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The Effect of Shot Blocker and Z – Track Techniques on Reducing the Needle Pain and Anxiety Associated With Intramuscular Injection

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Abstract: Administering IM injection is one of the basic and important duties of a nurse often associated with pain and anxiety. Providing pain relief is considered a basic human right and it is the duties of the nurse to use most successful techniques to minimize pain. Different methods are used by the nurses to reduce pain during intramuscular injections such as applying pressure, taping the skin, giving injections to a relaxed muscle, applying cold, ShotBlocker, and Z-track techniques. ***Aim:*** the study aimed to evaluate the effectiveness of using ShotBlocker and Z – Track techniques on minimizing the needle pain and anxiety among adult receiving intramuscular injection. ***Methods:*** Quazi experimental research design was conducted at Medical & Surgical department at Mansoura University Hospital. A convenient sample of a sixty adult patients, aged (18-65 years old) .Subjects were selected by simple random sampling technique and assigned in to two groups ,30 for each(30 in shotblocker and 30 in Z- track technique). ***Results:*** It revealed that the pain score was reduced when IM injections were administered using ShotBlocker and Z-track techniques (second injection) rather than routine standard technique (first injection).The patients in the group II (Z-track) shows that a mean anxiety score was decrease after second injection. There was no statistical significant difference between two groups before and after two times of injections. While there was a statistical significant difference between first injection and second injection in group II, where p- value = 0.000. But no statistical significant difference between first injection and second injection in group I, where p- value = 0.330. ***Conclusion:*** It was noticed that the ShotBlocker and Z-track technique was effective in minimizing needle pain perception and Z-track technique is effective in minimizing level of anxiety but ShotBlocker was not effective in reducing anxiety.

Keywords: Intramuscular injection, ShotBlocker, Z-track technique, needle pain and anxiety.

INTRODUCTION

The administration of intramuscular (IM) injection is a basic nursing skill and is a common nursing procedure in the clinical setting. [(1)] IM injections usually cause some degree of pain at the injection site and cause anxiety, therefore, patients are often afraid of receiving injections because they perceive that it will be painful and may postpone seeking medical help because of painful injection.[(2)]Some physiological responses to injection pain are increased heart rate, blood pressure, and anxiety.[(3)] Unnecessary pain can interrupt the nurse- patient relationship, whereas knowledge of proper techniques can improve patient care and satisfaction.[(4)]

Intramuscular injections is injections into muscle tissue, (IM) injections are absorbed more quickly than subcutaneous injections because of the greater blood supply to the body muscles.[(5-6)] Intramuscular injections must be done with awareness to prevent complications occurrence . Complications with IM it can cause tissue, musculoskeletal and neurological complications such as abscess, tissue necrosis, muscle damage and nerve injury. [(7)]; if delivered with a proper technique, its complications are very rare.
Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. [(8)]The main consideration in the administration of IM injections is the selection of an appropriate site located away from large blood vessels, nerves, and bone.[(9)]The relief of pain or distress during health related procedures is a basic human right. [(10)]Patients are usually anxious about planned medical care, and those experiencing anxiety and less likely to have the confidence to healthcare providers on their care. The nurses are required to recognize when people are anxious and respond kindly and attempt to reassure patients. The anxiety that impede a planned medical or nursing care such a surgery or any invasive procedure.[(11)]

Over the years, clinicians have tried to explore various methods to reduce pain, including the pain of injections. These studies have examined the effect of different factors and interventions, such as cold, manual pressure, acupressure, needle temperature, two-needle technique, injection speed, patient positioning, the Z-track technique, and shotblocker.[(2,4,12)] Many nurses did not use procedures that can reduce the pain and tissue trauma associated with intramuscular injections.

Administer an IM injection using the Z- track technique, which is recommended for all IM injections.[(13).] The Z-track method has been found to be a less painful technique, and it decreases leakage of irritating medications into the subcutaneous tissue [(14-14)]. Although the Z-track technique is not always used in practice, research evidence supports its effectiveness and recommends its routine use. [(15)]The Z-track technique is a lateral displacement of the skin away from the injection site before the injection, then the medication is injected, the needle is withdrawn, and the skin is released. This technique of administrating an IM injection prevents the medication being tracked through the subcutaneous tissue so minimizing irritation from the medication. [(16)]

Another aspect of IM injection technique is the ShotBlocker is a plastic device with several short and blunt contact points on its surface that contact the patient's skin. ShotBlocker is non-pharmacological method that reduces pain via gate control theory during the administration of IM injections. The use of the ShotBlocker device has no reported side effects. (17-20)

Nurses play a greater role in minimizing the pain and discomfort during any invasive procedure and in preparation and safe administration of medications.(21)The most appropriate technique for the administration of intramuscular injection will reduce pain, anxiety and fewer complications. (22-23)

MATERIAL AND METHODS

Aim of the study:

The study is aimed to evaluate the effectiveness of using ShotBlocker and Z – track techniques on minimizing the needle pain and anxiety among adult receiving intramuscular injection.

Study Design: Quazi Experimental research design has been utilized.

Research Hypothesis

H1. Patients who receive IM injection by ShotBlocker (Second injection) will experience less pain and anxiety level compared to patients who do not receive (First injection)

H2. Patients who receive IM injection by Z-track technique (second injection) will experience less pain and anxiety level compared to patients who do not receive (first injection)

H3. There will be a significant difference in the level of pain and anxiety among adult patients between first injection and second injection in the two studied groups.

Setting: This study was conducted at Medical & Surgical department at Mansoura University Hospital. The data collection lasted for a period of three months, starting from first of June to end of august 2019.

Study population: convenient sample of all adult patients, aged from (18-65 years old) who are admitted to medical and surgical departments during a period of 3 months. Subjects were selected by Simple random sampling technique and assigned in to two groups, 30 for each (30 in Shotblocker and 30 in Z- track technique). The patients were selected based on the following criteria **the inclusion criteria included**: Adult subjects who are:

- Between the age group of 18 to 65 years, both male and female receiving intramuscular injections.
- Capable of giving adequate response to pain.
- Available during the study period
- Willing to participate in the study

Exclusion Criteria: Subjects who are:

- Unconscious or critically ill.
- Receiving oily injections.
- Getting any other type of oral or IV analgesia
- Received sedatives less than two hours before the procedure.
- Suffering from bleeding disorders.
- Unable to assume lateral position with knee slightly flexed.

Data collection tools:

Demographic and health-related data sheet: Developed by the researcher that includes (age, sex, education, occupation, educational level, fear from IM injection, previous complication, and previous history for IM injection).

Verbal Descriptor Scale (VDS)*:* The Verbal Descriptor Scale, also referred to as the Verbal Rating Scale (VRS), is a six-point verbal categorical rating scale. Patients are asked to select one of six descriptors that most accurately describe the current intensity of their pain. The verbal descriptors are: "No pain", "Slight pain", "Mild pain", "Moderate pain, "Severe pain", "Extreme pain", "The most intense pain imaginable" and have corresponding numbers ("No pain" = 0; "The most intense pain imaginable" = 6). The scale can be self-administered, most patients can complete it in one minute, it requires pencil and paper (24-25)

Beck Anxiety Inventory (BAI)*:* This scale is a self-report measure of anxiety is composed of 21 items, each item responses on the BAI range from 0 to 3, and each item rating is accompanied by a statement describing the severity of a given anxiety symptom, with 0 indicating no self-reported symptoms and 3 indicating more severe symptoms. The total score is calculated by finding the sum of the 21 items. Score of 0-21 = low anxiety Score of 22-35 = moderate anxiety Score of 36 and above = potentially concerning levels of anxiety. (26)

Content validity*:* The content validity of the tool was established on the basis of opinion from the experts, Medical expert and Nursing expert and the tool was finalized.

A pilot study:

By simple random sampling technique, 10 samples with intramuscular injection were selected. For the first experimental group, shot Blocker was used for giving intramuscular injection and for second experimental group was received intramuscular injection using Z track technique

Ethical considerations:

The study was conducted after the approval of the Ethics Committee at the Faculty of Nursing, Mansoura University. Informed consent was obtained from each study participant after giving full information about the study. Anonymity was assured to each participant and maintained by the researcher.

Reliability:

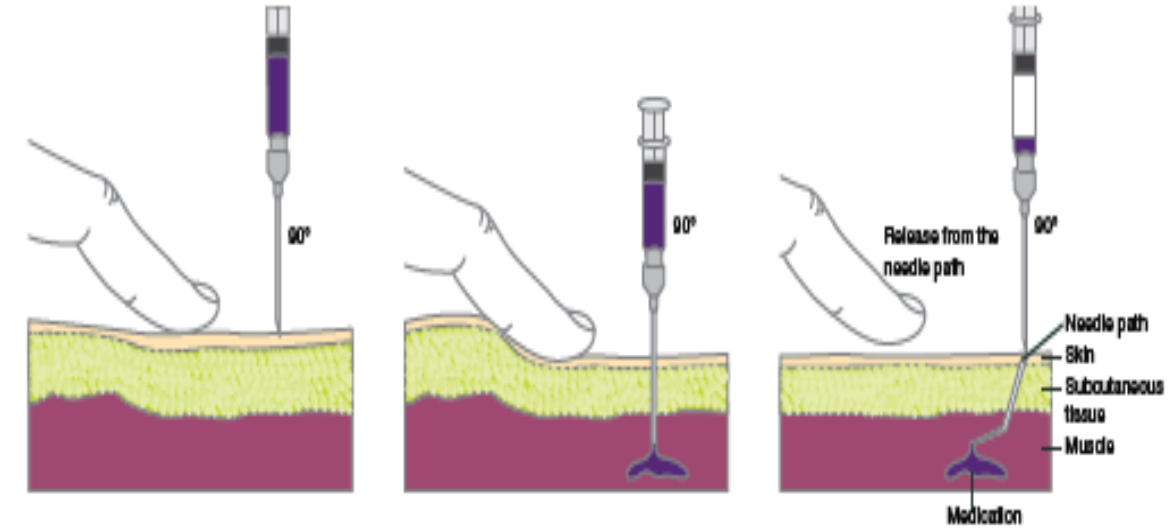
Reliability of the tool was assessed by using test-retest reliability (1 week)
value= 0.78.

Data collection:

- Each patient who fulfilling the inclusion criteria has been interviewed individually.
- A convenient sample was divided randomly into two equal study groups:
  - Group I: received Shot blocker during administration of IM injection

- Group II: received Z-track technique during administration of IM injection

- Patient was interviewed by the researcher to fill out the socio-demographic characteristics and health-related data.
- Researcher should be consider the factors may be affect on pain during injection, such as (amount of drug injected, technique used, needle size, patient position, and speed of delivery). Therefore, all factors must be consistent in IM injection for all patients and IM injection should be give in the same manner.
- Intramuscular injection criteria includes (23 gauge, 3 cc sterile disposable needle used for giving intramuscular injection , 3 ml of neurovit , in dorso gluteal muscle and patient lying on right or left side, insertion angle= 90 degree,
  Insert the needle quickly and smoothly. Inject the medication slowly and steadily, withdraw the needle with the same angle, and light pressure applied at the injection site without massage).
- At first time patient in two groups was considered as a control group where no intervention (first injection), the researcher will administer IM injection to patient in dorsogluteal muscle with patient in side-lying with muscle relax and the pain scores and anxiety level will be recorded immediately after the injection.
- At second time the same patient in two groups was considered as study group where intervention will be applied. The group I (received the second IM injection by ShotBlocker) with the same manner in first injection. The group II (received the second IM injection by Z track technique). After injection the pain and anxiety level will be recorded immediately.
- The comparison was done between two groups to investigate the aim of the current study



Adapted from Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health, Seventh Edition. © 2003 by Saunders, an imprint of Elsevier, Inc. All rights reserved.[11]

Z-track technique for intramuscular injection

Intramuscular injection with the use of ShotBlocker

***Data analysis**:*

The data were planned to be analyzed in terms of objectives of the study using descriptive statistics in the form of frequencies and percentages. Mean and standard deviation to assess the scores. Inferential statistics **as** Independent't' test for comparison of the first injection and second injection in two groups. Chi square to find the association between two studied groups and selected demographic variables. Paired-samples t-test for comparison between first injection and second injection in each group.

RESULTS

Table (1): demographic data of the studied groups:

Items	Group 1 Shot blocker		Group 11 Z Track		Total		Pearson Chi-Square X2 test (P)
	No=30	%	No=30	%	No=60	%	
Age (in years)							
18≥29	9	30.0	5	16.7	14	23.3	2.819
30≥39	11	36.7	11	36.7	22	36.7	(0.589)
40≥49	6	20.0	8	26.6	14	23.3	
50≥65	4	13.3	6	20.0	10	16.7	
Gender							0.659
Male	12	40.0	9	30.0	21	35.0	(0.417)
Female	18	60.0	21	70.0	39	65.0	
Marital status							
Married	16	53.3	13	43.3	29	48.3	0.821
Widowed	7	23.3	6	20.0	13	21.7	(0.844)
Divorced	3	10.0	5	16.7	8	13.3	
Single	4	13.4	6	20.0	10	16.7	
Level of Education							
Illiterate	8	26.6	8	26.6	16	26.7	
Read& write	4	13.4	4	13.4	8	13.3	7.200
Middle education	18	60.0	12	40.0	30	50.0	(0.066)
Associate degree &above	0	0.0	6	20.0	6	10.0	
Occupation							0.468
Manual work	6	20.0	7	23.3	13	21.7	(0.792)
Professional	12	40.0	9	30.0	21	35.0	
House wife	12	40.0	11	36.7	23	38.3	
No work	0	0.0	3	10.0	3	5.0	

Table 1: shows the demographic data of the studied groups. The majority of the sample in two groups ranged from 30 to years old. Female were prevailing in the studied sample (60.0 in the group I &70.0 in the group II). In relation to marital status nearly half of studied groups I and II were married (53.3 % &43.3% respectively). Regarding to educational level, the majority of studied groups I and II were middle education60.0% &40.0% in that order. Regarding occupation, 40.0% of the group I was professional work & house wife while 36.7% of the group II was house wife. No significant differences between two groups concerning all demographic data.

Table (2): Health-related data of the two groups:

Items	Group 1 Shot blocker		Group 11 Z Track		Total		Pearson Chi-Square X2 test (P)
	No=30	%	No=30	%	No=60	%	
Mean &SD of BMI	26.333±2.022		26.633±1.973				**T test(p)** 0.581 (0.563)
Previous history for IM injection							
Yes							0.741
No	26	86.7	28	93.3	54		(0.389)
	4	13.3	2	6.7	6		
Fear from IM injection							
Yes	24	80.0	20	66.7	44		1.364
No	6	20.0	10	33.3	16		(0.243)
Previous complication from IM injection							0.659
Yes	3	10.0	7	23.3	10		(0.317)
No	27	90.0	23	76.7	50		

Table (2): Shows health-related data among the two studied groups. It was noticed that, mean score of BMI was26.33 in group I & 26.63 in group II .the majority of the two groups have previous history for IM injection (87.6% in group I and 93.3 % in group II).More than three quarter in group I (80.0%) & more than half in group II (66.7%) were fear from IM injection. the majority of two groups (90.0% in group I &76.7% in group II) don't have previous complication from IM injection. With no significant difference between the two groups.

Table (3): Comparison between the level of pain using verbal descriptor scale among two groups in two times of injections.

Verbal Descriptor Scale	Group 1 Shot blocker (n=30)	Group 11 Z Track(n=30)	Test of significant (independent sample t test)	(P)[1] value
	Mean±SD	Mean±SD		
First injection (without intervention)	3.010±**1.114**	3.200±**1.126**	0.691	0.492
Second injection (with intervention)	1.610±**0.621**	1.933±**0.691**	0.786	0.435
Test of significant(P)[2]	5.771(0.000)*	5.430(0.020)*		

Independent sample t test (P^1): Comparison between first injection and second injection in two groups. Paired-samples t-test (P^2): Comparison between first injection and second injection in each group.

Table (3) & figure (1): Shows comparison for the level of pain using Verbal Descriptor Scale between two groups in two times of injections. It revealed that the pain score was reduced when IM injections were administered using shotblocker and Z-track techniques (second injection) rather than routine standard technique (first injection) .There was no statistical significant difference between two groups in first and second injection. While there was a statistical significant difference between first injection and second injection in each group, where p- value = 0.000; p- value = 0.020 respectively.

Table (4) : Comparison between anxiety level using Beck Anxiety Inventory (BAI) Scale among two groups before and after two times of injections.

Beck Anxiety Inventory (BAI)	Group 1 Shot blocker (n=30)	Group 11 Z Track(n=30)	Test of significant (independent sample t test)	(P)[1] value
	Mean±SD	Mean±SD		
Before first injection (without intervention)	22.86±2.116	21.66±2.016	0.750	0.356
After first injection (without intervention)	21.98±2.756	21.36±2.876	0.851	0.456
Before second injection (with intervention)	21.06±2.576	20.86±1.940	0.606	0.383
After second injection (with intervention)	20.76±1.546	17.76±1.740	0.446	0.683
Test of significant(P)[2]	10.124(0.330)	9.317(0.000)*		

Independent sample t test (P^1): Comparison between first injection and second injection in two groups. Paired-samples t-test (P^2): Comparison between after first injection and after second injection in each group.

Table (4) & figure (2): Shows comparison for the level of anxiety using Beck Anxiety Inventory (BAI) Scale between two groups in two times of injections. The patients in the group II (Z-track) shows that a mean anxiety score was decrease after second injection. There was no statistical significant difference between two groups before and after two times of injections. While there was a statistical significant difference between first injection and second injection in group II, where p- value = 0.000. But no statistical significant difference between first injection and second injection in group I, where p- value = 0.330.

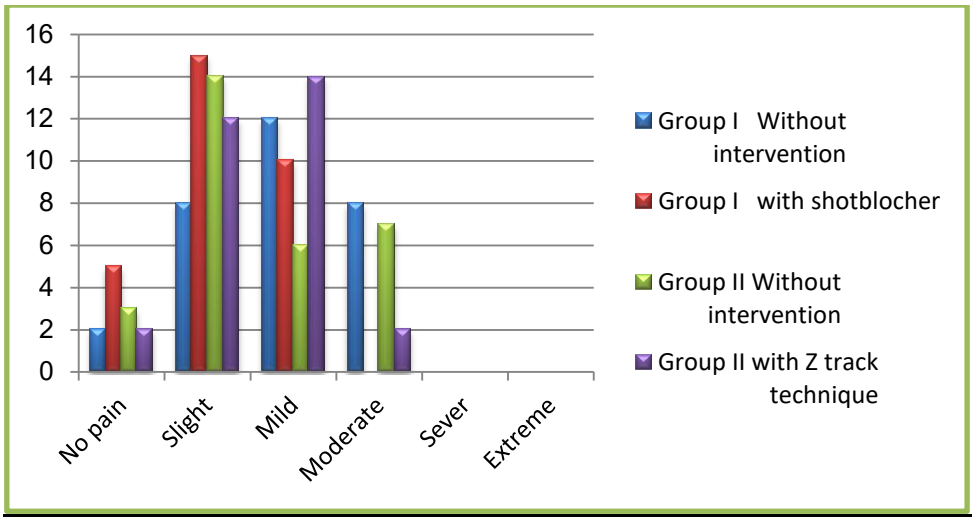


Figure 1: Comparison between the levels of pain using verbal descriptor scale among two groups in two times of injections.

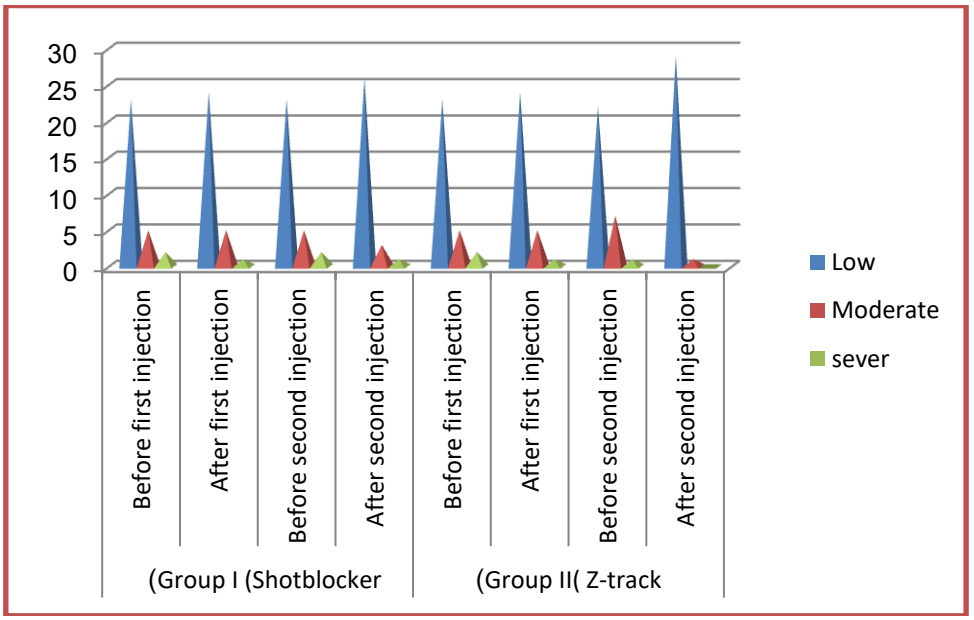


Figure (2): Comparison between anxiety level using Beck Anxiety Inventory (BAI) Scale among two groups before and after two times of injections.

DISCUSSION

Pain is the most unpleasant experience for human beings. Fear of IM injection pain leads to noncompliance of many treatment modalities, thus as healthcare worker it is our responsibility to find ways to minimize pain and provide maximum comfort during any therapeutic or diagnostic procedure. Needle pain is primary source of anxiety for patients receiving injections, fear can intensify pain. The current study was conducted to evaluate the effectiveness of using ShotBlocker and Z-track technique on minimizing the needle pain and Anxiety among adult receiving Intramuscular Injection.

It is illustrated from the current study that the greater part of studied samples in two groups were in the age group 30- 39 years old and the most of the studied patients in two groups were females (60.0% & 70.0% respectively).Nearly half of the two studied groups were married (group I 53.3% & group II 43.3%). theses finding came in the same line with study conducted in Menoufia (Shehata O S 2016)[27] who reported that the majority of the studied sample were in the age group 30- 39 years with a mean age for study group I was 39.72 ± 11.36 while for study group II was 39.44. also, (Bilge S, 2019&Celik N, 2015)[28-29] who reported that the majority of subjects were female and married . These results came in contrast with (Yilmaz DK, 2016)[30] who stated that the majority of subjects are male with mean age 46.60 in study group & 43.50 in control group.

In relation to health –related data, It was noticed that a mean score of BMI was26.33 in group I & 26.63 in group II .the majority of the two groups have previous history for IM injection (87.6% in group I and 93.3 % in group II).More than three quarter in group I (80.0%) & more than half in group II (66.7%) were fear from IM injection. the majority of two groups (90.0% in group I &76.7% in group II) don't have previous complication from IM injection. With no significant difference between the two groups. These finding is in accordance with study carried out by (Yilmaz DK, 2016) [30] who stated that a mean BMI equal 26.59 in experimental group & 26.89 in control group. In the same contexts with our results (Shehata OS 2016)[27] who reported that more than half of the two groups had not previous complication of IM (62% & 58% respectively).

these results came in contrast with study by(Shehata OS 2016)[27] revealed that more than half of study group I and II had not fear of IM injection (58% &56% respectively).

Concerning level of pain using Verbal Descriptor Scale between two groups in two times of injections. It revealed that the pain score was reduced when IM injections were administered using ShotBlocker and Z-track techniques (second injection) rather than routine standard technique (first injection). There was no statistical significant difference between two groups in first and second injection. While there was a statistical significant difference between first injection and second injection in each group. This finding come congruent with (Shehata OS 2016)[27]who reported that there were highly significant decreasing of total pain in second and third times of injection for both study group I(Helfer Skin Tapping) and II (Z – Track Techniques) compared with the first time of injection there were significantly lower mean values for both study group I and II concerning to three component of universal pain assessment in second and third time of injection compared to first time of injection. Also in the same line with (Celik N, 2015) [29] indicated that ShotBlocker was an effective method to reduce pain caused by IM injection of diclofenac sodium. And agreement with study carried out by (Kara D, 2014) found that patients reported less pain with the Z-track technique than with technique A.(patient in prone position) When compared with technique B(patient in prone position with one foot internally rotated).Moreover study conducted in Turkey by (Yilmaz DK, 2016) [30]who stated that pain intensity was reduced when sodium diclofenac injected intramuscularly using the Z-track technique. These results also supported by study conducted by (Tambunan EH, 2015)[31] who showed that both Z-track and air lock method are less pain compared to traditional method.

Regarding the level of anxiety using Beck Anxiety Inventory (BAI) Scale between two groups in two times of injections. The current study illustrated that the patients in the group II (Z-track) showed that a mean anxiety scores were decrease from mean score 20.86 before second injection to mean score 17.76 after second injection. While in group I (ShotBlocker) there is no significant reduction in mean anxiety scores. No significant reduction in anxiety level in ShotBlocher group may be due to use of a new device (ShotBlocker), Although ShotBlocker was introduced to the patients before used. There was no statistical significant difference between two groups in first and second injection before and after intervention. While there was a statistical significant difference between first injection and second injection in group II after second injection, where p- value = 0.000. But no statistical significant difference between first injection and second injection in group I, where p- value = 0.330.These findings are agreement with a study by (Celik N, 2015) [29]who stated that anxiety levels of the patients in ShotBlocker group were higher than those in other groups before and after the injection.

CONCLUSION

Intramuscular injections may be unpleasant experience for the subjects which are commonly carried out by the nurses. It was found that the ShotBlocker and Z-track technique was effective in minimizing needle pain perception and Z-track technique is effective in minimizing level of anxiety but ShotBlocker was not effective in reducing anxiety.

RECOMMENDATION

- ShotBlocker and Z-track techniques can be included in the literature on IM injection
- The procedure of using ShotBlocker and Z-track techniques for IM injection can be included into the nursing curriculum
- Nursing students can be taught about the ShotBlocker and Z-track techniques and it can be practiced in the clinical setting.

CONFLICT OF INTEREST

The author announces that they have no conflict of interest.

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