Use of Viscoelastic Testing in Trauma Patients

Nicolas Chanes[1]; Shyam Murali, MD[2]; Eric Winter, BS[2]; Madhu Subramanian, MD[2]
Allyson Hynes, MD[2]; Mark Seamon, MD[2]; Jeremy Cannon, MD[2]; Alison Smith, MD, PhD[1]
[1]LSUHSC School of Medicine, Department of Trauma Surgery
[2]University of Pennsylvania, Division of Traumatology

Introduction

- Approximately 25% of trauma patients develop some form of coagulopathy that impacts their clinical course (1).
- Trauma-induced coagulopathy (TIC) carries significant risk, with TIC+ patients experiencing up to three times the mortality rates of TIC- patients (2).
- Despite awareness of this increased mortality and improvements in damage control resuscitation, the etiology of TIC has not been fully elucidated and is likely multifactorial (3).
- Currently, the management of TIC relies on standardized treatment protocols that do not address the nature of the hemostatic deficits, but rather provide blood products in proportions that approach the composition of whole blood (4).
- Thromboelastography (TEG) and rotational thromboelastometry (ROTEM), which provide a point-of-care assessment of global clot formation and dissolution, have become an integral part of the management of trauma patients as they can be used in real time to guide the transfusion of blood products.
- Recent investigations have suggested that the use of TEG/ROTEM testing may be of value in the early management of trauma patients; however, there is a need for determining the specific TEG/ROTEM criteria and thresholds that guide hemostatic resuscitation and predict mortality (5).

Objectives

- Conduct a retrospective review of a pre-existing database containing adult trauma patients who required massive transfusion protocol and had viscoelastic testing (TEG or ROTEM) in order to develop a TEG score that may be used to better guide future practice.
- Use the findings we obtain from this study to determine the specific TEG/ROTEM criteria and thresholds that guide hemostatic resuscitation and predict mortality.

Methods

- This was a secondary analysis of a multicenter retrospective review, which included adult patients receiving massive transfusion protocol at 7 level 1 trauma centers (2012-2018).
- TIC was defined using a “TEG score” with one point assigned for abnormalities in each of the following:
  - Clot time (>8.9 min)
  - Alpha angle (<65 degrees)
  - Clot strength (<55 mm).
- TIC+ patients (TEG score 1-3) were compared to TIC- patients (TEG score 0).
- Multiple regression was used to control confounding variables while evaluating the association between abnormal TEG values and the endpoints of in-hospital mortality (primary outcome) and 24-hour blood product transfusion (secondary outcome).

ROTEM and TEG Explained

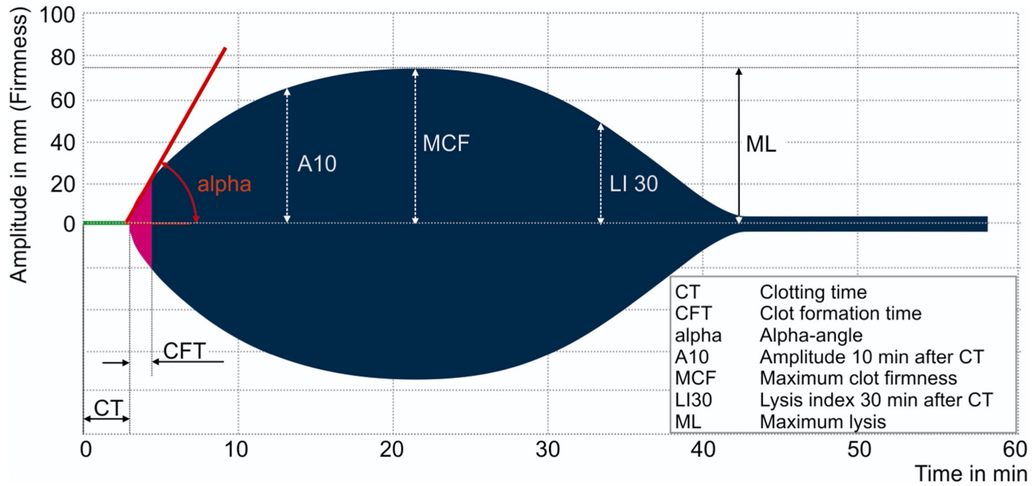
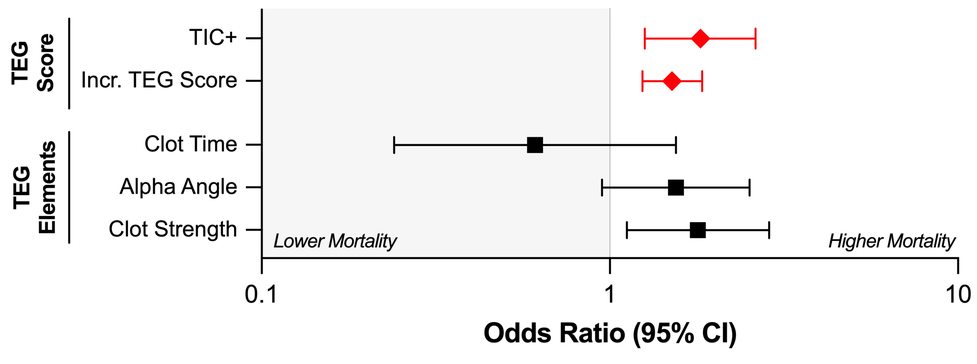


Figure 1. A typical ROTEM trace (top) and TEG trace (bottom). Adapted from Sinclair, et. al (6).

Results



Results (con’t)

- Of 1,145 total patients, 442 (38.6%) were TIC+.
- On adjusted analysis, abnormal clot time significantly predicted 24-hour platelet (p<0.001) and cryoprecipitate (p=0.046) transfusion requirements.
- Abnormal alpha-angle similarly predicted 24-hour platelet (p<0.001) and cryoprecipitate (p<0.001) transfusion.
- Abnormal clot strength predicted in-hospital mortality (p=0.015) and 24-hour fresh frozen plasma transfusion (p=0.016).
- Increasing TEG score significantly predicted mortality (p<0.001), 24-hour packed red blood cell (p=0.028), and 24-hour platelet transfusion (p<0.001).

Conclusions and Future Directions

Conclusions

- Abnormal TEG values are independently associated with greater transfusion requirements and increased mortality.
- A TEG score based on the number of abnormal parameters reliably identifies TIC and an increased score is associated with greater TIC severity.

Future Directions

- Further research is needed to validate the TEG score in a prospective manner.

References

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