MAJOR FLAWS IN TECHNIQUE OF INTRAMUSCULAR INJECTIONS

Sheikh Saadat Ullah Waleem, Yasser Saeed Khan, Humayun Munir Tarar
Combined Military Hospital, Sargodha

ABSTRACT

Objectives: To identify the major flaws in technique of administering intramuscular injections by our health care professionals and to suggest improvements based upon a scientific study.

Design: Cross sectional (Jan-Feb, 2011).

Place: Combined Military Hospital Sargodha, Pakistan Air Force Hospital Sargodha, Pakistan Air Force Hospital Mianwali.

Patients and Methods: All staff involved in administration of IM injection to the patients. A detailed questionnaire was required to be filled in front of an observer and submitted. Injection sites were required to be marked on diagrams. The data were analyzed by SPSS 17.

Results: Major flaws were identified in the technique of administration of IMI.

Keywords: Drug administration by intramuscular route, sites for intramuscular injection, Intramuscular injection technique, site for vaccination, Intramuscular injection.

INTRODUCTION

According to WHO, intramuscular injection (IMI) is an administration of medications parenterally through a skin puncture by a syringe and a needle deep into a large muscle of the body for prophylactic or curative purposes[1]. It has been stated that IMI are amongst the most frequently used medical procedures. It has been documented that only 5% of all the injections are for the purpose of vaccination whereas the rest of the injections are administered with therapeutic intentions. In the developing countries, many of the injections for therapeutic administration of drugs have been judged to be unnecessary[2]. The complications reported are muscle fibrosis and contracture, abscess at the injection site, gangrene and nerve injury. Unsafe injection practices may result in a number of infections, most feared being hepatitis B, C and HIV[3]. Although these iatrogenic complications are all well-known, less effort is being imparted in educating medical students about the proper IMI techniques (IMIT).

The purpose of this study is to identify the common flaws in our IMIT and to make our healthcare providers realize the fact that the administration of a drug by IMI is a skilled task that needs to be learned in order to maximize the therapeutic effect of the medication and eliminate or minimize the complications and patient discomfort from IMIs.

Correspondence: Maj Sheikh Saadat Ullah Waleem, Classified ENT Specilaist, Saudi Armed Forces Hospital Sharourah, KSA.
Email: saadatwaleem1972@gmail.com
Received: 8 Jun 2012; Accepted: 21 Dec 2012

MATERIAL AND METHODS

This was a descriptive (cross sectional) study carried out at Combined Military Hospital Sargodha, Pakistan Air Force Hospital Sargodha and Pakistan Air Force Hospital Mianwali in January-February, 2011. All staff involved in patient management: doctors, staff nurses and male nurses were included in the study. A questionnaire was devised in Urdu language and distributed among the health care workers of these hospitals. Diagrams were printed on the questionnaire and the subjects, in addition to answering the questions, were asked to mark the exact sites on the printed diagrams which they use when they inject intramuscularly. Only one attempt was allowed and the questionnaire was filled in front of an observer. They were requested to attempt all sections. A total of 201 proforma were filled. The data were entered in SPSS version 17 and descriptive statistics were used to describe the results.

RESULTS

Out of our test population of 201, 3.5% were doctors, 32.8% were staff nurses and 63.7% were male nurses. It was noted that 11.9% of the paramedic staff were in a habit of

cleaning their needle with a spirit swab before injection; 2.5% were not in a habit of drawingthe plunger before injecting; 10.4% didn't know at what speed to inject and another 20.4% were injecting too fast; 80.1% didn't know about the Z track technique of IMI. A sizeable percentage of test subjects didn't know the correct sites of intramuscular injection as shown in table no 3. It was surprising to find out that 5.5% of the trained health care providers had admitted to have injected through clothes. The results are shown in tables1–3.

DISCUSSION

IMI is a very common technique used to deliver medication parenterally into a large muscle of the body. However it is not an entirely benign procedure and unsafe injection techniques have resulted in a lot of patient morbidity and even mortality. It has been quoted in the literature that unsafe IMI techniques have resulted in millions of dollars of medical cost on an annual basis[4].

The selection of the site for IMI is very important because depending upon the choice of site the effect of the medication/ vaccine can be enhanced or diminished and complications can be avoided or vice versa[5]. It is not only important to choose a correct site but it is also important to inject at the proper place. It was horrifying to note in our study that 64.2% were not sure about the correct place of injection in the deltoid muscle, 48.3% did not know the correct site for IMI in the gluteal muscle and an astounding 87.6% were injecting into the wrong muscle in the thigh, 26.9% of our test subjects stated that triceps can be used as a site for IMI which is not recommended as a very favored site for IMI in the literature because of fear of damage to the radial and profunda brachii artery which lie under the triceps muscle. The correct site for IMI in the deleted region is 3-5cm (about 2 fingers' breadth) below the acromion process–a very prominent landmark. Wrong IMI in deltoid has a potential for injury to auxiliary and radial nerves[5,7]. Similar results were noted by Cook who reported that the lack of awareness of anatomical structures around the deltoid muscle and the correct site of injection has resulted in an increasing risk of complications after IMI in this region[8]. Injections into the gluteal region are given dorsogluteally or ventrogluteally the latter being preferred over the former as it is claimed to be safer. Wrong IMI in this region may result in debilitating and lasting sciatic nerve injury[9,10]. This has also been reported by Walsh L, who concluded that nurses are not using the correct site for IMI in the gluteal region as recommended in the literature[11]. The target muscle for injection into the thigh is vastus lateralis. The muscle is well developed at birth and is recommended to be the site of choice for IMI up to 2 years of age. The site is antero-lateraly in the middle third of the portion between the greater trochanter and lateral femoral condyle. Most of the subjects were injecting into the rectus femorus which lies entirely and is wrong. Wrong site selection can lead to damage to femoral nerve or artery[6].

Recent studies have highlighted the importance of administering vaccines correctly. Most vaccines should be given via the intramuscular route into the deltoid or the anterolateral aspect of the thigh[12]. This optimizes the immunogenicity of the vaccine and minimize adverse reactions at the injection site. Injecting a vaccine into the layer of subcutaneous fat, where poor vascularity may result in slow mobilization and processing of antigen, is a cause of vaccine failure for example in hepatitis B[13], rabies, and influenza vaccines[14].Traditionally the buttocks were thought to be an appropriate site for vaccination, but the layers of fat do not contain the appropriate cells that are necessary to initiate the immune response (phagocytes or antigen-presenting cells). The antigen may also take longer to reach the circulation after being deposited in fat, leading to a delay in processing by macrophages and eventually presented to the T and B cells that are involved in the immune response. In addition, antigens may be denatured by enzymes if they remain in fat for hours or days. In our study we noted that only 55.2% of the test subjects knew that vaccine should not be injected in the gluteal region whereas only 17.4% opted for lateral aspect of thigh as the best site for vaccine

injection in age less than 2yrs (in the literature lateral thigh is recommended to be the and C and HIV[18]. Despite the fact that there is a large amount of data available on the subject of

Table -1: Basic knowledge of intramuscular injection technique 1.

	Yes	No	Do not know
	Percentage		
Knows about the hazards of wrong IMI?	98%	0.5%	1.5%
Can vaccines be injected in the gluteal region?	55.2%	32.3%	12.4%
Can IMI be given in triceps?	26.9%	55.2%	17.9%
Can blood mixed with injection be injected intramuscularly?	14.9%	78.6%	6.0%

Table-2: Basic knowledge of intramuscular injection technique 2.

	yes	no
	Percentage	
Do you clean needles with spirit swab?	11.9%	88.1%
Do you draw the plunger before injection?	97.5%	2.5%
Knows about Z track technique of IMI	19.9%	80.1%
Have you ever injected through the clothes?	5.5%	94.5%

Table-3: Basic knowledge of intramuscularinjection sites.

	Marked correctly	Marked wrongly
	Percentage	
A site marked by subjects for IMI in the deltoid area	35.8 %	64.2 %
A site marked by subjects for IMI in the gluteal region	51.7 %	48.3 %
A site marked by subjects for IMI in the thigh area	12.4 %	87.6 %

preferred site for all injections including vaccines in age <2years) and 82.6 % opted for gluteal region. Keeping in view the fact that sciatic nerve injury following IMI into the gluteal region has been a persistent complication, especially in the developing countries where health care workers are not properly trained, Sitati FC recommended that the gluteal region should not be used as an intramuscular injection site in children[15]. Similar recommendations were submitted by Mishra P[16].

The poor IMI technique can also result in complications like muscle fibrosis and contracture, abscess at the injection site, gangrene and the most feared and debilitating nerve injury[17]. In addition these unsafe and unhygienic injection techniques can result in a number of infections, particularly hepatitis B correct IMI technique pertaining to injection sites, blood flow and absorption in various muscle groups, discomfort, positioning, administration techniques and complications, our health care workers are not being imparted a proper knowledge of the same hence they mostly rely on ritual practices that travel from person to person and from one generation to the next. In our study it was noted that 5.5% of test subjects admitted to have injected through the clothes where as 11.9% were in a habit of cleaning the needle with a cotton swab before injection. Injecting through the clothes can lead to the introduction of dust, cloth fibers and other infecting organisms into the site of injection. Wiping the needle with alcohol swab may lead to increase in discomfort at the injection site because of the irritant action of alcohol. If cotton swab is used some of the

fibers may be left over on the needle and may lead to foreign body reaction and abscess formation therefore these practices should be discouraged[19].

It was good to notice that most of the subjects were in the habit of withdrawing the plunger to ensure that they are not injecting into a vessel however 14.9 % were injecting the medicine mixed with blood into the muscle (which can lead to more pain and discomfort) and another 6% were not sure what to do if they draw blood into the syringe during IMI. Similarly only 69.2% knew that the appropriate recommended speed of injection should be 1ml/10 seconds and the rest was either injecting too fast or too slow, both causing increased discomfort for the patient. The majority of the subjects including doctors and senior nursing staff did not know about the Z track technique of IMI. It is a technique that prevents tracking or leakage of drug into the subcutaneous tissue which can produce significant discomfort for the patient. It is particularly useful for the drugs which are irritant or discoloring to the subcutaneous tissues[20].

CONCLUSION

Administering an IM injection is a complex psychomotor task that requires very precise skill and knowledge that can not just travel from person to person and therefore the health care providers should be trained properly. Our goal in learning the perfect IMIT should be to maximize the therapeutic effect of the medication being delivered and to eliminate or minimize the complications and discomfort from IM injections. A little effort in this context can prevent debilitating and life lasting complications like muscle contracture or nerve injury.

REFERENCES

1. WHO. Safety of injections: A brief background. WHO, Geneva. Fact sheet no. 231, 1999.
2. Lala MK, Lala KR. Review of injection practice. Indian J Practical Pediatr 2001; 3: 72-5.
3. Beecroft PC, Redick SA. Possible complications of intramuscular injections in the pediatric unit. Pediatr Nurs 1989; 15: 333-36.
4. WHO. Unsafe injection practice and transmission of blood borne pathogens. WHO, Geneva. WHO bulletin 1999; 77: 787-99.
5. Center for disease control and prevention (CDC). General recommendations on "immunization, recommendations of the Advisory Committee on Immunization Practices (ACIP), Atlanta, USA. MorbidityMortality Weekly Report (MMWR) 1994: 43 (RROl): 1-38.
6. Pandian JD, Bose S, Daniel V, Singh Y, Abraham AP. Nerve injuries following intramuscular injections: a clinical and neurophysiological study from Northwest India. J Peripher Nerv Syst. 2006 Jun; 11:165-71.
7. Davidson LT, Carter GT, Kilmer DD, Han JJ. Iatrogenic axillary neuropathy after intramuscular injection of the deltoid muscle. Am J Phys Med Rehabil. 2007 Jun; 86:507-11.
8. Cook IF. An evidence based protocol for the prevention of upper arm injury related to vaccine administration (UAIRVA). Hum Vaccin. 2011 Aug; 7:845-8.
9. Small SP. Preventing sciatic nerve injury from intramuscular injections: literature review. J Adv Nurs. 2004 Aug; 47:287-96.
10. Sitati FC, Naddumba E, Beyeza T. Injection-induced sciatic nerve injury in Ugandan children. Trop Doct. 2010 Oct; 40:223-4. Epub 2010 Sep 8.
11. Walsh L, Brophy K. Staff nurses' sites of choice for administering intramuscular injections to adult patients in the acute care setting. J Adv Nurs. 2011 May; 67:1034-40.
12. Poland GA, Borrud A, Jacobson RM, McDermott K, Wollan PC, Brakke D, et al. Determination of deltoid fat pad thickness: implications for needle length in adult immunization. JAMA. 1997; 277:1709–11.
13. Shaw FE, Jr, Guess HA, Roets JM, Mohr FE, Coleman PJ, Mandel EJ, et al. Effect of anatomic site, age and smoking on the immune response to hepatitis B vaccination. Vaccine. 1989; 7:425–30.
14. Groswasser J, Kahn A, Bouche B, Hanquinet S, Perlmuter N, Hessel L. Needle length and injection technique for efficient intramuscular vaccine delivery in infants and children evaluated through an ultrasonographic determination of subcutaneous and muscle layer thickness. Pediatrics. 1997; 100:400–03.
15. Sitati FC, Naddumba E, Beyeza T. Injection-induced sciatic nerve injury in Ugandan children. Trop Doct. 2010 Oct; 40:223-4.
16. Mishra P, Stringer MD. Sciatic nerve injury from intramuscular injection: a persistent and global problem. Int J Clin Pract. 2010 Oct; 64:1573-9.
17. Kamlesh R. Lala Mrudula K. Lala. Intramuscular Injection: Review and Guidelines. Indian Pediatrics 2003; 40:835-45
18. Beecroft PC, Redick SA. Possible complications of intramuscular injections in the pediatric unit. Pediatr Nurs 1989; 15: 333-36.
19. Newton M, Newton D, Fudin J. Reviewing the 'big three' injection techniques. Nursing 1992; 22: 34-41.
20. Lippincott Williams and Wilkins. Intramuscular injection technique. In: Nursing Procedures. 2000: 243-47.