Effectiveness of Thumb Manual Pressure on Pain, Bruising and Satisfaction Associated with Anticoagulant Subcutaneous Injection.

Noura Mahmoud Mohammad Elrefaey [(1)], Laila A. Hamed[(2)], Suzan Mohamed Elsayed[(3)]

[(1)] Lecturer of Medical-Surgical Nursing, Faculty of Nursing- Matrouh University

[(2)] Assistant professor of Medical-Surgical Nursing, Faculty of Nursing - Zagazig University. ORCID ID https://orcid.org/0000-0002-7921-6343

[(3)] Lecturer of Medical-Surgical Nursing, Faculty of Nursing - Zagazig University

*Corresponding Author: noramahmoud@mau.edu.eg

Abstract

Anticoagulant medications help prevent thromboembolisms, and improve health. The most common negative consequences of anticoagulant injection are pain, bruising that affect negatively on patient satisfaction. Non pharmacological methods to decrease such consequences had a great attention. **Aim of the study:** Explore the effectiveness of thumb manual pressure application on anticoagulant subcutaneous injection pain, bruising, and satisfaction experienced compared to routine SCI. **Study design:** A quasi-experimental nonequivalent one-group self-controlled design was used. **Setting:** the study applied in the orthopedic Surgery department at New-surgery hospital of Zagazig University hospitals. **Subjects:** a convenience sample of a single group from both males and females. It included 88 participants. **Tools:** Four tools were used in this study. The same participants were both in control and intervention. The same nurse applied a subcutaneous injection into the upper outer Lt arm followed by thumb pressure for 10 seconds as an intervention group. Whereas, the routine SCI in the upper outer Rt arm was injected in the same patient by the same nurse and considered as a control group. Pain level, bruising and patient satisfaction were assessed. **Results:** there was a statistical significance difference in the pain level, bruising and satisfaction, explored via less pain intensity, minor bruising and high satisfaction level where thumb manual pressure applied over the left arm SC anticoagulant injection. **Conclusion**: manual pressure application is a more effective method in reducing pain, bruising and increasing satisfaction level due to subcutaneous injection. Thus using such non-pharmacological methods was effective.

Keywords: Anticoagulant Subcutaneous Injection, Bruising, Pain, Satisfaction, Thump Manual Pressure.

Introduction:

In terms of administering medications, nurses have a significant concern. Subcutaneous injection is one technique of parenteral drug administration; it is typically used with medications including insulin, hormones, and anticoagulants. Anticoagulant medications help prevent thromboembolisms, improve health, and extend life. Despite having negative effects that could endanger a patient's life, this medication is nonetheless extensively used. (**Kilic & Midilli., 2017; Visvanathan., 2015**).

According to **Avsar and Kaşikçi (2013) and Pourghaznein et al. (2014),** administering subcutaneous anticoagulants frequently results in side effects such as pain at the injection site, bruising, sclerosis, and the development of hematomas. According to **Poursafar et al 2019** .'s study, there is a 26.6% to 88.9% range and a 40% to 88% range in the incidence rates of bruising and hematomas following the subcutaneous injection of low molecular weight heparin, respectively.

Furthermore, **Palese et al. (2013)** noted that the prevalence of ecchymosis

following subcutaneous injection of anticoagulant medications ranged from 20.6% to 88.9%, which is a glaring indicator of such a problem. Although bruising is a benign consequence, it can nonetheless make the patient discomfort. These side effects often harm the patient, causing anxiety, a loss of confidence, and even rejection to get treatment, which may place the patient's safety in danger. In addition, after bruising, it is required to avoid repetitive injections in the bruised area, therefore limiting the injectable areas **(Wang et al., 2020; Cengiz & Özkan., 2018; Koratala & Bhattacharya., 2018)**.

A study by **(Ahmadi et al., 2016**) further demonstrated that these treatment-related bruises and hematomas not only cause physical damage but also impair body awareness and make it challenging to choose an injection site. Using the traumatized area for later injections hurts and hinders the body's ability to absorb the medication. The relationship between patients and nurses can be affected by painful injections **(BLG., 2021; Najafi et al., 2019)**. The location of the subcutaneous heparin injection, how long it takes to provide the injection, how long the needle is in the tissue, and the airlock and aspiration procedures all contribute to the occurrence of these issues. **(Pourghaznein et al., 2014; Avşar & KAŞIKCI., 2012).**

Therefore, among the most important aspects of drug administration is safe drug injection. Additionally, one of the most crucial aspects of medication therapy and a crucial nursing practice is the subsequent assessment of drug administration to determine the efficacy of treatment. Nurses should keep an eye on a patient's response to pharmacological therapy, as well as any beneficial or harmful effects (**Frandsen & Pennington., 2013)**.

As a result, nurses should employ techniques and skills to reduce the likelihood of the aforementioned negative effects when administering subcutaneous anticoagulant injections to increase patient satisfaction with the standard of nursing care they receive, boost their confidence in healthcare professionals, and motivate them to participate in their care (Woodley et al., 2022). Moreover, one of the most fundamental human rights is the right to be free from pain. To reduce injection discomfort, a variety of techniques have been developed throughout history (**Derya et al., 2015).**

There are many ways in which we can lessen the severity of pain by reducing catecholamine levels, increasing endorphin levels, and postponing the transmission of pain signals to the central nervous system. One of them is cold application. Cold application is a treatment that reduces tissue temperature, blood flow, and cell metabolism (**Unal et al., 2021; Thijs et al., 2019**).

The application of local physical pressure at the injection site reduces pain after later intramuscular injection, according to additional studies. They proposed that applying pressure would trigger the release of beta-endorphin into the local bloodstream, reducing localized discomfort (**Attia & Hassan., 2017**). This manual pressure technique has the advantages of not requiring additional medication, having few (if any) side effects, requiring no additional equipment, and not considering extending the treatment time. Therefore, this technique may be a useful and efficient way to reduce pain during subcutaneous injection (**Nakashima et al., 2013**).

Few studies have examined the potential impact of manual pressure on bruising and patient satisfaction related to anticoagulant subcutaneous injection, hence the researchers thought it was crucial to investigate this issue.

Significance of the study:

The anticoagulant drug is widely used within a subcutaneous route. Its adverse reactions primarily embrace subcutaneous hemorrhage, pain, thrombocytopenia, and skin necrosis. Many studies examine the role and variant effect of pressing time after injection. improper pressing technique and inadequate pressing time after needle extraction are important reasons for anticoagulant subcutaneous hemorrhage and pain. In addition, subsequent ecchymosis will affect the consequent injection operation, lessen the scope of subcutaneous injection, and root patients' discomfort, dissatisfaction, tension, and worry, as well as their distrust of nurses. Numerous studies have supported the impact of pressure in reducing intramuscular injection and vaccination-related pain. The effectiveness of the thump manual pressure technique for reducing discomfort, and bruising, and boosting satisfaction after the subcutaneous anticoagulant injection has not been evaluated in a study. Thumb manual pressure can be an effective method for reducing subcutaneous anticoagulant injection-associated pain and bruising which reflect positively on patient satisfaction.

Aim of the study:

Explore the effectiveness of thumb manual pressure application on anticoagulant subcutaneous injection pain, bruising, and satisfaction experienced compared to routine SCI.

Research hypotheses:

H_{1a}: The patient's arm that experienced thumb manual pressure will experience less pain compared to routine SCI.

H_{1b}: The technique of Subcutaneous injection with thumb manual pressure would decrease bruising formation compared to routine SCI.

H_{1c}: Patients who experienced thumb manual pressure will experience more satisfaction than those who do not receive a such intervention.

Operational definitions:

Thump manual pressure in this study was *defined operationally* as an application of 10 seconds of local pressure by the researcher's thump at the patient's left arm anticoagulant subcutaneous injection site considering the intervention area.

Materials &Method

Study design: A quasi-experimental nonequivalent one-group self-controlled design was used to assess the causal effect of SCI with thumb manual pressure on Pain, Bruising, and patients' satisfaction.

Setting: the current study applied in the orthopedic Surgery department at New-surgery hospital of Zagazig University hospitals. This department performs orthopedic surgery for both males and females gender. This department is located on the 5th floor and divided into 2 groups (A&B), including eight rooms Prepared with monitors, Oxygen apparatus, and occupied 40 beds.

Subjects & Sampling: the current study applied a convenience sample of a single group from both males and females. It included 88 participants.

Sample size calculation:

The researchers estimated the sample size by using (https://clincalc.com/) at a confidence level of 95%, type I error (α=0.05), type II error (β=0.10), and power (1-β=0.90).

Inclusion criteria: Adult male and female aged between 18 to above 50-years-old, fully conscious, willing to participate in the study, able to communicate, and newly injected with Enoxaparin sodium (Clexan), not taken parenteral or oral pain sedative before injection. the participants who met the inclusion criteria were enrolled in the study.

Exclusion criteria: the researchers excluded the participants with upper extremities and mastectomy surgery, sensory or motor deficit, ecchymosis, and generalized edema.

Tools:

Four tools were used in this study for data collecting, based on an extensive review of related literature.

The tool I: "Structured Questionnaire for Sociodemographic and Clinical Data on Patients". It is divided into two parts.

Part 1 included data about the participants' age, gender, and education level.

Part 2 included past medical history, measurement of Rt arm, and Lt arm circumference. Additionally, height and weight were measured to estimate the Body Mass Index (BMI).

Scoring of BMI:

Body weight in kilograms divided by height in meters squared is used to compute BMI. Based on **(Liang, X., & Fan, J. (2022))**, the patient's body mass index is classified into: "underweight <18.5, normal (18.5-24.9 kg/m2), overweight (25.0-29.9 kg/m2), and obese (30.0 kg/m2)"

Tool II: Pain Visual Analogue Scale: It was adopted by **(Delgado et al., 2018)** to assess pain intensity. It is a 10-cm-long scale. The right end is for "severe pain" whereas, the left end of it is for "no pain".

Scoring system: this scale classified pain intensity into no pain (0), mild pain (1–4), moderate pain (5–7), and severe pain (8– 10).

Tool III: The researchers used a transparent millimeter ruler to measure the size of the bruising at the injected site**. A Bruising Category Scale was** adopted from **(McGowan and Wood., 1990) for Scoring bruising. It is** classified into three categories according to the surface area: Absent bruise (<5 mm^2), small (2-5 mm^2), and large (>5 mm^2)

Tool IV: Satisfaction Visual Analogue Scale (SVAS) was adopted from (**Brokelman et al., 2012**). After each SCI, the researchers asked this question, thinking about the procedure of SCI delivered, what is your overall satisfaction with this procedure?

The SVAS was used to measure the degree of patient satisfaction after SCI. it is a 10-cm long line with subjective, descriptive statements on both sides made up the VAS, the left end (0 cm is for not satisfied at all) and the right end (10 cm very satisfied). The participant was instructed to sign on the line expressing their level of satisfaction. The researcher noted the numerical values.

Satisfaction degree was Categorized into: dissatisfied (0-4), Neutral (5-7), and satisfied (8-10)

Method:

- The researchers developed data-collecting instruments during the preparation phase. It involved reviewing relevant literature and acquiring a theoretical understanding of numerous research components, utilizing books, papers, the internet, magazines, and journals.
- Three experts in medical-surgical nursing specialists evaluated the study's tools for content validity to ensure the accuracy and completeness of its items.
- For measuring internal consistency, utilize Cronbach's alpha test. The tools' reliability ratings were r coefficients of (r= 0.94) for tool II and (r= 0.75) for tool IV, indicating the good internal consistency of the used tools.

Fieldwork:

- To assess the tools' clarity, viability, and application, a pilot study including eight patients (10% of the patients meeting the inclusion criteria) was done. The pilot sample was included in the study's sample.

Data collection:

-The researchers evaluate orthopedic surgical patients newly receiving SCI enoxaparin (Clexan) who met the inclusion criteria. Patients who satisfied, the research's eligibility requirements have explained the study and asked whether they would be willing to participate. The actual work for this study began in August of 2022 and until the end of December 2022.

In the previously indicated setting, the investigator gathered data five days a week during afternoon shifts.

- The researchers used a standardized electronic scale to measure body weight, a measurement tap for taking height, a transparent millimeter ruler to measure the size of the bruising, and a flexible non-stretch tape to measure the mid-upper Lt and Rt arm circumference.
- The same participants were both in control and intervention. The same nurse applied a subcutaneous **injection** into the upper outer Lt arm followed by thumb pressure for 10 seconds as an intervention group. Whereas, the routine SCI in the upper outer Rt arm was injected in the same patient by the same nurse and considered as a control group.
- The SCI protocol for all the participants was, Injection of enoxaparin with (a pre-filled syringe), 27 needle size, 70% ethyl alcohol swab to disinfect the injection site, no aspiration for 10 seconds, and injection in the lateral outer region of the arm.
- The first dose of SCI was delivered routinely on the control side first. Whereas, the second dosage was injected on the experimental side, followed by thumb manual pressure for 10 seconds. A skin marker was used to label the regions up to 5 mm^2 after injection. After administering each SC injection, a numerical Visual pain and satisfaction scale was immediately done.
- The respondents were informed that the researchers will visit them for a bruise evaluation at 24 and 48 hours for examining the respondent's bruise using a clear ruler scale.

Ethical considerations:

Approval of the Ethical Research Committee was taken from the faculty of nursing, Zagazig University. Additionally, official permission was obtained from the study setting's responsible director after explaining the study's objectives to conduct it there. After being informed of the study's objectives, participants provided signed informed permission. Their involvement was entirely voluntary, and they were given the freedom to withdraw at any time. Data privacy and confidentiality were ensured.

Data analysis

Data collected throughout history, nursing physical examination, and outcome measures were coded, entered, and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) **(Statistical Package for the Social Sciences)** software for analysis. According to the type of data, qualitative represent number and percentage, and the quantitative continues group is represented by mean ± SD, the following tests were used to test differences for significance; difference, and association of qualitative variable by Chi-square test (X^2). Differences between quantitative independent groups by t-test, correlation by Pearson's correlation for parametric data or–Kendell's_taue for non-parametric data. P value was set at <0.05 for significant results & <0.001 for highly significant results.

Results:

The present study included 88 of the participants who received anticoagulant SC injections. They are injected with one dose routinely in the right arm, whereas, another dose was injected in the left arm followed by thumb pressure.

According to their demographic data, the study's result shows that more than half (55.7%) of them were females. Their mean age is 38.61 (SD 11.68), and one-third of them are aged between 30 to less than 40 years. Furthermore, 27.3% of the participants have a secondary education.

One-third of them has a past Diabetes mellitus medical history. Regarding body mass index, 71.6 % of patients are obese ≥30 kg/ m^2. Moreover, the mean BMI of the participants is 33.32 (SD7.69). additionally, the mean of their right and left arm Circumferences are 23.91 ±4.694 / 23.80±4.617 respectively (**Table1**).

Figure (1) portrays the distribution of the participants according to their current diagnosis. It illustrates that nearly one-third (33%) of the participants have hip fractures whereas the minority of them have cartilage removal (7%).

Table II summaries the pain, bruising, and satisfaction of the participants according to the SC injection protocols. It shows that one-quarter of the participants have severe pain in the Rt arm after routine SC injection (25%) with statistically significant association compared to (1.1%) of them who have severe pain in the Lt arm after SC injection with Thumb pressure. Moreover, the mean pain score decreased from 5.75±2.23 in the Rt arm to 2.61±2.08 in the Lt arm with statistically significant difference at ($p<0.001$).

Regarding bruising, nearly half of the participants (48.9%) have large bruising in the Rt am with routine SC injection with statistically significant association. Whereas, only (2.3%) of them have large bruising in the Lt arm after SC injection followed by thumb pressure. Furthermore, the mean bruising score decreases from 5.46±2.08 in the Rt arm to 2.59±1.463 in the Lt arm with statistically significant difference at ($p<0.001$).

Concerning the satisfaction of the participants, correspondingly, **table II** shows that a majority of them are dissatisfied with routine SC injections in the Rt arm (69.3%) with statistically significant association. Whereas, the minority of them (8.0%) are dissatisfied with SC injection in the Lt arm which is followed by thumb pressure. Likewise, the mean satisfaction score of the participants improved from 3.24±2.08 after routine SCI in the Rt arm to 7.15±1.82 after SCI in the Lt arm with Thumb pressure with statistically significant difference at ($p<0.001$).

Table III displays Kendall's tau_b correlation of demographic parameters, pain, and satisfaction with bruising in SCI protocols. It shows a small negative correlation between satisfaction after SCI in the Lt arm and bruising in both arms without a statistically significant (r -0.037, -0.083; P 0.688, 0.373). Furthermore, there is no significant correlation between bruising and other parameters.

Table IV portrays the relation of demographic characteristics with Bruising categories after SCI Protocols. It shows that there is no statistically significant association between the demographic data and bruising in the Rt arm with routine SCI. Whereas, foot deformity and cartilage removal is statistically significantly associated with large bruising in the Lt arm ($p=0.036$).

Table 1 Demographic data of the participants who received anticoagulant SC injection (n=88)

Parameters	Categories	No	%
Gender	Male	49	55.7
	Female	39	44.3
Age	18-<30 years	23	26.1
	30-<40 years	28	31.8
	40<50 years	15	17.0
	≥50 years	22	25.0
	Mean±SD 38.61±11.68		
Education Level	Illiterate	22	25.0
	Primary	22	25.0
	Secondary	24	27.3
	University	20	22.7
Past Medical History	NO	39	44.3
	DM	18	20.5
	HTN	31	35.2
BMI	Underweight (<18.5 kg/m^2)	3	3.4
	Normal (18.5-24.9 kg/ m^2)	10	11.4
	Overweight (25-29.9 kg/ m^2)	12	13.6
	Obese ≥30 kg/ m^2	63	71.6
	Mean±SD 33.32±7.69		
Rt arm Circumference	Mean±SD 23.91±4.694		
Lt arm Circumference	Mean±SD 23.80±4.617		

BMI: Body Mass Index; SD: Standard Deviation; Rt: Right; Lt: Left.

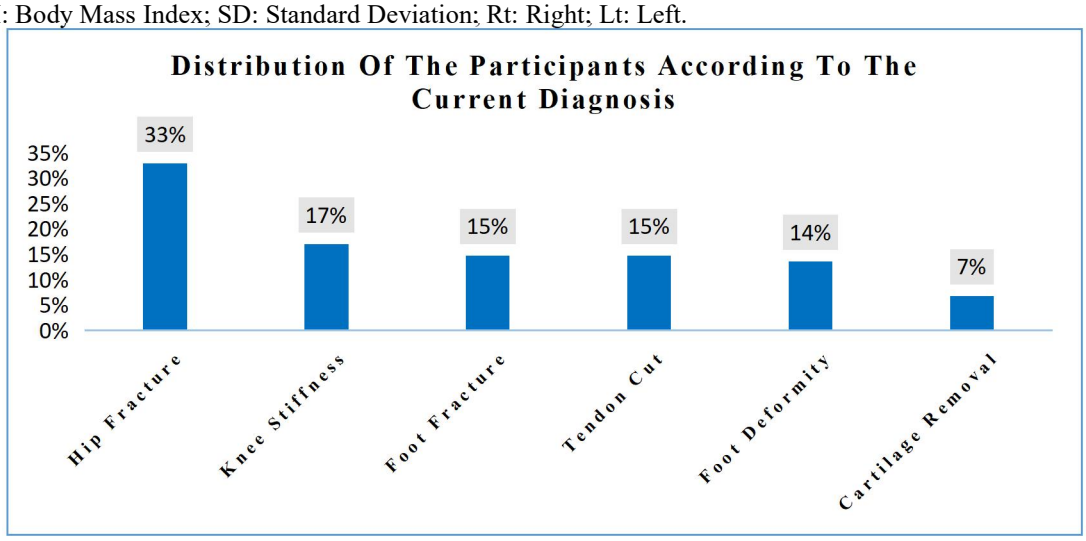

Figure.1 Distribution of the participants according to their current diagnosis

Table II. Distribution of Pain, Bruising, and Satisfaction of the participants according to Injection Protocol

Parameters	Categories	Routine SCI in Rt arm		SCI in Lt arm with thumb Pressure		Test	P-value
		No.	%	No.	%		
Pain	– No pain (0)	2	2.3	18	20.5	X^2 58.16	<0.001**
	– Mild (1-4)	21	23.9	53	60.2		
	– Moderate (5-7)	43	48.9	16	18.2		
	– Severe (8-10)	22	**25.0**	1	1.1		
Mean±SD		**5.75±2.23**		**2.61±2.08**		t=13.41	<0.001**
Bruising	– Absent (<2mm^2)	6	6.8	42	47.7	X^2 64.62	<0.001**
	– Small (2-5 mm$^{2)}$	39	44.3	44	50.0		
	– Large (>5 mm^2)	**43**	**48.9**	**2**	**2.3**		
Mean±SD		**5.46±2.08**		**2.59±1.463**		t=11.85	<0.001**
Satisfaction	– Dissatisfied (0-4)	**61**	**69.3**	**7**	**8.0**	X^2 83.95	<0.001**
	– Neutral (5-7)	26	29.5	40	45.5		
	– Satisfied (8-10)	1	1.1	41	46.6		
Mean±SD		**3.24±2.08**		**7.15±1.82**		t=14.85	<0.001**

X^2 : Chi-square test; t: t-test; **: high statistical significant (p<0.001); Rt: Right; Lt: left.

Table III. Correlation of demographic parameters, pain, and satisfaction with Bruising in SCI Protocol

			Bruising in Rt arm categories	Bruising LT arm Categories
Kendall's tau_b	Pain after routine SCI in Rt arm	r	-.159-	-.093-
		P	.079	.315
	Pain after SCI with Thumb Pressure in Lt arm	r	-.164-	-.068-
		P	.073	.462
	Satisfaction after Routine SCI in Rt arm	r	.050	-.087-
		P	.586	.345
	Satisfaction after SCI with Thumb Pressure in Lt arm	r	-.037-	-.083-
		P	.688	.373
	BMI	r	-.073-	.085
		P	.397	.330
	Age in years	r	-.063-	.066
		P	.471	.457
	Height/cm	r	.009	-.052-
		P	.913	.557
	Weight/Kg	r	-.078-	.051
		P	.368	.563
	Rt arm Circumference	r	.116	.064
		P	.189	.476
	Lt arm Circumference	r	.132	.038
		P	.130	.667

Table IV: Relation of demographic characteristics with Bruising categories after SCI Protocols

Parameters	Categories		Bruising Lt arm Categories			X^2 (p-value)	Bruising in Rt arm categories			X^2 (p-value)
			Absent	Small	large		Absent	Small	large	
Gender	Male	N	25	23	1		4	20	25	
		%	59.5%	52.3%	50.0%		66.7%	51.3%	58.1%	
	Female	N	17	21	1	0.48 (0.78)	2	19	18	0.705 (0.703)
		%	40.5%	47.7%	50.0%		33.3%	48.7%	41.9%	
Educational Level	Illiterate	N	10	11	1		1	13	8	
		%	23.8%	25.0%	50.0%		16.7%	33.3%	18.6%	
	Primary	N	10	11	1		1	9	12	
		%	23.8%	25.0%	50.0%		16.7%	23.1%	27.9%	
	Secondary	N	12	12	0	2.09 (0.91)	3	7	14	5.44(0.48)
		%	28.6%	27.3%	0.0%		50.0%	17.9%	32.6%	
	High School / University	N	10	10	0		1	10	9	
		%	23.8%	22.7%	0.0%		16.7%	25.6%	20.9%	
Current Diagnosis	Hip Fractures	N	18	11	0		3	13	13	
		%	42.9%	25.0%	0.0%		50.0%	33.3%	30.2%	
	Knee Stiffness	N	5	8	0		0	5	8	3.25(0.97)
		%	11.9%	18.2%	0.0%		0.0%	12.8%	18.6%	
	Foot Fracture	N	3	9	0		1	5	6	
		%	7.1%	20.5%	0.0%		16.7%	12.8%	14.0%	
	Tendon Cut	N	6	9	0	**19.36 (0.036*)**	1	6	8	
		%	14.3%	20.5%	0.0%		16.7%	15.4%	18.6%	
	Foot Deformity	N	9	3	1		1	7	5	
		%	21.4%	6.8%	**50.0%**		16.7%	17.9%	11.6%	
	Cartilage Removal	N	1	4	1		0	3	3	
		%	2.4%	9.1%	**50.0%**		0.0%	7.7%	7.0%	
Past Medical History	No	N	20	19	0		2	19	18	
		%	47.6%	43.2%	0.0%		33.3%	48.7%	41.9%	
	DM	N	9	7	2	8.97 (0.062)	1	7	10	1.13(0.88)
		%	21.4%	15.9%	100.0%		16.7%	17.9%	23.3%	
	Hypertension	N	13	18	0		3	13	15	
		%	31.0%	40.9%	0.0%		50.0%	33.3%	34.9%	

Discussion:

Subcutaneous anticoagulant injection is one of the most common methods for thromboembolic therapy in high-risk patients. Nurses frequently inject anticoagulants subcutaneously and this action often results in some complications including bruising, haematoma, pain and induration at the injection site. All of these negative consequences encourage the nurse to search and found some alternatives to decrease the patient suffering and increase their satisfaction as safe and accurate administration of medications is one of the most important responsibilities of nurses. Injection techniques that reduce bruising, pain, induration and hematoma formation at the injection site have been researched. They have not been adopted as the standard practice for administering these medications **(Woodley et al., 2022)**. Therefore, this study aimed to assess the effectiveness of thumb manual pressure application on anticoagulant subcutaneous injection pain, bruising and satisfaction experienced by patients.

Pain as an apparent complication of subcutaneous anticoagulant injection can cause physical and mental discomfort. Pain resulting from subcutaneous LMWH

injection occurs because of the presence of pain receptors in the subcutaneous tissue, and when LMWH solution is administered to the tissue, the resulting damage to the tissue causes pain. The size and shape of the injection needle, depth of injection and amount and rate of injection are effective factors of pain (**Pourghaznein et al., 2014; Avşar & Kaşikçi., 2013; Yılmaz et al., 2020)**. One of the exclusive findings of the present study is the dramatic effect of thumb manual pressure on pain level among the study group compared with control group. This finding may be related to considering pressure as a distractional activity that attract the patient attention from pain and negative feelings. In addition, pressure by thumb decrease the effect of medication on the subcutaneous pain receptors. This finding is harmonious with **Morissette., 2015** and **Potter et al., 2019** who found that application of gentle pressure, ensuring the site is not rubbed or massaged after medication is injected slowly are standard subcutaneous injection techniques that can be used to decrease pain. Similar results were reported by **Şanlialp Zeyrek et al., 2019** who proved that manual pressure are safe and effective intervention to reduce severity of pain that accompanied with intramuscular injection.

Moreover, **Öztürk et al. (2017)** compared a group with the application of manual pressure with a group without the application of manual pressure at the injection site. They found that the participants in the manual pressure groups reported lower pain intensity scores (at a small to moderate level) relative to those in the comparison group.

When LMWH injections are performed, bruising may frequently be seen as a result of the leakage of blood from the vessels to the tissues under the skin **(Visvanathan., 2015)**. According to the study by **Pourghaznein et al., 2014**, more than 90% of heparin injections lead to bruising at the injection site. Factors such as the injection site, size of needle, amount of heparin, applying aspiration before the injection, post injection massage and duration of injection can impact on the occurrence of bruising. This goes with the current finding as near to half of patients injected in the right arm experiencing a large bruising compared with a minority of patient who were injected in the left arm with post injection thumb pressure with a statistically significant difference between the two groups. Positive impact of manual pressure may be owed to that the application of pressure causes manual vasoconstriction, and prevents the leakage of blood from superficial blood vessels that are traumatized during needle insertion. **Morissette., 2015** also provide a rationale for extended pressure application. They, too, state that pressure significantly reduces bruising at the injection site. Because it is included in standard subcutaneous injection protocol, pressure should be applied after injection. For Heparin and LMWH, the amount of time to apply pressure can be concluded to a minimum of 30 seconds.

Table 2 highlighting the subsequent indirect effect of decreasing pain and bruising on increasing the patients' satisfaction level. Enhancing the patients' comfort and satisfaction play a role in improving the patient acceptability of medications. As an individual who experiences pain may refuse treatment by experiencing anxiety for consequent injections. **Karabey (2021)** concluded that the mean comfort score of SC injection applied by applying manual pressure was statistically higher. In addition, the study results showed no significant correlation between pain, bruising and the patients' biosociodemographic characteristics.

Limitation of the study:

Although the present study adds an important perspective to the already robust literature on this subject, it has limitations related to the long term effect of manual pressure when anticoagulant used for a chronic base. So conducting this study on a larger sample and examining the long term impact of such maneuver would provide more generalized findings

Conclusion and recommendations:

It has been determined that manual pressure application is a more effective method in reducing pain and bruising due to subcutaneous injection compared to the standard application. It was determined that as the pain and bruising experienced by the individuals due to subcutaneous injection application decreased, their satisfaction level increased. In line with these results, it is recommended that health professionals, especially nurses, use non-pharmacological methods with proven efficacy more frequently to relieve pain in SC injection, follow the developments in this field and put them into practice.

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Disclosures:

The authors declare no conflict of interest concerning the research, authorship and publication

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