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Cellular Indices as Inflammatory Biomarkers in Acute PE

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Hypothesis:

- Inflammatory biomarkers and cellular indices of inflammation will be elevated in acute PE patients relative to healthy controls.

Pulmonary Embolism Introduction

- a) Formation of a thrombus within the pulmonary arteries or its branches
 - i) leads to impairment of blood flow and oxygen exchange in the lungs
- b) Often fatal
- c) Incidence : 60-70 out of 100,000
- d) Triggers inflammation within the blood
 - i) Quantified through clinical laboratory testing and measurement of thrombo-inflammatory biomarkers
 - ii) May have predictive implications with regard to measurable clinical outcomes

Complete Blood Count (CBC)

- a) Measures 4 major components: RBC, WBC, PLT , and HCT

- b) Ratios previously found to be associated with inflammation:
 - i) NLR: neutrophil to lymphocyte ratio
 - ii) PLR: Platelet to lymphocyte ratio
 - iii) Plt: Hgb – Platelet to hemoglobin

Thrombo-Inflammatory Biomarkers

- Utilized in guiding diagnostic and therapeutic efforts.
- Thrombo-inflammatory biomarkers of interest:
 - PAI-1 (ng/ml)
 - D-Dimer (ng/ml)
 - XIII-A (%)
 - CRP (ug/ml)
 - Microparticles (nM)
 - vWF (%)
 - uPA (ng/ml)
 - TNF-a (pg/ml)

Data Analysis

- Data source
 - Electronic medical records (EMR) of 419 patients

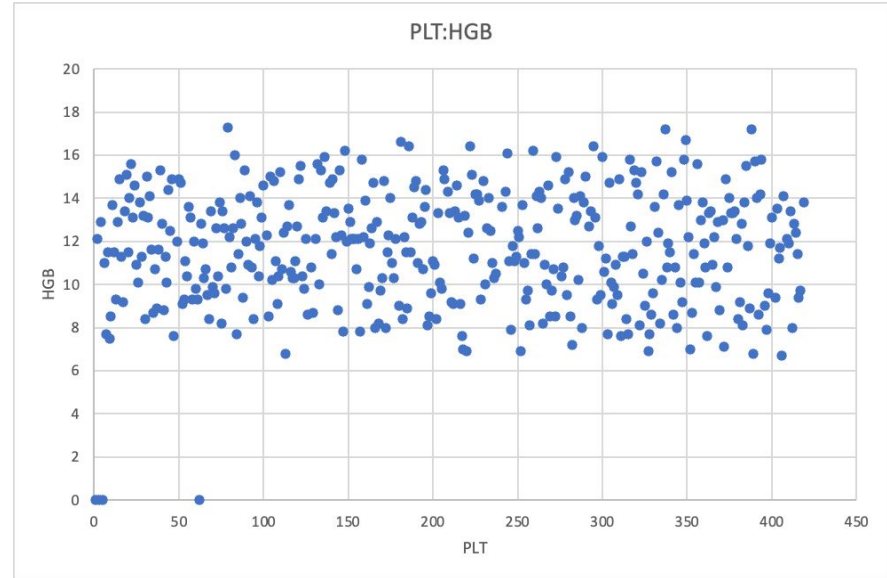
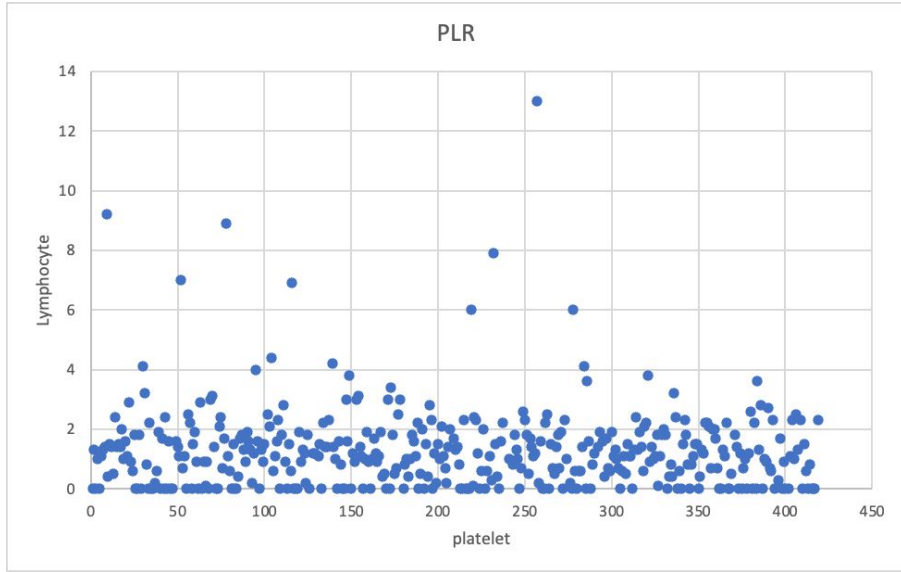
Table 1. Patient demographics

Parameter	
Mean age	63.7
Mean BMI	31.03
Malignancy	128

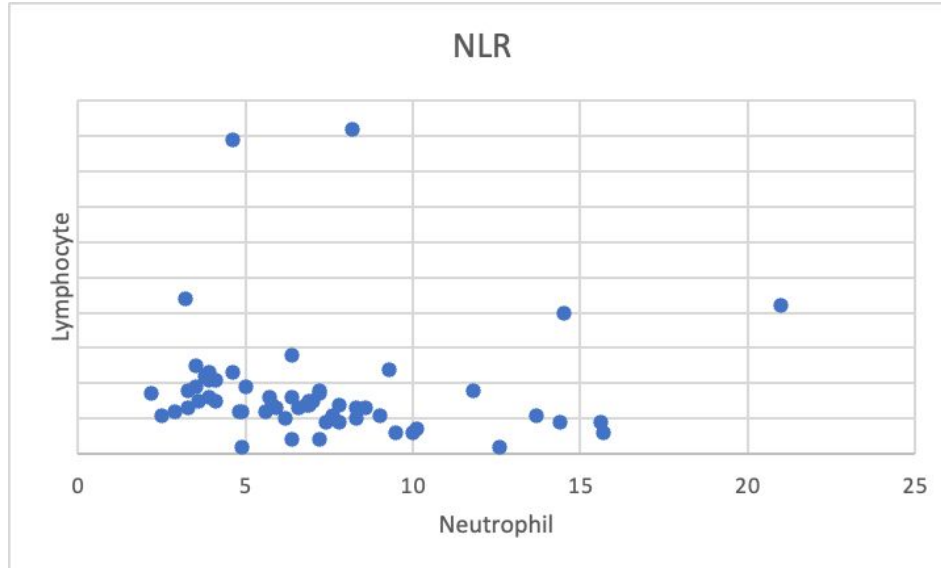
Table 2. Cellular indices of inflammation

Neutrophil to Lymphocyte ratio	7.705995771
Platelet to hemoglobin ratio	21.5787232
Platelet to lymphocyte ratio	220.7621659

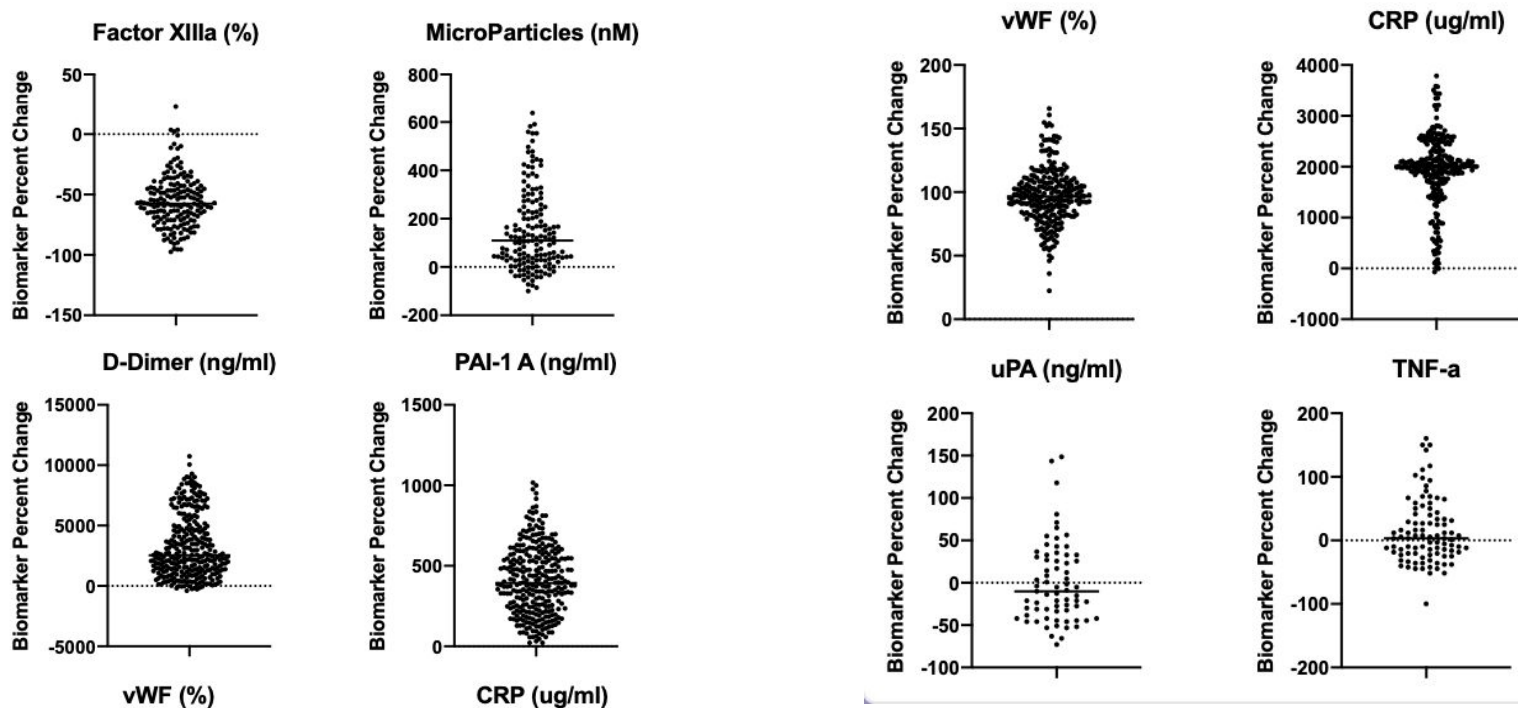
Data Analysis



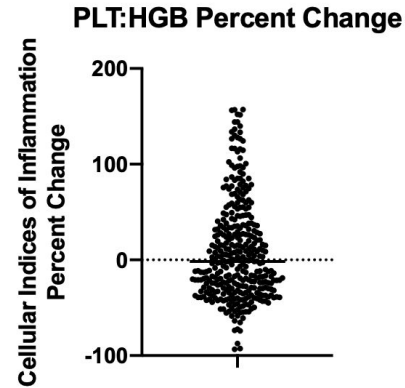
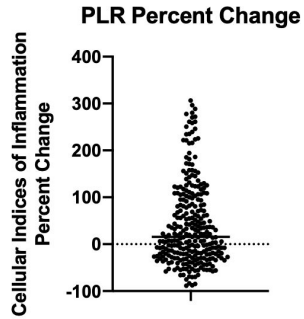
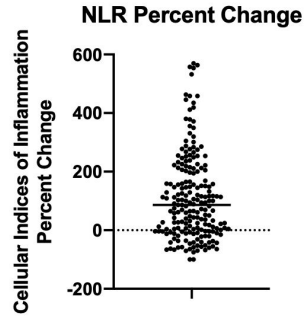
Data Analysis



Percent change of thrombo-inflammatory biomarkers relative to healthy controls



Percent change of cellular indices of inflammation relative to healthy controls



Analysis of Variance (ANOVA)

- a) Statistical modeling done to analyze and determine statistical significance between means.
- b) Measurements reported as p values
- c) Conventional statistical significance accepted when $p < 0.05$

Biomarker	Adjusted P Value
Factor XIIIa	<0.0001
MicroParticles	<0.0001
D-Dimer	>0.9999
PAI-1 A	<0.0001
vWF	<0.0001
CRP	>0.9999
uPA	0.9367
TNF-a	0.2618

Conclusion

- a) Healthy control values:
 - i) Neutrophil to lymphocyte:
 - (1) 1.1 – 3.53 (determined ratio ≈ 7)
 - ii) Platelet to hemoglobin:
 - (1) 1.60 (determined ratio ≈ 21)
 - iii) Platelet to lymphocyte:
 - (1) >110.63 considered high (determined ratio ≈ 220)
- b) Cellular indices of inflammation will be elevated in acute PE patients relative to healthy controls.

Conclusion

- In conclusion, my research found that inflammatory biomarkers (CRP, D-Dimer, MicroParticles, PAI-1, vWF, uPA, and TNF- α) as well as cellular indices of inflammation (NLR, PLR, and plt:hgb) were elevated in acute PE patients relative to healthy controls.
- However, my research also found that inflammatory biomarker Factor XIIIa was not elevated in acute PE patients relative to healthy controls.
 - It decreased
 - Studies found an association between abnormal FXIIIa levels and function with thrombosis risk.

Discussion

- a) Currently using sPESI as a predictive model for mortality outcome
 - i) has a low positive predictive value

- b) Data analysis can be used to further augment current tools, such as sPESI scores, to risk stratify patients with acute PE.

Future Plans

- Abstract for the 2023 Experimental Biology Meeting
- Potential publication for the International Union of Angiology (IUA)
- Continued research on FXIIIa and its implication in PE

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References

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