Major Thromboembolic Complications in Liver Transplantation

Saner, Fuat H.; Bezinover, Dmitri; Blasi, Annabel; Lisman, Ton; Weiss, Emmanuel

Published in:
Transplantation

DOI:
10.1097/TP.0000000000003656

Major Thromboembolic Complications in Liver Transplantation: The Role of Rotational Thrombelastometry and Cryoprecipitate Transfusion

Fuat H. Saner, MD,[1] Dmitri Bezinover,[2] Annabel Blasi,[3] Ton Lisman,[4] and Emmanuel Weiss[5]

We read with great interest the study published by Nguyen-Buckley et al[1] and congratulate the authors on their study. The authors found that rotational thrombelastrometry (ROTEM)-guided coagulation management was associated with more frequent cryoprecipitate transfusions, and an increase in both thromboembolic events and worse 1-year survival. We feel that their conclusion that ROTEM-guided coagulation management may result in increased thrombotic events does not accurately reflect the results of their study because:

1. The algorithm used for cryoprecipitate administration in this study can lead to cryoprecipitate overtransfusion resulting in a hypercoaguable state. Moreover, FIBTEM MCF reflects fibrinogen contribution to the clot formation, but does not reflect the need for cryoprecipitate administration.
2. ROTEM-guided coagulation management was associated with an increase in the number of cryoprecipitate units transfused from 1.6 to 2.9. Although this may be statistically significant, it may be clinical irrelevant because the fibrinogen content of the difference in cryoprecipitate administered is likely insufficient to affect coagulation.
3. A ROTEM-based algorithm for PCC and fibrinogen concentrate (FC) administration during liver transplantation (LT) has been reported by Kirchner et al.[2] They found no significant differences in thromboembolic events between patients receiving FC and those who did not. In contrast to FC, cryoprecipitate also contains Factor VIII and von-Willebrand factor, which accelerates hemostasis, substantially increased in cirrhotic patients. With ROTEM-guided cryoprecipitate administration, a further increase in the plasma levels of these 2 factors must be taken into consideration. In addition, it has been clearly demonstrated that a ROTEM-guided hemostasis management is associated with a significant decrease in blood product administered.[3]
4. The large number of red blood cells (RBCs) and fresh frozen plasma (FFP) transfused (mean of 25 units RBCs and 25–30 units FFP per case) is surprising. The median lab-model of end-stage-liver disease (MELD) score in Kirchner's study was 21 compared to Na-MELD of 30.5 in the study by Ngyuen-Buckely et al. Although these patients appear to be sicker, blood product use of >20 RBCs per case cannot be explained solely by an increased MELD score. In addition, the authors did not report whether the MELD scores were calculated or included exception points.
5. From the study methods, it is also unclear whether transfusions were performed using a standardized protocol or what the transfusion targets were. The substantial amount of blood products transfused alone may have been associated with significant side effects, including thrombosis and increased portal venous pressure resulting in increased bleeding.[4]
6. In this study, with almost constant RBC and FFP transfusion, ROTEM-based fibrinogen management becomes relative because coagulation factors, including fibrinogen, are constantly being added.
7. Several important factors including donor risk index, cause of end-stage liver disease, previous history of thromboses and other, were not included in the study.

The value of viscoelastic testing to identify fibrinogen deficiency and to guide transfusion management during LT has been demonstrated in several publications. The clinical interpretation and integration into patient management remains the responsibility of the provider. Physicians should not be discouraged to continue to use viscoelastic testing during LT.

REFERENCES

1. Nguyen-Buckley C, Gao W, Agopian V, et al. Major thromboembolic complications in liver transplantation: the role of rotational thromboelastometry and cryoprecipitate transfusion. *Transplantation*. [Epub ahead of print. August 24, 2020]. doi: 10.1097/TP.0000000000003427

Received 15 November 2020.

Accepted 8 December 2020.

[1] Department of General, Visceral and Transplant Surgery, Medical Center University, Duisburg-Essen, Germany.

[2] Department of Anesthesiology and Perioperative Medicine, Penn State Health Milton S. Hershey Medical Center, The Pennsylvania State University, Hershey, PA.

[3] Anesthesiology Department, Hospital Clínic, Institute d'Investigacions Biomèdica Agustí Pi i Sunyer (IDIBAPS), University of Barcelona, Barcelona, Spain.

[4] Surgical Research Laboratory and Section of Hepatobiliary Surgery and Liver Transplantation, Department of Surgery, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands.

[5] Department of Anesthesiology and Critical Care, Beaujon Hospital, DMU Parabol, AP-HP Nord, Paris, France.

F.S. received fees from speaker's bureau of CSL Behring and Werfen but no funding for the article. The other authors declare no funding and conflict of interests.

All authors contributed substantially to the article design. F.S. wrote the article; D.B., A.B., T.L., and E.W. contributed to critical revision of the article for important intellectual content. All authors read and approved the final version of the article.

Correspondence: Fuat H. Saner, MD, Department of General, Visceral and Transplant Surgery, Medical Center University, Duisburg-Essen, 45130 Essen, Germany. (fuat.saner@uni-due.de).

ISSN: 0041-1337/21/1055-e58

DOI: 10.1097/TP.0000000000003656

<zdoi;10.1097/TP.0000000000003656>

2. Kirchner C, Dirkmann D, Treckmann JW, et al. Coagulation management with factor concentrates in liver transplantation: a single-center experience. *Transfusion.* 2014;54(10 Pt 2):2760–2768.
3. Bonnet A, Gilquin N, Steer N, et al. The use of a thromboelastometry-based algorithm reduces the need for blood product transfusion during orthotopic liver transplantation: a randomised controlled study. *Eur J Anaesthesiol.* 2019;36:825–833.
4. Giannini EG, Stravitz RT, Caldwell SH. Correction of hemostatic abnormalities and portal pressure variations in patients with cirrhosis. *Hepatology.* 2014;60:1442.