Assessment of the Coagulopathy of Burns with Thromboelastometry

Presenting Author	Constance Joel, MD, Resident, Joseph M. Still Burn Center, Doctors Hospital, Augusta, GA
Co-authors	Marcos Aranda, MD, Dwight D Eisenhower Army Medical Center, Ft Gordon, GA Christopher A. Truelove, Jr., JSCIN, RRT-NS PhD Student, Augusta University, Augusta, GA Michael Quinn, MD, JMS Burn Center, Augusta, GA
Disclosure Information	Author and Co-authors have no relevant financial relationships to declare

Abstract

Introduction: Burn coagulopathy has been well documented and is multifactorial. There has been some research using thromboelastometry for predicting the development of coagulopathy on admission, and limited data at time of excisional surgery. The longitudinal change in thromboelastometry over time and correction of these changes needs better defined. Additionally, most of these studies have been of low volume, and this study would be an important addition to the literature for future systematic reviews.

Methods: From November 2016 to August 2019, de-identified information of patients with greater than 20% burns who had a thromboelastometry was retrospectively reviewed for their age, mechanism of burn, their percent body surface area burned (BSA), length of stay, number of surgeries, estimated blood loss (EBL), transfusions, presence of inhalation injury, presence of venous thrombosis, and presence of GI bleed. The thromboelastometry 24 hours before and after surgery were reviewed for change over time numerically and categorically and for associations with patient characteristics including venous thromboembolism (VTE) and inhalation injury.

Results: Thirty patients were identified. The median time to collection of their first perioperative thromboelastometry was 3 days, the second was also 3 days, the third was 18 days, the 4th was 30.5 days, and the 5th was 37.5 days. BSA was correlated with APTEM Clot time on the first thromboelastometry by quantitative analysis. Total EBL for the hospital course was correlated qualitatively by INTEM clot time on the second thromboelastometry and quantitatively by INTEM, APTEM, and EXTEM CFT. Total packed red blood cell (PRBC) transfusions were correlated with INTEM, APTEM, and EXTEM MCF. There were 10 inhalation injuries which had no correlation with any quantitative or qualitative measures on thromboelastometry. VTE was correlated with EXTEM max lysis on the second thromboelastometry by quantitative analysis. The only significant change over time was between the 4th and 5th thromboelastometry.

Conclusion: In a limited sized study, thromboelastometry at a median of 3 days was useful in projecting future transfusion requirements. Changes in thromboelastometry over time are limited. BSA may be useful in predicting the development of coagulopathy even in those with more than 20%.

Learning Objectives
Discuss the use of thromboelastometry in burn patients

References
1 Glas GJ, Levi M, and Schultz MJ: Coagulopathy and its management in patients with severe burns. Journal of Thrombosis and Haemostasis 2016; 14(5): 865-874. DOI: 10.1111/jth.13283
2 King DR, Namias N, Andrews DM. Coagulation abnormalities following thermal injury. Blood, coagulation, and fibrinolysis. 2010; 21(7): 666-669. Doi: 10.1097/MBC.0b013e32833ceb08.
3 Ball R, Keyloun K, Brummel-Ziedins K et al. Burn-Induced Coagulopathies: A comprehensive review. Shock. 2019. doi: 10.1097/SHK.0000000000001484.
4 Wiegele M, Schaden E, Koch S et al. Thrombin generation in patients with severe thermal injury. Burns. 2019; 45(1): 54- 62. Doi: 10.1016/j.burns.2018.09.020.
5 Marsden NJ, Van M, Dean S et al. Measuring coagulation in burns: an evidence-based systematic review. Scars, burns, & healing. 2017;3: 2059513117728201. Doi: 10.1177/2059513117728201.
6 Meizoso JP, Ray JJ, Allen CJ et al. Hypercoagulability and venous thromboembolism in burn patients. Seminars in thrombosis and hemostasis. 2015; 41(1): 43-48. Doi: 10.1055/s-0034-1398380.
7 Huzar TF, Martinez E, Love J et al. Admission Rapid Thromboelastography (rTEG) Values Predict Resuscitation Volumes and Patient Outcomes After Thermal Injury. Journal of Burn Care Research. 2018; 39(3):345-352. doi: 10.1097/BCR.0000000000000593.
8 Welling H, Ostrowski SR, Stensballe J et al. Management of bleeding in major burn surgery. Burns. 2019; 45(4): 755- 762. doi: 10.1016/j.burns.2018.08.024.
9 Tapia NM, Suliburk J, et al: TEG-guided resuscitation is superior to standardized MTP resuscitation in massively transfused penetrating trauma patients. Journal of Trauma and Acute Care Surgery 2018; 74 :378–386.
10 Schaden E, Kimberger O, Kraincuk P et al. Perioperative treatment algorithm for bleeding burn patients reduces allogeneic blood product requirement. British Journal of Anesthesia. 2012; 109(3): 376-381. Doi: 10.1093/bja/aes186
11 Whiting D, DiNardo JA. TEG and ROTEM: Technology and Clinical Applications. American Journal of Hematology. 2013; 89(2): 228-232.