Research report:

Best Practice for Administering Low Molecular Weight Heparin (LMWH) Injection: An Evidence-Based Practice Project

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ABSTRACT

Context: Anticoagulation with subcutaneous heparin is the most common treatment for thromboembolic illnesses. LMWH is currently the most popular parenteral anticoagulant drug. Low molecular weight heparins are given by subcutaneous injection. This form of administration frequently results in adverse reactions, such as pain at the injection site, bruising, pain, sclerosis, and the development of hematomas.

Aim: Determine the best practice for administering low molecular weight heparin.

Methods: A total of 60 patients were included in the incremental rollout stage**.** The evidence-based practice team used a data collection tool to assess the incidence of bruising and pain. After appraising and synthesizing the evidence, the practice changes to use the abdomen as the first choice for injection of low-molecular-weight heparin was rolled out in the cardiac ward from OCT 2021 to NOV 2021.

Results: Highly statistically significant was found between both groups regarding injection site and incidence of pain P=0.000. Regarding the incidence of bruising, a statistically significant difference was found between both groups, p=0.004.

Conclusion: The abdomen should be the first choice for injection of low-molecular-weight heparin.

Keywords: Best practice, low molecular weight heparin, injection, evidence-based

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1. Introduction

Anticoagulation with subcutaneous heparin is the most common treatment for people with thromboembolic illnesses or those at risk of developing thromboembolism. Heparin solutions are available in unfractionated heparin (UFH) and low-molecular-weight heparin (LMWH). Due to its great bioavailability and consistent anticoagulant responses, LMWH is currently the most popular parenteral anticoagulant drug *(Li et al., 2021)*.

Subcutaneous injection (SC) of anticoagulants is a frequent nursing practice to treat or prevent thromboembolism. One of the basic responsibilities of nurses is to protect patients from preventable adverse effects by using proper injection techniques *(Çit & Senturan, 2018)*. Injection of low molecular weight heparins, including enoxaparin, has become more popular among anticoagulants given by SC injection *(Yi et al., 2016; Babaieasl et al., 2018)*. The primary locations to deliver LMWH are the lateral thigh, the inferior edge of the deltoid muscle on the upper arm, and the abdomen *(Cengiz & Ozkan, 2018)*. This form of administration frequently results in adverse reactions, such as pain at the injection site, bruising, pain, sclerosis, and the development of hematomas. It has been reported that the occurrence rates of bruising and hematomas following the subcutaneous injection of LMWH are, respectively, 26.6% to 88.9% and 40% to 88% *(Amaniyan et al., 2016; Koratala & Bhattacharya, 2018)*.

The patient is negatively affected, physically and psychologically, by these adverse effects associated with subcutaneous LMWH injections, which restricts the patient's

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options for injection locations *(Sendir et al., 2015).* Additionally, this affects the quality of life and negatively impacts treatment compliance. Bruising caused by enoxaparin injection typically appears after blood leaks from the injured arteries into the SC tissue. Typically, this condition peaks within 48 hours and begins to drop 60 to 72 hours afterward. Worry, anxiety, a loss of confidence, and treatment rejection could result from bruising. Additionally, bruises may force a patient to refrain from receiving repeated injections in the bruised location, reducing the available area for injections *(Dehghani et al., 2014).*

Pain is a side effect of injections that makes people physically and emotionally uncomfortable *(Zaybak & Khorshid, 2008).* Two different phenomena contribute to both the occurrence of pain and its intensification. The needle is first placed into the skin, which stimulates and damages neurons and causes pain. The drug's sulfate bonds, on the other hand, amplify its acidic qualities and, as a result, heighten the sensation of pain at the injection site *(Sanagoo et al., 2011).*

After subcutaneous injections, bruising, hematomas, and pain can occur at the injection site for various reasons. These reasons primarily stem from injection techniques, and numerous research has been done to prevent complications related to injection techniques. Several techniques have been suggested. These include choosing the right injection site and needle size, the duration of the injection, aspirating the syringe prior to injection, applying local dry heat, and massaging the area after the injection *(Ciftci & Avsar, 2016; Pourghaznein et al., 2014; Yılmaz et al., 2016).*

2. Significance of the study

There is an increased incidence of pain and bruising after administering LMWH in King Abdullah Medical City in Makkah. In addition, there is a variation in practice regarding the injection site of LMWH. Some nurses administer the injection in the arm, while others administer it in the abdomen. Furthermore, we wonder if strong evidence supports one site over the other to help reduce pain and bruising after the subcutaneous injection.

The potential sites for further injections may be limited by bruising, which happens when blood leaks from broken blood vessels into subcutaneous tissues. Additionally, it can result in unpleasant experiences that make patients less likely to accept treatment due to reduced trust in nurses' competence to administer the injections, anxiety, and disruption of body image *(Palese et al., 2013)*. Additionally, the pain brought on by medication administration can induce both physical and mental distress *(Pourghaznein et al., 2014)*, as patients frequently connect pain with later-appearing bruises and skin tissue damage. The probability of LMWH extravasation is thought to be decreased by the abdominal wall's greater surface area and thicker subcutaneous tissue (>25 mm) *(Avsar & Kasikci, 2013)*.

Comparatively to the arm area, the abdominal region has a thicker layer of subcutaneous tissue and fewer active muscles, which may reduce the possibility of LMWH injection extravasation into the superficial tissue. This reason may be behind why abdominal bruising occurs less frequently. Additionally, fewer nerve endings in the abdominal wall contributed to fewer reports of pain in the abdominal region. Nurses can build more trusting relationships with patients, lessen anxiety, and help patients develop positive body images by minimizing pain and bruising caused by LMWH.

3. Aim of the study

Determine the best practice for administering low molecular weight heparin.

4. Methods

4.1. PICOT Question

Among patients treated with subcutaneous injections of LMWH, does the administration of subcutaneous injection of LMWH at the abdomen compared to the arm site more effective in reducing pain and bruising?
P: Patient treated with subcutaneous injection of LMWH.
I: Administration of subcutaneous injection of LMWH at the abdomen.
C: Administration of subcutaneous injection of LMWH at arm site (standard practice).
O: Incidence of pain and bruising after the LMWH injection.
T: 30 days.

4.2. Search strategy

The databases CINAHL, EBSCOhost, Medline, Cochrane, Ovid, PubMed, and Google Scholar were used to thoroughly search relevant material. Search limited to the English language, literature published from 2000 to 2020, and literature on an adult population.

4.3. keywords

Heparin/subcutaneous heparin injection*/ Subcutaneous Low Molecular Weight Heparin/LMWH/ Low Molecular Weight Heparin/injection* site/Arm/abdomen/bruising/bruises*/pain.

4.4. Critical Appraisal of the Evidence

4.4.1. Johns Hopkins Nursing Evidence-Based Practice Model

The Johns Hopkins Nursing Evidence-Based Practice Model served as a framework for gathering, evaluating, synthesis, and translating the evidence. The John Hopkins Research Evidence Appraisal Tool was used to critique the article *(Dang et al.,2021).* Eleven articles were identified, and only one systematic review and meta-analysis done by *Li et al. (2021)* were included that reviewed all previous studies on the topic. The meta-analysis confirmed that selecting the abdomen as the injection site could reduce the incidence of side effects in the injection sites and reduce patient discomfort. The abdomen is proposed as the first choice of injection site for LMWH.

4.4.2. Integration of the Evidence with Clinical Expertise and Patient Preferences

After appraising and synthesizing the evidence, the practice changes to use the abdomen as the first choice for

injection of LMWH was rolled out in the cardiac ward from Oct. 2021 to Nov. 2021.

4.4.2.1. Gathering

A total of 60 patients were included in the incremental rollout stage. Nurses followed the hospital policy and used the arm site as the first choice for injection of LMWH to 30 patients; then, nurses changed the injection site as nurses used the abdomen as the first choice for injection of LMWH for 30 patients. The evidence-based practice team used a data collection tool to assess the incidence of bruising and pain. The pain was assessed using a visual analog pain scale after the injection of LMWH. In order to monitor any bruising, a waterproof pen was used to mark the injection site with a 5 cm perimeter circle then a plastic ruler was used to measure at 24 and 48 hours of injection. According to the evidence, bruising usually peaks at 48 hr and tends to resolve around 72 hr after injection of LMWH. A phased rollout allowed the EBP team to resolve inconsistencies or problems that may emerge during a full practice implementation.

4.4.2.2. Evaluation

Data were collected for the first 30 patients as baseline data (arm injection), and the new practice was implemented (abdominal injection) for 30 patients. The comparison was done between two groups regarding bruising and pain. Highly statistically significant was found between the two groups regarding injection site and incidence of pain. Regarding the incidence of bruising, a statistically significant difference was found between both groups, p=0.004.

Table (1): Comparison between the baseline group and new practice group regarding to occurrence of bruising and pain (n=60).

Items	baseline group (n=30)		New practice group (n=30)		X^2	p-value
	No	%	No	%		
Injection site						
Abdomen	0	0	30	100	60	0.000
Arm	30	100	0	0		
Incidence of pain					22.2	0.000
Yes	29	96.7	12	40		
No	1	3.3	18	60		
Incidence of bruising					8.52	0.004
Yes	13	43.3	3	10		
No	17	56.7	27	90		

4.4.2.3. Dissemination

As a part of nursing research and EBP day, this EBP practice change was presented in an internal system-wide poster session. In addition, hospital policy was updated and included the practice change that the abdomen site is the first choice for LMWH injection. A poster with practice change and a policy copy was sent to all nursing staff through e-mail and WhatsApp hospital groups.

4.4.2.4. Linking evidence to action

Based on current evidence and results of implementation, it is concluded that:

- The abdomen should be used as the first choice for injecting LMWH.
- An arm injection could be an option for patients who are reluctant or have any contraindications to receive LMWH injection in the abdomen.
- A system-wide change to evidence-based LMWH injection site practice can be successfully implemented and sustained through education and policy change.
- An evidence-based approach to change LMWH injection site practice improves patient comfort and quality of care.
- Hospital policy and procedures regarding the LMWH injection site should be updated.

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