

Ventrogluteal site injections in the emergency department: a comprehensive educational program

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ABSTRACT

Purpose: This study aimed to evaluate the effectiveness of the training provided to emergency nurses regarding applying intramuscular injections into the ventrogluteal site.

Materials and methods: The research was quasi-experimental, performed with a single group and pre-test/post-test sequence. One hundred sixty-one nurses' ventrogluteal site knowledge levels, frequency of using the ventrogluteal site, and the accurate ventrogluteal site detection rates on the model were evaluated three months after baseline and training.

Results: The nurses' mean knowledge scores after training was significantly higher than before training ($t=12.323$; $p=0.001$). While using the ventrogluteal site was 37.9%, and the rate of accurate detection of the site on the model was 8.3%, these rates were found to be 54.6% and 48.1%, respectively, after the training.

Conclusion: Although the training increased the knowledge level and accurate detection rates, it did not statistically affect the frequency of use of the site.

Keywords: Emergency nurse; intramuscular injection; in-service training; nursing education, ventrogluteal site

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INTRODUCTION

Intramuscular (I.M.) injection application, which has been the responsibility of the nurses since the late 1960s, is a parenteral drug administration method that is often used in the safe delivery of drugs such as antibiotics and analgesics [1-2]. Worldwide, 16 billion drugs are administered annually via I.M. injections [3].

I.M. route is used more often during drug applications in emergency departments [4].

None of the sites preferred in I.M. injection applications are completely reliable, but the dorsogluteal (D.G.) site is the most disadvantaged one among these sites [5,6]. However, it was determined that nurses used the D.G. site most frequently in I.M. injection applications [7]. Yet, there are various disadvantages, such as administering the drug to the fat tissue instead of muscle tissue because D.G. site is rich in vascular structure and the thickness of the subcutaneous layer especially in overweight individuals, and its proximity to the sciatic nerve [5,8].

In addition, it has been suggested that the anatomical location of the sciatic nerve may differ in individuals, that mistakes can be easily made in drawing the imaginary line used in the determination of the site and that there is a risk of injury in injections to the D.G. site especially in terms of nerve injuries [9]. A study that examined 217 cases with injection-related sciatic nerve injury found that the D.G. site was preferred in all injection applications [10].

In addition, studies conducted on cadavers identified that although there was no mechanical injury of the sciatic nerve as a result of the drug injected into the D.G. site. The administered drug was in contact with the perineural sheath of the nerve, and the D.G. site was more dangerous in terms of complications due to its proximity to the sciatic nerve and the superior gluteal artery [11].

Studies conducted in recent years address the need for expanding the use of ventrogluteal (V.G.) site as a safe application area for adults [10,13] and children over 12 months [1,9,11-14].

Complications related to I.M. injection such as fibrosis, abscess, tissue necrosis, muscle contraction, pain, gangrene can be observed at a higher rate in the D.G. site compared to the V.G. site [9]. One reason why the V.G. site is preferred for injection is related to the distance of this site to the large blood vessels and nerves [1,15].

Another reason is associated with the ease of injecting into the V.G. site both in supine and lateral positions [9]. In addition, due to the prominence of the bone protrusions related to the position, the ease of site detection is among the reasons for preferring the V.G. site. Also, the thicker muscle layer in the V.G. site and the thinner subcutaneous layer reduces the possibility of drug delivery to the subcutaneous layer [1,15].

In addition, the V.G. site has a lower possibility of faeces and urine contamination than the D.G. site [9,16].

Although recent studies reported that the V.G. site should be preferred during I.M. injections [1,7,11], the V.G. site is rarely preferred for injections by nurses working in clinics [17].

The fact that the D.G. site is still the most frequently used site during I.M. applications suggests that the advantages of the V.G. site are not sufficiently understood or internalized by nurses [9]. Insufficient knowledge and experiences of nurses about detecting the V.G. site as well as injecting in this site, the small anatomical structure of the site, and perceptions of both nurses and patients that it is an unsafe site cause nurses to avoid this site [9,15].

This study aimed to evaluate the effectiveness of the training about the V.G. injection site for I.M. provided to emergency department nurses.

MATERIALS AND METHODS

Study design and participants

The research was of quasi-experimental design, performed with a single group and pre-test/post-test sequence.

The study was carried out in the emergency departments of six hospitals in a province in Turkey during February 2018-February 2019.

The study consisted of 196 nurses working in the emergency departments of these hospitals, and the sample was composed of 161 nurses who agreed to participate in the study.

The second stage of the study was completed with a total of 108 nurses due to the inaccessibility of some participants (workplace change, annual leave, etc.) (Figure 1).

The Instruments

Information Form and V.G. Site I.M. Injection Questionnaire were used to collect research data.

Information Form: The form consists of 20 questions to determine the identifying characteristics of nurses such as age, gender, the nursing program they graduated from, time spent in the profession and questions related to their use of I.M. injections and the V.G. site.

V.G. Site I.M. Injection Questionnaire: The questionnaire consists of 10 multiple choice questions to measure nurses' knowledge level about I.M. injection applications to the V.G. site. The questions were developed by the researchers in line with the literature [2,7,9]. The questionnaire was evaluated by three faculty members who are experts in the subject. After making the required modifications in line with the suggestions, a pilot was applied to 10 nurses who were not included in

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the study sample. Each correct answer in the questionnaire was calculated as one point. High scores obtained from the questionnaire point to high

level of knowledge about I.M. injection applications to the V.G. site.

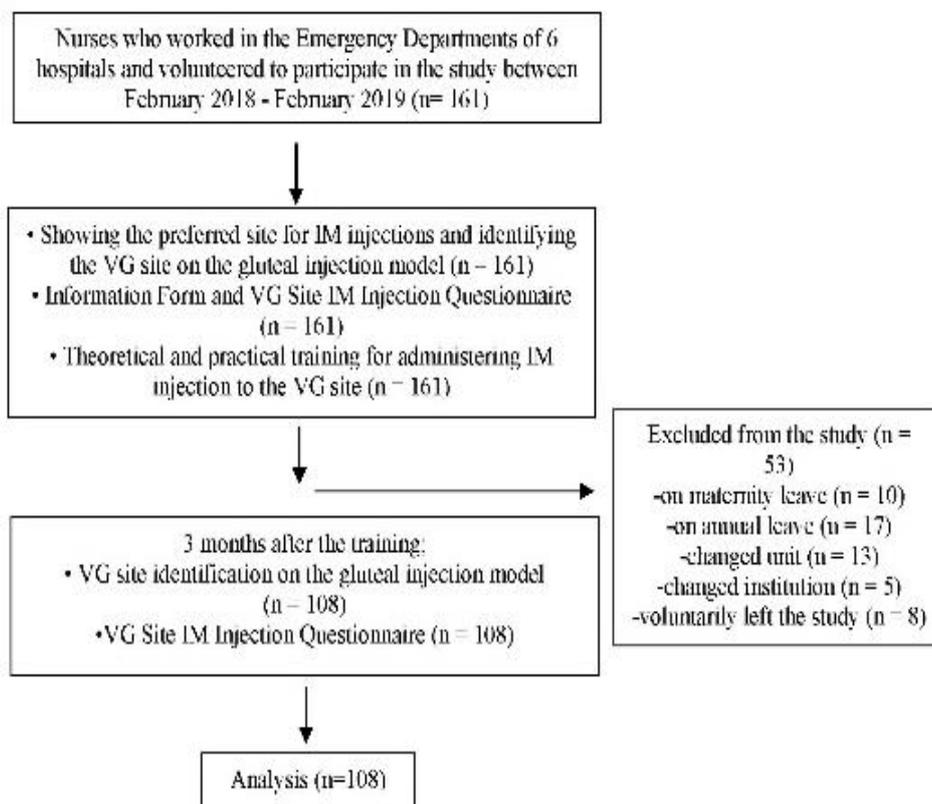


Figure 1. Flowchart of the research procedure.

Data Collection

Lists of nurses were obtained from the hospitals where the study was going to be conducted. All nurses were invited to participate in the study. Nurses were first asked to show their preferred site for I.M. injection on the gluteal injection model and to identify the location of the V.G. site. Subsequently, V.G. Site I.M. Injection Questionnaire (pre-test) was applied to nurses. Then, theoretical and practical training was given to nurses by the researchers regarding how to apply I.M. injections to the V.G. site. During the applied training, the location of the V.G. site was identified by using the method defined by Hochstetter and called the V method [15,17]. After the site was identified, nurses applied I.M. injections on the model. V.G. Site I.M. Injection Questionnaire (post-test) was re-administered to these nurses three months after the training and they were asked to identify the V.G. site on the gluteal injection model.

Statistical analysis

Study data were evaluated by Statistical Package for Social Science (SPSS) 21.0 program. Identifying information about nurses was provided

in numbers and percentages. Paired samples t-test was used to evaluate the difference between the nurses' knowledge level for the pretest and post-test mean scores in regards to I.M. injection application to the V.G. site. Chi-square analysis was used to test the difference between the nurses' use of V.G. site before and after the training. A value of $p < 0.05$ was considered statistically significant.

Ethical considerations

Written permission was obtained from the Clinical Research Ethics Committee of the University (Approval no: 16-9.1/1) and from the management of six participating hospitals in order to conduct the research.

The nurses participating in the research were informed about the research and their written consents were obtained.

RESULTS

Table 1 shows the demographic and professional characteristics of nurses. The majority of participants were staff nurses (96.3%) with

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bachelor-level education (58.3%). The mean age of the nurses was 34.69 years (SD=8.43), and they had

a mean of 12.35 (SD=9.05) years of professional experience (Table 1).

Table 1. Demographic and professional characteristics of nurses (n=108)

| | n | % |
|-----------------------------------------------|-----|-------------|
| Mean Age (mean±SD) | | 34.69±8.43 |
| Gender | | |
| Female | 89 | 82.4 |
| Male | 19 | 17.6 |
| Education | | |
| Medical vocational high school* | 7 | 6.5 |
| Associate degree | 31 | 28.7 |
| Bachelor degree | 63 | 58.3 |
| Master of Science/ PhD | 7 | 6.5 |
| Professional status | | |
| Head nurse/ supervisor/ director | 4 | 3.7 |
| Staff Nurse | 104 | 96.3 |
| Mean Professional Experience (mean±SD) | | 12.35± 9.05 |
| Night shifts worked per month | | |
| None | 11 | 10.2 |
| 1-3 | 4 | 3.7 |
| 4-6 | 11 | 10.2 |
| 7-9 | 30 | 27.8 |
| >10 | 52 | 48.1 |

Note. SD= standard deviation,

* Medical vocational high school: 4-year high school, after an 8-year primary school

Table 2. Distribution of Nurses' Characteristics Concerning Administering IM Injections

| | n | % |
|----------------------------------------------------------------------------|-----|-------------|
| Most frequently used site | | |
| DG site | 105 | 97.2 |
| VG site | 3 | 2.8 |
| Frequency of IM injections/month (mean±SD) | | 51.29± 8.44 |
| Site recommended in the latest literature | | |
| VG site | 28 | 25.9 |
| DG site | 27 | 25.0 |
| Vastus lateralis site | 37 | 34.3 |
| Rectus femoris site | 9 | 8.3 |
| Deltoid site | 7 | 6.5 |
| Complications during IM injections | | |
| Yes | 14 | 13.0 |
| No | 94 | 87.0 |
| Type of Complication | | |
| Infection | 3 | 21.4 |
| Pain | 7 | 50.0 |
| Hematoma | 1 | 7.1 |
| Nerve Injury | 1 | 7.1 |
| Tissue Ossification | 2 | 14.4 |
| Site of Complications* | | |
| VG site | 2 | 14.3 |
| DG site | 5 | 35.7 |
| Vastus lateralis site | 2 | 14.3 |
| Deltoid site | 7 | 50.0 |
| Have you given injections to the VG site in your professional life? | | |
| Yes | 41 | 38.0 |
| No | 67 | 62.0 |

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| Reasons for not using the VG site (n=67)** | | |
|-----------------------------------------------------------------------|----|------|
| The site is too small | 4 | 5.9 |
| I can't locate it | 20 | 29.8 |
| I'm afraid of harming the patient | 4 | 5.9 |
| I'm not used to it | 37 | 55.2 |
| I have no information on the VG site | 15 | 22.3 |
| Knowledge of locating the VG site | | |
| Yes | 60 | 55.6 |
| No | 48 | 44.4 |
| Before the training, the VG site was | | |
| Accurately identified on the model | 9 | 8.3 |
| Inaccurately identified on the model | 99 | 91.7 |
| After the training, the VG site was | | |
| Accurately identified on the model | 52 | 48.1 |
| Inaccurately identified on the model | 56 | 51.9 |
| VG site used after the training | | |
| Yes | 59 | 54.6 |
| No | 49 | 45.4 |
| Reasons for not using the VG site after the training (n=49)*** | | |
| The site is too small | 10 | 20.4 |
| I can't locate it | 5 | 10.2 |
| I'm afraid of harming the patient | 17 | 34.6 |
| I'm not used to it | 22 | 44.8 |
| It is difficult to locate the site | 5 | 10.2 |
| patients do not want it | 15 | 30.6 |

Note. SD= standard deviation, VG= ventrogluteal, IM= intramuscular

* Percentages were based on 14 respondents. More than one response was received **Percentages were calculated based on 67 respondents. More than one response was received.

***Percentages were calculated based on 49 respondents. More than one response was received.

Table 2 presents the distribution of nurse characteristics related to administering I.M. injections. While the three-quarters of the participants were aware that the V.G. site was recommended in current literature (25.9%), the most frequently used I.M. injection site was the D.G. site (97.2%). The average monthly frequency for injections was 51.29 (SD = 8.44). Most of the nurses (87.0%) were found to have no experience with complications and the most frequently encountered complication was pain (50.0%), and the injection site was deltoid (50%). More than half of the nurses (62.0%) reported that they did not prefer the V.G.

site for I.M. injections. Although 55.6% of the nurses stated before the training that they knew how to locate the V.G. injection site, only 8.3% of them were able to detect the V.G. site on the gluteal injection model accurately. About half of the nurses (55.2%) stated that they were not accustomed to giving injections at the V.G. site. After training, 54.6% of the nurses indicated that they used the V.G. site for I.M. injection, but only 48.1% of them could accurately locate the V.G. site. After training, 44.8% of the nurses stated that they did not use the V.G. site because they were not accustomed to it.

Table 3. VG injection knowledge test mean scores of nurses before and after training

| | X±SD | t | p |
|----------------------------------------|-------------|----------|----------|
| Knowledge Score Before Training | 4.30±2.49 | 12.323 | 0.001 |
| Knowledge Score After Training | 7.16±1.81 | | |

Note. SD= standard deviation, t= paired samples t-test, VG= ventrogluteal

Table 3 presents nurses' V.G. Injection Knowledge Test mean scores before and after the training. The nurses' mean score after training (7.16 ± 1.81) was found to be significantly higher than their mean pre-training knowledge scores (4.30 ±

2.49) (p = 0.001). Nurse responses to the V.G. Injection Knowledge Test questions before and after the training were examined. It was found that the nurses generally answered the questions correctly about the injection technique [position to be given to

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the patient (50.9%), providing skin antisepsis (69.4%)] at a higher rate. While 47.2% of the nurses answered the question related to locating the V.G. injection site correctly before the training, 83.3% of the nurses answered this question accurately after the training (Data are not shown).

While using the V.G. site for I.M. injections before training was 37.9%, this rate increased to 54.6% after the training. There was no statistically significant difference between the rates of using the V.G. site for I.M. injections for the nurses ($p > 0.05$).

Table 4. Distribution of nurses' use of vg site before and after training

| Use of VG site after the training | Use of VG site before the training | | | | Total | | χ^2 | p |
|-----------------------------------|------------------------------------|------|----|------|-------|------|----------|--------|
| | Yes | | No | | n | % | | |
| | n | % | n | % | | | | |
| Yes | 25 | 23.1 | 34 | 31.5 | 59 | 54.6 | 1.074 | p=0.30 |
| No | 16 | 14.8 | 33 | 30.6 | 49 | 45.4 | | |

DISCUSSION

The World Health Organization reports that 16 billion injections are administered annually in the world, and 50% of them are not safe [4]. Especially technical mistakes made in I.M. injection applications and improper site selection increase the risk of injury and cause various complications for patients [18,19]. The DG site has lost its reliability in recent years due to the potential to develop complications and difficulty in its detection [20]. However, studies conducted in our country and abroad reveal that more than 70% of nurses preferred the D.G. site for I.M. injections [6,7,9,13,17,21,22]. Similar to the literature, this study found that the nurses mostly preferred the DG (97.2%). As a result, it is observed that the use of the D.G. site is typical in intramuscular injection applications and nurses traditionally use this site.

The V.G. site, whose importance was emphasized for the first time in the early 1950s, is recommended as the safest site in I.M. injection applications for children over 12 months old and adults [20,23]. Although V.G. has proven to have many advantages, its use by nurses is limited. The literature reports that theoretical and practical training provided before and after graduation lacks teaching why the V.G. site should be selected as the first choice in I.M. injections [24,25]. In this study, one-fourth of the nurses (25.9%) stated that the V.G. site was recommended in the current literature and less than half of the nurses (38%) reported that they applied injections into the V.G. site. In their studies, Milutinović et. al. [7] 28.1% and Arslan and Özden [26] determined that a quarter of the nurses preferred the V.G. site for I.M. injection. Sarı et al. [9] concluded that half of the nurses were aware of this suggestion. However, the rate of nurses using the V.G. site in I.M. injections is similarly low in other studies [6,13,17,18,26].

There are many reasons for not preferring the V.G. site in I.M. injections, including the fact that the site small, difficulty of locating the site, fear

of harming the patient, unfamiliarity with the site and lack of knowledge [9,13]. In addition, it was reported that a lack of information about locating the V.G. site created mistrust in using the site and resulted in continuing to use the traditional sites. In this study, approximately half of the nurses (55.2%) stated that they were not familiar with the site, while 29.8% indicated that they did not prefer the V.G. site because they did not know how to identify the location. Literature also presents findings similar to the results of this study [9,22]. Other studies also emphasized that nurses were not knowledgeable about determining the V.G. site [17,26]. This study supports these results with the finding that the rate of nurses who did not know how to locate the site was more than half (55.6%).

Very few nurses (8.3%) identified the V.G. site correctly before the training in this study. Other studies reported similar findings, stating that the nurses did not know how to locate the V.G. site [6,9,13,26]. After training, the number of nurses (48.1%) who could accurately identify the V.G. site considerably increased. Although the nurses perceive the V.G. site as difficult to locate, the significant increase observed after the training has once again demonstrated the importance of updating information in nursing. Another striking result in this study was related to the fact that although half of the nurses reported having sufficient knowledge on identifying the V.G. site before the training (55.6%), their information proved to be incorrect. Therefore, it is recommended that nurses update their knowledge from evidence-based studies in periodicals, articles, or textbooks. In addition, in-service training should be planned for nurses to update their knowledge, and they should be encouraged to put their knowledge into practice after this training. This study demonstrated a significant increase in the knowledge level of nurses after the training. The studies carried out in Turkey by Gülnar and Özveren [13], Arslan and Özden [26], Zeyrek and Kurban [27] and Eroğlu and Çevik [28] concluded that training caused an increase in

knowledge levels regarding the V.G. site. A qualitative study conducted with twenty-two nurses found an increase in nurses' theoretical and practical knowledge after the workshop on the V.G. site [24]. Accumulation of knowledge, which is an important factor for the professionalization of the nursing profession, emerges with continuous training [29,30]. Similar to the literature [6,9,24], the increase in the low knowledge scores after training in the present study reveals the importance of training.

As the most current evidence suggests that the D.G. site should not be preferred for I.M. injections [7,9,12]. Nurses in our study were expected to use the V.G. site after training. The difference in the rates of V.G. site use before and after the activity was not significant in the analysis. Unlike our study, some studies reported that the rate of nurses' use of V.G. site increased after training [13,22,27,28]. The authors interpreted the reasons for this finding by citing that nurses found it easier to locate the D.G. site than the V.G. site. In this present study, about half of the nurses reported that they did not use the V.G. site because they were not accustomed to this site. This finding may be related to the fact that most participants were middle-aged (with 12 years of average working experience). The widespread use of this site was not common during their student years, and this site may have been perceived as a new site for injections now. According to the literature, nurses are known to hesitate to give up old practices. They find it difficult to adapt to injecting into unfamiliar sites and are reluctant to change the D.G. site they are familiar with for injections [17].

CONCLUSION

Based on the findings of this research, which investigated the effectiveness of the training provided to emergency nurses to apply I.M. injections into the V.G. site, it was determined that the nurses frequently used the dorsogluteal site during I.M. injections. It was concluded that the training provided in regards to the V.G. site increased nurses' knowledge levels and the rates of correctly identifying the site location. However, it was determined that while the training increased the rate of V.G. site by nurses, this rate was not at the desired level. As supported by the literature, it was found in this study that nurses did not follow and use current methods during I.M. injection applications. According to the research results, it is recommended that nurses who need perform I.M. injections frequently and quickly in emergency departments should be regularly provided with training in using the V.G. site. Thus, it can be ensured that the complications caused by injection applications are prevented, and it is ensured that nurses use current information in the application site. The inclusion of

emergency department nurses working in one province is the limitation of this study. It is recommended to replicate the research with larger sample groups. In addition, the number of nurses who reported using the V.G. site in I.M. injection applications after training was based on self-reports. In future studies, nurses may be observed while applying injections to patients to encourage their use of the V.G. site. Thus, patients can be encouraged by providing information about the safety of the site as well.

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Conflicts of Interest

The authors have disclosed no potential conflicts of interest, financial or otherwise.

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