Variability and Discordance Among Assays for Monitoring Anticoagulation During Extracorporeal Membrane Oxygenation

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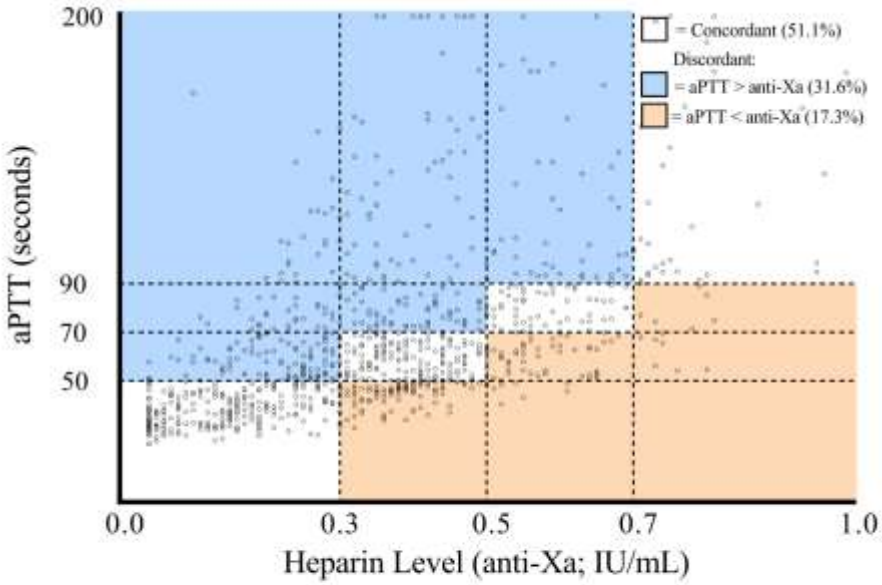
Objectives: The optimal method for monitoring of anticoagulation in patients on extracorporeal membrane oxygenation (ECMO) is unknown. The objective of this study was to assess the relationship between anti-factor Xa level (anti-Xa; IU/mL) and activated partial thromboplastin time (aPTT; seconds) for monitoring intravenous unfractionated heparin (UFH) anticoagulation in adult ECMO patients.

Materials and Methods: Charts of all adult patients cannulated for ECMO from 2015 through 2017 were reviewed and laboratory and heparin infusion data were extracted for analysis. Time matched pairs of anti-Xa and aPTT were considered concordant if both laboratory values were within the same clinically utilized range. A hierarchical logistic regression model was used to determine factors associated with discordance while accounting for patient level effects.

Results: A total of 1016 paired anti-Xa and aPTT values from 65 patients were evaluated. Anti-Xa and aPTT were discordant in 500 (48.9%) paired samples with a high degree of variability on linear regression (R2 = 0.33, Figure). The aPTT fell into a higher therapeutic range compared to the anti-Xa range in 31.6% and lower in 17.3%. Logistic regression demonstrated that discordance was independently associated with time from initiation of ECMO (OR 1.28 per day, $p<0.001$), fibrinogen level (OR 1.002, $p=0.044$), and INR (OR 3.22, $p<0.001$).

Conclusions: Half of all anti-Xa and aPTT values were in discordant ranges and discordance is more likely as the time on ECMO increases. The use of either assay in isolation to guide UFH therapy may lead to the over or underestimation of the degree of anticoagulation in complex ECMO patients.

Figure. Plot of paired aPTT and anti-Xa lab values



Axes include cutoff points for the clinically utilized, institutionally determined lab value ranges. An aPTT of 50 to 90 is considered therapeutic with 70 determining the difference between the goal range for high and low bleeding risk patients. An anti-Xa of 0.3 to 0.7 is considered therapeutic with 0.5 determining the difference between the goal range for high and low bleeding risk patients. aPTT, activated partial thromboplastin time; anti-Xa, anti-factor Xa level.