted:

- Before administering the medicine, the area was wiped using an alcohol-containing cotton with circular movements from the center to outside at a 5-cm area.
- The practice started after the tissue was held, and the tissue was not released during the practice.
- The injection was performed at 45° on those whose BMI was normal or less than normal holding the administration

area. For the overweight/obese individuals, the injection was performed at 90° holding the tissue.

- The medicine was administered in 20 s, and the injector was extracted at the same angle after administering the medicine.
- In the control practice, the pressure was applied for 3 or 4 s using dry cotton after the injector was extracted in accordance with the clinic routine.
- In the experimental practice, the pressure was applied for 60 s using dry cotton after the injector was extracted.

The injection was performed using the following method by the same researcher at the same hour. The injection was administered on the right abdominal area on the first day (experimental practice), on the left abdominal area on the second day (control practice), on the right abdominal area on the third day (experimental practice), and on the left abdominal area on the fourth day (control practice). Thus, the experimental and control practices were performed every other day. The injection areas were changed by rotation, and the injection was performed at least 2.5 cm further from the previous spot in the following subcutaneous injections. The development and size of bruising in the injection area were evaluated in the 24th, 48th, and 72th hours after each injection. The borders of bruising area (if emerged) were marked using an acetate pen. The Opsite Flexigrid measurement tool was placed on the acetate, and its size was measured in millimeter square and defined in three groups: a small bruising with a diameter smaller than 2 mm as pinpoint needle tip, a moderate-sized bruising with a diameter ranging between 2 and 10 mm, and a large bruising with a diameter greater than 10 mm. [24]

Ethical Considerations:

The approval of the ethics committee of the Halic University was obtained before the study (consent date-number: 11/12/2013 - 86). Permission was taken from the hospital administrator. Later, informed consent was obtained from those who agreed to participate.

Statistical Analysis:

The data analysis was performed using SPSS 15.0 for Windows. The details regarding the demographic data were presented in frequency and percentage tables. The chi-square test was used to examine the relationships between the variables. The Fisher's exact test was used as a continuity correction factor when the value in the tables with four cells was smaller than 5. The significance level was accepted as $p < 0.05$ in the analyses.

RESULTS

Table 1. Characteristics of patients (n=49)

Characteristics	Groups	n	%
Age	45-64	16	32,7
	65-84	33	67,3
Gender	Women	43	87,8
	Men	6	12,2
BMI	underweight /normal	4	8,2
	Overweight / obese	45	91,8

Table 2. Distribution of the development of bruising (n=49)

First Practice								
Hour	**Control Practice**				**Experimental Practice**			
	Present		**Absent**		**Present**		**Absent**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
24 th	22	44,9	27	55,1	18	36,7	31	63,3
	X^2=0,676 ; p=0,411							
48th	24	49	25	51	19	38,8	30	61,2
	X^2=1,036; p=0,309							
72nd	24	49	25	51	18	36,7	31	63,3
	X^2=1,500 ; p=0,221							
Second Practice								
Hour	**Control Practice**				**Experimental Practice**			
	Present		**Absent**		**Present**		**Absent**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
24 th	23	46,9	26	53,1	11	22,4	38	77,6
	X^2=6,485 ; p=0·011*							
48th	24	49	25	51	12	24,5	37	75,5
	X^2=6,323 ; p=0,012*							
72nd	25	51	24	49	12	24,5	37	75,5
	X^2=7,338 ; p=0,007*							

The chi-square test

Of the patients, 67,3% (n = 33) were aged between 65 and 84 years, and their mean age was 68,5 ± 9.5 years; 87,8% were (n = 43) female; and 91,8% (n = 45) were overweight/obese (Table 1). Following the first injection practices, no significant difference was present in the development of bruising observed at all hours between the experimental and control practices (p > 0,05). Following the second practice, significant differences were found in the

development rates of bruising between the experimental and control practices ($p < 0.05$) (Table 2).

The sizes of bruising were examined, and no significant difference was found between the experimental and control practices. However, the sizes of the numerical values were found to range (Table 3). Although small bruising developed in 28% of the patients in the experimental practice 24 h after the first practice, this rate was 50% in the control practice. The development rate of moderate-sized bruising was 72% in the experimental practice and 36% in the control practice. Although large bruising developed in all hours of the control practice within the first practice, they did not develop in the experimental practice. Regarding the second practice, the development rate of large bruising seen in the control practice was found to be higher (Table 3).

Table 3. Distribution and relationship of the size of bruising (N=49)

First Practice												
Hour	**Control Practice**						**Experimental Practice**					
	Small		**Moderate**		**Large**		**Small**		**Moderate**		**Large**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
24 th	11	50	8	36,4	3	13,6	5	27,8	13	72,2	-	-
	X^2=6,716 ; p=0,082*											
48th	4	16,7	16	66,7	4	16,7	4	21,1	15	78,9	-	-
	X^2=4,487 ; p=0,213*											
72nd	3	12,5	15	62,5	6	25	6	33,3	12	66,7	-	-
	X^2=7,597 ; p=0,055*											
Second Practice												
Hour	**Control Practice**						**Experimental Practice**					
	Small		**Moderate**		**Large**		**Small**		**Moderate**		**Large**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
24 th	5	21,7	17	73,9	1	4,3	4	36,4	6	54,5	1	9,1
	X^2=7,622 ; p=0,055*											
48th	3	12,5	19	79,2	2	8,3	2	18,2	9	81,8	1	9,1
	X^2=6,427 ; p=0,093*											
72nd	4	16	18	72	3	12	2	16,7	8	66,7	2	16,7
	X^2=6,267 ; p=0,099*											

The chi-square test * The Fisher's exact test

DISCUSSION

The effect of developments seen in science and technology also reflects on nursing practices. This reflection is effective when nurses use their knowledge and skills together rather than using them separately. Nurses support the developments in science and technology with the evidence-based practices they perform and also support the development of nursing. Subcutaneous HLMW injection practices facilitate good nursing practices for patients. They increase nurses' responsibilities regarding complications. Incorrect or incomplete practices cause pain to patients, besides the development of bruising with an undesired appearance. In a study that examined the effect of applying pressure for 60 s on the development of bruising, the development rate of bruising significantly diminished in the experimental practices within the second practice (Table 2). The decrease in the experimental practice was not significant in the first practice, and the development rate of bruising was higher in the experimental practice than in the control practice. The decrease in the development rate of bruising in this practice supported the significant difference in the second practice, although the decrease in the development rate was not significant. The findings in this study were consistent with those in previous studies [1,2,16,17,19] indicating that the pressure applied to the injection area following the subcutaneous heparin injection reduced the development rate of bruising, and also revealed the effect of the duration for which the pressure was applied. Several previous studies have included the study outcomes related to various pressure durations. Yıldırım's study (1999) suggested that bruising developed in patients on whom pressure was applied for 5–10 s. [25] In a study conducted to determine the effect of

the duration of pressure (10 or 60 s) applied on the development of bruising following the subcutaneous heparin injection, Zaybak (2008) suggested that no significant difference (p > 0,05) in the development of bruising was observed between the experimental and control practices, which was in contrast with the former study. However, in a study conducted by Zaybak and Khorşit (2008) to examine the effect of applying pressure (for 30 and 10 s) on the development of bruising in the injection area, it was found that applying pressure for 30 s significantly reduced the development rate of bruising compared with that for 10 s. [1,5] The findings of the present study indicated that pressure should be applied, but the differences in the duration of pressure still exist. Different studies are needed to further validate this result.

Previous studies report that bruising and hematoma developed following the subcutaneous heparin injection reached their most distinctive form 48 h after the injection and started fading no later than 72 h. [1,15] Thus, the measurements were performed at the 24th, 48th, and 72nd h. The difference generated by the sizes of bruising in hours was not significant (Table 3). However, fewer and smaller bruises were present in the experimental practices compared with those in the control practices, and no large bruising was found. Consequently, the findings of this study suggested that applying pressure for 60 s following the subcutaneous heparin injection reduced the rate and size of bruising.

CONCLUSION

Subcutaneous HLMW injection practices provide facilitation for both patients and the nursing practices. Subcutaneous heparin practices increase nurses' responsibilities regarding complications. This study indicated that applying pressure for 60 s following the subcutaneous heparin injection facilitated the development of fewer and smaller bruises. Thus, the method of applying pressure for 60 s following subcutaneous heparin injections was effective in preventing the development of bruising. However, further studies comparing different durations of applying pressure are still needed.

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