

Comparing applications of intramuscular injections to dorsogluteal or ventrogluteal regions

Erol Kilic¹, Rivahi Kalay², Cenk Kilic³

ABSTRACT

Intramuscular injection is a method used for drug delivery to large muscle mass. Muscles are supplied by more veins than the subcutaneous tissues. Therefore, after intramuscular injection, drug absorption is faster than in subcutaneous tissues. However, there are many risks associated with intramuscular injection. In order to reduce these risks, the anatomical structure of the treated area should be well known, and the region selection must be very well. The dorsogluteal (DG) region is commonly used for intramuscular injections. This area is close to blood vessels and nerves. Furthermore, the subcutaneous tissue of this region is thicker than the subcutaneous tissue of the other regions. For these reasons, it is the most dangerous region. The majority of health personnel accept that DG region is the most reliable for intramuscular injections. However, intramuscular injections to the ventrogluteal (VG) region have advantages in many ways. The VG region has been recognized as a primary intramuscular injection region. It was reported that a lot of health staff is not aware of the advantages of VG region. This review was organized with the aim to compare reasons for the preference of DG and VG regions and to explain the basis of evidence. Articles-related to selection of injection site, patient position and complications were reviewed and assessed. The reasons for preference of DG and VG regions were compared. Since intramuscular injection an important duty of medical personnel, it is expected that this review will be useful to update their knowledge on this issue.

¹Department of Painting, Faculty of Fine Arts, Akdeniz University, Antalya, Turkey, ²Department of Biochemistry, Konya Military Hospital, Konya, Turkey, ³Department of Anatomy, Faculty of Medicine, Gulhane Military Medical Academy, Ankara, Turkey

Address for correspondence:

Cenk Kilic, Gulhane Askeri Tip Akademisi, Anatomi Anabilim Dalı, 06010 Ankara, Turkey. Phone: +903123043510, E-mail: ckilicmd@yahoo.com

Received: March 16, 2014

Accepted: May 22, 2014

Published: August 27, 2014

KEY WORDS: Dorsogluteal region, injection, intramuscular, ventrogluteal region

INTRODUCTION

The world changes and developments in almost all areas, particularly in the health care field, are observed. When health is impaired as a result of acute or chronic disease, drug application is one of the most frequent used methods of treatment. In addition, this kind of application is one of the most important responsibilities of health personnel. Drug applications require a comprehensive set of knowledge and skill. Evidence-based developments in this area should be monitored carefully and should be implemented [1,2].

Health personnel working in centers offering health care services are responsible for the safety of the drug administered [2]. Drugs are applied in a variety of ways such as oral, topical and parenteral [2,3]. Intramuscular injection is one of the parenteral drug administration sites. This injection method is used to deliver drugs to a large muscle mass. Gluteus maximus, gluteus medius, gluteus minimus, rectus femoris, vastus lateralis, and the deltoid and triceps muscles are commonly used for intramuscular injection [4,5]. Muscles are supplied

by more veins than the subcutaneous tissues. Therefore, after intramuscular injection, drug absorption is faster than in the subcutaneous tissues. However, there are many risks associated with intramuscular injections. In order to reduce these risks, the anatomical structure of the treated area should be well known, and the region selection must be very well [2-4,6-9].

The dorsogluteal (DG) region is commonly used for intramuscular injections [2-4,6,7,10]. Another injection site of the gluteal are the ventrogluteal (VG) region. This review was organized with the aim to compare the reasons for the preference of DG and VG regions and to explain the basis of evidence. Articles related to the selection of injection site, to position the patient and complications were reviewed and assessed. The reasons for preference of DG and VG regions were compared.

SELECTION OF INJECTION REGION

The properties of the drug to be administered, the patient's age and the patient's body measurements should be taken into consideration for determining the intramuscular

injection technique which will be applied to the patient [11]. Intramuscular injections made in the gluteal region are generally implemented in DG and VG regions.

Although VG region is defined as the safest region [12], it was reported that the majority of nurses (81.5%) chose the DG region [13-15]. The main reasons for not to prefer the VG region are; (1) the small anatomical structure of the region, (2) the inability to identify this region, and (3) fear that the patients may be damaged since this region is falsely believed be not safe [16-18].

The most important problem related to the injection of the gluteal region is concerned about complications. The thought that gluteal region is not safe is depending on the experiences of DG region injections. However, this thought has been shown to be not correct for VG region [12,18-20]. It was stated that gluteal injection causes less local side-effects than thigh injection [21-24]. Even in babies and small children, the VG region was shown to be a suitable site for intramuscular injections [18]. In obese patients, it was stated that a longer needle is required for VG intramuscular injections to avoid side effects of the drug and for delivering the drug intramuscularly [25].

Preference of VG intramuscular injections depends mainly on the ability for making the injection in the supine, prone and lateral positions which are much comfortable for the patient [6,12,16]. VG region is also the most reliable region for injection practices; the main reasons are: (1) the absence of nerves and blood vessels in this region, (2) being away from bony prominences, and (3) low possibility of falsely subcutaneous injection [26].

PATIENT POSITIONING AND IDENTIFYING THE INJECTION REGION

The determination of VG region is a little harder in the prone position. However, probability of injections into the wrong area is very low during VG intramuscular injection, because, unlike the DG region, the VG region is determined by palpation of the bony structures. On the other hand, the positional displacement of the target region may occur during DG intramuscular injection; this problem does not occur during VG injections [11].

VG region can easily be determined by palpating the bony structures, and its boundaries are well defined, since bone spurs can be felt by hand without difficulty [6,16]. During palpation, left hand and right hand are used on right hip and left hip for identifying the injection region, respectively. The lower part of the palm of the hand is placed on the greater trochanter, the index finger is placed on the anterior superior iliac spine, the middle finger is placed on the iliac crest, and the thumb shows the groin. Injection is applied within the triangle formed by the index finger, the middle finger and iliac crest [Figure 1].

During DG intramuscular injection, patient's feet should be turned inward, providing that the toes of face each other. The

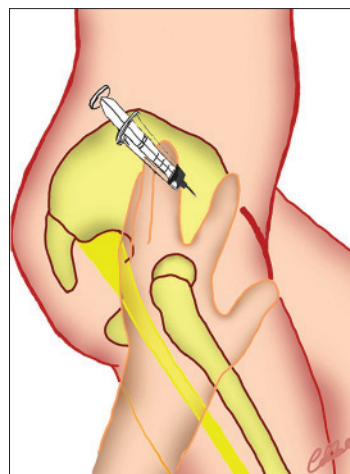


Figure 1: Identifying the ventrogluteal injection region

DG region is above an imaginary line between the greater trochanter and the posterior superior iliac crest. The injection should be made laterally and superior to this imaginary line while lying in the full prone position. However, in practice, patients often can be positioned to half-side position instead of full prone. In this case, the imaginary line is displaced upward. Therefore, the injection is made into the gluteus medius which is the target muscle of VG region instead of the gluteus maximus [3]. Thus, the injection site should be determined carefully in DG region. Because DG region is close to the sciatic nerve and gluteal artery [2-4,6,7,10,11,27-32], paralysis as a result of nerve damage and hematoma as a result of vascular injury may occur in cases of careless determining the injection site [33]. One of the most important complications as a result of intramuscular injections is damage to the sciatic nerve, which is particularly arising during DG injections [11,34].

PREFERING DG OR VG REGIONS?

Until recently, it was reported that the commonly used intramuscular injection sites are DG, VG, laterofemoral and deltoid regions [35-38]. It was expressed that the sciatic nerve injuries often develop due to DG injections [2,6,7,36,39]. The location of the sciatic nerve varies from individually; therefore the risk for being injured exists anytime with DG injections [2]. Since imaginary lines are used for identifying the DG region, easily mistakes can be made during determining the injection region. Furthermore, the subcutaneous tissue of this region is thicker than the subcutaneous tissue of other parts. For these reasons, the DG region seems to be the most dangerous intramuscular injection site [11] [Figure 2].

It was noted that the nurses use the most commonly the DG region for intramuscular injections [15,40]. The majority of health personnel accept that the DG region is the most reliable site for intramuscular injection and that they are not aware of the advantages of the VG region [16,17]. However, intramuscular injections at the VG region have advantages in many ways, and thus, the VG region has been recognized as a primary intramuscular injection region [11,12].

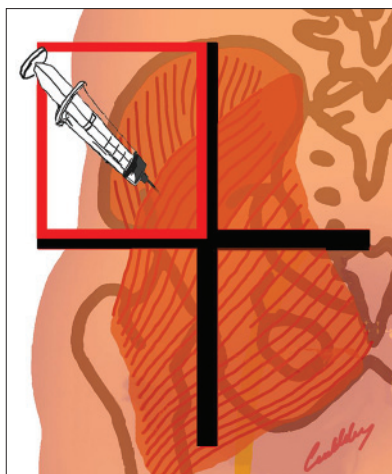


Figure 2: Identifying the dorsogluteal injection region

The VG region is a region that can be safely used instead of the DG region for intramuscular injections [28]. It was reported that VG intramuscular injections can be used safely in normal and slightly overweight individuals. The study was conducted in order to investigate the suitability for the VG injection region. As a result, the reliability of the method was determined in all of the individuals with body mass index (BMI) between 18.5 and 29.9. In addition, the method was found to be unreliable in 15% of the individuals with BMI value of 30-40 and all of the individuals with BMI above 40 [41].

Gluteus medius and gluteus minimus muscles are located in the VG region [30,41]. The muscle tissue of VG region is thicker than the muscle tissue of the DG region. The subcutaneous tissue of VG region is thinner than the subcutaneous tissue of the DG region. This condition reduces the possibility of accidental injections into the subcutaneous tissue [6,11,16,28,40,42]. There are topographically no large nerves and blood vessels in the VG region. The region is being innervated by small nerves and supplied by rami of the blood vessels. This situation prevents possible injuries and reduces pain [6,11,16,28,34,40].

Many complications were reported for intramuscular injections at the DG region. Following VG injection, no report regarding local complications resulting from the injection technique was found [3,12,30]. A reported complication with VG injection is muscle paralysis of the tensor fascia lata; however, this complication is more likely to see in older individuals with loss of muscle mass or in individuals who are bedridden for a long time [6].

The determination of the VG region is a little harder in the prone position. However, the probability of injections into the wrong area is very low during VG intramuscular injection. Additionally, the positional displacement of the target region may occur during DG intramuscular injection; this problem does not occur during VG injections [11].

Taken together, the reasons for the preference of the VG region in case of intramuscular injections can be summarized

as follows; (1) minimal risk to damage the sciatic nerve, (2) high reliability due to palpation of bone structures, (3) implementation possibilities in more positions including supine, prone and lateral position, (4) thicker gluteal muscles, (5) and thinner subcutaneous adipose tissue [6,11,12,16].

CONCLUDING REMARKS

Intramuscular injection is often used by health professionals. This injection is one of the routes of parenteral drug administration. The sciatic nerve injury associated with intramuscular injection causes many negative consequences in terms of health staff and patients. Available evidence indicates that DG region should be avoided for intramuscular injections. The VG region is the safest intramuscular injection site for several reasons, and thus, it is also the first choice site of intramuscular injections. However, in practice, the DG region is already used most frequently. This fact indicates that the advantages of the VG region is not known or understood by the majority of health personnel.

It is reported that the healthcare personnel did not receive any other training after basic teaching of injection techniques. They use many different methods [43]. They usually do not use techniques that reduce pain and tissue damage [15]. Since intramuscular injections are one of the most implemented duties of medical personnel, their knowledge regarding intramuscular injection needs to be updated.

The service training programs should be prepared about preventing injection-related nerve injuries and update knowledge of medical personnel on this subject. Although some developments in theoretical knowledge about intramuscular injections exist [4,7,41,44], avoidable complications still occur in many countries. Therefore, reconsidering the intramuscular injection subject in the curriculum of training of health personnel seem to be of particular importance. During the training of health personnel in the period before and after graduation, the reasons for preference of the VG region should be explained, and identification of the injection region should be shown in practice.

As final consideration, we recommend that more experimental and clinical studies should be made on DG and VG intramuscular injections. In addition, the use of terminology as “DG” and “VG” regions is confusing; for future researches, we suggest using “dorsomedial” and “dorsolateral” regions instead.

REFERENCES

1. Aslan Ö, Ünal Ç. Errors in parenteral drug administration in a surgical intensive care unit. *Gulhane Med J* 2005;47:175-8.
2. Potter PA, Perry AG. *Fundamentals of Nursing*. Philadelphia: Mosby Year Book; 2009. p. 752-3.
3. Nicoll LH, Hesby A. Intramuscular injection: An integrative research review and guideline for evidence-based practice. *Appl Nurs Res* 2002;15:149-62.
4. Potter PA, Perry AG. *Fundamentals of Nursing Concepts, Process and Practice*. St. Louis: The C. V. Mosby Company; 2005. p. 650-65.
5. Soanes N. Injection site safety. *Nurs Stand* 2000;14:55.
6. Small SP. Preventing sciatic nerve injury from intramuscular injections: Literature review. *J Adv Nurs* 2004;47:287-96.

7. Taylor C, Lillis C, LeMone P, Lynn P. Fundamentals of Nursing the Art And Science of Nursing Care. Philadelphia: Wolters Kluwer, Lippincott Williams & Wilkins; 2008. p. 131-798.
8. Hunter J. Intramuscular injection techniques. *Nurs Stand* 2008;22:35-40.
9. Berman A, Snyder S, Kozier B, Erb G, Levett-Jones T, Dwyer T, *et al.* Kozier & Erb's Fundamentals of Nursing. Concepts, Process and Practice. St. Louis: Prentice Hall; 2008. p. 551-82.
10. Craven RF, Hirnle CJ. Fundamentals of Nursing Human Health and Function. Philadelphia: Lippincott Williams & Wilkins; 2000. p. 537.
11. Emre Yavuz D, Karabacak Ü. Why should we choose ventrogluteal site for intramuscular injection? *Hemşirelikte Araştırma Geliştirme Derg* 2011;13:81-8.
12. DeLaune SC, Ladner PK. Fundamentals of Nursing: Standards and Practice. Clifton Park, New York: Thomson Delmar Learning; 2002. p. 713-6.
13. Cockshott WP, Thompson GT, Howlett LJ, Seeley ET. Intramuscular or intralipomatous injections? *N Engl J Med* 1982;307:356-8.
14. Farley HF, Joyce N, Long B, Roberts R. Will that IM needle reach the muscle? *Am J Nurs* 1986;86:1327, 1331.
15. Engstrom JL, Giglio NN, Takacs SM, Ellis MC, Cherwenka DI. Procedures used to prepare and administer intramuscular injections: A study of infertility nurses. *J Obstet Gynecol Neonatal Nurs* 2000;29:159-68.
16. Greenway K. Using the ventrogluteal site for intramuscular injection. *Nurs Stand* 2004;18:39-42.
17. Donaldson C, Green J. Using the ventrogluteal site for intramuscular injections. *Nurs Times* 2005;101:36-8.
18. Cook IF, Murtagh J. Ventrogluteal area – A suitable site for intramuscular vaccination of infants and toddlers. *Vaccine* 2006;24:2403-8.
19. Pichichero ME. Acellular pertussis vaccines. Towards an improved safety profile. *Drug Saf* 1996;15:311-24.
20. Hoppenbrouwers K, Kanra G, Roelants M, Ceyhan M, Vandermeulen C, Yurdakök K, *et al.* Priming effect, immunogenicity and safety of an Haemophilus influenzae type b-tetanus toxoid conjugate (PRP-T) and diphtheria-tetanus-acellular pertussis (DTaP) combination vaccine administered to infants in Belgium and Turkey. *Vaccine* 1999;17:875-86.
21. Baraff LJ, Cody CL, Cherry JD. DTP-associated reactions: An analysis by injection site, manufacturer, prior reactions, and dose. *Pediatrics* 1984;73:31-6.
22. Tozzi AE, Ciofi degli Atti ML, Wassilak SG, Salmaso S, Panei P, Anemona A, *et al.* Predictors of adverse events after the administration of acellular and whole-cell diphtheria-tetanus-pertussis vaccines. *Vaccine* 1998;16:320-2.
23. Ciofidegli Atti M, Anemona A, Tozzi AE, Stefanelli P, Giammanco A, Salmaso S. Reactogenicity of a three-dose pertussis acellular vaccine catch-up in children 21-40 months of age. *Vaccine* 1999;17:2030-5.
24. Cook IF, Murtagh J. Comparative reactogenicity and parental acceptability of pertussis vaccines administered into the ventrogluteal area and anterolateral thigh in children aged 2, 4, 6 and 18 months. *Vaccine* 2003;21:3330-4.
25. Zaybak A, Güneş UY, Tamsel S, Khorshid L, Eşer I. Does obesity prevent the needle from reaching muscle in intramuscular injections? *J Adv Nurs* 2007;58:552-6.
26. Beecroft PC, Redick SA. Clarification of ventrogluteal site. *Pediatr Nurs* 1990;16:396.
27. Altıok M, Kuyurtar F, Gökçe H, Taşdelen B. Primary care midwives and nurses' knowledge about intramuscular injections. *Fırat Sağlık Hizmetleri Derg* 2007;2:69-84.
28. Newton M, Newton DW, Fudin J. Reviewing the "big three" injection routes. *Nursing* 1992;22:34-41.
29. Ramtahal J, Ramlakhan S, Singh K. Sciatic nerve injury following intramuscular injection: A case report and review of the literature. *J Neurosci Nurs* 2006;38:238-40.
30. Rodger MA, King L. Drawing up and administering intramuscular injections: A review of the literature. *J Adv Nurs* 2000;31:574-82.
31. Workman B. Safe injection techniques. *Nurs Stand* 1999;13:47-53.
32. Wynaden D, Landsborough I, McGowan S, Baigmohamad Z, Finn M, Pennebaker D. Best practice guidelines for the administration of intramuscular injections in the mental health setting. *Int J Ment Health Nurs* 2006;15:195-200.
33. Campbell J. Injections. *Prof Nurse* 1995;10:455-8.
34. Atabek Aştı A, Karadağ A. Hemşirelik Esasları, Hemşirelik Bilimi ve Sanatı. İstanbul: Akademi Basın ve Yayıncılık; 2012. p. 721-61.
35. Bower F, Bevis EO. Fundamentals of Nursing Practice Concepts, Roles, and Functions. London: The C. V. Mosby Company; 1979. p. 473-7.
36. Craven RF, Hirnle CJ. Fundamentals of Nursing. Philadelphia: Wolters Kluwer, Lippincott Williams & Wilkins; 2009. p. 529-30.
37. Taylor, C, Lillis C, LeMone P. Fundamentals of Nursing the Art and Science of Nursing Care. Philadelphia: Lippincott Williams & Wilkins; 2001. p. 603-4.
38. Wolff L, Weitzel MH, Fuerst EV. Fundamentals of Nursing. Philadelphia: J.B. Lippincott Company; 1979. p. 614-5.
39. Beyea SC, Nicoll LH. Administration of medications via the intramuscular route: An integrative review of the literature and research-based protocol for the procedure. *Appl Nurs Res* 1995;8:23-33.
40. Floyd S, Meyer A. Intramuscular injections: What's best practice? *Nurs N Z* 2007;13:20-2.
41. Güneş ÜY, Zaybak A, Tamsel S. The examination of the reliability of the method used in identifying of ventrogluteal site. *Cumhuriyet Üniv Hemşirelik Yüksekokulu Derg* 2008;12:1-8.
42. Chan VO, Colville J, Persaud T, Buckley O, Hamilton S, Torreggiani WC. Intramuscular injections into the buttocks: Are they truly intramuscular? *Eur J Radiol* 2006;58:480-4.
43. Chiodini J. Vaccine administration. *Nurs Stand* 2000;14:39-42.
44. Ulusoy MF, Görgülü RS. Hemşirelik Esasları-Temel Kuram, Kavram, İlke ve Yöntemler. Ankara: TDFO Limited Şirketi; 1996. p. 72.

© GESDAV; licensee GESDAV. This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.

Source of Support: Nil, Conflict of Interest: None declared.