**Title:** TEG Talk: Using Thromboelastography to Guide Pharmacologic Treatment Decisions

**Presenter:** Allison Burdick, PharmD

 PGY-1 Pharmacy Resident

 UPMC Presbyterian

**Date:** 10/12/2022

**Learning Objectives:**

1. Identify thromboelastography (TEG) tracing components and interpret results
2. Recognize patient populations and disease states in which TEG may influence clinical decision making
3. Discuss literature regarding the use of TEG to guide pharmacologic treatment decisions

**Abstract:**

Thromboelastography (TEG) is a test that measures the efficacy of coagulation and can characterize the clotting cascade in real time. TEG is proposed to help manage bleeding by capturing a full picture of clot strength and formation. There are several advantages to using TEG over traditional coagulation assays such as assessment of platelet contribution, correlation with hypercoagulability and bleeding, evaluation of lysis, and the option for a point-of-care assay known as rapid TEG (r-TEG). Since its development in 1948, TEG has demonstrated utility in cardiac surgery, liver disease, and trauma resuscitation, which in combination with the limitations of traditional coagulation assays, have led to exploration in detecting pharmacologic agents and guiding treatment decisions. The lack of studies aimed at comparing TEG to standard coagulation assays in practice and standardizing ranges for TEG tracing components limits the role of TEG in the clinical setting.

**References:**

1. Adoption support resource – insights from the NHS. https://www.nice.org.uk/guidance/dg40/resources/adoption-support-resource-insights-from-the-nhs-pdf-11452187873221. Accessed October 5, 2022.
2. Bugaev N, Como JJ, Golani G, et al. Thromboelastography and rotational thromboelastometry in bleeding patients with coagulopathy: Practice management guideline from the Eastern Association for the surgery of trauma. *Journal of Trauma and Acute Care Surgery*. 2020;89(6):999-1017. doi:10.1097/ta.0000000000002944
3. Dias JD, Lopez-Espina CG, Ippolito J, et al. Rapid point-of-care detection, and classification of direct-acting oral anticoagulants with the TEG 6S: Implications for trauma and acute care surgery. *Journal of Trauma and Acute Care Surgery*. 2019;87(2):364-370. doi:10.1097/ta.0000000000002357
4. Dias JD, Norem K, Doorneweerd DD, Thurer RL, Popovsky MA, Omert LA. Use of thromboelastography (TEG) for detection of New Oral Anticoagulants. *Archives of Pathology & Laboratory Medicine*. 2015;139(5):665-673. doi:10.5858/arpa.2014-0170-oa
5. Fan D, Ouyang Z, Ying Y, et al. Thromboelastography for the prevention of perioperative venous thromboembolism in Orthopedics. *Clinical and Applied Thrombosis/Hemostasis*. 2022;28:107602962210779. doi:10.1177/10760296221077975
6. Figueiredo S, Vigué B, Benhamou D, Duranteau J. Emergency reversal of heparin overdose in a neurosurgical patient guided by thromboelastography. *British Journal of Anaesthesia*. 2013;111(2):303-304. doi:10.1093/bja/aet245
7. Furay EJ, Daley MJ, Satarasinghe P, et al. Desmopressin is a transfusion sparing option to reverse platelet dysfunction in patients with severe traumatic brain injury. *Journal of Trauma and Acute Care Surgery*. 2019;88(1):80-86. doi:10.1097/ta.0000000000002521
8. Gilbert BW, Adams TR, Reynolds TR, Moran DA, Philip GJ. Utilization of thromboelastography and a low molecular weight heparin anti-Xa assay for guidance in apixaban reversal: A case report. *The American Journal of Emergency Medicine*. 2019;37(10). doi:10.1016/j.ajem.2019.158369
9. Gilbert BW, Bissell BD, Santiago RD, Rech MA. Tracing the lines: A review of viscoelastography for emergency medicine clinicians. *The Journal of Emergency Medicine*. 2020;59(2):201-215. doi:10.1016/j.jemermed.2020.04.009
10. Gilbert BW, Ott MJ, Philip GJ. Thromboelastography utilization for dabigatran reversal in a patient with acute kidney injury. *American Journal of Health-System Pharmacy*. 2021. doi:10.1093/ajhp/zxab182
11. Groene P, Wagner D, Kammerer T, et al. Viscoelastometry for detecting oral anticoagulants. *Thrombosis Journal*. 2021;19(1). doi:10.1186/s12959-021-00267-w
12. Gum PA, Kottke-Marchant K, Welsh PA, White J, Topol EJ. A prospective, blinded determination of the natural history of aspirin resistance among stable patients with cardiovascular disease. *Journal of the American College of Cardiology*. 2003;41(6):961-965. doi:10.1016/s0735-1097(02)03014-0
13. Hranjec T, Estreicher M, Rogers; B, et al. Integral use of thromboelastography with platelet mapping to guide appropriate treatment, avoid complications, and improve survival of patients with coronavirus disease 2019–related coagulopathy. *Critical Care Explorations*. 2020;2(12). doi:10.1097/cce.0000000000000287
14. Kashuk JL, Moore EE, Sabel A, et al. Rapid thrombelastography (R-TEG) identifies hypercoagulability and predicts thromboembolic events in surgical patients. *Surgery*. 2009;146(4):764-774. doi:10.1016/j.surg.2009.06.054
15. Kashuk JL, Moore EE, Sabel A, et al. Rapid thrombelastography (R-TEG) identifies hypercoagulability and predicts thromboembolic events in surgical patients. *Surgery*. 2009;146(4):764-774. doi:10.1016/j.surg.2009.06.054
16. Kobayashi LM, Brito A, Barmparas G, et al. Laboratory measures of coagulation among trauma patients on NOAS: Results of the AAST-MIT. *Trauma Surgery & Acute Care Open*. 2018;3(1). doi:10.1136/tsaco-2018-000231
17. Kozek-Langenecker SA, Ahmed AB, Afshari A, et al. Management of severe perioperative bleeding. *European Journal of Anaesthesiology*. 2017;34(6):332-395. doi:10.1097/eja.0000000000000630
18. Liu J, Wang N, Chen Y, Lu R, Ye X. Thrombelastography coagulation index may be a predictor of venous thromboembolism in gynecological oncology patients. *Journal of Obstetrics and Gynaecology Research*. 2016;43(1):202-210. doi:10.1111/jog.13154
19. Matetzky S, Shenkman B, Guetta V, et al. Clopidogrel resistance is associated with increased risk of recurrent atherothrombotic events in patients with acute myocardial infarction. *Circulation*. 2004;109(25):3171-3175. doi:10.1161/01.cir.0000130846.46168.03
20. Neal MD, Moore EE, Walsh M, et al. A comparison between the TEG 6s and Teg 5000 analyzers to assess coagulation in trauma patients. *Journal of Trauma and Acute Care Surgery*. 2019;88(2):279-285. doi:10.1097/ta.0000000000002545
21. Rowe AS, Greene CL, Snider CC, et al. Thromboelastographic changes in patients experiencing an acute ischemic stroke and receiving alteplase. *Journal of Stroke and Cerebrovascular Diseases*. 2014;23(6):1307-1311. doi:10.1016/j.jstrokecerebrovasdis.2013.11.001
22. Sarker TT, Brophy D, Chitlur MB. Thrombelastography (TEG) and Thrombin Generation Assay (TGA) in severe hemophilia following factor replacement therapy. *Blood*. 2015;126(23):4666-4666. doi:10.1182/blood. v126.23.4666.4666
23. Tartamella F, Vassallo MC, Berlot G, Grassi P, Testa F. Thromboelastographic predictors of venous thromboembolic events in critically ill patients. *Blood Coagulation & Fibrinolysis*. 2016;27(7):804-811. doi:10.1097/mbc.0000000000000503
24. Thromboelastography - StatPearls - NCBI Bookshelf. https://www.ncbi.nlm.nih.gov/books/NBK537061/. Accessed October 5, 2022.
25. Tomescu D, Popescu M. Emergency surgery in a critically ill patient with major drug-induced bleeding and severe ischaemic heart failure. *The Journal of Critical Care Medicine*. 2017;3(1):34-38. doi:10.1515/jccm-2017-0003
26. Toukh M, Siemens DR, Black A, et al. Thromboelastography identifies Hypercoagulablilty and predicts thromboembolic complications in patients with prostate cancer. *Thrombosis Research*. 2014;133(1):88-95. doi:10.1016/j.thromres.2013.10.007
27. Tyler PD, Yang LM, Snider SB, Lerner AB, Aird WC, Shapiro NI. New uses for thromboelastography and other forms of viscoelastic monitoring in the Emergency Department: A narrative review. *Annals of Emergency Medicine*. 2021;77(3):357-366. doi:10.1016/j.annemergmed.2020.07.026
28. Volod O, Bunch CM, Zackariya N, et al. Viscoelastic hemostatic assays: A Primer on legacy and New Generation Devices. *Journal of Clinical Medicine*. 2022;11(3):860. doi:10.3390/jcm11030860
29. Volod O, Lam LD, Lin G, et al. Role of thromboelastography platelet mapping and international normalized ratio in defining “normocoagulability” during anticoagulation for mechanical circulatory support devices: A pilot retrospective study. *ASAIO Journal*. 2017;63(1):24-31. doi:10.1097/mat.0000000000000445

**Audience Response Questions:**

1. JF takes dual antiplatelet therapy with aspirin and clopidogrel at home. Which tracing component would be most affected by JF’s home medications?
	1. R
	2. K
	3. MA
	4. LY30
2. Based on the studies reviewed, what test would you use to distinguish between dabigatran and AFXa?
	1. TEG 6s
	2. Standard TEG
	3. r-TEG
	4. TEG-PM
3. Based on the case studies reviewed, which agents would you consider TEG or r-TEG to guide reversal?

I. Heparin

II. Dabigatran

III. VKA

* 1. I only
	2. II only
	3. I and II only
	4. I and III only