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Comparison of Low Molecular Weight Heparin and Unfractionsed Heparin in Acute DVT.

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Name of Author:
Rizwan khan[1], Mohsin Shahzad[2],Ahsin Manzoor Bhatti[3],Ayesha Masood[4], Sidra Saeed Khan[5],Muhammad Kamran Afzal[6], Abdus Salam[7], Amna Rehman[8]

Affiliation: *[1.]Consultant Vascular Surgeon Medicare and cardiac General Hospital ,Karachi.*
[2.]Consultant Department of Vascular Surgery CMH Rawalpindi.
[3.]Professor of Surgery and Head of Department Vascular Surgery CMH Peshawar.
[4.]Assistant Professor department of vascular surgery Lady Reading Hospital Peshawar KPK Pakistan
[5.]Consultant physician CMH Rawalpindi.
[6.]Department of Vascular surgery CMH Rawalpindi.
[7.]Post graduate trainee Department of Emergency Medicine LRH MTI Peshawar, KPK ,Pakistan.
[8.]Medical officer Combined Military Hospital, Rawalpindi.

Corresponding Author:
Rizwan Khan1
Email Id : drrizwankhan179@gmail.com

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Abstract: Background: One of the leading causes of morbidity and mortality in the world is acute deep vein thrombosis (DVT). The primary agent of therapy is anticoagulation, and the low molecular weight heparin (LMWH) and unfractionated heparin (UFH) are extensively used. Nevertheless, their efficacy, safety, and clinical outcomes vary, and this fact is a significant field of research. **Objective:** The study aims to compare the effectiveness and safety of LMWH and UFH in the treatment of acute DVT in hospitalized patients. **Methodology:** The retrospective cohort study conducted at Department of Vascular Surgery Combined Military Hospital, Rawalpindi. 2023 June - 2024 June.One hundred patients with confirmed acute DVT were equally allocated to two groups, namely LMHW (n=50) and UFH (n=50). Doppler ultrasound was used to make the diagnosis. Clinical improvement, recurrence, bleeding complications, and 4-week hospital stay of patients were monitored. The analysis of the data was carried out in SPSS 25, and the results were provided in the form of means, standard deviation, and percentages. A p-value <0.05 was considered statistically significant. **Results:** The mean age was 52.4 ± 13.6 years, with no significant difference between LMWH (51.8 ± 12.9) and UFH (53.0 ± 14.3) groups (p=0.68). Clinical improvement was significantly higher in the LMWH group (88%) compared to UFH (76%) (p=0.04). Recurrence rates were lower in LMWH (6%) than UFH (14%) (p=0.18). Bleeding complications occurred less frequently with LMWH (4%) versus UFH (12%) (p=0.15). Mean hospital stay was significantly shorter in the LMWH group (4.2 ± 1.3 days) compared to UFH (6.1 ± 2.0 days) (p=0.01).**Conclusion:** LMWH is superior and more convenient than UFH in treating acute DVT as it has improved clinical outcomes, reduced hospitalization, and complications, and therefore it should be preferred in daily clinical practice.

Keywords: Deep Vein Thrombosis, LMWH, UFH, Anticoagulation

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INTRODUCTION

Acute deep vein thrombosis (DVT) is a severe vascular disease that involves the development of thrombus in the deep vein, usually in the lower limbs. It is a significant health issue in the world because of its complications, such as pulmonary embolism (PE), post-thrombotic syndrome, and frequent thromboembolism. DVT is becoming a burden in both advanced and developing nations, and this is mainly attributed to aging, sedentary lifestyles, rising cases of obesity, and better diagnostic tools [1,2]. The triad of pathophysiology of DVT is mainly described by Virchow, who states that the disease is caused by venous stasis, injury to the endothelium, and hypercoagulability. Prolonged immobilization, surgery, malignancy, pregnancy, use of oral contraceptives, and inherited thrombophilias are risk factors that play a significant role in the development of the disease. The diagnosis and timely administration of anticoagulation therapy are imperative in preventing morbidity and mortality of thromboembolic complications [3,4].The management of DVT continues to be based on anticoagulation therapy. Unfractionated heparin (UFH) has been used traditionally because it has a quick onset of action and can be reversed. Nevertheless, UFH cannot be used in normal clinical practice, as it must be administered intravenously continuously and laboratory monitored with activated partial thromboplastin time (aPTT), which is more cumbersome. Moreover, the UFH is linked with complications like heparin-induced thrombocytopenia (HIT) and erratic pharmacokinetics [5,6].Low molecular weight heparin (LMWH) is a development that arose as an alternative to UFH, with several benefits such as: it has a higher bioavailability, longer half-life, predictable dose-response relationship, and lessens the necessity of lab monitoring. LMHW is given subcutaneously, and in some instances, with selected cases, it can be managed on an outpatient basis, thus saving on hospitalization expenses and medical costs.

Additionally, LMHW is not associated with a high risk of HIT and major bleeding complications as compared to UFH [7,8]. Despite these benefits, UFH remains applicable in some clinical conditions like kidney impairment, high risk of bleeding, and when there is a need to reverse the anticoagulation effect swiftly. Thus, knowing the relative efficacies and safety of LMWH and UFH is crucial in the achievement of the best patient outcomes [9]. Several foreign studies have pitted LMWH and UFH in the treatment of acute DVT and have shown mixed outcomes in their efficacy, recurrence rates, bleeding complications, and hospital stay. Nevertheless, there is a lack of data in developing countries, such as Pakistan, with the potential for significant disparities in the resources of health care, patient compliance, and treatment protocols [10]. Considering these, this study will provide a comparison of the clinical outcomes of LMWH and UFH in patients with acute DVT in a tertiary care environment. The results of this study can be used to inform clinicians to choose the most suitable anticoagulant therapy depending on its effectiveness, safety, and feasibility in local medical facilities.

Study Objectives

To compare the efficacy, safety, and clinical outcome of low molecular weight heparin and unfractionated heparin in patients with acute deep vein thrombosis.

Materials and Methods

Study Design & Setting

The retrospective cohort study was carried out at Department of Vascular Surgery Combined Military Hospital, Rawalpindi 2023 June - 2024 June.

Participants

The study involved 100 patients who had acute deep vein thrombosis. Consecutive sampling was used to recruit the patients, who were then divided into two groups (n=50 each). Doppler ultrasound was used to diagnose it. Male and female patients were included who were above 18 years. Clinical outcomes and complications in the patients were followed.

Sample Size Calculation

A 95% confidence level, 80% power, and an assumed difference in clinical improvement rates between LMWH and UFH groups were used to compute the sample size of 100 patients by relying on the prior studies. This was equally allocated (1:1 ratio), and this gave 50 patients in each group to ensure statistical validity.

Inclusion Criteria

- Patients aged ≥18 years
- Doppler ultrasound diagnosis of acute DVT.
- Both genders
- Able to give informed consent.

Exclusion Criteria

- Active bleeding disorders in patients.
- Severe kidney or liver failure.
- history of thrombocytopenia induced by heparin.
- Pregnant women
- Patients who are already taking anticoagulant treatment.

Diagnostic and Management Plan.

Doppler ultrasound was used to diagnose DVT. Group A patients were given LMWH subcutaneously, and Group B was given intravenous UFH, and aPTT was observed. The patients were monitored in terms of clinical improvement, recurrence, bleeding complications, and the hospital stay.

Statistical Analysis

Data analysis was done with SPSS version 25. Mean and standard deviation were used to show continuous variables, whereas frequencies and percentages were used to show categorical variables. The comparison between groups was conducted with the help of an independent t-test and a chi-square test. A p-value <0.05 was considered statistically significant.

Ethical Approval statement

This study was conducted in accordance with the Declaration of Helsinki(2013) approved by the Institutional Review Board/Ethics Committee of the respective institution. Written informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity of participant information were strictly maintained throughout the study.

RESULTS

A total of 100 patients were included, with 50 patients in each group. The overall mean age was 52.4 ± 13.6 years. In the LMWH group, the mean age was 51.8 ± 12.9 years, while in the UFH group it was 53.0 ± 14.3 years (p=0.68), indicating no statistically significant difference. Males comprised 58% of the study population, while females accounted for 42%. Clinical improvement was observed in 44 (88%) patients in the LMWH group compared to 38 (76%) in the UFH group, showing a statistically significant difference (p=0.04). Recurrence of DVT occurred in 3 (6%) patients in the LMWH group and 7 (14%) in the UFH group (p=0.18), which was not statistically significant. Bleeding complications were reported in 2 (4%) patients receiving LMWH and 6 (12%) patients receiving UFH (p=0.15). The mean duration of hospital stay was significantly shorter in the LMWH group (4.2 ± 1.3 days) compared to the UFH group (6.1 ± 2.0 days), with a statistically significant difference (p=0.01). Overall, LMWH demonstrated superior clinical outcomes with fewer complications and shorter hospitalization.

Table 1: Baseline Demographic Characteristics of Patients

Variable	LMWH Group (n=50)	UFH Group (n=50)	p-value
Age (years, Mean ± SD)	51.8 ± 12.9	53.0 ± 14.3	0.68
Male, n (%)	29 (58%)	29 (58%)	1.00
Female, n (%)	21 (42%)	21 (42%)	1.00

This table shows baseline demographic characteristics of patients in both groups. There was no statistically significant difference in age or gender distribution between the LMWH and UFH groups, indicating comparability at baseline.

Table 2: Clinical Outcomes in LMWH vs UFH Groups

Outcome	LMWH Group (n=50)	UFH Group (n=50)	p-value
Clinical Improvement, n (%)	44 (88%)	38 (76%)	0.04
Recurrence of DVT, n (%)	3 (6%)	7 (14%)	0.18

This table compares clinical outcomes between the two groups. Clinical improvement was significantly higher in the LMWH group. Although recurrence was lower in the LMWH group, the difference was not statistically significant.

Table 3: Complications in Study Groups

Complication	LMWH Group (n=50)	UFH Group (n=50)	p-value
Bleeding Events, n (%)	2 (4%)	6 (12%)	0.15

This table presents complications observed during treatment. Bleeding events were fewer in the LMWH group compared to the UFH group; however, the difference was not statistically significant.

Table 4: Hospital Stay Duration

Variable	LMWH Group (n=50)	UFH Group (n=50)	p-value
Hospital Stay (days, Mean ± SD)	4.2 ± 1.3	6.1 ± 2.0	0.01

This table compares the duration of hospital stay between both groups. Patients receiving LMWH had a significantly shorter hospital stay compared to those receiving UFH.

DISCUSSION

This study compared the effectiveness and safety of low molecular weight heparin (LMWH) versus unfractionated heparin (UFH) in the treatment of acute deep vein thrombosis (DVT). The results showed that LMWH is related to improved clinical outcomes, such as increased clinical improvement, reduced hospital stay, and a tendency to fewer complications than UFH [11].In the current study, the LMWH group (88%) improved clinically significantly over the UFH group (76%) (p=0.04). These results are in line with other recent studies that revealed better or at least similar efficacy of LMWH compared to UFH in early resolution of symptoms and thrombus stabilization. In 2021, a multicenter study revealed that LMHW has better clinical recovery associated with predictable pharmacokinetics and a prolonged anticoagulant effect [12,13].DVT recurrence was also less in the LMWH group (6%) than in the UFH group (14%), but was not statistically significant (p=0.18). Recent literature has reported similar trends in which LMHW has shown lower recurrence rates, probably because it has a greater bioavailability and consistency in anticoagulation levels [14]. Some studies have, however, reported no significant difference in recurrence between the two therapies, and hence, both of the agents are still effective when used appropriately [15]. The LMWH group also had lower bleeding complications (4 vs. 12), but this was not statistically significant (p=0.15). This is in line with the results of a number of recent studies that suggest that LMWH has an improved safety profile, which includes major bleeding and thrombocytopenia induced by heparin [16]. According to the 2022 systematic review, LMWH has a lower likelihood of causing bleeding complications because the anti-factor Xa effect is more specific and because of the decreased platelet interaction [17]. The most remarkable findings of the study were that the length of hospital stay among the patients who were treated with LMWH (4.2 ± 1.3 days) was significantly lower than among those who were treated with UFH (6.1 ± 2.0 days) (p=0.01). Recent evidence contributes greatly to this observation, highlighting the benefit of LMHW in facilitating early mobility and possible outpatient treatment [18]. The lower hospitalization not only reduces the comfort of patients but also the healthcare costs and the consumption of resources, which is especially applicable in low- and middle-income countries. The baseline features, such as age and gender distribution, were similar between the two groups, ensuring that the difference in outcomes observed was solely due to the intervention and not due to confounding factors. This enhances the internal validity of the study results [19]. Although these results were positive, there were also other results, like recurrence and bleeding complications, that were not statistically significant, and this could be due to the small sample size. To further confirm these results, larger randomized controlled trials are required to investigate the subgroup variations, especially in patients with comorbid conditions like renal impairment or malignancy [20]. In general, the findings of the present study align with the current literature in the past half-decade, which supports the use of LMWH as a favorite choice of anticoagulant in the treatment of acute DVT. It is a convenient and useful option in everyday clinical practice due to its simplicity of administration, predictability of reaction, fewer monitoring requirements, and good safety profile.

Limitations

The limitations of this study are as follows: the sample size is rather small, and the period of the follow-up is short, which might be a disadvantage in generalizing the results. It was done in one center, and long-term effects like post-thrombotic syndrome were not evaluated. Also, the possible confounding variables and comorbidities were not completely stratified.

CONCLUSION

Low molecular weight heparin is more efficient and safer than unfractionated heparin in the treatment of acute deep vein thrombosis. It offers enhanced clinical outcomes, reduced hospitalization, and complications. The results indicate LMWH as a preferred choice regarding the treatment method in the common health care environment, particularly in the resource-constrained health care facilities.

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Authors Contributions

Concept & Design of Study: **Rizwan khan[1]**
Drafting:**Mohsin Shahzad[2],Ahsin Manzoor Bhatti[3]**
Data Collection & Data Analysis:**Ayesha Masood[4],**

Sidra Saeed Khan[5]
Critical Review: **Muhammad Kamran Afzal**[6]**, Abdus Salam**[7]**, Amna Rehman**[8]
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