

Original Article

A Comparison of the Dorsogluteal and Ventrogluteal Sites Regarding Patients' Levels of Pain Intensity and Satisfaction following Intramuscular Injection

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Abstract

Objective: The aim of the study was to compare dorsogluteal and ventrogluteal sites regarding patients' levels of pain intensity and satisfaction following intramuscular injection.

Methods: The sample of the study consisted of 60 patients who came to the Manisa City Hospital outpatients' injection department for IM injections of 2*1 gr doses of antibiotic groups with cephalosporin as the active ingredient. The research was conducted as a semi-experimental study with a single group.

Results: Mean pain intensity scores for the DG site were mean±sd= 4.61±1.65, and 3.25±1.51 for the VG site. No significant difference was found between mean pain intensity at the VG site and the DG site (t=5.900, p=0.000). No patients chose the response 'very good' for satisfaction level at the DG site, while %21.7 of patients chose that response for the VG site. No significant difference was found between the satisfaction levels ($\chi^2=12.551$, p= 0.051).

Conclusions: Less pain was felt at the VG site than at the DG site. Levels of satisfaction with the VG site were higher than with the DG site.

Keywords: Ventrogluteal site, dorsogluteal site, pain intensity, satisfaction level

Introduction

Preparing and administering medications correctly and appropriately is the responsibility of nurses in health institutions (Taylor et al., 2011). One of the routes by which drugs are administered, intramuscular (IM) injection, is a preferred method for antibiotics in hospitals and centers where primary health care services are provided (Coskun, Kılıc, Senture, 2016). Antibiotics are bioactive substances, either of biological origin or obtained synthetically, which kill or stop the growth of micro-organisms. There are many antibiotics, which differ in the way they act and the micro-organisms which they are active against. One of these is cephalosporin, which kills bacterial cells by causing extensive damage to them (Topal et al., 2015).

In IM injection, the choice of site is a very important step in the process. In terms of preventing complications which develop as a result of the site which is used, a safe site, far from large blood vessels, nerves or bone, is to be preferred. There are five sites in the human body where IM injections can be performed. These are the dorsogluteal (DG), ventrogluteal (VG), deltoid and vastus lateralis sites and the rectus femoris area (Gulnar & Caliskan, 2014). The deltoid muscle, the vastus lateralis muscle and the VG site are the most recommended areas in the administration of IM injections because they are far from large nerves and blood vessels (Sisson, 2015). Because the VG site is far from blood vessels, nerves and bone projections and the likelihood of delivering the drug to the subcutaneous tissue is small, it is the safest site

(Ay, 2019; Sari et al., 2017; Sendir & Coskun, 2016).

In IM injections, complications may occur for various reasons (Tugrul & Denat, 2014). The frequency of complications developing in patients after IM injections varies between 0.4% and 19.3% (Potter & Perry, 2009). The complications which may be seen are the following: abscess, necrosis, hematoma, ecchymosis, infection, pain, periostitis, and damage to blood vessels and nerves (Dogu, 2016; Kaya et. al., 2015). In IM injections, pain occurs in relation to the trauma when the needle enters the muscle and the sudden pressure when the drug is administered into the muscle (Gulnar & Caliskan, 2014). It has been reported in other studies that relative to the muscle tissue in the DG site, the muscle tissue of the VG site is thicker, and so tissue irritation and a feeling of pain which may occur is less (Dogu, 2016; Kemaloglu, 2013; Ocal & Karabacak 2012). In the administration of IM injections, the patient's anxiety level significantly affects the pain felt (Kara &Yapucu, 2016). For the patient's calm and comfort, the patient must be placed in a suitable position (Ay, 2019).

Patient satisfaction is the sum total of the positive and negative feelings of individuals towards the services which they receive. Today, patient satisfaction has an important place in the evaluation of the quality of the service given (Aslan et. al., 2012). Complications such as pain when an injection is given affects patient satisfaction (Yilmaz, 2010).

In this study, the DG and VG sites were compared with regard to patients' intensity of pain after the administration of IM injections and their satisfaction levels, and a determination was made of perceived satisfaction levels and of which of these sites was to be preferred.

The aim of this study was to determine the perceptions of patients with regard to pain intensity and satisfaction levels following the administration of IM injections to the DG and VG sites by nurses. The VG site has been found in studies both in Turkey and in other countries to be safer than the DG site, and it is desirable that it should be the first choice in health services. In extending the use of the VG site in the field of health services in this country and abroad, it is aimed to make the VG site the first choice for injections both with patients and with health personnel.

Materials and Methods

This research was conducted as a single-group semi-experimental study with the aim of comparing the DG and VG sites from the point of view of patients' pain intensity and satisfaction levels after the administration of IM injections, and of determining perceptions of pain and satisfaction levels.

Location and Duration of Research: The research was conducted between September and December 2018 with patients visiting the outpatients' injection clinic of a city hospital in the Aegean Region of Turkey. This hospital has a covered area of 180 000m², and a 558 bed capacity. It has three emergency services for adults, maternity and children.

Population and Sample of the Research: The population of the research was the 1800 patients who came to the injection clinic of a city hospital in the Aegean Region of Turkey between September and December 2018 for an IM injection. Of the patients who visited the injection clinic between September and December 2018 and who could be contacted, those who did not agree to participate in the study (n=2) and those who were given the first dose but failed to return for the second (n=9), a total of 11 patients, were excluded from the study. The research sample consisted of 60 patients who conformed to the sampling selection criteria below.

Patients were included in the study who accepted to participate in the research, who were aged 18 or over, who had a prescription for a 2*1 g dose by IM of antibiotics in which cephalosporin was the active ingredient, who had the physical and mental capacity to make use of the questionnaire, and who could speak Turkish. Excluded from the study were patients who were not willing to participate voluntarily in the research, who were under the age of 18, who did not have a prescription for a 2*1 g dose by IM of antibiotics in which cephalosporin was the active ingredient, whose medication was other than a 2*1 g dose by IM of antibiotics in which cephalosporin was the active ingredient, who had an amputation or paralysis, who had scar tissue, an incision, lipodystrophy or an infection in the site where the injection was to be given, and who had a history of drug allergy.

Research Hypotheses

H₁: Pain intensity in IM injections given to the VG site is less than in those given to the DG site.

H₂: The satisfaction level with IM injections given to the VG site is greater than with those given to the DG site.

Data Collection Instruments: A Patient Description Form with questions on patients' descriptive characteristics and injection experiences, and an Injection Administration Form with questions on pain and satisfaction levels after the administration of an injection, were used to collect data.

Patient Description Form: This form was prepared by the researcher in line with the literature (Asti & Karadag, 2011; Gulnar & Caliskan, 2014; Kaya & Pallos, 2013) and taking into account similar studies. It had questions on patients' descriptive characteristics and their IM injection experiences. These questions gathered such information as age, gender, weight, height, BMI, diagnosis, education level, and experience of injections. This form took about two minutes to complete.

Injection Administration Form: This consisted of 11 questions. These were questions about the intensity of pain felt in relation to the first and second injections while the injection was being given in the DG and VG sites, and about the satisfaction level with injections given in the DG and VG sites. This form took about three minutes to complete.

Data Collection Method: This research was carried out in the injection outpatients' clinic of the hospital, with the researcher and the patient alone in a quiet room which was set aside for injections, had a bed, and was surrounded by curtains. Informed voluntary consent was first obtained from patients, after which data collection was performed by face to face interview.

In the first stage, the research to be performed was explained to patients who had been prescribed a 2*1 dose of antibiotic with cephalosporin as the active ingredient by the IM route. Those who accepted to participate were given the Patient Description Form. The patient's first injection was administered to the DG site, according to the procedural steps for injection to the DG site (Gulnar & Caliskan, 2014; Kaya & Pallos, 2013). The patient's pain and satisfaction levels were ascertained by asking the patient questions on the DG site. *In the second stage*, the second dose of the drug was given by the researcher to the VG site, according to the procedural steps for injection to the VG site (Karabacak, 2010; Kaya & Pallos 2013; Potter &

Perry, 2009). The patient's pain and satisfaction levels were ascertained by asking the patient questions on the VG site. The administration of both injections was performed by the same researcher.

Evaluation of Data: Analysis of the data obtained in the research was analyzed using the Statistical Package for Social Science (SPSS) 15.00. Data obtained in the research was expressed in the tables as mean \pm standard deviation and maximum-minimum values. For DG pain intensity, the Shapiro-Wilk test was 0.938, $p=0.004$, and for VG pain intensity it was 0.847, $p=0.000$, and it was seen that the data did not show a normal distribution. Categorical data was expressed as n (number) and percentage (%). In making comparisons between the variables not showing normal distribution, Kruskal Wallis, Mann Whitney U, paired sample t test, Spearman correlation and chi-square tests were used. Data was examined at a confidence level of 95%, and p values of less than 0.05 were taken as significant.

Limitations of the Research: Only patients prescribed with antibiotic groups in which the active ingredient was cephalosporin at a dose of 2*1 gr by the IM route were able to participate in the research.

The Ethical Aspect of the Research: In order to conduct the research, written permission was obtained from the health sciences institute of the university concerned, and from the Ethics Committee of the Health Sciences Medical Faculty of the university concerned. After the patients were given information, their written consent was obtained by means of an informed voluntary consent form

Results

It was found that the mean age of the patients taking part in the research was 45.05 ± 16.51 , min = 19 max = 76 years; 51.7% were male, 36.7% were high school graduates, 51.7% were overweight, and 85% were having injections because of a diagnosis of respiratory system diseases. All of the patients had previously had injections to the DG site, 53.3% to the deltoid site, and 5% to the vastus lateralis site. None had previously had injections to the rectus femoris or the VG sites, and 71.7% had a fear of injections.

Distribution of Patients by Pain Intensity and Satisfaction Levels with Injections to the DG and VG Sites: The distribution of patients taken into the research according to pain intensity and

satisfaction with regard to injections to the DG and VG sites is given in Table 1. The mean pain intensity score for the DG site was 4.61 ± 1.65 , and that for the VG site was 3.25 ± 1.51 . It was found that 25% of the patients felt mild pain with the injection to the DG site, 73.3% felt mild pain with the injection to the VG site, and no severe level of pain was seen at the VG site. With injections to the DG site, 48.3% of the patients were satisfied at a medium level, and with injections to the VG site, 56.7% of the patients were satisfied at a medium level. A burning, stinging or pricking sensation was felt by 43.3% of the patients with injections to the DG site and by 11.7% with injections to the VG site. It was seen that 26.7% of the patients were satisfied with injections to the DG site, and 30% with injections to the VG site. Examining the reasons for the patients' satisfaction with the injections according to the sites, it was found that 33.3% of the patients with injections to the DG site and 83.3% of those with injections to the VG site were satisfied because they felt little pain; 28.3% with injections to the DG site and 3.3% with injections to the VG site were satisfied because of position comfort; with injections to the DG site, 26.7% of the patients were satisfied because of its continuous use; with injections to the VG site, no patients continuously had used the VG site for injections. Examining the reasons for the patients' satisfaction with injections according to the sites, it was found that with injections to the DG site, 11.7% of the patients were not satisfied because of excessive pain, while with injections to the VG site, 13.3% of the patients were not satisfied because of excessive pain. It was stated by 1.7% of the patients that they were not satisfied because they thought that the drugs should be given orally rather than by injection to the DG site. It was found that with injections to the DG site 85% of the patients, and with injections to the VG site 86.7% of the patients stated that they would prefer the same site again.

Comparison of Patients' Descriptive Characteristics and Injection Experiences and Injections to the DG and VG Sites According to Pain Intensity: Table 2 shows a comparison of the descriptive characteristics and injection experiences of the patients included in the research and injections to the DG and VG sites according to pain intensity. No statistically significant differences ($p > 0.05$) were found between the patients' mean age and the DG site ($r = 0.023$, $p = 0.864$) and the VG site ($r = 0.092$, $p =$

0.485), between the pain severity score in the DG site ($\chi^2 = 4.55$, $p = 0.103$) and the pain severity score in the VG site ($\chi^2 = 3.928$, $p = 0.140$) according to age group, between the individuals' pain severity scores in the DG site ($z = 0.151$, $p = 0.880$) and the pain severity scores in the VG site ($z = 0.093$, $p = 0.926$) according to gender, between the individuals' pain severity scores in the DG site ($\chi^2 = 8.020$, $p = 0.091$) and the pain severity scores in the VG site ($\chi^2 = 3.484$, $p = 0.480$) according to education level, or between the individuals' pain severity scores in the DG site ($\chi^2 = 0.597$, $p = 0.742$) and the pain severity scores in the VG site ($\chi^2 = 1.243$, $p = 0.537$) according to BMI. There was no difference between individuals' pain severity scores according to fear of injections ($z = 0.197$, $p = 0.844$). The DG pain severity of individuals with a fear of injections was found to be statistically significantly higher than that of those without a fear of injections ($z = 2.728$, $p = 0.006 < 0.05$).

Comparison of the Administration of Injections to the DG and VG Sites with Pain and Satisfaction Levels: Table 3 shows a comparison of the administration of injections to the DG and VG sites with pain and satisfaction levels of the patients included in the research. With injections to the DG and VG sites, no statistically significant difference was found between patients' satisfaction levels ($\chi^2 = 12.551$, $p = 0.051 > 0.05$). However, it was seen that with the DG site, no responses of 'very good' were given with regard to satisfaction level, whereas with the VG site, 21.7% of the patients gave the response 'very good'. No statistically significant difference was found between feeling a burning, stinging or pricking sensation ($\chi^2 = 2.547$, $p = 0.110 > 0.05$) in injections given to the DG and VG sites, between satisfaction for feeling little pain in injections given to the DG and VG sites ($\chi^2 = 0.960$, $p = 0.327 > 0.05$), or between satisfaction because of position comfort in injections given to the DG and VG sites ($\chi^2 = 0.818$, $p = 0.366 > 0.05$) ($p > 0.05$). A statistically significant difference was found between pain severity levels in injections given to the patients' DG and VG sites ($\chi^2 = 7.988$, $p = 0.018 < 0.05$), between satisfaction from injections given to the patients' DG and VG sites ($\chi^2 = 4.156$, $p = 0.041 < 0.05$), between preference for repetition in injections given to the patients' DG and VG sites ($\chi^2 = 8.869$, $p = 0.003 < 0.05$), and between dissatisfaction because of a feeling of excessive

pain in injections given to the patients' DG and VG sites ($\chi^2= 5.978$, $p= 0.014<0.05$) ($p<0.05$).

Comparison and Correlation of Patients' Mean Pain Intensity Scores of the DG and VG Sites:

Table 4 shows the comparison and correlation of patients' mean pain intensity scores of the DG and VG sites. There was a statistically significant

difference between the patients' mean pain severity scores of the DG site and the VG site ($t=5.900$, $p=0.000$). There was a weak positive correlation between patients' mean pain intensity score of the DG site and their mean pain intensity score of the VG site ($r=0.363$, $p=0.004$).

Table 1. Distribution of Patients by Pain Intensity and Satisfaction Levels with Injections to the DG and VG Sites (n=60)

Variables	DG		VG	
	n	%	n	%
Pain intensity	Mean±SD=4.61±1.65		Mean±SD= 3.25±1.51	
Pain level				
Mild Pain (1-3)	15	25.0	44	73.3
Moderate pain(4-7)	41	68.3	16	26.7
Severe pain(8-10)	4	6.7	0	0
Satisfaction Level				
Bad	8	13.3	5	8.3
Medium	29	48.3	8	13.3
Good	23	38.3	34	56.7
Very Good	0	0	13	21.7
Feeling burning, stinging, pricking				
Yes	26	43.3	7	11.7
No	34	56.7	53	88.3
State of satisfaction				
Yes	16	26.7	18	30.0
No	44	73.3	42	70.0
States of satisfaction				
Satisfaction: little pain				
Yes	20	33.3	50	83.3
No	40	66.7	10	16.7
Satisfaction: Position comfort				
Yes	17	28.3	2	3.3
No	43	71.7	58	96.7
Satisfaction: the site's continuous use				
Yes	16	26.7	0	0
No	44	73.3	0	0
Not States of satisfaction				
Not satisfaction: too much pain				
Yes	7	11.7	8	13.3
No	53	88.3	52	86.7
Not satisfaction: (Other: by oral preference)				
Yes	1	1.7	0	0
No	59	98.3	0	0
Preference for repetition				
Yes	51	85.0	52	86.7
No	9	15.0	8	13.3

DG: Dorsogluteal Site VG: Ventrogluteal Site SD: Standard Deviation

Table 2. Comparison of Patients' Descriptive Characteristics and Injection Experiences and Injections to the DG and VG Sites According to Pain Intensity(n=60)

Variables	Pain Intensity DG site			Pain Intensity VG site		
	n	X	SD	X	SD	
Age Group						
19-37	24	4.54	1.61	2.88	1.30	
38-57	20	5.20	1.82	3.95	1.93	
58-76	16	4.00	1.32	2.94	0.85	
<i>Kruskal-Wallis test</i>		$\chi^2 = 4.55, p=0.103$		$\chi^2 = 3.928, p=0.140$		
Gender	n	X	SD	X	SD	
Female	29	4.69	1.89	3.34	1.72	
Male	31	4.55	1.43	3.16	1.32	
<i>Mann-Whitney U test</i>		$z=0.151, p=0.880$		$z=0.093, p=0.926$		
Education Status	n	X	SD	X	SD	
Illiterate	9	4.89	1.96	3.78	1.48	
Literate	7	3.29	1.38	2.86	1.07	
Primary education	14	5.36	1.65	3.57	2.10	
High school	22	4.55	1.60	2.91	1.19	
Bachelor, master	8	4.38	1.19	3.38	1.51	
<i>Kruskal-Wallis test</i>		$\chi^2 = 8.020, p=0.091$		$\chi^2 = 3.484, p=0.480$		
BMI	n	X	SD	X	SD	
Normal weights	13	4.31	1.80	3.31	1.65	
Overweight	31	4.71	1.87	3.29	1.32	
1st degree obese and 3rd degree morbidly obese	16	4.69	1.08	3.13	1.82	
<i>Kruskal-Wallis test</i>		$\chi^2=0.597, p=0.742$		$\chi^2=1.243, p=0.537$		
Fear of Injection	n	X	SD	X	SD	
Yes	43	4.95	1.59	3.33	1.63	
No	17	3.76	1.56	3.06	1.20	
<i>Mann-Whitney U test</i>		$z=2.728, p=0.006^*$		$z=0.197, p=0.844$		

DG: Dorsogluteal Site VG: Ventrogluteal Site SD: Standard Deviation Z: Mann Whitney U Test χ^2 : Kruskal Wallis Test
* $p<0.05$

Table 3: Comparison of the Administration of Injections to the DG and VG Sites with Pain and Satisfaction Levels (n=60)

Pain Intensity of DG Site	Pain Intensity of VG Site						Total	Ki kare Test			
	Middle Pain (1-3)		Moderate Pain (4-7)		Severe Pain (8-10)						
	n	%	n	%	n	%					
Middle Pain	14	93.3	1	6.7	0	0	15	25.0	$\chi^2 = 7.988$ $p=0.018^*$		
Moderate Pain	29	70.7	12	29.3	0	0	41	68.3			
Severe Pain	1	25.0	3	75.0	0	0	4	6.7			
Total	44	73.3	16	26.7	0	0	60	100			
Satisfaction level for DG site	Satisfaction level for VG Site						Total	Ki kare Test			
	Bad		Medium		Good				Very Good		
	n	%	n	%	n	%			n	%	
Bad	3	37.5	1	12.5	2	25.0	2	25.0	8	13.3	$\chi^2=12.551$ $p=0.051$
Medium	0	0	4	13.8	18	62.1	7	24.1	29	48.3	
Good	2	8.7	3	13.0	14	60.9	4	17.4	23	38.3	
Total	5	8.3	8	13.3	34	56.7	13	21.7	60	100	
Feeling burning, stinging,	Feeling burning, stinging, pricking in the VG Site						Total	Ki kare Test			
	Yes			No							

pricking in the DG Site	n	%	n	%	n	%	
Yes	5	19.2	21	80.8	26	43.3	$\chi^2= 2.547$
No	2	5.9	32	94.1	34	56.7	$p= 0.110$
Total	7	11.7	53	88.3	60	100	
Preferring DG site again	Preferring VG site again				Total		Ki kare Test
	Yes		No				
	n	%	n	%	n	%	
Yes	47	92.2	4	7.8	51	85.0	$\chi^2= 8.869$
No	5	55.6	4	44.4	9	15.0	$p= 0.003^*$
Total	52	86.7	8	13.3	60	100	
States of satisfaction for DG site	States of satisfaction for VG site				Total		Ki kare Test
	Yes		No				
	n	%	n	%	n	%	
Yes	8	50.0	8	50.0	16	26.7	$\chi^2= 4.156$
No	10	22.7	34	77.3	44	73.3	$p= 0.041^*$
Total	18	30.0	42	70.0	60	100	
DG site satisfaction: middle pain	VG site satisfaction: middle pain				Total		Ki kare Test
	Yes		No				
	n	%	n	%	n	%	
Yes	18	90.0	2	10.0	20	33.3	$\chi^2= 0.960$
No	32	80.0	8	20.0	40	66.7	$p= 0.327$
Total	50	83.3	10	16.7	60	100	
DG Site satisfaction: Position comfort	VG site satisfaction: Position comfort				Total		Ki kare Testi
	Yes		No				
	n	%	n	%	n	%	
Yes	0	0.0	17	100	17	28.3	$\chi^2= 0.818$
No	2	4.7	41	95.3	43	71.7	$p= 0.366$
Total	2	3.3	58	96.7	60	100	
DG site not satisfaction: too much pain	VG site not satisfaction: too much pain				Total		Ki kare Testi
	Yes		No				
	n	%	n	%	n	%	
Yes	3	42.9	4	57.1	7	11.7	$\chi^2= 5.978$
No	5	9.4	48	90.6	53	88.3	$p= 0.014^*$
Total	8	13.3	52	86.7	60	100	

DG: Dorsogluteal Site VG: Ventrogluteal Site * $p<0.05$

Table 4: Comparison and Correlation of Patients' Pain Intensity Mean Scores of the DG and VG Sites (n=60)

	DG Site	VG Site	Test**
	Mean±SD	Mean±SD	
Pain Intensity	4.61±1.65	3.25±1.51	$t=5.900$
			$p=0.000^*$
Test***	$r=0.363, p=0.004^*$		

* $p<0.05$ **Paired Sample t test *** Spearman Correlation

Discussion

In this study, a comparison was made of the DG and VG sites with regard to patients' pain severity and satisfaction levels after the administration of IM injections. A comparison of patients' descriptive characteristics and injection experiences with injections to the DG and VG sites according to pain severity, and a comparison of the distribution of injections administered to the DG and VG sites according to pain severity and satisfaction levels and the administration of injections to the DG and VG sites with pain level and satisfaction were examined.

Evaluation of the Comparison of Patients' Descriptive Characteristics and Injections to the DG and VG Sites According to Pain Intensity:

When giving injections, it is necessary to take account of patients' general characteristics and to select the most suitable injection technique (Potter & Perry, 2009). In our study, no significant correlation was found between patients' mean age and mean pain intensity scores at the DG and VG sites. However, the mean pain intensity scores in the DG and VG sites in those in the 38-57 year age group and the mean pain intensity score in the DG site were greater. The perception of pain decreases with age, and old people feel less pain and pressure with the same intensity of pain than do young people (Ay, 2019). It is thought that the reason why mean pain intensity in the 58-76 year age group was lower than that of the 38-57 year age group was that sensitivity to pain decreases with age. The result of our study and the study results of Apaydın (2018), Mohaheri et al. (2007) and Ocal and Karabacak (2012) are similar in that there was no significant difference between mean pain intensity scores at the DG and VG sites and age (Apaydın, 2018; Mohaheri et al., 2007; Ocal & Karabacak, 2012). In the study, no significant difference was found by gender between the pain intensity score at the DG site and the pain intensity score at the VG site. However, mean pain intensity at the DG and VG sites was seen to be greater in females than in males. In a study by Gunes et al., it was found that the thickness of subcutaneous tissue in the DG and VG sites was greater in females than in males (Yapucu, Zaybak, Tamsel, 2008). The results of this study support our conclusion that females' mean pain was greater than that of males. It is thought that the greater intensity of pain sensation in females may derive from the fact that there is more fatty tissue in the hips of females, while it is thicker in

the abdominal site of males (Yapucu, Zaybak, Tamsel, 2008). The results of our study are similar to the conclusions of studies comparing mean pain scores in the DG and VG sites by Mohaheri et al. (2007) and Ocal and Karabacak (2012) in that there was no significant difference between the genders (Mohaheri et al., 2007; Ocal & Karabacak, 2012). No significant difference was found between individuals' pain intensity scores at the DG site and at the VG site according to education level. It was seen that the mean pain intensity of injections to the DG site was greatest in patients with a primary school education at 5.36 ± 1.65 , and mean pain intensity at the VG site was greatest in illiterate patients at 3.78 ± 1.48 . In a study by Apaydın (2018), no significant difference was found, similar to our study, between education level and pain intensity (Apaydın, 2018). No significant difference was found according to BMI between patients' pain intensity scores in the DG site and those in the VG site. This is similar to studies in the literature (Mohaheri et al., 2007; Ocal & Karabacak, 2012).

In our study however, pain intensity in the DG site was seen to be 4.71 ± 1.87 more in overweight patients, and pain intensity in the VG site in patients of normal weight was 3.31 ± 1.65 more. It is thought that the greater pain intensity in the DG site, particularly in overweight patients, may be because there is more fatty tissue in the DG site especially in overweight individuals. In the VG site, as the literature states, muscle tissue extends over a wider area than fatty tissue (Yapucu, Zaybak, Tamsel, 2008). There was no significant difference according to fear of injections between patients' pain intensity scores in the VG site, but mean pain intensity scores in the DG site of individuals with a fear of injections were found to be higher than the scores of those without a fear of injections. The mean pain intensity score in the DG site of patients with a fear of injections, 4.95 ± 1.59 , was found to be greater than that in the VG site, 3.33 ± 1.63 . It is thought that patients' previous experiences of injections triggered a fear that the pain of injections would be great. The significantly higher mean pain intensity in the DG site of patients with a fear of injections is correlated with the greater use of the DG site in the clinical administration of injections. It is thought that fear of injections is a factor affecting the higher mean pain intensity in the DG site compared with the VG site.

Evaluation of the Comparison of Injections to the DG and VG Sites with Pain Intensity and Pain Level:

In IM injection, pain develops in connection with sudden pressure because of the trauma caused by the entry of the needle into the muscle and the drug being delivered into the muscle (Gulnar & Caliskan, 2014). The VG site is the safest known site, as it is far away from large blood vessels, nerves and bony projections, and the subcutaneous fatty layer is thin, so that unwanted outcomes such as pain, swelling and hematoma are reduced to a minimum as the drug passes to the muscular layer (Ay, 2019). In our study, the mean pain intensity of the VG site (3.25 ± 1.51) was lower than that of the DG site (4.61 ± 1.65) and was found to be statistically significant. In the literature also (Apaydın, 2018; Dogu, 2016), conclusions are seen which are similar to our findings. Therefore, Hypothesis H₁ of our study, 'Pain intensity in IM injections given to the VG site is less than in those given to the DG site', is accepted. In our study, a significant difference was found between the pain intensity levels of injections given to the DG and VG sites. Seven out of ten patients in our research felt pain of medium intensity in the DG site, while three out of ten patients felt a medium level of pain in the VG site. Also, while 6.7% severe pain was reported in the DG site, none was reported in the VG site. In the literature, the conclusions of studies by Mohareri et al. (2007) and Ocal and Karabacak (2012) are similar to our study. IM injection is a procedure which causes pain and discomfort in patients (Kara, 2013; Yapucu, Zaybak, Tamsel, 2008) and it has been stated to be the most painful of invasive procedures given to patients in hospitals (Kara, 2013; Unal & Kasikci, 2017). Also, antibiotics such as those in the cephalosporin group further increase pain and related discomfort in patients. In a study by Gunes et al., the thickness of subcutaneous tissue was compared in the DG and VG injection sites of patients included in the study, and it was found to be 25.4 ± 13.4 mm in the VG site and 26.3 ± 11.7 mm in the DG site (Yapucu, Zaybak, Tamsel, 2008). Injection pain and discomfort generally comes from the drug leaking under the skin, where it causes damage, giving rise to such negative feelings as irritation, physical and mental discomfort, and dissatisfaction. Because the thickness of the subcutaneous tissue is less at the VG site, the feeling of pain is less (Apaydın, 2018; Yapucu, Zaybak, Tamsel, 2008). In our study also, a significant difference was not found between

burning, stinging or pricking sensations in injections to the DG and VG sites. However, while 43.3% of patients felt unpleasant sensations of burning, stinging or pricking in injections to the DG site, it was seen that 11.7% of patients felt such sensations with injections to the VG site. This result confirms what the literature says, that sensitivity to discomfort at the VG site is less than at the DG site.

Evaluation of the Comparison of Injections to the DG and VG Sites with Satisfaction:

Patient satisfaction is the total of positive or negative thoughts about the services which an individual has received and is an important measure of the quality of service (Aslan et. al., 2012). The pain which patients experience during and after an injection and similar discomforts affect patient satisfaction (Yilmaz, 2010). A statistically significant difference was found in our study between the state of satisfaction of patients given injections in the DG and VG sites ($\chi^2 = 4.156$, $p = 0.041 < 0.05$). Satisfaction from injections to the DG site was 26.7%, while satisfaction with injections to the VG site was 30%. It was seen that satisfaction with the VG site constituted a statistically significant difference. No significant difference was found between patients' satisfaction levels in injections to the DG and VG sites. Therefore, hypothesis H₂ of our study, 'The satisfaction level with IM injections given to the VG site is greater than with those given to the DG site', was rejected. However, while no patients selected the response 'very good' for the satisfaction level with the DG site, 21.7% of the patients responded 'very good' with the VG site. This result shows that the level of satisfaction with the VG site was greater than that for the DG site. At the same time, looking at medium level satisfaction, it was seen that while 48.3% of the patients were satisfied at a medium level with injections to the DG site, 56.7% of the patients were satisfied to a medium level with injections to the VG site. Thus if only medium level satisfaction percentages are compared, it is seen that satisfaction with the VG site was greater. No significant difference was found between patients' satisfaction for little pain felt with injections to the DG and VG sites. However, the satisfaction rate of patients for injections to the DG site was 33.3%, while it was 83.3% for the VG site. Sahin and Eser (2018) examined the effect of the use of Buzzy® on pain and injection satisfaction on adults who were given IM injections. It was found that the reduction in the

sensation of pain experienced by patients during the injection affected patient satisfaction. It was seen that the method of applying ice to the injection site before the injection was performed reduced pain. Another method which reduces pain and increases satisfaction is to select a site where there is less subcutaneous fatty tissue, such as the VG site. Examining satisfaction after the injection in patients in the experimental and control groups, it was found that the mean injection satisfaction score of patients in the experimental group was 94.82 ± 4.97 , which was higher than that of the control group, 85.06 ± 13.39 ($p = 0.000$) (Sahin & Eser, 2018). An appropriate injection site, an appropriate technique, placing the patient in an appropriate position, explaining the procedure to the patient, calming, and establishing trust reduce patient anxiety, and help to prevent complications by reducing the feeling of pain (Kara, 2013; Sahin & Eser, 2018). A reduction in pain increases the satisfaction of someone who is ill (Yilmaz, 2010). It is thought that in our study, the low mean pain intensity in the VG site increased satisfaction. It is thought that the use of ice in Sahin's study reduced pain intensity and thus increased the mean satisfaction score, similar to our study. A significant difference was found between the patients' preference for repetition with injections to the DG and VG sites. The preference for repetition with injections to the DG site was 85%, while with the VG site it was 86.7%. In other studies, possible tissue irritation and pain were less because of the greater thickness of the muscular tissue in the VG site compared to the DG site (Dogu, 2016; Kemaloglu, 2013; Ocal & Karabacak, 2012). It is thought that the patients' preference for repetition of the VG site comes from the lower mean pain intensity creating a significant difference in our study, and from percentage satisfaction being greater. However, although patients experienced more pain and were less satisfied with injections to the DG site, 85% stated that they would prefer to have a repeat injection to the DG area. It is thought that the reason for this is that patients do not give up on the DG site which they are used to. No significant difference was found between satisfaction because of position comfort with injections to the DG and VG sites. It was seen that satisfaction with position in the DG site was 28.3%, while in the VG site it was 3.3%. The reason for this result is thought to be that nurses use the DG site and that position out of habit. In a study by Yigit Gokbel and Sagkal Midilli, it was

seen that most nurses (90.0%) used the DG site as a first choice when giving IM injections, and that for more than half of nurses (60%), the VG site was their fifth choice (Gokbel & Midilli, 2017). In the study by Gulnar and Caliskan, it was found that 85.9% of nurses most frequently used the DG site, and that 63.3% never used the VG site (Gulnar & Caliskan, 2014; Tugrul & Denat, 2014). Regarding clinical practice, it is seen that among the reasons for preferring the VG site are the use of imaginary lines in the DG site, and the determination of bony structures at the VG site by palpation. It is stated that the boundaries of the VG site are better identified by both palpation and inspection. Injection to the VG site can be performed with the patient in the supine, lateral or prone position (Kaya & Pallos, 2013; Potter & Perry, 2009; Vicdan, Su, Alpar, 2015). The reason for thinking that patients are comfortable in the prone position of the DG site is that because the VG site is not much used, patients are not aware of these positions. A significant difference was found between dissatisfaction with excessive pain in injections given to patients in the DG and VG sites. Dissatisfaction because of excessive pain in the DG site was 11.7%, while in the VG site it was seen to be 13.3%. In our study, the level of satisfaction with the VG site was found to be significantly higher than that with the DG site. Again, the satisfaction level because of feeling little pain in injections to the DG site in patients in our study was 33.3%, while it was 83.3% for the VG site. However, dissatisfaction with excessive pain in the VG site was found to be statistically significant. As can be seen, satisfaction with pain experienced during injections is a problem affecting patients to a significant extent. Patients are more satisfied with injections to the VG site than to the DG site because they feel less pain.

Conclusion and Recommendations: In our study, less pain was felt at the VG site than at the DG site. The mean pain intensity score for the VG site was lower than that for the DG site, and there was a positive correlation. There was no significant difference between patients' satisfaction levels for injections to the DG and VG sites. The level of satisfaction with the VG site was higher than for the DG site. In line with these results, nurses' first choice must be for the VG site when selecting a site to administer injections. Use of the VG site in clinics must increase compared with use of the DG site.

Nurses working in the field must be made aware of evidence-based studies concerning the VG site by means of in-service training and practical methods. Finally, the use of the VG site should be extended in the field of health care services in this country and internationally.

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