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From Needle to Pill: Tracking Anticoagulant Transition Time In Venous Thromboembolism In A Tertiary Care Setting

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ABSTRACT

Background: Fewer studies have been conducted for specifically studying the efficacy of UF heparin and LMWH. The study is mainly done to know the time taken for each drug response and also check its effectiveness in VTE patients and is also crucial for optimizing the patient care. It can provide insights into which medication is more effective, safer and more cost effective. Thus, guiding healthcare professionals in making inform treatment decision. We aim in analyzing factors such as rates of recurrent thrombosis, length of hospital stays and overall patient outcomes.

Objective: To estimate the median time taken to change from Parenteral UF Heparin and LMW Heparin to Oral anticoagulant in a tertiary care hospital in Kerala, India.

Materials and methods: A retrospective cohort study was conducted to assess the prevalence of patients diagnosed with VTE in a tertiary care facility. The sample size of the study was 96 and the duration of the study was approximately about 6 months (November 2023- April 2024). The data was collected from medical records and patient drug charts. It was also obtained from the telephone communications. The medical records and patient drug charts were analyzed and further follow up were done through telephone interviews.

Results: To estimate the median time taken to change from Parenteral UF Heparin and LMW Heparin to Oral anticoagulant in a tertiary hospital.

Conclusion: The study suggests UFH might be a more suitable option for VTE treatment due to its lower cost, the decision should be made on a case-by-case basis considering individual patient factors. Both drugs seem to be equally effective in achieving treatment goals, with the main difference lying in cost.

KEYWORDS: Venous thromboembolism, Unfractionated heparin, Low molecular weight heparin.

INTRODUCTION

Venous Thromboembolism (VTE) is a condition that occurs when a blood clot forms in the vein. VTE include Deep Vein Thrombosis (DVT), Pulmonary Embolism (PE) and Cerebral Venous Sinus Thrombosis (CVST). A blood clot in the deep vein, generally in the lower leg, thigh, or pelvis, causes DVT. Additionally, DVTs can develop in the arms, particularly if the vein has a sizable intravenous central

line. When a clot breaks free and enters the bloodstream and goes to the lungs, it can cause a pulmonary embolism. [5]

VTE is a prevalent, recurrent illness that has a substantial morbidity, mortality, and healthcare expense, particularly in the elderly. It includes deep vein thrombosis (DVT) and pulmonary embolism (PE) [6]. Age, color, and geography all affect its incidence, with European and African-American groups having greater rates. VTE is caused by a combination of acquired (such as surgery, malignancy, and immobility) and hereditary (such as Factor V Leiden, prothrombin mutation) causes. [7]

There are no specific requirements for VTE in general, although the well's DVT criteria are applied when evaluating DVT. [8] By summing up each risk factor and categorizing patients, the Caprini score, initially created for surgical patients, simplifies the calculation of VTE risk. [9] A clinical method for determining a hospitalized patient's risk of venous thromboembolism (VTE) is the Padua Prediction Score. [10]

Different ethnic groups have different genetic predispositions, and diseases like hyperhomocysteinemia or antiphospholipid syndrome raise risk. VTE is caused by blood clots that form in veins, frequently as a result of hypercoagulability, stasis, or vascular damage. Serious difficulties may result from clots that move to the lungs, causing PE and affecting gas exchange. [11] Age over 40, surgery (particularly orthopedic or cancer-related), fractures, cancer, trauma, heart failure, and genetic thrombophilia are major risk factors. Antiphospholipid antibodies, varicose veins, and obesity might also be involved. [12]The diagnosis consists of imaging (ultrasound, MRI, CT scan, pulmonary angiography, V/Q scan), as well as blood testing (D-dimer, platelet count, aPTT, INR). [13] Non-pharmacological therapy may include diet and exercise, vena cava filters, compression stockings, and pneumatic devices. [14] Pharmacological therapy may include LMWH and UFH (heparins), DOACs (such as apixaban and rivaroxaban), VKAs, such as warfarin and Fondaparinux. Surgery is optioned for extreme situations were embolectomy or thrombectomy. [15]

OBJECTIVE

The study aims to estimate the median time taken to change from Parenteral UF Heparin and LMW Heparin to Oral anticoagulant. In clinical practice, there is still variation in the best time to switch from parenteral anticoagulants like UFH and LMWH to oral anticoagulants, which may have an effect on patient outcomes like bleeding risk and thromboembolism recurrence. Standardizing treatment procedures, enhancing safety, and improving therapeutic efficacy can all be achieved by knowing the median time needed for this shift and figuring out the elements that affect it.

MATERIALS AND METHODOLOGY

This retrospective cohort study aimed to evaluate the median time taken to change from Parenteral UF heparin and LMW heparin to Oral anticoagulant in tertiary care hospital in Kerala, India. Conducted between November 2023- April 2024 with 96 participants, the study received approval from the Institutional Review board of the tertiary care hospital in Kerala, India. All patients with a confirmed diagnosis of VTE were included, while patient below the age of 18 years, discharge against medical advice (DAMA) and patient on both drugs together were excluded.

In order to assess the participant's information and detail the data in accordance with the established goals, the data were assessed from the data medical records and patient drug charts. The data were analyzed according to criteria have been used.

The statistical formula used for calculating sample size was:

[Z2 * p * (1-p)/e2] / [1 + (Z2 * p * (1-p)/e2 * N]

Where,

P = Standard Deviation

N = Population Size

e = Margin of error

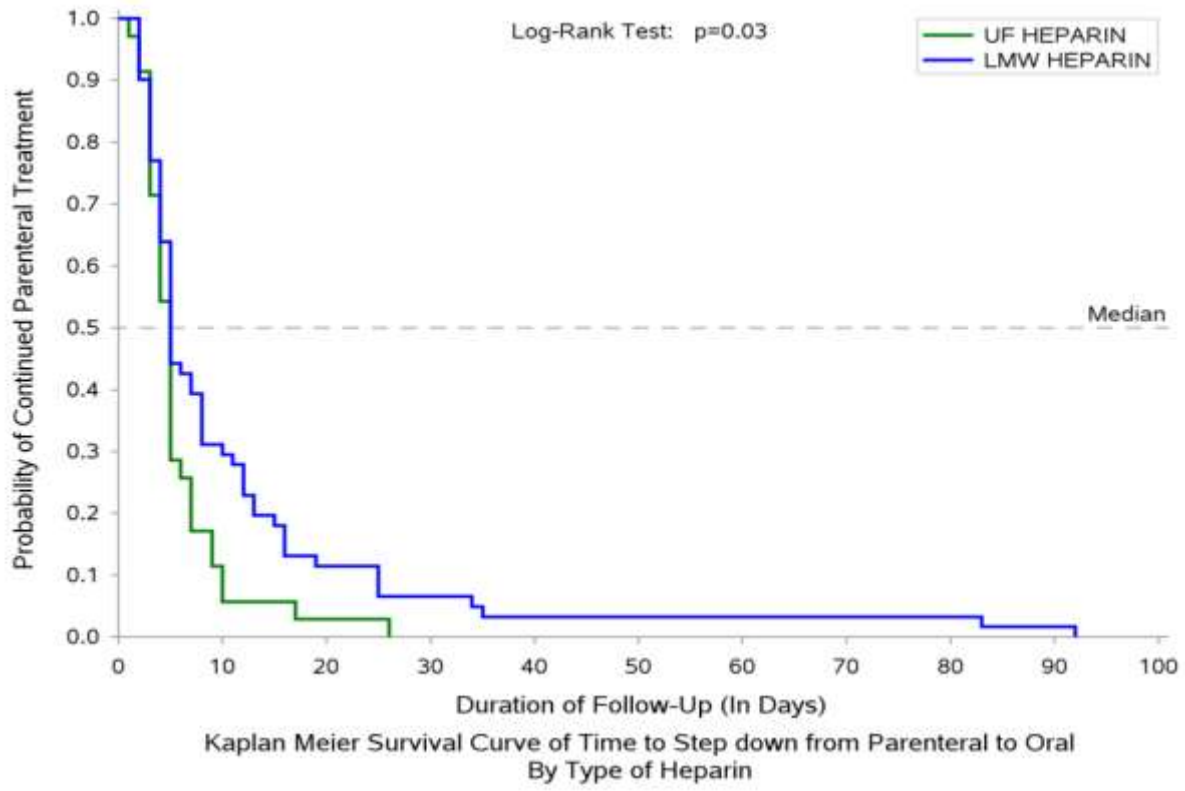
Z = 95% Confidence interval of Z

Mean and SD for quantitative variables and proportions for qualitative factors were used to define the research population profile. Kaplan Meier curves will be used to determine the median time to incident. The log rank test will be used to determine the difference in the likelihood of an even at any given time. SAS® software was used for all analysis.

RESULTS

TIME TO STEP DOWN FROM PARENTERAL TO ORAL BASED ON TYPE OF HEPARIN

Figure 01: Kaplan Meiers Survival Curve of time to step down from parenteral to oral by type of heparin



This graph showing Kaplan-Meier survival curve compares the time to step down from parenteral to oral anticoagulant between two types of heparin: unfractionated heparin (UF, green line) and low molecular weight heparin (LMW, blue line). The y-axis represents the probability of continued parenteral treatment, while the x-axis shows the duration of follow-up in days. The curve shows that patients on UF heparin transitioned to oral therapy more quickly than those on LMW heparin. The log-rank test indicates a statistically significant difference between the two groups ($p = 0.03$), suggesting that the type of heparin impacts the timing of the step-down.

DISCUSSION

A disorder known as venous thromboembolism (VTE) occurs when blood clots form in the veins, usually in the legs as deep vein thrombosis (DVT). These clots can migrate to the lungs and result in a pulmonary embolism (PE). It is an extremely dangerous and potentially fatal illness. Long-term immobility, surgery, cancer, pregnancy, and inherited clotting problems are risk factors. Venous stasis, endothelial damage, and hypercoagulability are the three components that make up Virchow's triad, which causes venous thromboembolism (VTE), which includes deep vein thrombosis (DVT) and pulmonary embolism (PE). Prolonged immobility (e.g., surgery, hospitalization, extended travel), trauma, cancer, pregnancy, obesity, age more than 40, smoking, use of oral contraceptives or hormone therapy, and hereditary clotting disorders such as Factor V Leiden are common causes and risk factors. In the pathophysiology, clots accumulate in deep veins, usually in the legs, and can become dislodged and move to the lungs, obstructing blood flow and causing problems with gas exchange. Serious side effects, including as PE, post-thrombotic syndrome, or even death, may result from untreated VTE. It was observed that the UF heparin may take 5 to 7 days and LMW heparin may took 7 to 10 days which may step down from parenteral to oral anticoagulant. This result was similar to study conducted by **Jack Hirsh et al., (2001) on "Guide to Anticoagulant therapy"** were UF heparin is typically administered for 5-7days and LMWH is administered for 7- 10 days. [16] **Russell D. Hull (1990)** conducted a study on **Heparin for 5 Days as Compared with 10 Days in the Initial Treatment of Proximal Venous Thrombosis.** The study was a randomized, double-blind trial and population included 199 patients with acute proximal venous thrombosis. The aim of the study is to compare a shorter course of continuous intravenous heparin (5 days, with warfarin sodium begun on the first day) with the conventional 10-day course of heparin (with warfarin begun on the fifth day). The study result showed that in the treatment of deep vein thrombosis, a five-day course of heparin is just as efficacious as a ten-day course. Moreover, taking the shorter course would allow for an earlier hospital discharge, which would result in significant expense savings. [17]

CONCLUSION

The study reveals that on the 5th day, 50% patients on both unfractionated heparin and low molecular weight heparin were converted to oral anticoagulant. In remining 50% patients UF Heparin took 5 to 7 days and LMWH took 7 to 10 days to step down from parenteral to oral anticoagulant and it depend on the patient status. Which means that UFH has faster step down to oral anticoagulants compared to LMWH. From the KM curve, log rank test, p value was found to 0.03 which showed that there was a significant statistical difference between the two groups.

In conclusion, the study suggests UFH might be a more suitable option for VTE treatment due to its lower cost and potentially faster step down, the decision should be made on a case by case basis considering individual patient factor. Both drugs seem to be equally effective in achieving treatment goals, with the main difference lying in cost.

LIST OF ABBREVIATION

VTE – Venous Thromboembolism
DVT – Deep Vein Thrombosis
PE – Pulmonary Embolism
CVT – Cerebral Venous Thrombosis
UF HEPARIN – Unfractionated Heparin

LMWH – Low Molecular Weight Heparin

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