Anti-Xa Level Monitoring in Elderly Trauma Patients Receiving Enoxaparin Prophylaxis

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Introduction

- Early venous thromboembolism (VTE) prophylaxis is essential to decrease mortality and morbidity in trauma patients, especially the elderly, who are at a high risk of VTE development.[1]
- Enoxaparin is a low molecular weight heparin (LMWH) commonly used for VTE prophylaxis.
- Twice daily subcutaneous administration of enoxaparin 30 mg is recommended in patients with low body weight, renal insufficiency, and old age. [2]
- Plasma anti-Xa level monitoring may be useful to evaluate therapeutic appropriateness of LMWH in VTE prophylaxis.

Objective

The objective of this study was to evaluate the appropriateness of serum anti-Xa levels for monitoring the effectiveness of VTE prophylaxis with enoxaparin in elderly trauma patients.

Patient Demographics

Table 1. Patient Demographics, *N=104*	
Male Gender, N(%)	62 (59.6)
Age (years), mean ± SD	74 ± 7.3
Race, N(%)	
White	68 (65.4)
Black	27 (26)
Other	9 (8.7)
BMI, median (IQR)	26 (23-31)
Blunt Injury, N(%)	102 (98.1)
ISS, mean ± SD	18 ± 9.3
Orthopedic Injury, N(%)	67 (64.4)
TBI/SCI, N(%)	80 (76.9)
HLOS (days), median (IQR)	17 (11-25)
MTP, N(%)	11 (10.6)

Abbreviations: **BMI** (body mass index), **ISS** (injury severity score), **TBI** (traumatic brain injury), **SCI** (spinal cord injury), **HLOS** (hospital length of stay), **MTP** (major transfusion protocol)

Anti-Xa Assay

- An indirect measure of a patient's plasma heparin
- A patient's plasma is added to an excess amount of exogenous factor Xa.
- The amount of heparin present in the patient's plasma is determined by how much exogenous factor Xa is inhibited after addition of the patient's plasma.

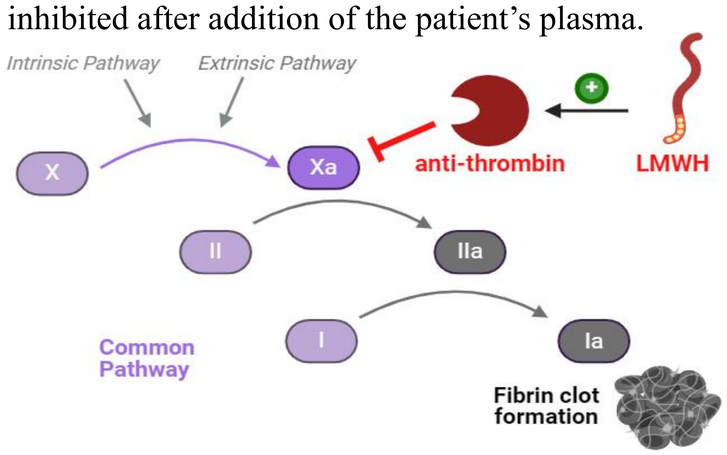

Figure 1. Mechanism of LMWH in inhibiting coagulation cascade. Heparin binds to anti-thrombin, which inactivates factor Xa and prevents downstream coagulation. Created with Biorender.

Anti-Xa Monitoring Outcomes

Table 2. Anti-Xa Monitoring for LMWH Prophylaxis, *N=104*	
Therapeutic Appropriateness of LMWH Prophylaxis , N(%)	
Therapeutic (anti-Xa level 0.2-0.4 IU/mL)	61 (58.7)
Subtherapeutic (anti-Xa level <0.2 IU/mL)	37 (35.6)
Supratherapeutic (anti-Xa level ≥ 0.5 IU/mL)	6 (5.8)
Time to Initiation of LMWH Initiation (days), median (IQR)	2 (1-3)
Complications , N(%)	
DVT/PE	7 (6.7)
Clinically Significant Bleeding	4 (3.8)

Abbreviations: **LMWH** (low molecular weight heparin), **DVT** (deep venous thrombosis), **PE** (pulmonary embolism)

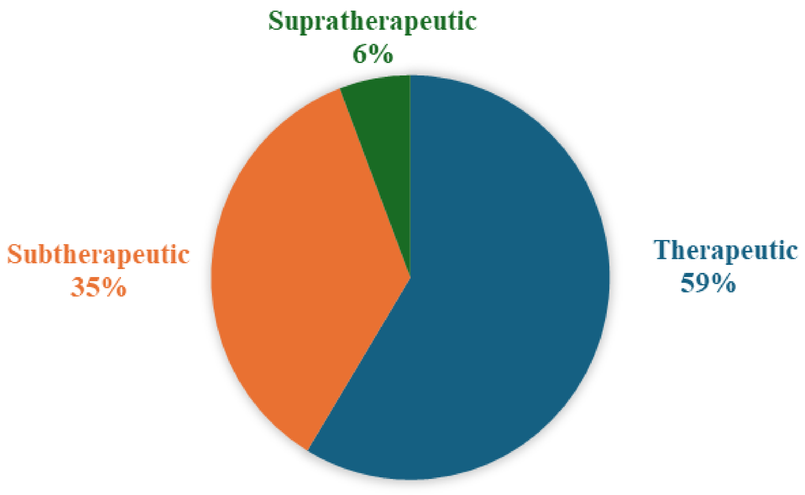

Figure 2. Therapeutic appropriateness of prophylactic LMWH in preventing VTE as measured by anti-Xa levels

Results/Discussion

- Only 58.7% of elderly patients achieved therapeutic anti-Xa peak levels while receiving 30mg of enoxaparin twice daily (BID).
- Only 3.8% of patients developed a complication of VTE prophylaxis, i.e. clinically significant bleeding.
- Administration of enoxaparin 30mg BID produced subtherapeutic anti-Xa levels in 35% of patients. However, VTE prophylaxis was effective in the majority of these patients, with only 6.7% of patients developing VTE.
- 77% of patients presented with traumatic brain injury (TBI) or spinal cord injury (SCI), additional indications for dosing enoxaparin at 30mg BID. [3]
- Based on low VTE incidence with a significant proportion of patients in the subtherapeutic anti-Xa range, the current therapeutic range for anti-Xa levels may not appropriately predict the risk for developing VTE in the elderly population.

Limitations/Conclusions

- While a significant portion of elderly trauma patients on LMWH for VTE prophylaxis did not demonstrate therapeutic anti-Xa levels, only a small proportion experienced complications of treatment, such as development of VTE or clinically significant bleeding.
- Limitations to this study include a its retrospective nature, small sample size, and data limited to a single institution.
- Future research is needed to evaluate the efficacy of LMWH dose adjustments at decreasing VTE incidence in elderly trauma patients using plasma anti-Xa monitoring.

Acknowledgements

I would like to thank the Division of Trauma & Critical Care in the LSU Department of Surgery for their support in this project and the Medical Student Research Symposium committee for the opportunity to present today.

References

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